Lake Minchumina, Telida, Nikolai, and Cantwell Subsistence Community Use Profiles and Traditional Fisheries Use

Technical Paper No. 295

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Alaska Department of Fish and Game
Division of Subsistence
Juneau, Alaska

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ABSTRACT

This report describes subsistence fishery uses, needs, and areas traditionally used for subsistence harvests by the subsistence residence zone communities of Denali National Park and Preserve: Lake Minchumina, Nikolai, Telida, and Cantwell. Subsistence fishery harvest areas and practices have always been dynamic. A goal of this project was to document fish use at a particular point in time. During the fieldwork for this project conducted in 1999-2003, residents of all four communities reported that some of the subsistence fish species they depend on are in decline. Nikolai and Telida residents noted declines in Chinook salmon and whitefish which they attributed to commercial fishing and changes in the environment. Lake Minchumina residents noted changes in the lake due to silting and a general drop in the water table, which they believe has affected fish habitat. Cantwell residents noted a general decline in the abundance of grayling and other freshwater species which they attribute to over harvest by urban sport fishers.

Keywords: Cantwell, Chinook salmon, Denali National Park and Preserve, Lake Minchumina, Nikolai, Telida, traditional ecological knowledge, traditional management practices, USFWS Fishery Resource Monitoring Program, whitefish.

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CHAPTER ONE: INTRODUCTION

This report presents information about subsistence uses and Traditional Ecological Knowledge (TEK) of fish in the four subsistence resident zone (SRZ) communities of Denali National Park and Preserve (DNP), Alaska: Cantwell, Lake Minchumina, Nikolai, and Telida (Figure 1.1). The term "subsistence resident zone" pertains to an area within, and the communities and areas near, a national park in Alaska in which persons who have customarily and traditionally engaged in subsistence uses within the national park permanently reside. All residents of SRZ communities may engage in authorized subsistence activities in the national park.

The purpose of this research was to complete a comprehensive report on the current subsistence fishery issues, customary and traditional uses (C&T), TEK, harvests and local capacity building in the four DNP resident zone communities. The hypothesis under which this research was conducted is that SRZ communities depend on subsistence fishery resources. Subsistence fishery uses have always been fluid. The aim of this research was to document the current state (circa 2000) of the changing subsistence fisheries in each community and show the continued importance of these subsistence fisheries even as they change. Recent changes will be shown by comparing data in this report with earlier studies including research in Cantwell by Stratton and Georgette (1984) and Lake Minchumina by Bishop (1978). The findings of two studies conducted by Jeff Stokes in 1982 and 1985: *Natural Resource Utilization in Four Upper Kuskokwim Communities* (ADF&G Subsistence Division Technical Paper #86) and *Subsistence Salmon Fishing in the Upper Kuskokwim River System*, 1981-1982 (ADF&G Subsistence Division Technical Paper #23) will be compared with research in this report from Nikolai and Telida.

This research was jointly funded by the National Park Service (NPS) and the U.S. Fish and Wildlife Service (USFWS), Office of Subsistence Management, Fisheries Resource Monitoring Program (FRMP). The subsistence fish and wildlife research mandates of both agencies can be found in the Alaska National Interest Conservation Act (ANILCA). The act was passed by Congress in 1980 and created 104 million acres of new national parks, preserves and wildlife refuges. Title VIII of ANILCA mandates a subsistence priority for rural residents on these federal lands. Further, section 812 of ANILCA specifies:

> …The Secretary, in cooperation with the State and other appropriate Federal agencies, shall undertake research on fish and wildlife and subsistence uses on the public lands, seek data from, consult with and make use of, the special knowledge of local residents engaged in subsistence uses and make the results of such research available to the State, the local and regional councils established by the Secretary of State pursuant to section 805, and other appropriate persons and organizations…
>
> Both agencies provided funding for research consistent with the mandate of ANILCA.

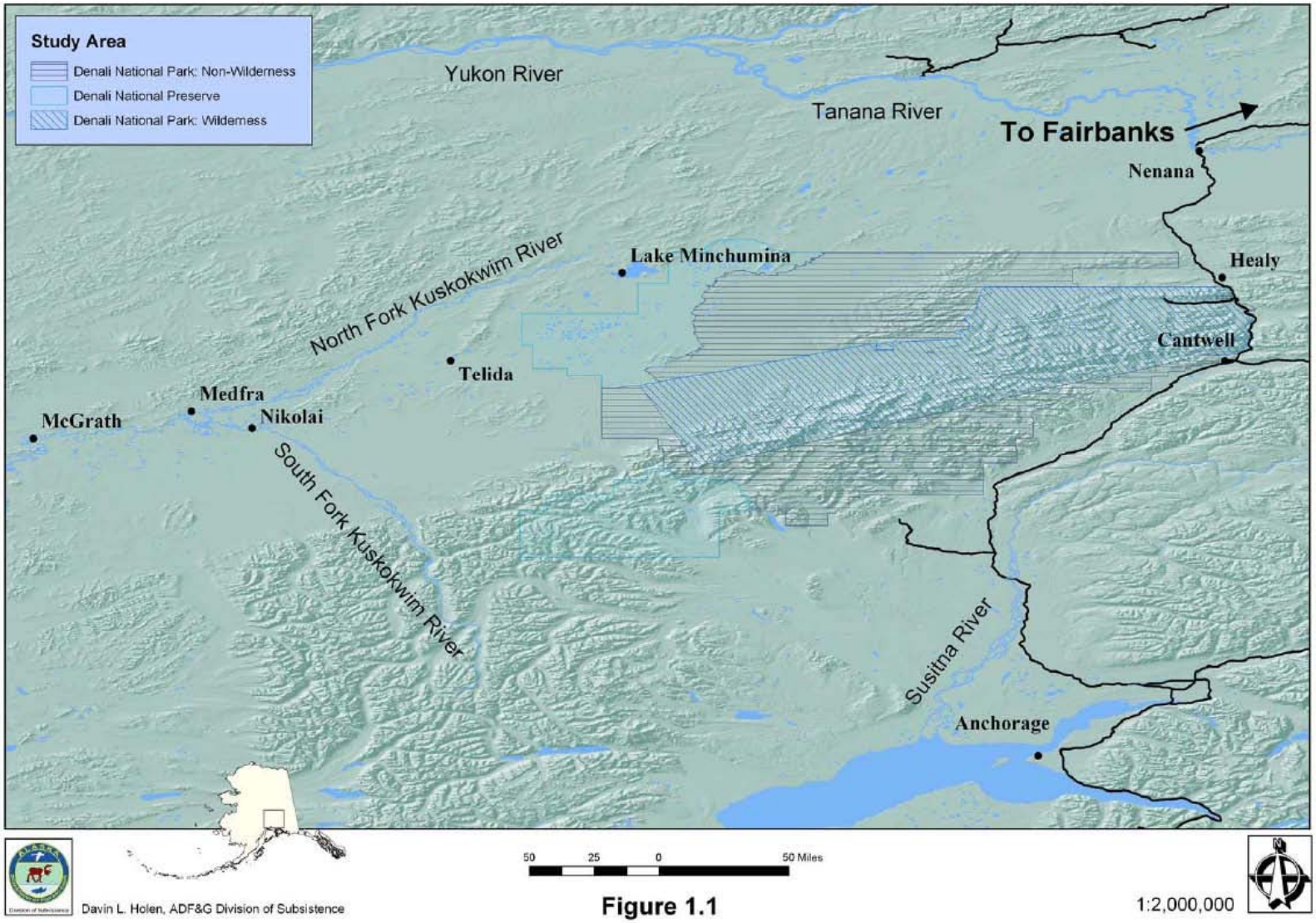

Study Area
Denali National Park: Non-Wilderness
Denali National Preserve
Denali National Park: Wilderness
Yukon River
Tanana River
To Fairbanks
Nenana
Healy
Lake Minchumina
North Fork Kuskokwim River
Cantwell
Telida
Medfra
McGrath
Nikolai
South Fork Kuskokwim River
Susitna River
Anchorage
50 25 0 50 Miles
Davin L. Holen, ADF&G Division of Subsistence
1:2,000,000

Figure 1.1

Traditional Ecological Knowledge

The reference in Section 812 to "special knowledge of local residents engaged in subsistence uses" refers in part to what is currently termed traditional ecological knowledge or TEK. There are many views on what TEK is and how or if it can be used in fish and wildlife management. In the particular application of this paper, TEK is viewed as a body of systematic knowledge derived from empirical data acquired over generations by subsistence fish and wildlife resource harvesters. It is important to emphasize that TEK is knowledge acquired by subsistence harvesters (Andersen 2004 personal communication). The empirical information gathered by subsistence harvesters and fishery managers is similar but their observations derive from different objectives. Managers may look at an entire watershed over a great geographic distance to study the entire life cycle of a fish species. Harvesters may look at local habitat and observe fish behavior that leads to a more efficient harvest such as migration and feeding. There are however, many points of intersection (life cycle, spawning habits, feeding habits, abundance) and these points are where TEK and western biological science (WBS) are symbiotic. Debates flourish as to whether or not TEK is compatible with or useful to WBS and vice versa. Since both TEK and WBS involve conclusions based on observation, it follows that the systems are complementary. It should also be noted that in theory, these two views are sometimes referred to as completely distinct…perhaps even two "pure" forms. In reality, among real people, many biologists and possessors of TEK readily consult with and work cooperatively with each other without using terms like TEK or WBS.

Fisheries Resource Monitoring Program

As noted, the USFWS Fisheries Resource Monitoring Program was implemented consistent with section 812 of ANILCA to address gaps in the information needed for the effective management of subsistence fishery resources. The four SRZ communities of DNP have a long history of subsistence use in and around the present boundaries of the park. However, TEK of subsistence species for these communities has only been partially documented and has not been updated. The purpose of the FRMP is to provide C&T, TEK, and harvest data to federal fishery management in order to conserve subsistence fisheries, ensure subsistence uses are given priority and to build capacity in rural communities and organizations to participate in fisheries management.

The data gathered for this report can be used by federal, state and other managers in multiple ways. In general, the information contained in this report contains information about the "customary and traditional" (C&T) uses of fish species for subsistence. Specifically, because this report contains information such as fish biology-TEK, observations of changes in returns of certain species, climate change and the effects of regulation on customary and traditional practices it provides considerable contextual information for managers.

Customary and traditional uses of fish and wildlife resources for subsistence on federal lands are protected under ANILCA. The information provided in this report is intended to assist federal managers in maintaining the sustainability of subsistence fisheries by providing insights and information from communities, TEK. The eight federal C&T factors are categories of information managers use to design regulations--harvest seasons, gear types, use areas, that facilitate the continuity of the customary and traditional subsistence harvest. It should be emphasized that subsistence practices, resources, resource areas, and harvest gear change over time and are not "fixed entities" (Stokes 1985: 294). Andersen also noted: "Subsistence economies are resilient, enduring, changeable and complex systems" (2004: 143). For this reason, information on C&T factors, TEK and harvest assessments must be periodically updated.

Logistics

The fieldwork for this project took place over a five year period. This was in part due to funding availability, research staff availability, the logistics of travel in rural Alaska and community schedules. On several occasions, researcher availability did not coincide with the majority of residents being present in their community. There are times when a large portion of the population of Cantwell is moose hunting or Nikolai is absent from the village due to subsistence hunting and fishing in other locations and opportunities for wage work such as big game guiding and firefighting. When this happens, it slows down field work and when site visits can be made.

The first field research was conducted in Cantwell in 1999. The competition for subsistence resources in Cantwell is intense; due largely to the fact that Cantwell is the only Denali NP SRZ community on the road system. Cantwell residents therefore compete with sport hunters from urban areas for fish and wildlife. Because of the intense competition for large land mammals in this area, the NPS and the community of Cantwell requested that the management of large land mammals constitute the focus of this research. During subsistence harvest surveys conducted by ADF&G in 1983, large land mammals accounted for 70% of the subsistence harvest in Cantwell (Stratton and Georgette 1984: 178). Consequently, the focus of the 1999 research in Cantwell was not on fish, and only cursory information on fish is provided in this report. The funding for the large land mammal research in Cantwell was provided by the NPS. Bill Simeone, ADF&G Division of Subsistence, Rachel Mason, NPS, Don Calloway, NPS, and local assistants conducted the fieldwork in Cantwell.

The field work in Lake Minchumina and Telida began in 2001. Hollis Twitchell, Rachel Mason, and Don Calloway, all of NPS, conducted research in Telida for two days. As of 2001, only three people reside in Telida and the harvest survey and interview were conducted quickly. Also in 2001, Hollis Twitchell, NPS, began research in Lake Minchumina at a community meeting. In fall 2002 and summer 2003, two short field visits were made to Lake Minchumina. The visits were short because the community is small. It should be noted that several of the households at Lake Minchumina are accessible only by boat or snowmachine and unique arrangements for transportation to some households was required. Davin Holen, ADF&G

Division of Subsistence, Chelsie Venechuk, NPS and local assistants conducted the fieldwork in Lake Minchumina.

Fieldwork in Nikolai was conducted over several weeks between 2002 and 2003. NPS requested an in-depth study of fish TEK for this community based on recommendations from the Denali Subsistence Resource Commission (SRC) and a member of the Western Interior Regional Subsistence Advisory Committee (RAC). Both of these organizations are mandated in ANILCA to facilitate local input in the regulatory process and to ensure that resources are managed for a subsistence priority for rural residents. Corollary to subsistence priority management, the Denali SRC requested this information to create an inventory and assessment of the current fishery resources in and around Denali National Park (DNP). Because Nikolai and Telida residents are the current generation of some of the longest term inhabitants of the area now known as DNP, the Denali SRC recognizes that their knowledge and practices represent the core of subsistence in the Park. The majority of the FRMP funding received for this study was spent in Nikolai. Hence, most of the report is focused on Nikolai. Field work in Nikolai was conducted by Bill Simeone, Liz Williams, Davin Holen, of ADF&G Division of Subsistence and Chelsie Venechuk, NPS.

Demography

A factor that made this study both interesting and challenging was the demographic differences between the four study communities. Cantwell is the only study community on the road system and is the most ethnically diverse. Of the 222 residents of Cantwell in 2000 (see Table 1), 64% identified themselves as white, 23% identified themselves as Alaska Native and 12% identified themselves as multiethnic (population of two or more races) (U.S. Census 2000). In 2000, Lake Minchumina was populated by 32 people. Of these, 84% identified themselves as white, 3% Alaska Native and 13% identified themselves as multiethnic.

Table 1-1. Populations of the Study Communities, 1940-2000

Community	1940	1950	1960	1970	1980	1990	2000
Nikolai	n/a*	88	85	112	91	109	100
Telida	n/a	n/a	n/a	n/a	33	11	3
Lake Minchumina	n/a	60	n/a	n/a	n/a	32	32
Cantwell	17	67	85	62	89	147	222

Source: Rollins 1978, U.S. Census 2000, Alaska Department of Labor 1987, 2000
*n/a indicates data were not available

In Nikolai and Telida, Upper Kuskokwim Athabascans are the predominant ethnic group. In 2000, in Nikolai, 81% of the population identified themselves as Alaska Native, 19% identified themselves as white and no one self-identified as multiethnic. The entire population of Telida in 2000, 3 people, identified themselves as Alaska Native.

These demographic ratios are helpful in understanding why different types of information were collected in each community and show that the time depth of the residents of each community, in general, is different. All of the study communities were at one point originally Alaska Native (Athabascan) settlements or areas of occupation. With the exception of Lake Minchumina, all of the study communities are still populated in part by Alaska Natives. The Alaska Native and several of the non-native households of Cantwell have been in the area for multiple generations. Their view of the area and their subsistence harvest experience encompasses many changes over time. The more recent arrivals undoubtedly have acquired their own knowledge of the area but over a much shorter span of time. This may also be the case for the largely non-native population of Lake Minchumina. Although cultural affiliations are not necessarily attributable to ethnic background, in some cases there is a difference between the knowledge and harvest ethic of the various community groups. Many of the Alaska Native families and some of the non-native families who have been in the study communities over multiple generations appear to employ subsistence harvest concepts that are communal[1] and reflect aspects of the concept of usufruct, (sharing the benefits of common property). Another type of harvest ethic is apparent with some recent arrivals who have moved away from urban centers to "take care of themselves" by living a subsistence lifestyle that is more individuated. The differences in these two types of harvest ethic are often most manifest in patterns of subsistence resource sharing. Sharing occurs within both types of "harvest ethics". However, in the communal type-usufruct ethic, there tends to be more sharing and some households that specialize in providing subsistence resources to those who can procure only some or none for themselves.

Since the 1980s, significant demographic changes have occurred in three of the four research communities. In the 1990s, all the residents of Telida, except for one family, moved to Nikolai because the Telida school closed. The population of Nikolai expanded while the population of Telida went from thirty-three to three. This move led to changes in the areas where most Telida residents harvested fish and wildlife. Significantly, some of their past harvest areas were in or near Denali National Park. Now, the former Telida residents live further from the Park. Some families return to Telida to harvest whitefish, trap and other activities. Most former residents of Telida have shifted their subsistence harvest areas closer to Nikolai. According to some in the community, this was a difficult transition. Cantwell's population has virtually doubled within the last twenty years mainly due to in-migration. This increase in population has lead to increased competition for fish and wildlife resources on NPS lands open to subsistence. At the same time, the population of Lake Minchumina has decreased by half since the 1950s. Residents there have not yet experienced an increase in outside visitors, but they are concerned that plans for new avenues of access to their community might lead to increased pressure on fish and wildlife resources.

Subsistence harvesters continually adapt their harvests and use patterns in response to a wide variety of factors. Residents of Nikolai, Telida, Lake Minchumina, and Cantwell, age 40 and over, described factors that have affected patterns of subsistence harvests and land use during their lifetimes. These included signs of climate warming and of a drier climate, perceptions of declining abundance of certain fish species, new opportunities for wage work, new harvest

[1] According to Wolfe, "There is specialization in the subsistence economic system," there are a few highly productive "super households" that "harvest most of a community's wild food supply and distribute it along sharing networks to other households in the community" (Wolfe 1987: 2).

technologies, and economic issues such as lower fur prices. Additionally, in recent years, many of the areas and fishery resources utilized by these four communities have come under increasing pressure by non-local users. The perception of increased competition for fish and wildlife resources was most keenly felt by residents of Cantwell and Nikolai. Many urban dwellers have moved to Cantwell for subsistence opportunities that decrease as the population increases. One of Nikolai's most important and long-used subsistence Chinook salmon fishery sites is Salmon River. Nikolai residents reported seeing a recent increase in catch and release fishers from out of state and McGrath and McGrath guides and their clients using their ancestral fishing areas.

CHAPTER TWO: OBJECTIVES

The objectives of this research were to:

1) To update and expand information about subsistence uses and needs and areas traditionally utilized for subsistence by residents of Lake Minchumina, Nikolai, Telida, and Cantwell;
2) Document knowledge of fish populations, fish life histories, geographic distribution, fishing techniques, practices, and equipment;
3) Build community involvement and support by working cooperatively with Denali's subsistence resident zone communities to incorporate TEK into management programs;
4) Gather additional qualitative information regarding the eight factors used in making customary and traditional determinations by the Federal Subsistence Board.

The following pages illustrate that objectives 1, 2, and 4, were successfully accomplished. However, as listed, the objectives as listed are very general. Instead of gathering information about 2 or 3 fish species, data collection efforts were expended on a wide variety of fish types. This led to some information about a lot of fish species as opposed to specific information about a few species. The "general" information collected is useful in that it shows which species are the priority of community residents and which species deserve unique attention in future research.

It is more difficult to determine whether or not Objective 3 was met as capacity building and incorporating TEK into management is a process and no specific performance measures were specified.

Capacity Building

The capacity-building objective of this project is perhaps the least tangible and most difficult one for which to provide measurable results. This aim of this objective was to build community involvement and support by working cooperatively with Denali National Park's subsistence resident zone communities to incorporate TEK into management programs. In this section, we focus on capacity building in the community of Nikolai because that is where the most fieldwork was accomplished.

The first step toward capacity building in this project was to consult with the various tribal councils and community organizations. In every case researchers not only asked permission to conduct the research, but also asked for input on appropriate research topics and methods. In each instance the tribal councils agreed that documenting the role of subsistence is important and agreed to the study. Local assistants were hired in Nikolai, Cantwell, and Lake Minchumina, but

their involvement in the project varied from place to place. In Nikolai the local assistant examined the survey form and said there was no way she could ask people in the village the types of personal questions about harvests that were on the survey. She said it would be okay for us to do it but it would be considered rude if she did. In Cantwell, the tribe hired two local people to work on the harvest survey and they conducted most of the interviews.

In Nikolai we encountered several people who initially refused to participate in the survey. Some told us directly and sometimes a third party explained these refusals. In the past, some people had been shamed and ridiculed about the types of foods they ate. One man said, "Too many people have ridiculed me, I'm not talking about that!" This is mentioned because it emphasized to us in a very real way, the sensitive, fundamentally personal nature of the topic of subsistence, and the experiences some people have had that have led to shame and secretiveness about this aspect of their lives. This information is offered to provide awareness to anyone who does this type of research. People are not necessarily doing illegal or secret things, nor are they "anti-government" if they opt not to participate in this type of research.

The interesting part about these refusals is that the more times researchers returned to Nikolai, the more the people who had initially refused became more open to participating. One of the major reasons for this change in attitude appears to be researchers' willingness to eat all subsistence foods that were offered, participation in local activities and following up and spending time in the community. People in Nikolai were shocked when researchers took steam baths and ate the subsistence foods that were offered. The point here is that before any capacity can be built, a relationship of trust has to develop, and this takes time, multiple visits and the interest of researchers and residents.

Successful capacity building did not occur in the easily tangible form of local assistants doing harvest surveys themselves and extolling the virtues of documenting harvest assessment and TEK. Instead, it took place in conversations with residents about who researchers worked for, what researchers' philosophies are, what would happen to the information gathered, and residents' relationships with enforcement personnel and biologists as well as their feelings about government agencies. Researchers also told community residents that this project was an opportunity to document public opinion about resource management. This may be significant in a community where many people, including leaders, said they are uncomfortable with public speaking.

It is also significant that although Nikolai residents participated in the household survey, they told researchers what to do and how they wanted researchers to learn. Most residents said that researchers needed to go out and see and do, not just talk about things. They emphasized that the Athabascan way to learn is to signal a knowledgeable person that one is interested in a topic and then to listen. They instructed us not to ask questions. Several families invited researchers on trips to check fishnets, pick berries, fish for pike, take steam baths, and to share meals so that researchers would see the daily importance of subsistence foods.

Perhaps the best way to approach capacity building is to emphasize reciprocity. From the above, it is clear that the residents of Nikolai were attempting to build the capacity of researchers to understand the significance of their subsistence way of life. Another critical aspect of capacity

building is flexibility. Researchers went in with a research plan but amended it according to the wishes of the local study participants. The community identified important research topics and issues. This type of community input reflects the intent of Section 812 of ANILCA "…Federal agencies, shall undertake research on fish and wildlife and subsistence uses on the public lands, seek data from, consult with and make use of, the special knowledge of local residents engaged in subsistence uses…" Consulting with subsistence users does not solely entail gathering data bytes on fish life histories but consulting with, listening and responding to local concerns and issues regarding subsistence fisheries.

Once the field research was complete, researchers continued to maintain communication with the community. In fact, throughout the data analysis process, there has been a continued dialogue between the community and researchers. Preliminary data analyses have been sent to the community as they have become available for community revision.

It would be optimal if we could start a second phase of this research now that a relationship of trust, flexibility, communication, and mutuality has been established. Now that we have data and both the community and the researchers know each other better, more questions are coming from the community about plans for research on certain species thought to be in decline.

Also, researchers have been in contact with ADF&G biologists who work in the area and have acted as an introductory liaison between these researchers and the community. ADF&G Division of Commercial Fisheries biologists Doug Molyneaux and Sara Gilk, for example, consulted with Division of Subsistence researchers as they planned for projects in the Nikolai area. These projects involve local assistants, and the ADF&G biologists have the benefit of the community knowledge presented in this paper as a point of departure for relationship building when they arrive. These biologists invited ADF&G Division of Subsistence staff to participate with them and local assistants from Nikolai in these projects.

It is very difficult to measure whether and how the capacity-building objective has been achieved. Researchers hope that at least a foundation of capacity building was built through trust and dialogue with the community. Much of this report was "written" by the community, since it includes the opinions, issues and knowledge that the community told researchers they wanted documented. The next step will be to see how much community feedback is received on the report, what regulatory changes or additions the community decides to pursue and how partnerships between the community, researchers, and agencies facilitate these processes.

CHAPTER THREE: METHODS

In all four communities, research methods included a formal harvest survey, key respondent interviews, mapping harvest areas, and participant observation. The harvest survey and the protocol for the key respondent interviews was the same for all communities (Appendix A). (The protocol for key respondent interviews in Cantwell was different, as noted in the Introduction the focus of the interviews was large land mammals, not fish). Maps differ for each community, although the process of recording subsistence harvest information onto maps was the same. Opportunities for participant observation were varied according to community invitation. Community descriptions are included in this section to provide context for research method execution in each community.

In order to obtain informed consent from research participants, verbal and written descriptions of the research, its potential uses and the funding agencies were provided to each person prior to any research interaction. Fieldwork began the same way in each community. Researchers started with numbered household lists and local assistants were hired. A census sampling design was used for harvest surveys in each community. In some communities, local assistants conducted surveys; in others they facilitated agency researchers in conducting surveys. Preliminary contact with most households occurred during a baseline harvest assessment survey conducted for the NPS[2]. A chain referral sampling design was used to conduct key respondent interviews. Initial contacts for key respondents were made through tribal or community organization suggestion, local assistant introductions, and knowledgeable individuals met through surveys and referrals from other key respondents.

Key respondents were interviewed based on their subsistence harvest experience, past and present and length of time in the community. In most cases, we interviewed long-term residents of study communities but it was also important to gain the input of recent arrivals who participated in subsistence activities.

It is important to note that different researchers conducted the fieldwork in each community. Although the same survey instruments were used, different researchers and demographic differences between communities are factors that contributed to varied results for each community. The information in the sections on each community, description, field methods, results and discussion are the product of contributions from community residents, local assistants and all agency field staff listed in the introduction. Each section was written by the main field worker in that community. The section on Nikolai and Telida is written by Liz Williams and Chelsie Venechuk, the section on Lake Minchumina is written by Davin Holen and the section on Cantwell is written by Bill Simeone.

[2] Data from the harvest survey was not available at the time this report was prepared. The harvest survey data can be found in Alaska Department of Fish and Game, Division of Subsistence, Technical Paper No. 296.

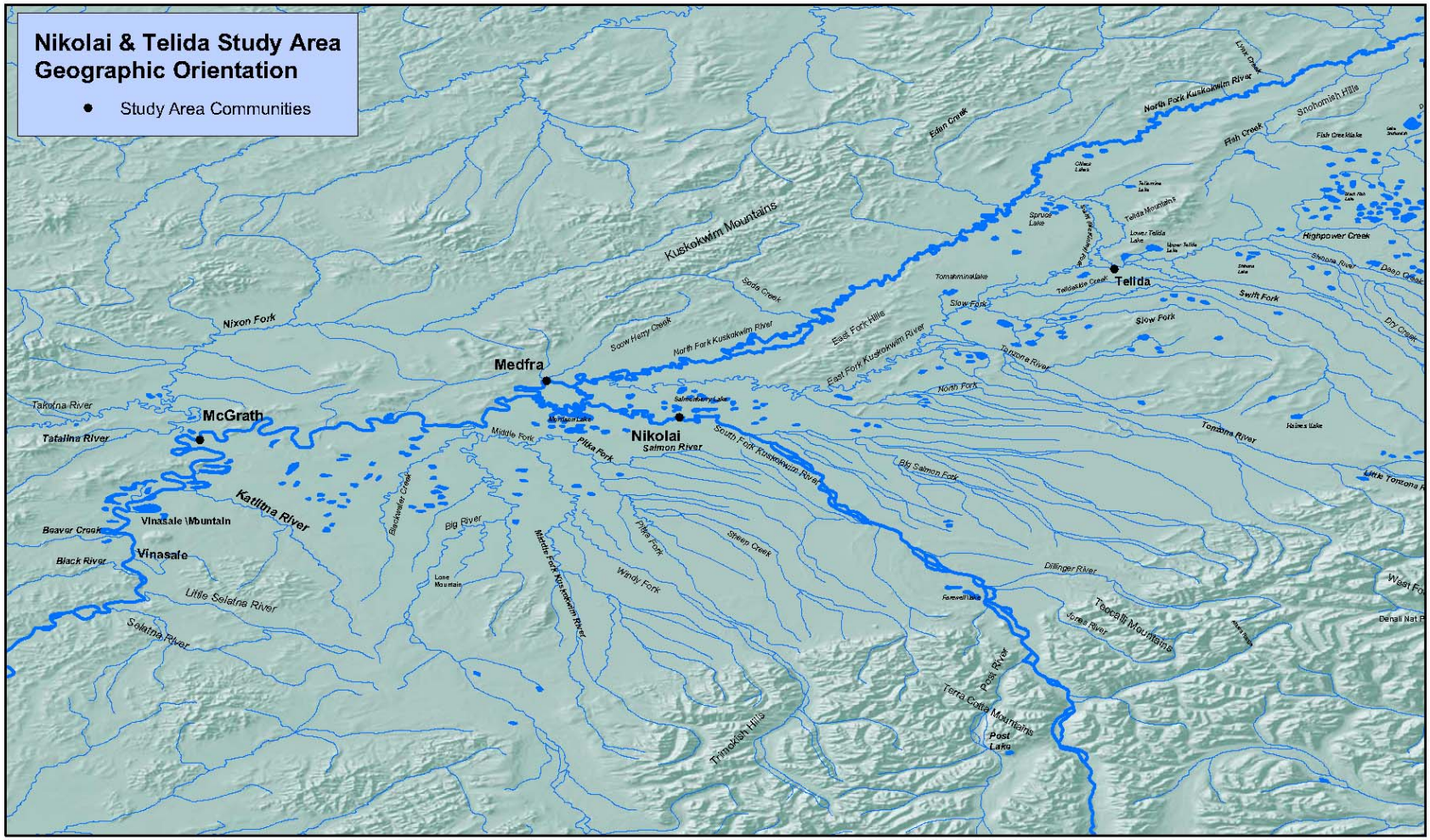
Community Description: Nikolai

Nikolai is a small Upper Kuskokwim Athabascan community located east of McGrath on the South Fork of the Kuskokwim River (Figure 3.1). The community is dependent on subsistence hunting, fishing, and gathering. Wage employment peaks in the summer when construction and firefighting jobs are available. Year-round wage employment includes positions in tribal and city government, the school, clinic and post office (Alaska Department of Community and Economic Development [ADCED]2004).

Prior to settling at a centralized village location, various families or bands lived nomadically in the area, hunting game in the mountains in winter and fishing in the lowlands in the spring and summer. The current village of Nikolai was established around 1918. Nikolai residents in their mid-fifties and older whose families settled in Nikolai much later, in 1948 when the school was established, recall the transition from semi-nomadism to village life that occurred in the late 1960's (Collins 2004: 18).

Nikolai was the site of a trading post and roadhouse during the gold rush in the early 20th century. It was situated on the Rainy Pass Trail, which connected the Ophir gold mining district to Cook Inlet. It became a winter trail station along the Nenana-McGrath Trail, which was used until 1926. Many elderly residents say they learned English when working with Euro-Americans who traveled through their homeland. In 1927, the St. Nicholas Orthodox Church was constructed. The first airstrip was built in 1963. Many current residents of Nikolai moved there from Telida when the school at Telida closed in the mid 1990s (ADCED 2003).

The Tribal Council is called the Nikolai Edzeno Tribal Council. Edzeno is an Upper Kuskokwim Athabascan word that refers to "place by the river". The river is considered a major provider of resources by community members. The river is a transportation corridor to hunting areas, fishing sites, wood gathering areas, and other communities in both summer and winter. Although "modern" conveniences are available, many people choose to maintain the traditional ways of doing things quite simply because they like them better. The river supplies the materials needed for these traditional activities. Nikolai has city water but many residents prefer to drink the river water because they say it tastes better. Most Nikolai residents seem to prefer to wash themselves in the steam bath instead of using the bathtubs and showers in their homes because they say a steam bath gets them clean from the inside out; not just on the surface like a shower. Several families prefer wood heat to more modern and expensive fossil fuel burning sources because to them, it is warmer, more dependable, and just feels better. These reflect the practicality and adaptability of the mixed cash-subsistence economy and lifestyle. The use of new technologies and traditional practices are not mutually exclusive; rather, they are complementary. A striking example of this is the persistence of the family fish camp at Salmon River. Nikolai families have had fish camps at Salmon River for generations and they persist in spite of technological (from fish trap to rod and reel) and regulatory (indigenous beliefs to sport fish bag limits to subsistence with rod and reel only) changes that might discourage others.



Davin L. Holen, ADF&G Division of Subsistence

Figure 3.1

The landscape, flora and fauna of the Nikolai and Telida area are typical of the boreal forest of interior Alaska. Historically, the Upper Kuskokwim has been an area of low biological carrying capacity; and the early Athabascans of this area responded to this constraint by pursuing an adaptation based upon small roving family bands (Hosley 1966, Zagoskin 1967, Oswalt 1968). Despite its low carrying capacity, the area has adequately supported the many families that have congregated from their own base camp locations to form the current village of Nikolai. Most Nikolai families return seasonally to ancestral subsistence harvest areas for their primary sources of food.

Fieldwork in Nikolai

ADF&G and NPS study personnel made six trips to Nikolai. In May 2002, ADF&G Division of Subsistence and NPS staff visited Nikolai to discuss the upcoming research with community members and to review the proposed key respondent questions regarding fish harvested for subsistence. ADF&G and NPS staff traveled to Nikolai during the week of August 5-13, 2002. During this time, they engaged in community outreach, conducted key respondent interviews, mapped past and present fishery harvest areas, and were participant observers in various subsistence activities. From September 30 to October 12, 2002, ADF&G and NPS researchers went to Nikolai again, this time to conduct formal harvest surveys. In addition, agency researchers conducted more key respondent interviews, continued mapping past and present fishery harvest areas, and participated in subsistence activities. From January 4 through 12, 2003, ADF&G Division of Subsistence staff participated in Russian Christmas in Nikolai in order to document use and preparation of subsistence fishery resources for this important community celebration (this trip was funded by the Alaska Humanities Forum). In May and July 2003, one ADF&G researcher participated in a spring fishing trip with a Nikolai couple and another participated in a Chinook salmon fish camp with a family from Nikolai.

Project personnel held two meetings with the Edzeno Nikolai Tribal Council prior to the start of research to request community approval and participation. At the first meeting researchers and the tribal council were introduced and the researchers presented the background for the research. ADF&G and NPS staff presented the project to the community as a study about subsistence harvests, past and present with an emphasis on subsistence fisheries. The second meeting included a review of a draft survey instrument and logistics planning. The first actual field visit began with another meeting with the tribal administrator.

The Council helped project personnel recruit a local assistant to facilitate introductions between the community and the agency researchers, to conduct project outreach and harvest assessment research. The assistant made community contacts in order to explain the project and gain community interest, support, and project participation. It was helpful to have someone local clarify information collected that did not seem complete, for example, by explaining family relationships and filling in other data gaps. In addition to the protocol for key respondent interviews, researchers used a set of fish drawings borrowed from the Nikolai bilingual classroom to prompt discussion about the variety of fish species. Key respondent interviews

were conducted with members of 11 households. Nineteen separate interviews were conducted, including 17 recorded on audiocassettes. The approximate age of the 11 household members who were interviewed were 90 (1), 80 (1), 70 (3), 60 (2), 50 (2), and 40 (2). Fish was the primary topic of discussion, although all participants presented information about fish as one part of a larger whole that included information about wildlife, environment, history, politics, and their life stories. Once the study focus and the reason for the research had been explained, most key respondents spoke at length without much more prompting. In most cases, once the first few questions were asked, respondents began speaking spontaneously, and further questions seemed unnecessary. Respondents understood that we wanted to know about fish and chose to relate what was of importance to them in light of that general research topic. Several community members told us that once you have told someone what you are interested in knowing, it is considered rude to ask questions once they begin talking. All key respondents were lifetime residents of the area and all subsistence fished. Following the descriptions of fieldwork in each study community is a discussion of the data gathered, categorized by species.

To document where people harvest specific species, as well as the locations of fish camps, two types of maps were used. USGS 1:250,000 scale maps were used during surveys and interviews. Researchers asked people to mark the locations of their fish camps and other fishing locations they used directly on the maps. In addition, 11x17 GIS created maps utilizing ARC View 3.2 were used at a scale of 1:600,000. Interviewees were asked to draw circles around their lifetime hunting and fishing areas directly on these maps. Some elders said it was difficult for them to record specific routes, because they had traveled "everywhere." A few older people said that using the maps was not an appropriate method for learning from them, because they did not read English. Many respondents said researchers needed to "go out there."

Participant observation and participating in community activities provided learning opportunities that could not have occurred solely with survey questions or scheduled interviews. When the research began, community members stated that it was preferable for agency researchers to learn by participating and observing because of the cultural expectation that if a person wants to know about something or how to do it, they should observe instead of asking questions. As we participated in various activities in Nikolai, people told us things that we would not have known to ask about. For example, by visiting a summer fish camp we learned that people leave fish in the river overnight before cutting them. This family explained that they do this because the fish are easier to cut after soaking. On a fall ride down the river to show researchers fish camps, another family said they leave their fish in the water overnight to make sure the fish spirits have time to get back into the river. Other examples of opportunities for participant observation included the daily steam bath, hunting for spruce grouse, berry picking, attending daily community coffee hour at the school, and eating meals with families in their homes.

Community Description: Telida

Telida is a small Upper Kuskokwim Athabascan community located northeast of McGrath on the South Fork of the Swift (McKinley) Fork of the Kuskokwim River (Figure 3.1). The community is highly dependent on subsistence hunting, fishing, and gathering. There is no wage employment in Telida.

An Upper Kuskokwim Athabascan story describes the first camp at Telida (Collins 2004). It is said that a band of Athabascans near Mt. McKinley was attacked by Indians from the Yukon River. Two sisters escaped and lived on nothing but snared parka squirrels until they stumbled upon the Telida Lakes. These lakes contained copious amounts of whitefish at the lake outlets. The village and the lakes of Telida are named after *Tilaya*, or the "lake" whitefish that sustained the sisters. Later, they were discovered by other stragglers from their band, married them and continued to live in the area (Collins 2004).

The village of Telida has moved three times since 1900. The first location was over a mile upstream from the current site. When the Swift Fork changed course, the village moved to what is now called "Old Telida." In 1916, some residents moved to the present day site. The people still living in the old village site in 1918 built a Russian Orthodox Church there. In 1935 the old village flooded and the remaining residents moved to the current site (ADCED 2004).

When asked about the Telida people who have moved to Nikolai, current resident Deaphon Eluska said, "They still live here, they've just left for a while."

Fieldwork in Telida

In the spring of 2001, Hollis Twitchell, Division Chief of Subsistence and Cultural Resources, Denali National Park and Preserve, visited the residents of Telida, explained the proposed research and sought their approval. On July 10, 2001, two anthropologists from the National Park Service regional office in Anchorage accompanied Twitchell on an overnight visit to Telida. A harvest survey was completed and a key respondent interview was conducted. This key respondent interview went according to the same protocol used in Nikolai. Lifetime hunting and fishing areas were mapped for one household whose members had lived in the area for multiple generations. Interviewees recorded their resource harvest areas on clear Mylar overlaid on USGS maps of a scale of 1:250,000. The interviewees drew circles around areas they used for hunting, fishing, and gathering. Mapping categories included: salmon and freshwater fish, moose, caribou, furbearers, birds, and berries. This report only includes information on the subsistence use of fish.

Community Description: Lake Minchumina

Surrounded by bluffs, woods, and marshy plains, Lake Minchumina is within sight of the Kantishna Hills on the northern rim of Denali National Park and Preserve. On a clear day the sights of nearby Mt. McKinley and adjacent Mt. Foraker dominate the horizon. The community of Lake Minchumina surrounds the lake from which it takes its name (Figure 3.2). The lake is the community's focal point for transportation, recreation, drinking water, and food. To travel between their homes and the main area where the runway, library, and post office are located, residents use snow machines or dog sleds in the winter and boats in the summer. Planes are used year round for travel in and out of Lake Minchumina.

At one time there were as many as 50 residents living year round at Lake Minchumina. In the 2000 U.S. Census, there are 32 "official" residents listed as living at Lake Minchumina year-round (ADCED 2003). Local residents interviewed for this project attributed this population decline to a lack of jobs and declining interest in subsistence hunting and fishing. Local residents identified only 19 residents living at Lake Minchumina throughout the year; three of the nineteen are school-aged children.

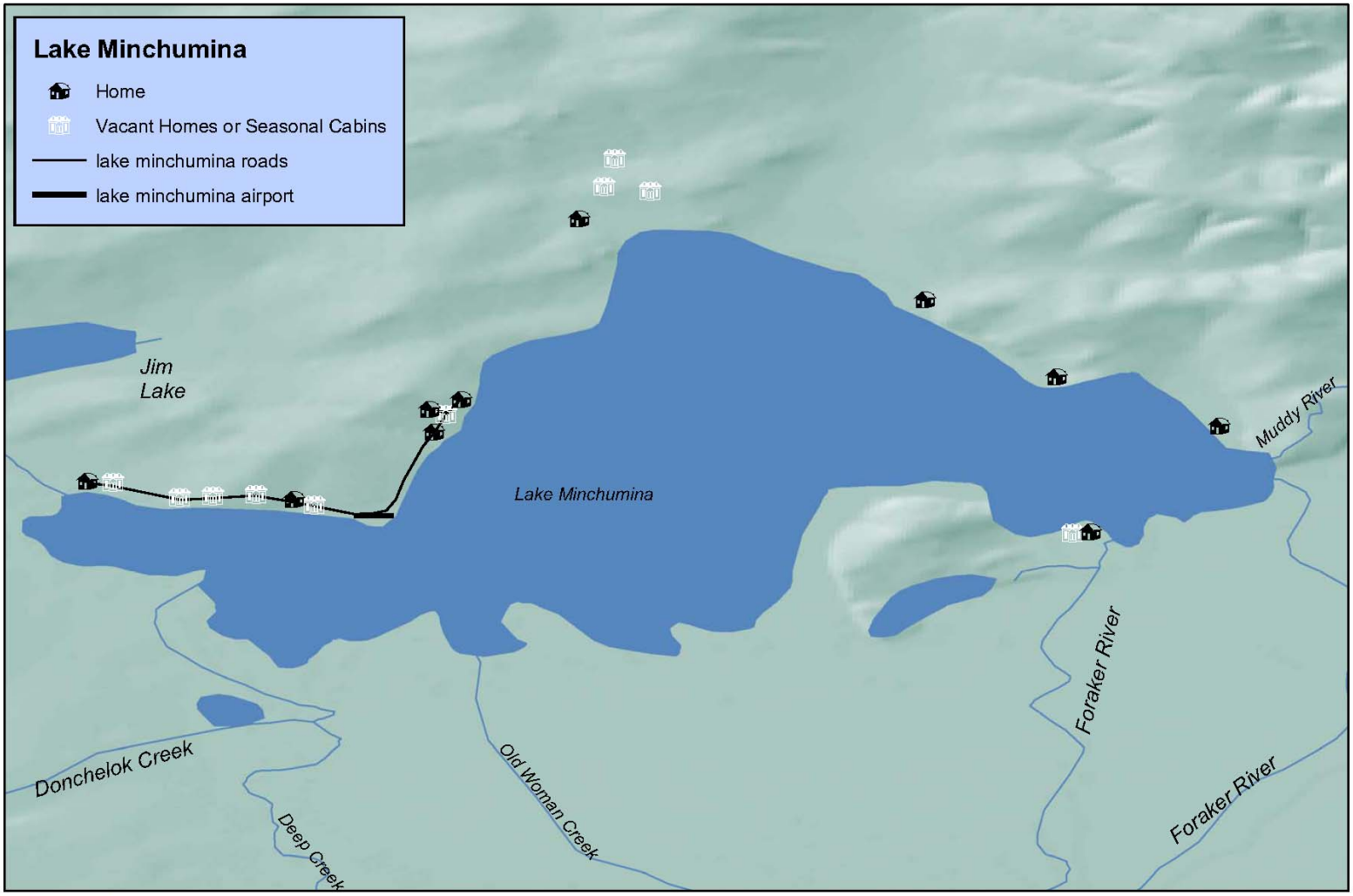
In 1963, an FAA-funded school was established for children of FAA employees and other local residents. It was later taken over by the Iditarod School District (Minchumina Community School 1997). The public school ran for eight years, but closed down in 1999 when a majority of the students graduated and the community no longer had the minimum state requirement of 11 students necessary to maintain a public school. The FAA building now serves as the library and community center and local children are home-schooled.

Many residents of Lake Minchumina today live there seasonally and spend time outside Alaska or in Anchorage or Fairbanks during the winter. Of the 32 residents listed in the last census, only one resident is listed as Alaska Native (ADCED 2003).

Local residents make their living trapping, working for the power company, working at the post office, keeping up the library, and building and maintaining cabins. The main local employer is Denali West Lodge where, according to one resident, everyone has worked at one time or another. The lodge caters to a small number of visitors who want an encounter with the Alaskan wilderness.

For some residents, Lake Minchumina is a quiet place to retire. One couple, who arrived in Lake Minchumina in 1975 upon retirement, said they came to "get away from work." They now live off the income from trapping and from working in the Lake Minchumina post office. They hunt and fish for subsistence.

Located between the Tanana-Yukon and Kuskokwim Watersheds, Lake Minchumina was called *Menchu Mene* by the Athabascan people (Gudgel-Holmes 1990). Occupied for 10,000 years, Lake Minchumina was an important location for staging caribou and sheep hunts in the foothills of the Alaska Range (Holmes 1986). In addition, the lake was an optimal fishing location for freshwater fish such as pike, whitefish, and burbot.



Division of Subsistence

Davin L. Holen, ADF&G Division of Subsistence
& Chelsie Venechuk, National Park Service

Figure 3.2

1:125,000

Archaeological evidence shows that in the pre-contact period, Lake Minchumina was an important location for portaging between watersheds. Multiple groups utilized the area. There is evidence both of Athabascan traditions and the distinctively Eskimo Norton/Iputak tradition (Holmes 1986).

The first documented contact by Euro-Americans with Alaska Natives at Lake Minchumina was the 1899 military expedition led by Lt. Joseph Herron, where the party found 15 Alaska Natives living at Lake Minchumina (Holmes and Gudgel-Holmes 1987; Herron 1909), the *Minkhotanas*. Beginning in 1907 with George Gordon (Holmes and Gudgel-Holmes 1987), several trappers and prospectors began to arrive at Lake Minchumina, eventually building cabins where they could over-winter and trap for furs. Fox and mink farms were also built and operated throughout the 1920s and 1930s. In 1930 a post office was established to support this small population of trappers (Gudgel-Holmes 1990).

When the CAA (Civil Aeronautics Authority) arrived at Lake Minchumina in 1941 to build a runway, the area had only a few scattered cabins, Kammisgaard's Roadhouse near the east end of the lake, and a small Alaska Native settlement. The CAA left a two-story office building, electricity infrastructure, a 4400 foot runway, and three houses, which are clustered together on the north side of the lake. A road connects this central area with two houses towards the west and a few more towards the east (Figure 3.2). Other residents live on the east and south side of the lake connected by trails in some cases. In the 1960s the Bureau of Land Management established a summer firefighting camp at the former CAA location. This lasted until 1986 when a "let it burn" policy was instituted for natural forest fires (Minchumina Community School 1997). During the 1970s "back to the land movement," as people called this time period in Alaska's history, the State of Alaska established a subdivision on the east side of the lake. Homestead and recreational wilderness cabins were also built during this period. Today Lake Minchumina's population is a mix of long-time residents and newer arrivals.

Demographic Shifts

According to local residents interviewed for this project in 2002-2003, many people who had lived at Lake Minchumina for the subsistence and trapping lifestyle have left over the last 10 years. Longtime residents observed that the population is shifting from those who prefer subsistence hunting and fishing, trapping, and some wage employment to a recreational and retirement community.

Today, many of the cabins and homes built around Lake Minchumina sit empty or are only used seasonally (Figure 3.2). According to the Alaska Department of Community and Economic Development (2003), 25 of the 41 structures surrounding Lake Minchumina are vacant. Most are log homes; one resident has made a living over the past 30 years building the homes and cabins using traditional log building techniques. Cabin building has slowed in the past few years as residents drift away and are not replaced by others. Some of the homes and cabins are used only for a few weeks each summer.

There is no store in the community, which means that groceries must be shipped through the mail or by passenger plane. In 2003, shipping costs increased dramatically. According to a longtime resident there have been small increases in postal costs in the past but in 2003 it was considerably higher. It "doubles the price of everything," this person said. The increase in postage makes the price of heavy staples, such as flour, twice what they would cost at the store from which they were shipped. Residents may increase their subsistence harvests to acquire food. Another response to this may be that residents choose to leave Lake Minchumina altogether, as it becomes prohibitively expensive to continue a rural lifestyle.

Fieldwork in Lake Minchumina

In 2001, Hollis Twitchell met with the residents of Lake Minchumina, explained the proposed research, and sought approval for the project. Between October 21-24, 2002, ADF&G Division of Subsistence and NPS staff conducted key respondent interviews and fishery related harvest area and use mapping in Lake Minchumina. Between June 2-4, 2003, ADF&G Division of Subsistence staff conducted more detailed key respondent interviews and fishery related harvest area and use mapping.

The preliminary contact with each household occurred during a baseline harvest assessment survey conducted for the National Park Service. During each survey, ADF&G Division of Subsistence staff recorded interview field notes. TEK was recorded in field notes and created a base to work from in formulating questions for more detailed key respondent interviews. From a total of eight households, six were interviewed for this project. A local assistant facilitated setting up the interviews, provided transportation to and from the interviews, and helped fill in gaps in the information after the interview. Longtime residents of Lake Minchumina were selected as potential key respondents. The main emphasis of the key respondent interviews was TEK of fish, both anadromous and freshwater species.

During key respondent interviews, mapping sessions were conducted using the map as a discussion tool. Contemporary subsistence resource use areas were mapped and key respondents discussed changes in the lake and local ecosystem. To document where people harvest specific species, as well as the locations of fish camps researchers asked people to mark the locations of their fish camps on 11x17 GIS created maps. The maps were made from ARCView 3.2 at a scale of 1:600,000. Participants wrote directly on the maps during interviews. On these paper maps, the lake was at the center and larger rivers were labeled. Residents pointed out subsistence use areas precisely, which facilitated transferring the information into the GIS database.

Community Description: Cantwell

Cantwell is located on the uplands situated between the central Alaska Range and the Talkeetna Mountains(Figure 3.3). In fair weather residents have a spectacular view of Mt. McKinley to the southwest. South of town is Broad Pass, elevation 2,300 feet, and to the north is the Nenana River canyon, which provides a corridor through the Alaska Range for both the Alaska Railroad and the Parks Highway. The climate is continental, characterized by relatively warm summers and long, cold, dark winters. Temperature extremes have been recorded from -54 F. to +89 F. degrees. Average annual snowfall is 78 inches.

The uplands around Cantwell have always been noted for their big game and to a lesser extent for freshwater fish. Salmon are not found in the immediate vicinity of Cantwell, but in the streams and lakes around Cantwell there are rainbow and lake trout, grayling, burbot, and whitefish.

The first known people to live in the Cantwell area were Athabascans, the Ahtna. The geologist Fred Moffit (1915:20) noted that Ahtna from the upper Susitna River basin spent a large part of the year hunting in the Broad Pass area, on Jack Creek, the Yanert Fork of the Nenana River, and the area around Valdez Creek. In 1903 gold was discovered on Valdez Creek and a small community of miners and Ahtna gathered to form the first relatively permanent settlement in the area. Eventually Ahtna from Valdez Creek settled in Cantwell, where their descendents live today (Dessaur and Harvey 1980).

In 1916 Cantwell was established as a construction camp for the Alaska Railroad. Soon after, it became a jumping off point for miners and freight going to the Valdez Creek mine. The population in 1939 was 17, but it had swelled to 67 in 1950. The increase was due, at least in part, to an influx of Ahtna families who moved from Valdez Creek to Cantwell to work as laborers on the railroad. Both men and women worked on the section crews and since the work was steady most settled permanently in Cantwell and eventually retired from the railroad there (Tuck 1938).

Old Cantwell was oriented toward the railroad. Following the completion of the Parks Highway the community reoriented itself toward the highway and in the process began to spread out. While a few people still reside near the railroad, almost all of Cantwell's businesses, including a restaurant, two gas stations, a bed and breakfast, and the post office are now located at the intersection of the Parks and Denali Highways. This area, called "downtown," also includes a number of residences, the offices of the Native Village of Cantwell, and a large parking lot built to accommodate recreational vehicles driven by tourists. A second group of homes, referred to as Cantwell Heights, is located three miles from the highway in a new subdivision that is on the west side of the railroad tracks. A third group of houses, called the Drashner Subdivision, is located on a lake three miles up the Denali Highway. More homes are dispersed along the Parks Highway between mile 207 and mile 217 and along the first three miles of the Denali Highway.

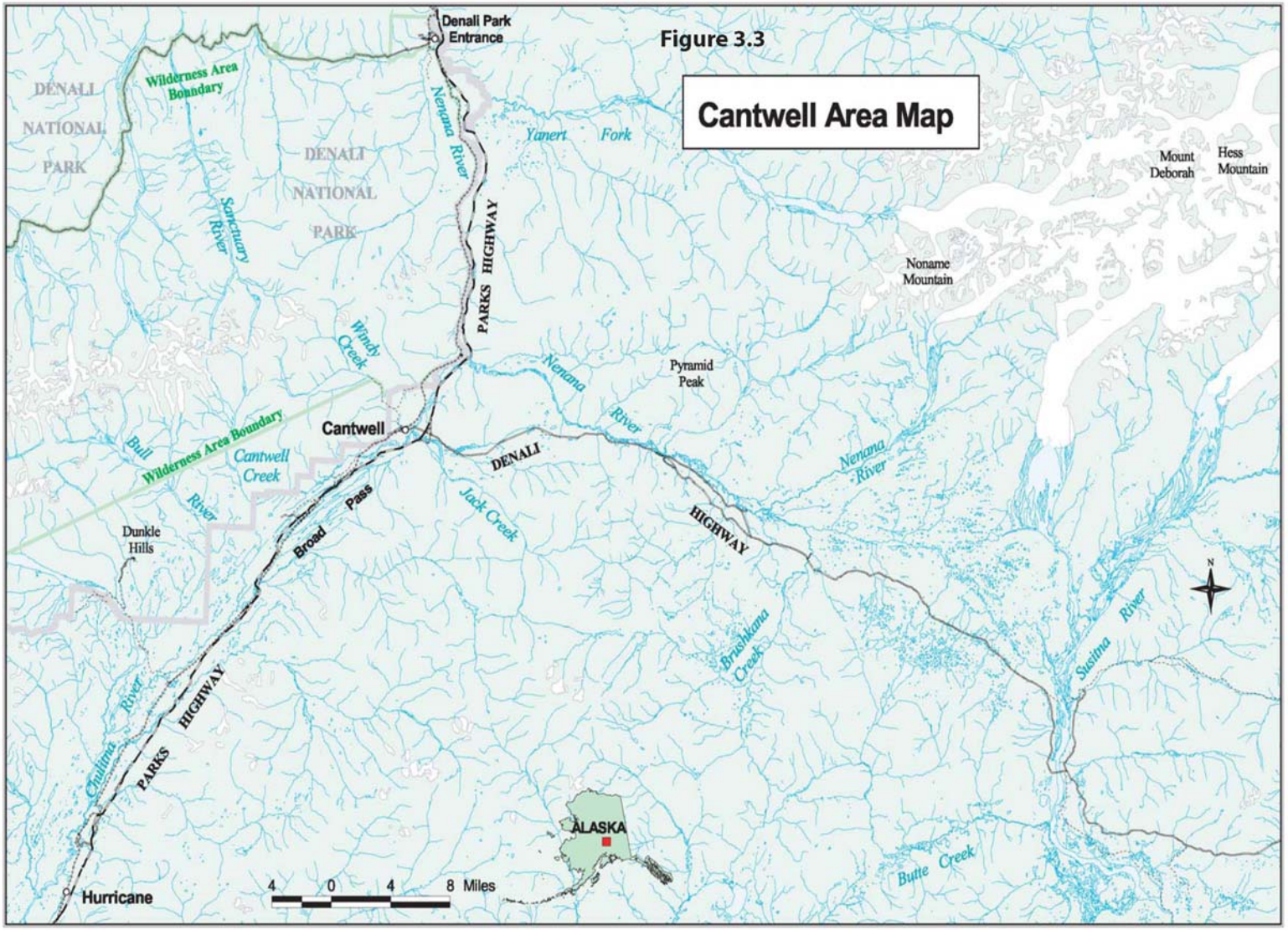


Figure 3.3
Cantwell Area Map
Denali Park Entrance
Wilderness Area Boundary
DENALI NATIONAL PARK
Sanctuary River
Nenana River
Yanert Fork
PARKS HIGHWAY
Mount Deborah
Hess Mountain
Noname Mountain
Windy Creek
Pyramid Peak
Cantwell
Bull River
Cantwell Creek
Broad Pass
DENALI HIGHWAY
Jack Creek
Dunkle Hills
Chulitna River
Brushkana Creek
Susitna River
Butte Creek
Hurricane
ALASKA
4 0 4 8 Miles
N

Fieldwork in Cantwell

Of the four communities discussed in this report, Cantwell stands out because it is the only community on the road system (Figure 3.3)[3]. Because Cantwell is accessible from larger population centers via the Parks and Denali highways, competition over fish and wildlife resources in this area is intense. However, as members of a DNP SRZ community, Cantwell residents can avoid this competition by hunting and fishing on specific parklands designated under ANILCA. In 1999 the ADF&G Division of Subsistence was contracted by the National Park Service to update the Division's earlier research on Cantwell, conducted in 1983 (Stratton and Georgette 1984). The purpose of the 1999 research was both to document levels of subsistence activity in the new additions to the national park and to document Cantwell residents' past uses of the park.

According to data from the household survey conducted in Cantwell in April 2000, fish made up 25 percent of the total harvest of wildlife in Cantwell. By contrast, large land mammals comprised 62 percent of the total harvest. Issues surrounding the management of large land mammals were a major concern for Cantwell residents (Simeone 2002: 36). For this reason, relatively little information about fish or fishing was collected in Cantwell.

ADF&G staff in cooperation with the Native Village of Cantwell and the NPS conducted the Cantwell study. In addition to the research objectives listed in the beginning of the report, the NPS asked that we also conduct research on other topics including attitudes about the use of off-road vehicles, attitudes and practices for conserving and protecting resources, shifting uses of resources, and the utilization and preservation of wild foods. These issues became the main focus of the research in Cantwell and are fully addressed in ADF&G, Division of Subsistence, *Technical Paper 272 Wild Resource Harvests and Uses by Residents of Cantwell, Alaska 2000.* The research in Cantwell was funded by the NPS.

Data gathering techniques included an ethnographic literature review, a household survey, key respondent interviews, and mapping lifetime harvest use areas. Lifetime hunting and fishing areas were mapped for seven households whose members had lived in the area since the 1920s. Interviewees recorded their resource harvest areas on clear Mylar overlaid on USGS maps of a scale of 1:250,000. The interviewees drew circles around areas they used for hunting, fishing, and gathering since they began to live in Cantwell. In addition to salmon and freshwater fish, mapping categories included: moose, caribou, black bear, sheep, furbearers, birds, and wild plants and berries. This report only includes information on the subsistence use of fish.

The subsistence focus of this area appears to have always been large land mammals. The central Alaska Range has long been a paradise for hunters. The Ahtna called the Valdez Creek area ***C'ilaan Na'*** or "a lot of game is present place" (Kari 1983:66) and the conservationist Belmore Browne referred to the entire region as the "fountain head of the game supply south of the Yukon and west of the Tanana River…" (cited in Kauffman 1954:2).

[3] The maps for Cantwell were prepared by the Bureau of Land Management. The differ from the other report maps which were prepared by ADF&G Division of Subsistence.

CHAPTER FOUR: RESULTS

Current and Traditional Fisheries Use in Nikolai and Telida

Information on current and traditional fisheries and TEK of fish was obtained primarily through key respondent interviews. A wide range of fish species is available in the area. A list of harvested fish species in the study area was adapted from Stokes (1985) and an Upper Kuskokwim species list provided by John Burr (Alaska Department of Fish and Game, Division of Sport Fish), who has many years of experience and research in the Upper Kuskokwim area. Available fish species include Chinook salmon, silver salmon, chum salmon, broad whitefish, humpback whitefish, round whitefish, least cisco, sheefish, grayling, Dolly Varden, burbot (loche), pike, sucker, eel, blackfish, lake trout, and one non-fish species, freshwater mussels. Table 2-1 provides the classifications in four categories: common name, local name, Upper Kuskokwim Athabascan name, and Linnaean (scientific) classification. All interviews were conducted in English, since all of the key respondents of Nikolai and Telida are bilingual. It should be noted that it would have been possible to obtain more information on Upper Kuskokwim fish taxonomies if the researchers were also bilingual. Information collected is not uniform across species. As might be expected, more information was available for the most frequently used species, Chinook salmon and whitefish. It is important to note that although species were separated in this report for clarity of presentation, in fact they are frequently harvested at the same time.

Because of the connections between the two communities, and in order to maintain the confidentiality of the information provided by the few residents of Telida, data from Nikolai and Telida are presented together (TEK and map data). A few exceptions will include information that is unique to Telida but will not reveal the identity of the individual or a harvest quantity.

Chinook (King) Salmon

Chinook salmon arrive in the above areas in late June or early July. In Upper Kuskokwim Athabascan, June is *Gasno'o'*, "Chinook Salmon Month" (Collins and Petruska 1979:64). The Fourth of July weekend is considered by locals to be a very important time to be at fish camp. If possible, families stay at their camps for a month from late June through late July or early August. Almost all Nikolai families go at least once a summer, even if they can only go for a few days. Because most locally available wage work occurs in the summer, it sometimes interferes with fish camp participation. Firefighting and construction are two major sources of cash income in the area and occur during the Chinook salmon run. Some, but not all, families with a seasonal wage earner will go to fish camp without that person. People who are not able to fish receive fish from others in Nikolai or other communities. In addition to providing an important food source, fish camp is a very important time for socialization. As people travel to their fish camps, they frequently stop and visit at other camps along the way. People chat and

Table 2.1 Fish Harvested in the Upper-Kuskokwim River Drainage

Local Name	Common English Name	Upper Kuskokwim Name	Scientific Name
Salmon			
King	Chinook	**Gas**	Oncorhynchus tshawytscha
'Red' or Silver	Coho	**Nosdlaghe**	Oncorhynchus kisutch
Dog	Chum	**nolaya, srughot'aye**	Oncorhyhnchus keta,
Non-Salmon			
Whitefish	Humpback	**sajila tsendude**	Coregonus pidschian
Whitefish	Broad, Lake	**tilaya, taghye**	Coregonus nasus
Candlefish Whitefish	Round	**Hwstin**	Coregonus
Whitefish	Least Cisco	**sajila dilmije**	Coregonus sardinella
Sheefish	Inconnu	**Zidlaghe**	Stenodus leucichthys
Grayling	Arctic Grayling	**ts'idat'ana**	Thymallus arcticus
Pike	Northern Pike	**ch'ighilduda**	Esox lucius linneaus
Blackfish	Blackfish	**Hozrighe**	Dallia pectoralis
Burbot, loche	Burbot	**ts'onya**	Lota lota
Sucker	Longnose Sucker	**donts'oda**	Catostomus catostomus
Dolly Varden	Dolly Varden	**hoch'ilmoya**	Salvelinus malma,
Trout	Lake Trout	**hoch'elmoya**	Salvelinus namaycush
Eel	Arctic Lamprey	**tl'ighirs**	Lampetra japonica
Mussels (clams)	Freshwater Mussels	**halts'oja**	Anodonta beringiana

(Sources: Collins and Collins 1966, Collins and Petruska 1979 for Upper Kuskokwim Athabascan names, American Fisheries Society 1991 for Linnaean classifications, Randy J. Brown, USFWS for freshwater mussels)

share information about fishing, river conditions, brine recipes and cutting techniques often while snacking on freshly dried fish. At some large fish camps, members of several families join together at one camp and work together. All ages including children and young adults are involved in all the work of the fish camp, gathering wood, cutting fish, hanging fish, cooking, cleaning up and visiting.

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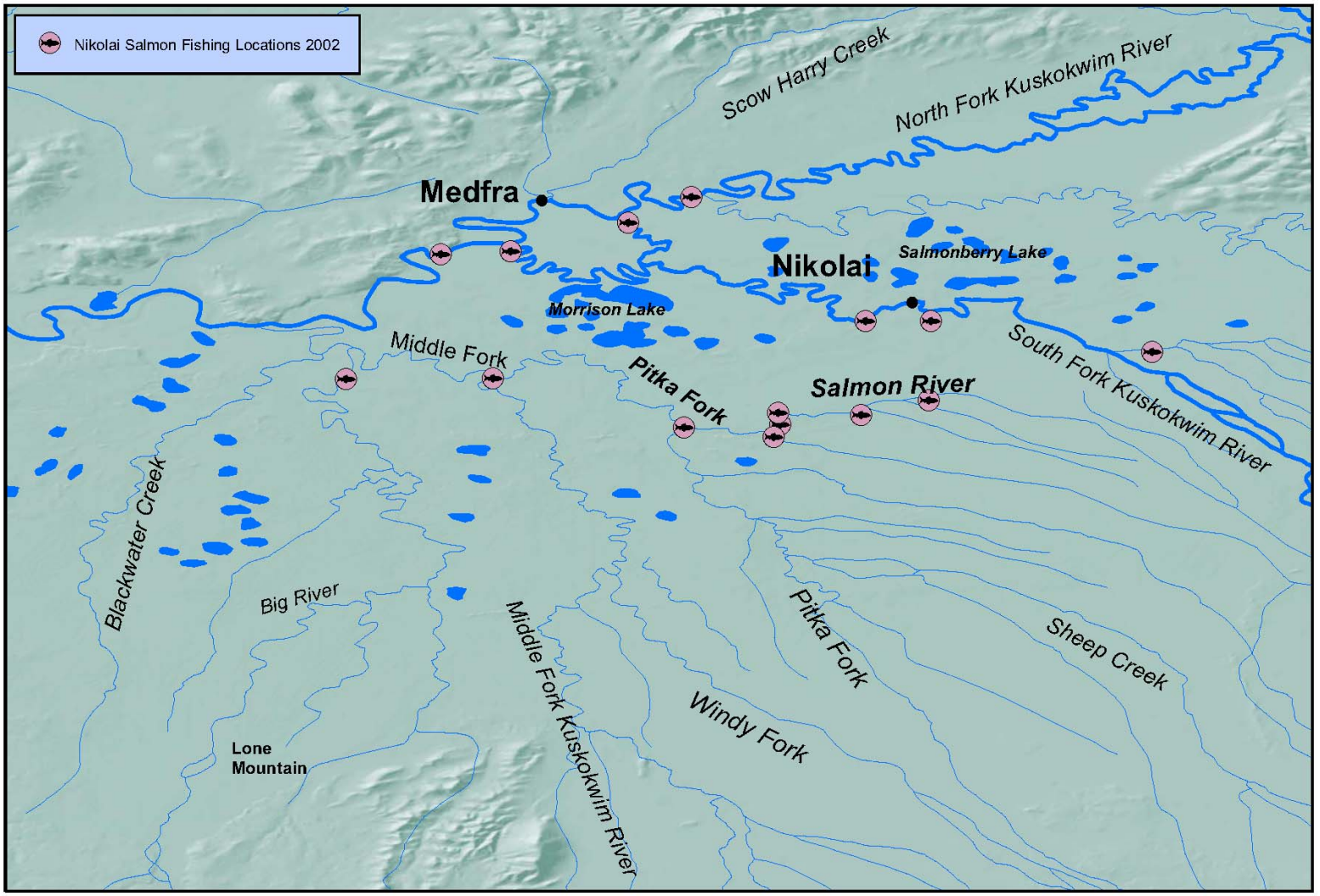
Harvesting Techniques and Equipment. In the past, Nikolai residents used fish traps, fences, fish spears, and nets to harvest Chinook salmon. Fish wheels were introduced to Alaska by gold miners in the late 1800's. Fish traps for harvesting salmon were made illegal in 1959, when Alaska became a state. People in the Nikolai area continued to use the traps until 1966, but eventually the law was enforced and their use of salmon fish traps was eliminated (Stokes 1982: 20).

Today, many people in Nikolai in their forties and older recall using fish fences and fish traps. They expressed frustration that they are no longer able to fish in a traditional manner. At Salmon River, the only practical legal gear for harvesting Chinook salmon is hook and line (rod and reel). Fishers at Little Tonzona also use rod and reel and gill nets. The Salmon River (a major traditional fishing site) is a clear stream, and people said nets are ineffective there because the fish can see them and do not swim into them (Figure 4.1). At other fishing locations with silty or organic laden water, gillnets are placed across streams and in eddies (families who eat Chinook salmon from water that is not clear). Rod and reel is also widely used in such waters. After the elimination of the fish trap, Nikolai people began to harvest subsistence Chinook salmon with rod and reel at the Salmon River and elsewhere. Rod and reel is considered by locals to be the best and only alternative to their preferred method of fishing with a trap.

Currently no one in Nikolai uses a fish wheel. Since the early 1900's, fish wheels were used for all salmon species including Chinook salmon, but primarily for chum or dog salmon that were



Source: Division of Subsistence,
Alaska Department of Fish and Game,
Household Interviews 2002-2003
Note: As not all resident households were interviewed this is only a sample of harvest use areas.

0 2 4 8 12 16 Miles

Figure 4.1

1:500,000

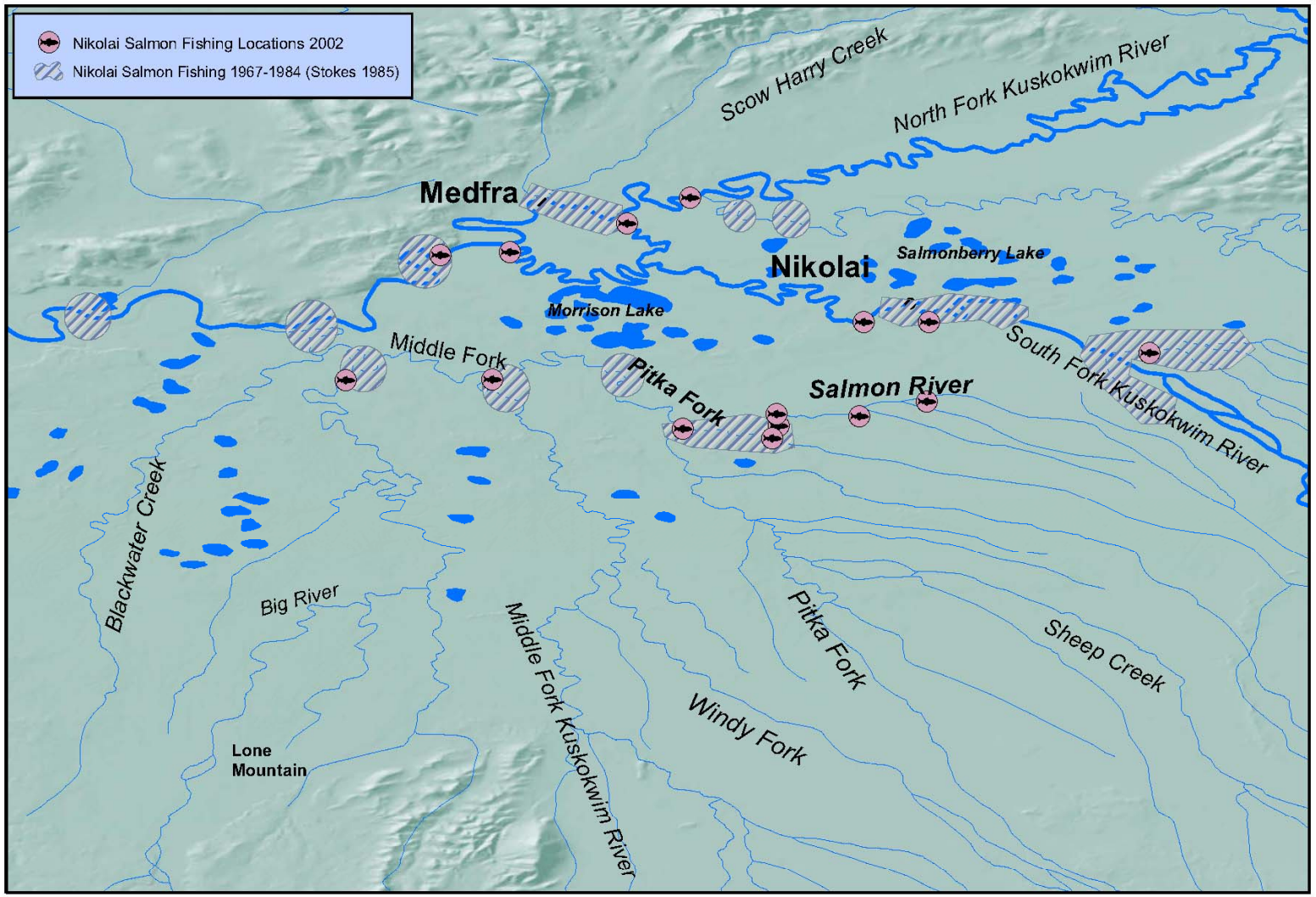
harvested for dog food because of the large quantities that can be taken with this technology. Fish wheels were capable of harvesting the large quantities of fish required to feed a dog team. Between the late 1960s and the early 1970s, the use of the fish wheel faded as the mode of transportation shifted from dog teams to snowmachines.

Though many fish with rod and reel, one woman said she refuses to use this gear because, in her view, it is not traditional. "It is not the Athabascan way to catch fish." She is still incredulous that the ban on fish traps for salmon was enforced in her area. She said there is no way the small-scale wooden fish traps her family used could have had a detrimental effect on salmon populations. She and others in her family described the "escapements" that were part of traditional management systems. They said that fences or traps were never left in the water for an entire run, because this type of gear had to be taken from the water frequently for repair or to be cleaned. This woman's family and several others talked about keeping their traps out of the water until that "trapful" was processed. People removed their gear from the water and stopped fishing when they had enough to process:

> That fish trap doesn't hold very much. It wasn't a huge thing, you know? It's only about that long and so wide. When it gets full you have to take it out. So there's a fish path. I think people know how to take care of what they live on, you know?

Another family also said people have to use a rod and reel at Salmon River because the water is clear and the fish swim right past nets. They said a rod and reel is no good either because the salmon are so far into their spawning cycle that they will not take bait, since they have stopped eating. While members of this particular family do not like to use a rod and reel, they do fish with rod and reel just a couple of days per year so they can fish with their relatives. This family said they fish primarily with nets in other areas (although not at Salmon River) because they feel that "the fish net is the Native way." For them, using a net is similar to using a fish trap. This family also said that once their net is full, they pull it out of the water and process all the fish in it before putting it back in the water.

Elders (60-80 years old) and many middle-aged people (40-59 years old) shared their memories when fish fences and fish traps were used at Tonzona, Salmon River, and Blackwater Creek (Figures 3.1 and 4.2). They talked about the abundant harvests of Chinook salmon that provided the mainstay of their diets. Some people said they were raised on fish; there were no moose when they were children. One 70-year-old woman said that her family only had fish and oatmeal to eat when she was a child. The Chinook salmon harvest was and still is a major effort for Nikolai residents. Some people said, in the past (20-30 years ago), more families worked together than do when this study was conduced in 2002-2003. People recalled the endless work of cutting fish, which several described as an assembly line type process in which everyone did a particular job. It sounded like everyone knew how to do and participated in most of the jobs but most people specialized in the jobs they were best at including maintenance and repair of fish traps and fences, cutting and hanging fish, teaching children to cut fish, and gathering firewood. One person told of a fish camp scene a generation ago, where the father of a large family, an elderly blind man, specialized in repairing the traps. Nikolai residents say harvests are smaller today because they have to use rod and reel at Salmon River, still probably the most important



Source: Division of Subsistence,
Alaska Department of Fish and Game,
Household Interviews 2002-2003
Note: As not all resident households were interviewed this is only a sample of harvest use areas.

0 2 4 8 12 16 Miles

Figure 4.2

1:500,000

fishing area for the majority of Nikolai residents, and because there are reportedly fewer fish and smaller ones.In the view of some residents, not only has use of the rod and reel led to a lower harvest, it has led to a different "view" of fishing.

> No, I don't know this thingie change –far's I know - getting less fish all the time…Caught almost same, but very few big salmon they get up here Tonzona. Not too many. …They put fence across Salmon River or Tonzona up here. They get lots, lots in those days, because they had a fence all the way across – and trap, they spear it. The only way get ready for fish is they go up there before fish get in to reach up here – and they prepare their fish rack and everything like that. There was a time they use fish trap, but …They share the fish. Not probably just one family. The whole group had to get together and fish. Well this is the time they fence across creek…fish the whole group – they can share it. It's lot of work – all we did those times – when I grew up and lived at Big River – we had to put fish away for our own use and we had to do that from the morning till all day we had cut maybe hundred fish in one day and that's all we do – there was no other work anyway. We used to get enough fish, but nowadays, it's maybe less fish now, and I don't think there's hardly any big, lots of fish long time ago came out…The kids don't nowadays, they don't know how to fish. When I grow up my parents gave me their own fish net. And, that's their life. Nowadays, kids using fishing reel and that's the only way they fish right now.

Another elder shared her memories of Salmon River. Her memories highlight the abundance of fish during a particularly good year and the shock of being told to use a hook and line instead of the fence and trap. She said when she and her husband arrived at Salmon River, they took green spruce and cut them into thin strips and made a fish trap that was almost as long and as big as her current house. She said the trap had to be made so that Chinooks could not turn in the trap and break it. They would build a big fence across the river to make the fish trap. When the fish came, they would constantly have to reinforce the fence to keep it from breaking. Early in the season, they would get a few Chinook salmon per day. When the run began in earnest, there would be a lot of noise. The river would rise, red with fish, and the whole fish trap would fill with about one hundred Chinook salmon. She would hang fish all day and all night. Then, she said, they had to stop because they were no longer allowed to put a fence in the Salmon River. She said "they" told them they had to use a hook and line but she and her husband did not know how.

Another elder also recalled the large fish traps that had to be built so that fish, particularly Chinook salmon, were not able to turn around and break the traps. He said the Upper Kuskokwim word for this trap literally means something like "they can't turn and break it":

> …it's narrow fish trap, it just go in there and get stuck you know, don't back out you know, that's what is meant by that… that way it won't break up the thing

When asked how people decided when to stop fishing the common answer was "when we have enough." One family described their traditional management system: they said they only keep one third of the female Chinook salmon they catch because they want them to lay their eggs but they also like to harvest eggs for consumption. This family said they put the remaining two

thirds of the females they catch back in the water. Two families said they released females when possible. Another family said they did not throw females back because that was "a white man's rule" they did not follow. They kept females and ate the eggs fresh and fermented and used them for trap bait.

One person described natural indicators for assessing water levels for the season. He said when the first Chinook salmon of the year is caught it should be boiled. He said the boiled water indicates river water levels for the season: if the boiled water is cloudy, the river water will be high that year; if the boiled water is clear, the river water will be low that year.

Spawning locations and behavior. The two places most people mentioned when asked where Chinook salmon spawn are the Salmon River and the Little Tonzona River (Figure 3.1). People said Chinook spawn in the South Fork of the Kuskokwim River. Most people said they prefer to harvest Chinook that spawn in the clear water of Salmon River and the Little Tonzona River. Although we didn't find out the reasons for this preference, one elder emphasized this concept on several occasions and said he only wanted to eat "clean" salmon.

Another elder reported seeing the lake at the head of the Salmon River 20 years ago. He described it as completely red with Chinook. He said when he saw this lake, it was huge and the salmon were jumping a large beaver dam to get into it. They would go to the far side of the lake from the dam to spawn. He reported many other fish species spawning at this site, including grayling. Since this elder is no longer able to travel to the area, researchers asked a forty-year-old hunter about this lake; he said it is now a marsh. The same elder said that Chinook salmon spawn at McKinley Fork, but as far as he knew, people had never harvested them there. He knew there were Chinook there because in March of one year, he saw where a wolf had dug through the snow, retrieved Chinook bones, and left them on the riverbank of the McKinley Fork. Two elders who were raised in different areas, one at Big River and the other at Vinasale (Figure 3.1), spoke of all three salmon species spawning in the South Fork of the Kuskokwim.

> I would see king salmon, dog salmon, red salmon [local name for coho] – they're all spawning in this river up here – the South Fork.
> I find out this summer there's none up there.
> Those king salmon and dog salmon and red salmon [coho] they spawn up there, they die.
> The story about the fish, the salmon they're spawning up there and in the gravel area, the eggs hatch up there and they stay under there.
> In spring, after breakup they come back down where they came.
> Within four years they come back again.
> That's what I was told, traditional story.
>
> King Salmon and dog salmon or red salmon [coho] are the same yeah, same place. Only red salmon goes further up river, you know, further up? Quite a ways up there I saw them…lots of them there at that time. Now there's hardly anything you know?

Another person described the effect of large numbers of spawning Chinook salmon at the Little Tonzona, "There used to be many salmon there – king salmon – so many that when they moved up the river they created waves."

Preservation, Storage and Consumption. Respondents stressed the importance of preparing the fish camp long before the fish arrive. The fish rack (upon which fish are dried), also called the "fish camp," must be repaired and made ready after winter, and the spruce sticks used to hang fish need to be harvested from trees and sharpened at the ends. Most fish racks have a roof and open sides with horizontal poles across the top and open shelves on one side. The base of the shelves is chicken wire. Once a fish has dried, it is placed on the shelves and a fresh fish is hung from the poles. Fish eggs are also placed on the chicken wire to cure. Fish heads are hung from the top poles to dry. Stokes (1985: 239-244) includes detailed descriptions and photos of fish racks (Figure 4.2).

Specific types of wood are gathered for drying and smoking fish. Some people use cottonwood, while others said elders told them that alder is better because it seals in the moisture of the fish while the fish are drying. Some people do not dry their fish at fish camp and instead take them back to the village to dry because of time constraints posed by employment. Others prefer to dry their fish at the fish camp because dry fish are lighter to transport and because fish dried in the village get sandy and gritty because of four-wheeler traffic.

Many households have a fish-cutting table overlooking the river at their fish camp. People told us that Chinook salmon should always be processed on a fresh layer of spruce bark or a gunnysack. The rough surface of spruce bark is used as a slip-free cutting board for slippery fish. More than one person told us that Chinook salmon should be left to soak in the river overnight prior to cutting. Members of two households said the reason for this is to allow the fish to soften for easier cutting the next day. Another family said this is to allow the spirits of the fish back into the river.

When asked if there was a method of cutting fish that was unique to Nikolai, several women responded "no." They said each person has his or her own method and skill levels vary according to extent of experience. They said each person or family cuts his or her fish a little differently due to personal preferences for certain preservation methods. For example, they said some people separate the belly meat from the upper part of the fillet because the belly flesh contains more oil and has a slower drying rate than the upper, drier meat. Some people leave the backbone in; others cut it out. Some people cut their fish in half for "strips." Others cut their fish along the belly to make "flat fish." In this process, the fish are heavily scored horizontally and vertically. They use sharpened spruce sticks to hold the fish open and hang the sticks from the horizontal poles of the fish rack. Some people sling their fish directly over a horizontal fish rack pole. Stokes (1985: 237) describes all of these processes in detail. In both drying processes, the desired outcomes are to retain oil and prevent spoilage. Some people turn their fish over as it dries so the oil re-coats the drying fish and does not drip on the ground.

Just before our first research trip to Nikolai, an elderly woman known for her ability to cut and smoke fish passed away. While we were out picking berries, several women brought dried

Chinook salmon as a snack. The conversation turned to fish cutting. The women lamented that not only did they miss the deceased woman, they would never have fish like that again in their lives. They described her as an expert whose skill at cutting and smoking created some of the best tasting fish available.

In addition to smoking and drying fish meat, fish heads and fish eggs are also preserved. People eat both heads and eggs, and also use them as bait for trapping. One person said fish heads make excellent bait for trapping because they are hard and greasy, which makes it difficult for creatures such as mice to steal the bait before the intended prey finds it. One elder said his family saved and used every part of the fish they caught. He said fish eggs dry fast and keep well, and his family used them for dogs and people. He said fish heads spoil easily, and are very attractive to bugs, much more so than are eggs. He said yellow jackets have increased in the past few years, and a lot of smoke is required to keep bugs off fish. A few people said they were afraid to eat fermented foods after they heard stories of botulism in other areas of the state. Many said they like the eggs fermented. People also mentioned fermented Chinook salmon:

> We used to, over Salmon River, we run out of room in fish camp, no place to put 'em. So, towards 'bout August – dig a big hole and start throwing them down there. When you get back there, the snow will be melted off on top. Frosted on the trees too right there, a lot of heat.

Members of this family said that as children in the 1950's, they did not particularly like the fermented fish, but anything different was a welcome change. One elder recalled his parents salting fish:

> My time, we used to salt them. My parents used to use a keg, wooden keg. It was good. I'd do it here too, but not anymore. I can't get any fish.

Many households reported that they eat all parts of the Chinook salmon and most other fish species. For this project, researchers used a semi-diagrammatic drawing (Appendix B) of an adult female salmon to record the Upper Kuskokwim words for the internal parts of salmon. The bilingual teacher at the school provided terms she knew or had obtained through research with elders. There are a multitude of ways to prepare Chinook salmon. One elder said that he "…loves fish livers, Chinook salmon livers…any livers." Most people consider Chinook salmon fish heads to be a delicacy. Many told us they save their best foods for Russian Christmas; Chinook salmon fish heads are often saved for this celebration. The heads are dried at fish camp, later frozen, and then served boiled. Another family described a favorite meal of Chinook salmon eggs and hearts sautéed together in Crisco. A young mother said her families' favorite foods are fish egg soup, salt salmon, pickled salmon, and fried, "crackled" salmon skins. To make crackled skin, she peels it, salts it, and puts it in a pan over a fire until it is crunchy. She dries all her fish at fish camp. She makes half dried salmon cut in segments, partially smokes it, and then freezes it. When she is ready to eat it she pulls it out and either boils it or puts it in the oven. Many people talked about the importance of dried fish as a traveling and hunting food, both now and in the past. They explained that dried fish is light to carry and staves off hunger pains.

Telida. There are no Chinook salmon near Telida. In the past, Telida families harvested Chinook salmon at a camp near Medfra.

Coho Salmon or "Reds"

Subsistence Harvest: Location and Timing. Coho (silver) salmon, locally called "reds," arrive in the Nikolai area in the fall, usually August, September, and October. They are called reds because by the time they reach Nikolai, their skin is red. August is nosdlagheno'o, "Silver Salmon Month" in Upper Kuskokwim Athabascan (Collins and Petruska 1979:63). Historically and during the time of this study, 2002-2003, for Nikolai residents, the coho salmon harvest has always been secondary to the Chinook salmon harvest (Stokes 1985: 254). This is probably due to the fact that the Chinook arrive first and in larger quantities during a short amount of time compared to the coho run which seems to be less concentrated than the Chinook return. The Chinook harvest is a more efficient way to get more protein at once. Respondents said they harvested these fish in the South Fork as well as the North Fork and Middle Fork of the Kuskokwim River (Figure 4.1). As is true of Chinook salmon, people said cohos are getting harder to harvest because they do not seem to be there. An elder said that in the past, they used to see 100 chum and coho per day at Nikolai during the fall run. In 2002, he said his son had checked his net repeatedly but he harvested only four coho:

> I used to remember lots and lots of salmon at this time [October]…And now, there is hardly anything out there…Most he got was four…he took four out of there yesterday and this morning there was nothing again. That shows there's no salmon. We get 'em up here about this time, August, September and October, yeah.

Some people had noticed a widespread decline in all salmon species (Figure 4.2). This trend was generally attributed to over harvest by commercial fishers and foreign high seas poachers. One elder also mentioned that all the waters where salmon spawn have been drying up. Several residents volunteered that there has been a drying trend over the last 10-20 years.

Techniques and Equipment Used for Harvest. Most people said they harvest coho salmon with gill nets and rod and reel. People said they can get them close by, right at the Nikolai boat launch, with a net. They said the water is low there and it is not hard to get them. People also harvest coho at the "second sand bar," a popular fishing spot a few bends down the South Fork from Nikolai. During our 2002 visits, people did not go to fish camp to harvest coho, because coho were available close to Nikolai.

Spawning Locations. As noted earlier, elders said Chinook, coho and chum salmon all spawn in the South Fork of the Kuskokwim River, but coho go the furthest to spawn. People have reported coho near Farewell on the South Fork and on Windy River (Figure 3.1).

Preservation, Storing and Consumption. The use of coho salmon is similar to Chinook salmon. Preservation methods include drying, half-drying, and freezing. Some families half-dry their salmon and then freeze it for use in winter.

Telida. Former Telida residents harvest a fall run of coho salmon from Highpower Creek from late August through October, concurrent with the coho harvest in Nikolai (Stokes 1985: 265).

Chum Salmon

Subsistence Harvest: Location and Timing. Harvests of chum salmon at Nikolai have declined substantially since snowmachines replaced dog teams for transportation in the 1960s. In the past, people used fish wheels to harvest the large numbers of chum salmon they needed to feed their dog teams. Fish wheels are no longer used because those large numbers of fish are no longer needed. One elder recalled,

> When we used dogs we count enough fish to last through the winter for the dogs. I had 9-12 dogs and long winter, it is pretty hard for me to describe it, make sure they eat, get more than thousand fish.

Residents reported seeing fewer chum salmon than usual during the 2002 season. There is a summer and fall run of chum salmon in the South Fork. July is *srughot'ayeno'o'*, "Dog Salmon Month" in Upper Kuskokwim Athabascan (Collins and Petruska 1979: 63). The decline in chum salmon was generally attributed to over fishing by commercial fishers.

Techniques and Equipment for Harvest. During our visit in October 2002, we learned that one household continued to harvest a high number of chum salmon compared with most other Nikolai residents. This household is Yup'ik and they said they like the chum more than the Athabascan residents of Nikolai. This household and others harvested chum with gill nets in eddies in the South Fork near the second sand bar from Nikolai. One resident said he wanted to use a dip net to harvest chum at the second sand bar, but the water was too high.

Spawning Locations and Behavior. Residents said that chum salmon spawn in Salmon River and the Little Tonzona, and 15 miles upriver from Nikolai in the South Fork in shallow side streams. One elder said he sees chum all winter in the South Fork.

Preservation, Storing and Consumption. By October, the household that harvested a large amount of chum salmon had them stacked in their yard for later use. They use some as dog food and some for themselves. They like to serve it baked and they also use it to make agutak or Eskimo ice cream.

Whitefish

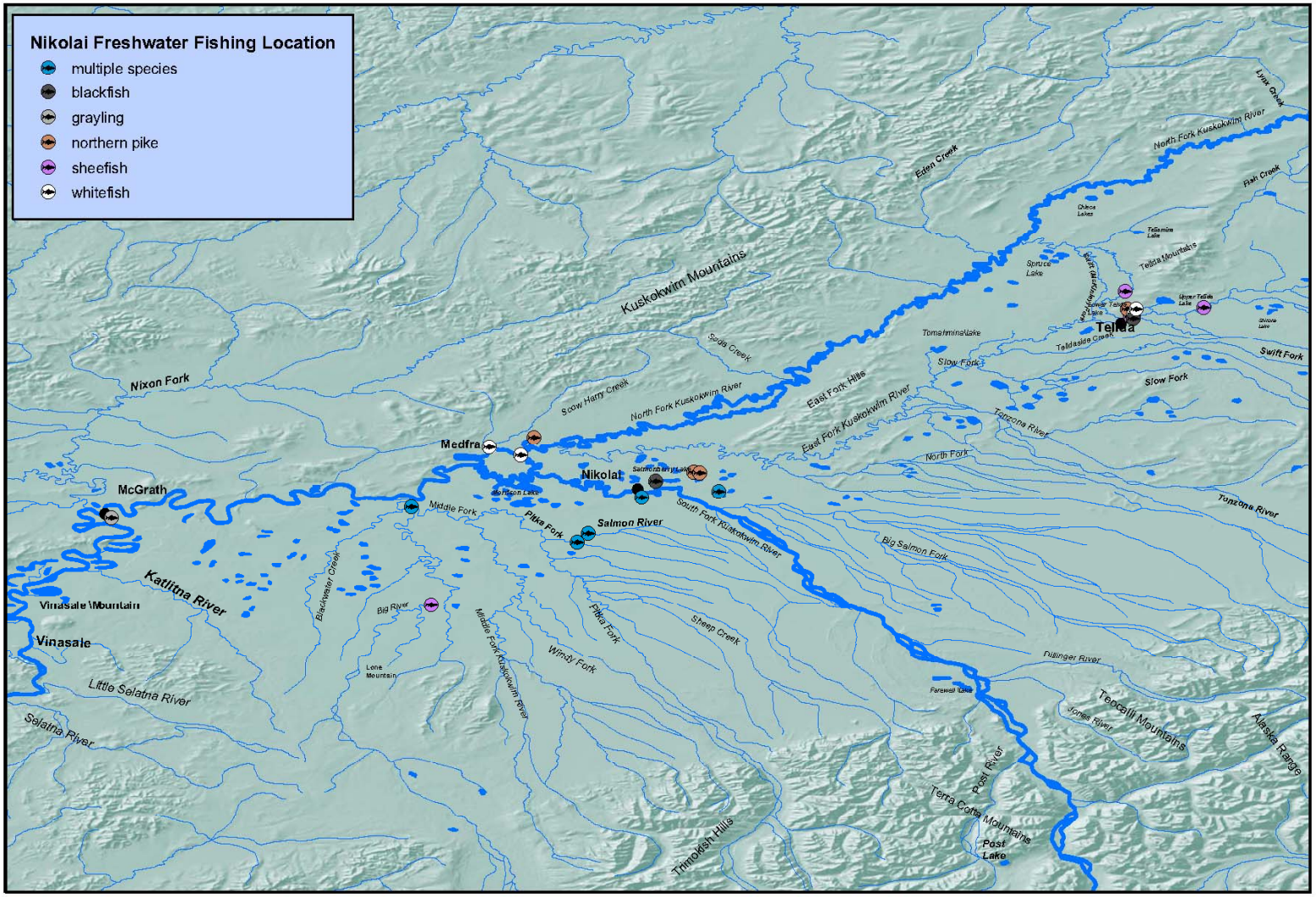
Whitefish Taxonomy. In Upper Kuskokwim Athabascan, September is tiayano'o' or "Whitefish Month" (Collins and Petruska 1979:63). However, people report harvesting whitefish almost year round. When asked about whitefish, key respondents discussed them in general, without regard to specific species. Andersen and Fleener (2001) provide an excellent description of the various Gwich'in classifications assigned to whitefish in the Yukon Flats. While a similar classification was not identified during this research, a cursory analysis of key respondent interviews suggests that there are comparable classifications in Upper Kuskokwim vocabulary. According to Collins and Petruska (1979) the people of Nikolai have a generic word for whitefish, sajila as well as dilmije, a word that means "common whitefish." There is a specific word for humpback whitefish, tsendude, and a specific word for lake whitefish, tilaya. Tilaya is the origin of the community name Telida, a location known for its abundance of lake whitefish. In an earlier version of the Collins' dictionary, there is a word for little whitefish, tokomidza (Collins and Collins 1966: 14). There is also a word for candlefish, hwstin' (Collins and Collins 1966: 13). As reported for the Gwich'in (Andersen and Fleener 2001), sheefish or zidlaghe do not appear to be included in the Upper Kuskokwim whitefish taxonomy. When questioned, two different people listed the following categories of fish available at Telida:

> Q: What kind of fish do people have up at Telida?
>
> Whitefish… and red salmon I guess [Coho salmon]. And sheefish.

According to the ADF&G Upper Kuskokwim Fish Inventory (Burr 2004), there are six types of whitefish in this area: Bering cisco, broad whitefish, humpback whitefish, least cisco, round whitefish, and sheefish (inconnu). A brief discussion of local whitefish identification can be found in Stokes (1985: 270-273).

Collins (nd) created drawings of fish harvested for subsistence use, and labeled them with Athabascan and English names for the bilingual classroom in Nikolai. We asked some key respondents to look at those cards. One person who had lived in Telida as a child said that humpback whitefish and broad whitefish were the same, but tasted different from each other if harvested from lakes. She said she liked the ones from the river because they taste better. This respondent also said that a small whitefish on the card labeled as a cisco (with a question mark) was called a candlefish. To reduce confusion about he specific Upper Kuskokwim names for whitefish, we will discuss all species of whitefish together as one generic kind of fish.

Location and Time of Harvest. Numerous whitefish harvest locations exist in the areas surrounding Nikolai and Telida (Figure 4.3). Whitefish, the most plentiful genus of fish found north of the Alaska Range (ADF&G 2004), inhabit almost every type of river and freshwater habitat in this part of interior Alaska (ADF&G 2004). Nikolai residents spoke of harvesting whitefish in many locations and almost year round. Elders recalled the various times of year they harvested whitefish:



Source: Division of Subsistence,
Alaska Department of Fish and Game,
Household Interviews 2002-2003
Note: As not all resident households were
interviewed this is only a sample of harvest use areas.

0 5 10 20 30 40 Miles

Figure 4.3

1:1,250,000

Fall

> Yeah, whitefish I like… there's a long, big lake down there by Vinasale, where it's a long lake back there and a long outlet. And that's where they used to get it from, around the lake sometime back there in towards the end of September? Make a fence across there, and across— close to the camp you know, we lived down by the river. And it's gettin' narrower out there, sandbar used to go out, and it's narrow in there. There used to be lots of whitefish comin' out there too, you know – small whitefish.
>
> Sometimes, early freezeup, around first, one week after the first of October, yeah. When they set a trap, when we would try to trap it. When ice stop and then let it clear up first. Just mush ice underneath you know, right after freeze up. Down at the forks here, up by Medfra. We used to set a net in there after freezeup. Got to go wait until the ice, everything clears up underneath. Take about, oh, maybe four or five days or so. Before it clears up, slush ice underneath it just pile up in there, in those eddies you know, right at the forks there. Right at that point we set a net in there. That's how we used to get whitefish down there.
>
> In the fall, you could see it, along the Kuskokwim we used to when the clear water, we used to go along the beach, there's fish down there, we used to carry splitting maul and there ice, the maul and the axe through the snow and used wood hooks, get it out of that to the bottom, right after freeze up before the ice is too thick.

One Nikolai resident recalled fall whitefish fishing several years ago:

> We used to set nets for whitefish at night. At night the whitefish swim on the sides of the river, but not during the day. Down at the second sandbar we'd put nets in for the whitefish.

An elder recalled when he began using a snowmachine instead of a dog team; in 1969, he got a single-track snow machine and no longer had to catch a lot of whitefish for dog food. He said Morrison Lake was good for whitefish and pike; whitefish were especially plentiful there. He said that in the fall, Nikolai people would fish from lakes. Everyone had to fish because each family had a lot of dogs. The use of the snow machine has led to a decline in the overall fish harvest; specifically chum for dog food, people need fewer fish now that they do not have to feed dog teams.

Another resident said some of the small lakes along the North Fork of the Kuskokwim are among the best local sources of whitefish (Figure 4.3). The whitefish come down in tributaries from these lakes in the fall and head back to the lakes in the spring

Winter

In winter, people ice fish for whitefish on rivers and lakes by putting nets under the ice.

Spring

In early spring, people said they used to put traps under the ice. Later in the season, they used nets. Some people also used fish wheels:

> I had a fish camp in, for whitefish in springtime. I used to have a fish wheel down there too, in Medfra. Right below the fork. Springtime, it's just skinny though, but I had dog, and I need dry fish for dog.

Summer

In summer and fall people fish for whitefish with gill nets, rod and reel, and dip nets. Many people get them near Nikolai at the second sand bar or near Medfra. They also harvest whitefish as they are harvesting salmon.

Telida. One former resident of Telida who moved to Nikolai with his family as a child talked about fishing for whitefish in fall at Telida Creek between Upper and Lower Telida Lakes (Figure 4.3). In fall, he said, the whitefish came down the creek on their way downriver and his family caught them with a fish trap. The fish moved to the lakes in the spring.

Whitefish Population Abundance. Although whitefish can be harvested almost anytime, or anywhere, many Nikolai residents complained of a recent scarcity of this resource. They cited two separate suspected causes: increasing numbers of beaver and a lower water table. Several people said the community does not trap beaver as much as it used to because of the decline in fur prices and the high cost of fuel. They added that many people still eat beaver but not as much as they did in the past. According to one elder:

> Whitefish we don't have anymore up here. Beaver mess it up. Like, here, where it's spawning area, it's messed up with beaver dam, never get out or something, or never come in or whatever, you know. High water will bring it in you know, but in the springtime, after the breakup. A lot of years we get they're the only one that will …But nobody take care of it. They have to break the dam out and get it out.
>
> Never have that trouble before. Lately it [beaver] started making dams in those places. I don't know what happened. They're just making dams and dams and there's water in there. Water can't go out, yeah. That lake used to be up there at Telida, they got lake up there… whitefish down there. They used to get lots of whitefish in the spring and in the fall. Now, beavers mess it up. Some don't know what to do with that, cause they don't hunt beavers. Yeah, long time ago, there was hunters you know? I guess but they just don't want to go anymore for skin. Been true that nobody use beaver like they use to. …All dying out, and all the fish dying out…

Several people were planning to go out and remove certain beaver dams to allow whitefish to pass through. A person in her fifties said her father did this when she was a child. During a fall trip up the North Fork of the Kuskokwim River she and her husband showed us a place where a small lake outlet feeds into the main river. She said that in the spring whitefish went up the creek and were washed over a beaver dam by the spring flood. When the water receded the fish were trapped. In the fall, her father broke up the dam to let the whitefish out so they could move through the river and feed.

Another person said there used to be lots of muskrats around, but now there are none. She attributed this to her observation that the water in the lakes is warmer and the lakes are drying up. She added that there used to be whitefish down at the Forks, but for the last few years Nikolai people have either missed the runs or the fish are not there. She speculates that this is due to changes in the weather and how much dryer it is now than it was four to five years ago.

One person said she had noticed that changes in the environment, especially increased water temperature and lower water levels in the lakes has had an adverse effect on fish populations. She and her husband agreed that during the last four to five years the water in the lakes has lowered and become warmer. They thought these effects of climate change had caused a reduction in whitefish numbers because whitefish need deep, cool water.

Techniques and Equipment Used for Harvest. Today Nikolai residents use gill nets, dip nets and rod and reel to harvest whitefish in nearby lakes and rivers. People also use gill nets and hand lines to ice fish for whitefish in winter. When dog teams were still used, people also harvested whitefish with fish wheels. Up until the 1960's, fish traps and fences were used to harvest whitefish as they moved between rivers to lakes. One elder said whitefish and salmon were caught in the same fish traps. He said he made a fish trap with a smaller mesh than that of his brothers. He would set his trap behind his brothers' trap because they liked big whitefish and he preferred the small ones.

Spawning Locations and Behavior. People in several households told of harvesting whitefish as they moved from lakes in the fall into rivers and also when they headed back to the lakes in the spring to spawn.

Preservation, Storage, and Consumption. People in Nikolai process whitefish in the same ways they process salmon: they score the fish for drying and half or completely dry it. Half dried fish is frozen for later use. Some people freeze their fish whole. Almost every part of the whitefish is consumed by Nikolai and Telida residents, including the meat, liver, stomach, eggs, and something one person referred to as a "little bag with a rock in it."[4]

[4] According to Randy J. Brown of the U.S. Fish and Wildlife Service, the "little bag with the rock in it" is the ascending leg of the stomach in humpback whitefish and broad whitefish. The order of passage when one of these species swallows food is mouth, esophagus, descending leg of stomach (which is a highly expandable part that is relatively thin), ascending leg of stomach and the descending intestinal trail that runs straight to the vent. The gizzard-like ascending leg of the stomach is not at all stretchy, and it is frequently eaten by residents of rural

> There's little bag in there, about in the middle of throat. It's got rock in it, and whatever, whatever it eats, it grinds up in there, yeah, and it's got rocks in there. Clean that out, and I like, I like those, you know…

One family described a recent treat when they caught two whitefish and boiled and fried the stomachs. People noted that they were very careful about cleaning the stomachs first, explaining that they knew of a woman who died after eating improperly cleaned whitefish. Another person related that after whitefish stomachs were cooked, they tasted like clams. His wife said there used to be a belief that they should not be eaten, but she thought the older people used to say this because they wanted them all for themselves.

Several people told us they loved whitefish eggs and cranberries mashed together. Whitefish are also used for *nemaje*, Indian ice cream (Collins and Petruska 1979: 50). Most people emphasized that this dish was not the same as Yup'ik *agutak*. They said *nemaje* has much more fish than agutak, is much pulpier, has less sugar and is mixed with a stick, not a mixer. Some people said only men can make it. According to one person, only men should make *nemaje* because it used to be made with moose fat and was mixed by hand. In the past, men's hands were considered clean whereas women's hands were not considered clean due to their menstrual cycle. Thus, some moose products were mainly prepared by men. One woman said that people needed fat in the past and there was no sugar. She attributed the increase in overweight people in her community to an increase in sugar consumption. She said that until forty years ago, she had never seen overweight people in Nikolai.

Both in the past and today, people have received whitefish from nearby communities. A former teacher in Nikolai and Lake Minchumina used to fly his plane from Lake Minchumina to Nikolai with a planeload of whitefish for the elders. He knew they loved it and that the village was in short supply. The last time he did this was about 1997; he and his family have since left the community. Other Nikolai residents said they receive whitefish from other Lake Minchumina residents.

Alaska. In some communities it is not cleaned out, it is boiled and eaten with the food items still included. Both humpback whitefish and broad whitefish consume large quantities of small snails and clams and these shelled animals make it feel like a bag full of gravel.

Sheefish

Subsistence Harvest: Location and Timing. Many people mentioned that sheefish was one of the first fish to return to the area in early spring. Sheefish are found in many of the tributaries of Kuskokwim, such as the McKinley Fork, Swift River, Blackwater, Salmon River, Big River and Highpower Creek near Telida (Figure 3.1). One resident indicated that some sheefish travel, "up to the mountains from there, McKinley Fork," late in the fall to spawn. He also said that sheefish travel back downriver about the time of freezeup, and they were harvested there using traps or nets set underneath the ice.

> The first fish come, sheefish then after breakup. Pretty soon the king salmon show up. The breakup occurs about middle of May over here, down around Medfra, and they come about that time – right in there – 'round middle May there's sheefish around Medfra. Up here, seems like no sheefish in this river – only just accident – people get one or two – that I think – there's nothing.

Sheefish are harvested in Big River, downriver from Nikolai, in June. In late August and early September, the sheefish finally make it to Highpower Creek. Telida residents said the fish are "fat" at that time of year.

Techniques and Equipment used for Harvest. Sheefish continue to be harvested using gill nets set underneath the ice, as described by Stokes (1985: 284-286). They are also caught with gill nets at fish camps throughout the summer during salmon fishing, and with rod and reel.

Spawning Locations and Behavior. Informants indicated that sheefish travel upriver to their respective spawning areas in summer and they return downriver during freezeup. One resident said he once found evidence of sheefish spawning on a trip he took upriver. He discovered sheefish bones dug up by a wolf. He inferred that the fish had traveled this way and spawned out.

> There is king salmon at McKinley Fork but people never went after it, but once, in March, I found wolf taken way back up there where it is shallow. Where there used to be salmon in the fall. I just stand there and there was some bones you know, that a wolf dug out. That is how I know that big fish go up there. That is how I know sheefish go up there too.

Preservation, Storage and Consumption

People use sheefish in the some of the same ways they use whitefish as described above. They make *nemaje* and mash the eggs with berries.

Arctic Grayling

Subsistence Harvest: Location and Timing. Nikolai residents harvest grayling almost year-round. In spring, grayling are harvested at eddies along the South Fork using hand lines and set nets underneath the ice. Later in the spring, once the ice has disappeared, they are harvested using light rod and reel gear. In the summer, nets or rod and reel gear are used and in the early winter, grayling are caught along with whitefish in nets under the ice. Historically, grayling were taken in traps set in creeks.

> [Blackwater River] That's where they used to use that net often, this other river here is a creek down below there. Oh, here it is [indicates trap]. That's where we used to fish too, for grayling. In the winter, that's when you trap it, like in the fall – after freezeup. We would freeze it like that you know.

When asked about specific creeks to find grayling (spawning), one person replied as follows:

> Any creek, all the – it [grayling] goes up in all the branches. When you find one that's going to the river, little creek or something, there might be lake back there. Close up in there in the spring when river opens up. There's a lot of them. I used to get 'em down here [Nikolai]. Just couple, around a couple bends from the second sandbar. Downriver from that one that comes out from that side. (looking at map) Yeah —— we used to — there was only one old man I used to know that set a trap in there in the springtime. [He fished for] grayling, lots of them you know. Early in the spring. When the water would start coming down that creek. Little creek you know.

A Nikolai resident expressed a sentiment also heard in reference to several other freshwater fish. In the fall, he said, the South Fork is too muddy to fish, and fishermen have to wait until the "ice will stretch across the river." The water becomes clear, and the mush ice has cleared up underneath, before they are able to resume fishing.

One resident said that jet boats have increased people's access to fishing spots, especially for grayling. He also said that small fish, particularly small grayling, get sucked up into jet engines. Another person said he harvested over one hundred grayling during the past winter and shared them with all the elders in the village.

Techniques and Equipment Used for Harvest. Depending on the season, hand lines for ice fishing, gill nets, and rod and reel are used to harvest grayling. At one time, traps and weirs were used to harvest grayling, often at the same time as whitefish. One resident spoke of the fishing techniques he had learned from his father, including how to make fish traps:

> I learned a lots from dad too, you know, I grew up with my dad. … like, the fishing, you know, under the ice, you know, out on some of those creeks…fish trap. You know what that is? Oh, not too long, maybe this long. Square, like this, but it fits right against the cylinder here. Fish goes down here and gets stuck

in there, there's no way out. Only through hole in there. But it's small, wood just like this huh? With, all kinds of funnel like. And the only way out is the middle of this, like, and that, that's how we used to make fish trap. Little smaller creek too you know, used to put fence across there and put a fish trap.

Q: Was that around Vinasale?

Yeah.

Q: What kind of fish would you get in those traps?

Oh, grayling. Yeah, mostly, you know. Go, go up in those creeks summertime, come back in fall, after freezeup, I think. Summer too we used to get lots, and lots on the river, like whitefish. Those are really good, big ones, yeah, fat you know. They used to trap them under the ice on the river, yeah, and loche. Big, those are big around Vinasale. I don't know what happened to it, but never showed up here. And down around Stony, around Vinasale, it's only maybe, like this [indicates size].

Spawning Locations and Behavior. Grayling migrate up area creeks during the spring to spawn near the lakes at the heads of these tributaries of larger rivers such as the Salmon River. Grayling generally return to the rivers in the fall during freezeup. When asked where grayling spawn, a long-time Nikolai resident recalled watching grayling trying to reach a lake at the head of the Salmon River in late June. "The water was clear and you could see the bottom, it was just red and nothing but king salmon." A ten-foot beaver dam lay between the edge of the lake and the feeder stream. Chinook salmon was able to jump the dam, but the grayling had to make repeated attempts, and some were ultimately unable to make it.

Preservation, Storage and Consumption. We heard several times that grayling are often prepared or preserved just like whitefish. Grayling are reported to be "very fat" in the winter. Some people enjoy cutting them up fresh and frying them.

They'd dried it like they dry whitefish– split it open you know. But we didn't split too many of those. Only in the springtime, you could get 'em with nets.

Northern Pike

Pike are an important subsistence resource for Upper Kuskokwim communities. They are available throughout the year and are found in most rivers and many of the area lakes. One person informed us that a local person planted pike in Salmonberry Lake at Nikolai, and now residents are able to fish for pike, just a short walk away from their homes (Figure 4.3). One

resident spoke about the spread of pike through the region. He described a flood in Telida, which filled the creeks, making them spill over into one another, dispersing fish.

> Yeah. I used to see high water, lots of water in creek; they just go all over the place, the pike.

Subsistence Harvest: Location and Timing. Nikolai residents fish year round for pike. They spend a considerable amount of time ice fishing for pike in March. People in Nikolai said pike should be harvested right before breakup. They added that if one missed this period, pike would still be available after the ice went out. Lake fishing was also described as good in the fall.

> It's that time, after breakup, we used to get whitefish. Right after breakup, and pike, and that longnose [sucker] (laughing).

Several lakes were said to have particularly good pike fishing: Pike Lake, Fish Lake, Morrison Lake, and Farewell Lake. The lake at the head of Salmon River was also described as having good pike fishing. Nikolai residents also said pike availability was good in the Kuskokwim River on the North Fork and near Medfra (Figure 3.1).

> Q: Where would you fish for pike a long time ago?
>
> Down they're at Medfra on this river with just a fish net. At the forks of this river, just right above there.

Although several local lakes and rivers were named as good places to find pike, one resident indicated that pike did not travel as far as Nikolai along the South Fork,

> There's nothing up here. It doesn't go up this far. It goes up the North Fork I guess, — like in the fall before the ice starts to run. The biggest one I saw was about that long, forty-eight inches, forty-nine inches long.

One person mentioned that he had seen some pike with red flesh, which he thought resulted from the pike preying upon trout in the Alaska Range. Apparently, when the pike ate the pinkish flesh of the trout, it caused "red" flesh in the normally white-fleshed pike.

> …its got lots of pike in there. And the fish are just red you know, the meat you know, pike.
>
> Q: Usually pike has white meat, but those have red?
>
> Yeah. Yeah. White meat down here, but there's lots of that trout there. And it's kind of red you know. They give me one or two that time. But they're not very big ones up there, you know. Yeah.

Another resident described the necessity of traveling to good pike fishing lakes. Snow machines are often used along winter trails to reach these ice-fishing lakes. Pike are very

common around Telida (Telida Lake), especially in the spring. In the past, fish traps were used to harvest them.

Techniques and Equipment used for Harvesting. The gear type used to harvest pike depends upon the season, and is similar to gear used for other freshwater varieties of fish. Gillnets are used both for summer fishing and for winter fishing underneath the ice. Hand lines and rod and reel are also used. Traps and nets were used in the past:

> My parents yeah – way down there –they used a net early. Down at that big lake that I was showing you on that (indicates map) – There used to be pike in there in the summertime, there's lots of 'em out there— we used to catch lots— what they have in those big tub, we'd carry two of those tub, and we carry them full you know— me and my brother, but we just paddle, three or four miles to that fish.

Preservation, Storage and Consumption. Many of the same methods described for preparing other freshwater fish were also mentioned in reference to pike. Some people dry pike as flat fish like they do Chinook salmon. Other people freeze it and later boil or fry it. Pike is also used to make nemaje.

Other Freshwater Species

As the following section illustrates, only incidental information was collected about Dolly Varden, burbot (loche), longnose suckers, eels, blackfish, lake trout, and freshwater mussels.

Dolly Varden. An elder and a man in his thirties both said that Dolly Varden used to be found in the South Fork of the Kuskokwim River, but they have disappeared from there. Both men said they liked to eat them. One person said that Dolly Varden can still be found at the Little Tonzona. Another said they spawn upriver from Nikolai where Chinook, coho, and chum salmon spawn (Figure 3.1).

Burbot (Loche). Burbot or loche, are caught incidentally along with whitefish and pike during spring fishing with nets set under the ice, or with light rod and reel gear after breakup. An elder spoke of setting nets for loche at the fork near Medfra. These nets were set after freeze up. He specifically mentioned waiting to set the net until the slush ice had disappeared, and the water cleared. He said he did not know where the loche spawn but that he and his family spent much of each winter at that fork, maintaining their net.

Another elder said his family used to trap loche under the ice near Vinasale. Trying to find out their range, he looked in the Takotna River and the North Fork and found none. He said there are some loche near Nikolai but they have big heads and small bodies. He said they are still good, and he especially likes the livers. Nikolai residents said that burbot are available year

round but are not plentiful. Other people said loche can grow to be very large and that they used to get them with hooks.

One elder talked about putting the fish wheel away in the fall and moving to the lakes to fish for whitefish, pike and loche. They also stored fish at these lake fishing sites, and were able to return to them when necessary.

> After they put their fish wheel away fall time, maybe about this time (mid-October), they take their fish wheel and put somewhere where ice breakup won't get to it. They store them away, someplace in an eddy or what – and then they go to, to creek where they're fish, fish in lake- whitefish and pike and loche. They go there and they also store fish there.

Current and former residents of Telida who fished there during the past year have harvested loche in the same areas as Nikolai residents.

Longnose Suckers. Longnose suckers are incidentally caught in nets set in the fall by Nikolai fishers. While helping village residents check their nets, we witnessed many suckers being thrown back. Given the current availability of preferred food resources, some people described suckers as too bony to eat anymore. Suckers are found throughout the area, including North Fork and East Fork as well as near Medfra and Vinasale (Figure 4.3).

> Up here those, there's lots of those suckers. One time, me and [my son] was up North Fork to try for fishing you know. Where East and North Fork comes together, that's above Medfra there. And we got BIG one, oh, about this big.

Residents talked about catching suckers early in the spring while fishing under the ice with nets for whitefish. Almost every person who mentioned catching suckers talked about how bony they were. One elder used them by boiling only the heads to make chowder:

> All the fish that grew up in there, I ate all except that eel, and then longnose fish, yeah? (laughing) So much lots of little bones, yeah? So what I do is, I cut the head off and I boiled it [the head]. And I keep, I don't touch it til it's really cooked good, and then I took it out. I make that, make chowder soup out of it, that's one way you make chowder? We used to get some in lakes down there at Vinasale, mmhmm, big ones, yeah. In the summer it's all, it's open little bit, and that side is straight up, huh?? And we used to get willows, small willows at the top? And then stick that in there and just trap it. (laughing)

In the past, local people utilized suckers as a food resource both for themselves and their dogs. One resident told of eating nothing but fish, often only suckers, for months on end. He emphasized that any variety in his diet was appreciated, bones or no bones. During an interview, he described fishing for suckers:

> Husband: We used to fish for suckers – bunch of 'em – so much we couldn't catch them all… springtime. They come to spawn in the spring and summer. In

> the springtime, we'd go over there [slough across from second sand bar in Nikolai], put a five-gallon on a packboard and throw'em in there.
>
> Wife: They didn't use nets then, they used spears.
>
> Q: Which way do you like suckers cooked?
>
> Husband: Doesn't matter, we ate them all the time. We always wanted something different – boiled, baked, fried, dried… didn't matter, we always wanted something different (laughing).

Longnose suckers were not mentioned during the traditional knowledge interview with current residents of Telida. However, former Telida residents now living in Nikolai said they used this fish when they lived in Telida.

Eels. Only one person mentioned harvesting eels. He used to live much further south along the Kuskokwim River at Vinasale, and remembered harvesting them when he was younger (Figure 4.3). He described how he and his brothers harvested eels when it was dark by luring them close with lamplight shined through a hole they had chopped in the ice. Once the fish were drawn to the hole, the boys were able to spear them.

> What you were talkin' about was that my brother used to tell me, good to eat, you know? How we used to get it was when— right after freeze up, we'd make a hole out there, down there through. Could come through that light in that hole that he's got? He's got a- he has a lamp in there, I guess. It's shining down in the water. It comes there, and he has those willows you know. You get 'em on that willows, and you pull it up, you know? … Really fat with no bones in it, I guess. Just like a snake but it's not. You know, got no legs on it, it's like… swimming. Yeah, they get eel down there. Down the river, by McGrath, quite a ways down.

Blackfish. Blackfish are small fish, described by Nikolai residents as having many bones. They can live in shallow and swampy areas in the summer because they are adapted to breathe atmospheric oxygen. Late in the fall, they migrate to the deeper parts of local lakes.

> Long time ago, my mom used to cook it. Little moose fat, and boil it. Got a lot of bones though.

Blackfish over winter in lakes and by late winter, the lakes begin to run short of oxygen. Reportedly, the low oxygen is what makes blackfish easy to catch in large numbers in winter. In the late winter and early spring, these fish are seen "swarming" around small holes in the ice in search of oxygen. Sometimes blackfish use either muskrat pushups or beaver holes for air. People also sometimes cut holes in the ice to give the blackfish a location to congregate. The blackfishes' swarming activity eventually expands the hole, giving the fish room to breathe, and for man and animal alike room to harvest them. People noted that the snow around these holes was tramped down by animals such as birds and other mammals that frequented the lakes to fish for easy prey.

> I seen open place long time ago. I seen little blackfish come out of the hole. Just a whole bunch, and there's no water going, water I think. Maybe they smell it and come out like that. Fox and raven eat it.

Informants also spoke of a cultural rule regarding blackfish. A few elders explained that people were not allowed to scoop blackfish up out of the creeks with their hands. It was necessary to use a dipper, a frying pan or a small net. It is interesting to note that we did not learn of many specific traditional rules regarding other species of fish. We did learn general rules about the treatment of fish such as not wasting, taking only as much as needed, leaving salmon in the water overnight for easier cutting and also that their spirits could return to the river. The specific rule about blackfish was purely an incidental comment. It may also be because blackfish are so unique and had to be treated in a unique way according to local beliefs. Answers were not forthcoming when this question was posed.

From conversation, it did not appear that blackfish are regularly harvested. Most people say that only older people used to eat them. Some people fish for them in early spring. In the past, blackfish were caught in large quantities to provide an easy source of dog food. One young local resident talked about fishing for blackfish to use as bait for predatory fish, such as pike.

A few former residents of Telida mentioned that they used to harvest blackfish in the Telida Lakes and smaller, neighboring lakes (Figure 4.3).

Lake Trout. Three Nikolai residents mentioned harvesting lake trout in lakes near the Alaska Range. One hunter in his thirties said he sometimes eats lake trout when he is hunting in the mountains. An elder mentioned seeing trout near the head of Salmon River:

> There is moose hunting season about the time they go to— for other different kinds little fish, whitefish and pike. And we don't have no eel though either. We don't have no trout either. Every once in a while, someone might caught a big trout – but somewhere out there in the fish spawning area, there's, there's few trout – but I don't know what kind trout – there's so many different kind trout. It's not in this river, but there's someplace, there's some trout, head of Salmon River creek – but no, we don't hardly knew about it.
>
> Mountain trout is up there too now, yeah. Close by mountain you know.

Another elder said that trout were redistributed from one river or lake to another near the Alaska Range. Describing floods near Farewell Lake, he said that sometimes the river would rise so high that "there's a whole stream of water comin' under the building there" [Farewell Lake Lodge]. He described the floodwaters "lifting up" the trout and moving them to different lakes. When asked where the water came from he said,

> That comes out from under the mountains back there. That— it's that rivers I guess, under those mountains. Creek, you know, yeah. And when it rains, rain water just come and you see lots of rain water just down into that creek down there under the mountains and it gets over flowing then it comes in the slough,

> and fish you know, those trouts? They're about this long I guess (indicated 4-5 inches in length). They come out from the canyon back there. Way the hell back there. How it got there, nobody knows, but that's where it comes from, you know. (laugh) Yeah, that channel down there under the mountain, it's just full down there and it just come out into the rock, when the water gets high down there? Rain water. And it comes out in that there canyon. There's water in there, but it just happen that the water drop them off and they couldn't find their way back where they came from I guess.

Freshwater Mussels. Only a few people mentioned harvesting freshwater mussels. One person said she heard of other residents trying to transplant freshwater mussels from Lost Jack Lake into Salmonberry Lake at Nikolai (Figure 4.3). She was not sure if their efforts were successful or not, but knew that several types of fish had been successfully transplanted to this lake over the years.

Another resident informed us that there are mussels in many of the lakes around Nikolai, but that he did not know of anyone who harvested them. He mentioned that he knows they exist in Morrison Lake, south of Medfra (4.3). When he was younger, his mother told him that people used to eat mussels, but after someone got sick, they stopped eating them. He quickly followed this story by telling us that his mother kept him and his family healthy by keeping them clean and feeding them good food all the time. They did not get influenza. Several people said that once they heard of people getting sick from eating mussels they stopped eating them. One person said there was a certain way to clean them that could prevent illness, but the person who knew how had passed away.

Two elders described historic mussel harvests. One said:

> In McGrath, we saw them takin' clams [mussels] from the bottom of the lake. They got a lake down there that they get clams out of. I don't know if they're doing it yet, but we used to go down for it? I watched them get them out, there's about this much water, waded out, …put their head down and…Not that good you know, taste like codfish. Yeah.

The other elder said that on hot days people would wade into lakes with sticks. The mussel shells would be open. The people would put their sticks in between the shells and when the shells contracted they would pull the mussels up.

Nikolai Fish and Habitat Issues

Availability of Fish. As illustrated for many of the species described above, there appears to be general consensus in Nikolai that there are fewer fish than there used to be:

> As far as fish goes it's been slowing down quite a bit.

> Far as I know, getting less fish all the time.
>
> In the past, it's a lot of work, all we did those times, put fish away all day, maybe 100 per day. We used to get enough fish but nowadays it's maybe less fish now and I don't think there are hardly any big, lots of fish long time ago came out.
>
> How many fish they used to get, I don't know, they get all they can. Salmon was what they used to have long time ago, before white people. Then white people came and they made what we used to call fish wheel and that is how it started. White people came into Alaska and they figure out how they're gonna get 'em I guess. At that time I used to remember lots and lots of salmon at this time you know…right now. And now, hardly there's anything out there now.

Nikolai residents frequently mention decreases in fish populations, especially for Chinook salmon, whitefish, coho salmon and chum salmon. Stokes (1982) also spoke of a decrease in Chinook numbers. He noted that in 1982, Nikolai and Telida residents were concerned that a long term decline in Chinook salmon returns had begun in the early 1960s. Stokes did not mention decreases in whitefish, coho salmon and chum salmon in his two "baseline" studies based on research conducted between 1981 and 1985. Nikolai residents gave a variety of explanations for the decline of many fish species, including over fishing, commercial fishing, and foreign high seas poachers; indicators of an overall drying trend including dried-up salmon spawning areas, lakes becoming marshes, melting permafrost, shallower lake water and higher water temperatures; and an increase in beaver populations that may be associated with a decline in whitefish trapped by beaver dams.

Decrease in Water Level. Several residents made observations about falling water levels. One elder said the freshwater spawning areas of the Kuskokwim River drainage are drying up:

> What I think what really happens down there, back there, is that there creeks got dried out, you know, no water comes out, and nothing. One time not too long ago, few years ago maybe – around the mouth of the Kuskokwim we used to get lots of freshwater spawning area, and that's going down, cause we got no water coming down. Yeah, that'll make it go down too because there are no salmon there too you know [fish populations will go down].

Other people said the water in the lakes is warmer, the climate seems drier and the lakes are drying up. Some of these changes are attributed to the 1964 earthquake. People said the lakes used to be deeper in this area, and unlike now, there were no weeds. Some people said there were fewer fish because the water was warmer. Once-hilly land is now flat and the permafrost is melting. Other people see a decrease in muskrats as another symptom of a widespread drying trend.

Nikolai residents also said the dryness is affecting the berry patches; there haven't been many berries in the past four or five years. One woman said her dad told her the area down by the river [in Nikolai] used to be a swamp. She agrees that the area has changed. Village residents used to pick salmon berries down there, where it was wet. Now the berries are not there.

One woman said she thinks the reason the environment has changed is because no one has respect for the land and the animals anymore. She talked about old rules and beliefs that have disappeared. According to this woman, the rules and beliefs about respect for the land, the animals, and sharing are what made the people Athabascan.

Behavior with Regard to Fish. When asked about traditional limits on fish harvests, most people said that in the past they took as much fish as they needed. Their priority was not to waste fish, so "escapement" periods were a practical necessity. Everyone who had ever fished with traps and fences talked about the never-ending maintenance they required. They said it was constantly necessary to take gear out of the water to clean it and to repair it. Debris (branches, logs) in the water and the gnawing teeth of Chinook salmon ensured there was always something broken. People said that when their trap or net was full, they pulled the gear, processed the fish in that load, and did not put the gear back into the water until that batch was processed. One elder said, "We did not waste fish, we kept what we wanted and we store it, that is the way." Another elder said his parents told him to watch and make sure fish do not die out, to keep a clean camp, and not to throw anything away. Part of having a clean camp included not walking on fish bones or blood and disposing of these items properly. One elder said, "You can get as much as you want to use. If bones aren't burned, that is how it gets lonely, the birds or fish or whatever, getting caught less and less, everything."

Several families stressed the importance of being at fish camp prepared and ready long before the fish arrived. One elder spoke of the events that followed the arrival of the first Chinook salmon of the year:

> …people would cook it up and eat it together, all sharing, I saw one time sort of like an Eskimo dance when I was a kid. But they stopped that. But they used to get together quite a bit and they talked about how they lived long ago. How to take care of your food, don't throw anything away, don't waste… what they do in the wintertime, like Christmas, everybody cook and put lotta things together, then they get together and eat together. And what they do after that, them old people tell 'em stories about how they used to live long, long ago. You listen to them like you might be interested you know, there's lot of different stories from us older people. But nowadays, you know, it's all gone…Most of that was about how to take care of your food. Don't throw anything away that you wouldn't take care of, don't waste nothing, that's how it used to be… Here, I'm still that way, even today.

One elder told of a traditional management practice for manipulating runs of salmon:

> Only thing I know is that those who travel, hunt together, you know. And wherever it's good up here maybe this side or this side. And they do it, they put the fish eggs, last year fish eggs in this river, so when the salmon come up and turn off, away from that, they take other channel you know, other, other river you know.

Q: And so people put the fish eggs…

In the river, yeah.

Q: So if the fish were coming?

Those fish for the summer, that's the way it's gonna come now, you know.

Q: Oh, they put the fish eggs here?

Uh huh. Last year ones.

Q: Oh, and they could control the way the fish went?

Uh huh, yeah.

Q: And they could catch them better?

No, they would be more over here.

Q: Oh, and like if it was king salmon…

Uh huh.

Q: Would they put king salmon eggs?

Yeah, and there's one place up the river, that somebody down the river, you know, below Medfra, dump it in the river, and that's gonna go up Big River side, you know, up towards Salmon, yeah.

Q: If they dumped eggs by Medfra? It would go to Big River?

Or down below you know. Close to that way you know, where it comes in, yeah. River…

Q: Did people ever be mean and dump eggs so the fish would come to them and not to other people?

I guess that's what mainly they did, you know, to each other.

Q: So would like Big River people do that to Vinasale people?

No, there's only one river beyond that.

Q: Hmm… who would do that to somebody?

Oh, I don't know, I guess, if I was a Salmon, and you were up here, huh? You know, up towards the river, where there's spawning area, and if you don't like me, you dump last year's fish eggs in my river.

Q: Oh really? So you had to be nice to everybody?

Uh huh. So that you know, they go on this side, you know.

Q: Would the salmon know people did that?

Yeah, they did. ……., I guess. They get more on that river, yeah.

Q: Wow.

See that long time ago they used to get lots of salmon over there. Lots of people get together over there.

Q: Where?

At Salmon you know.

Q: Salmon River?

Uh huh, Yeah, they make fence and fish traps and they fished lots in there I guess.

Only two households mentioned throwing back female fish. One said that if they catch three female salmon they would throw two back so they could spawn and keep one because they like to eat the eggs. Another household said that the idea of throwing back female fish was a "white man's rule" and they did not throw female fish back because they like to eat the eggs.

Discussion: Nikolai and Telida

In an unpublished manuscript entitled *The Kolchan: Athapaskans of the Upper Kuskokwim* (1966), anthropologist Edward Hosely discusses the dynamic patterns of subsistence resource harvests followed by the ancestors of the current residents of Nikolai and Telida. He describes how people who relied on caribou, sheep, and bear in the foothills of the Alaska Range shifted to a dependence on salmon in the drainages below. Hosely attributes this shift to the people's desire to participate in the fur trade. He also links this increased focus on fish harvests with the introduction of durable commercially-made fish nets. Around the same time fish nets appeared, approximately 1900, prospectors arrived on the scene. Hosely's observations support Oswalt's supposition that the arrival of the fish wheel to the area in 1914 led to settlements near major streams. Local people adjusted their subsistence harvests to the particular places where they lived (Hosely 1966:155-197). These anthropologists documented the transition of the Upper Kuskokwim people from a nomadic to a permanent village lifestyle.

Some residents still recall living in the mountains in the winter and near fish streams in the summer as children. Today, many families in Nikolai, some of whom are from Telida, make seasonal trips of multiple days' duration away from their villages to harvest fish and wildlife resources. Most of the areas mapped in the early 1980s as fish camps for Stokes' study

(published in1985) have been used continuously and were again mapped during the 2002 study (Figure 4.2).

One of the best examples of the continuing adaptation of the Upper Kuskokwim people of Nikolai is the Chinook salmon fishery at Salmon River. In spite of gear changes, perceived declines in Chinook returns, and reports of increased competition from McGrath residents, the subsistence fishery at Salmon River continues; this study documented Nikolai residents' concerns about this fishery. For example, several people in Nikolai were concerned about increasing boat traffic on Salmon River. They complained that Salmon River has become increasingly popular with McGrath residents and visiting sport fishers outfitted or guided by McGrath businesses. One person said the water at Salmon River is clear, but is being stirred up by increasing numbers of boats from McGrath with high-powered motors. She said her family had to fish around this boat traffic. Instead of fishing all day like they used to, they got up early to fish before the boats stirred up the water and made it murky, because Chinook do not take lures or baited hooks in murky water.

Many of Nikolai residents' concerns related to uses of the area by non-local residents. One person mentioned that there is talk of building a sport fishing lodge at Salmon River; he was opposed to the idea. Another concern related to a program that allows Alaska Native veterans from the Vietnam War era to apply for Native allotments. Residents had heard that a non-local person was expressing interest in getting an allotment on the Salmon River.

Citing a number of responsible factors, many people commented on an overall decline in Chinook salmon at Salmon River and throughout the region. A common theme was over-harvest by commercial harvesters from near Bethel, south toward the mouth of the Kuskokwim. A woman said the Chinook salmon have never bounced back since there was a fire near the spawning area in the late 1970s. A man said that not only are there fewer Chinook salmon, but those that do return are much smaller than in the past. One elder repeatedly said that high seas poachers were affecting fish populations, including Chinook salmon. He also said that increasing numbers of bears and wolves are consuming more and more salmon.

These concerns are not new. Stokes talked about the same issues in the early 1980s (1985: 224-225):

> Sometime during the mid-1960s, individuals using a fence for Chinook 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 Chinook 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 Chinook salmon where other techniques either are unproductive due to various stream characteristics or traditional techniques have been eliminated by regulatory action. …The Chinook salmon resource, its continued use, and current regulations restricting harvest methods and means continue to be of concern to Nikolai residents (Stokes 1985: 224-225).
>
> Little consistent region-wide biological information has been collected on salmon in the Upper Kuskokwim area. …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 Chinook salmon stocks, particularly in the Salmon River drainage. In response to concerns expressed by area inhabitants over the years to the Alaska Board of Fisheries, the Division of Commercial Fish in 1981 constructed a weir to study salmon escapement on the South Fork of the Salmon River just upstream of the mouth. 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, little long-term information on the status of the largest and locally most important fishery was garnered. (Stokes 1985: 226-229)
>
> Concern over Chinook 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 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 (Stokes 1985: 230-231).

As Stokes noted, the Nikolai Chinook subsistence fishery at Salmon River has prevailed in spite of decreases in runs and increases in regulations and social obstacles to fishing there. Management of the Salmon River fishery is primarily under the jurisdiction of the Alaska Department of Fish and Game. In the 1980s, the state generally classified all rod and reel fisheries as sport fisheries. Until 2002, the people of Nikolai continued their subsistence fishery at Salmon River under sport fishing regulations. These regulations were cumbersome and not

suitable for subsistence fishers. In a 2001 letter to the Alaska Board of Fisheries, the state's fishery regulatory body, the chair of the federal Western Interior Regional Advisory Council, Ron Sam, requested that the regulations be changed so that rod and reel would become legal subsistence gear in the Upper Kuskokwim. The Board of Fisheries approved the change in March 2002.[5] Alaska statute now states that the residents of Nikolai may use rod and reel as subsistence gear (5AAC 01.270) (ADF&G 2001:372).

During this study, Nikolai residents expressed concern about the effect of the use of rod and reel on the nature of the Salmon River fishery. Some believe the declines in Chinook salmon harvests in the Salmon River area are not only because of declining runs. Several people attributed the declines to the loss of traditional values of respect for animals and less sharing and working together. Historically, when large numbers of fish were harvested using fish wheels and fish traps, everyone had to work together. The need to use a rod and reel has changed what used to be a collective effort into an individual one. One woman said the fish slowed down when people stopped using the fish wheel, they stopped sharing and stopped processing fish communally.

In addition to the decrease in Chinook salmon returns, Nikolai residents also reported decreasing numbers of whitefish. This concern was not voiced during Stokes' 1985 study. One of the reasons cited for the decline in whitefish was an increase in the number of beaver. Many people spoke of the large number of beaver dams that block lakes and therefore prevent the movement of whitefish. Most people attributed the increasing number of beavers to the decline of trapping. They said that because fur prices are down fewer people are trapping. Residents of the area said they do not remember ever having had a problem with too many beavers. During field visits, several Nikolai residents told researchers of their planned trips to remove beaver dams from lakes with whitefish.

The local perception of a general pattern of a dryer climate with resultant lower water levels is often mentioned by Nikolai people as a possible cause for the decline in whitefish. Andersen and Fleener's (2001) study of whitefish and beaver ecology in the Yukon Flats indicates that people in that region also cited lower water levels and decreased beaver trapping as factors in the decline of whitefish. Residents of the Yukon Flats and of Nikolai observed that lakes were drying up. People in the Yukon Flats cited decreased flooding as a reason whitefish were not moving as they had in the past (i.e. flooding or high water events allows escapement beyond beaver dams) (Andersen and Fleener 2001:33, 36). This explanation did not come up in Nikolai residents' comments about whitefish.

Another fishery issue not voiced in Stokes' study is the reported disappearance of Dolly Varden from the Nikolai area. When asked, residents said they had no idea what happened to the Dolly Varden. "They just disappeared," they said.

[5] This Board of Fisheries action in the Upper Kuskokwim mirrored what the Board of Fisheries had done in the Lower Kuskokwim and which the Federal Subsistence Board had done statewide.

Management Applications

As noted in the introduction, the customary and traditional use of subsistence fisheries of SRZ communities is protected under ANILCA. This report provides information on the customary and traditional use of the subsistence fisheries of Nikolai and Telida over time. The Salmon River Chinook salmon subsistence fishery continues even though rod and reel is now used instead of fish traps. This is a good example of how culture is a process, not a static entity, and how cultural changes can be seen in subsistence harvest practices. As previously noted "Subsistence economies are resilient, enduring, changeable and complex systems" (Andersen 2004: 143). This Upper Kuskokwim fishery continues in the same place, with the same species of fish, fished by descendants of those who fished it generations ago. The fish trap, the customary and traditional gear type used in the past, the fish trap that was used in the past is not legal gear today. Some Nikolai residents take time off from wage jobs to fish with their families at Salmon River, use rod and reel until only very recently under sport fishing bag limits and regulations and use motorized boats to get there. This change in gear type does not diminish the customary and traditional nature of the fishery. The fact that people have continually adapted and that this fishery persists is an illustration of the changing nature of customary and traditional practices.

Specific implications for management involve the concerns voiced by residents during this research. The decline of salmon and whitefish populations, the effects of climate change and an increase in non-local fishers are all issues that require attention from managers.

The biological information provided in this collection of TEK is relevant for maintenance of sustainable subsistence fishery resources. A good illustration of the relevance of TEK for management can be found in a comparison of the information in this report with the information in an inventory of freshwater fish conducted by the Central Alaska Inventory and Monitoring Network (CAKN). The Alaska Inventory and Monitoring Program of the NPS conducted the inventory. The CAKN includes Denali and Wrangell St. Elias National Park and Preserve and Yukon-Charley Rivers National Preserve.

The inventory was conducted to document the freshwater fish species that were "expected yet undocumented" within the CAKN (Markis, et al 2004: 2). It is important to note that the CAKN inventory was conducted strictly within park and preserve boundaries. The DNP SRZ communities fish primarily outside of DNP boundaries. However, a comparison of the fish inventoried in DNP by the CAKN and the list of fish species discussed in this USFWS FRMP report used for subsistence in Nikolai, Telida and Lake Minchumina are virtually identical and include almost every fish species in the Kuskokwim drainage. The list in the inventory contains all fish on Table 2-1 of this USFWS FROM report except for Least Cisco, *Coregonus sardinella*. The CAKN inventory contains one fish, not on Table 2-1, Slimy Sculpin, (*Cottus cognatus)*.

The CAKN inventory in DNP was conducted in the northwest portion of the park in the Kantishna and Kuskokwim River drainages. The information on fish in this USFWS FRMP funded TEK report is based on information from outside DNP boundaries but it is information about the same drainage, the Kuskokwim (Figure 3.1). The relevance of TEK for management

can be seen in the introduction of the inventory and shows how this document and the inventory are complementary:

> The lack of information surrounding watershed characteristics and species presence data within these watersheds presents numerous problems for resource managers. First, it is extremely difficult to understand ecological interactions within an ecosystem without knowing which species are present in that ecosystem. Species composition directly affects interspecific competition levels, predator-prey relationships, habitat partitioning and, subsequently, growth rates, population dynamics, and natural selection. Second, detailing the effects of environmental change, whether human induced or natural is problematic without knowing basic watershed characteristics. Subtle changes in the physical, chemical, or biological characteristics of freshwater habitat may result in local extinction, or variation in life-history tactics of numerous aquatic organisms. Without baseline data to serve as a reference point, documenting or responding to these events becomes extremely difficult (Markis et al 2004: 4).

The TEK in this USFWS FRMP report provides baseline information on many of the topics listed above: surrounding watershed characteristics, species presence, species abundance or population dynamics, predator-prey relationships, habitat, effects of environmental change, changes in freshwater habitat and life history-tactics of fish.

It was interesting to note that the classification of whitefish was also difficult for the NPS/CAKN researchers as well: "Humpback whitefish are difficult to distinguish from both the Alaska whitefish and lake whitefish. The only way to distinguish between these three species is through modal gill raker counts of large samples" (Markis et al 2004: 46). As also noted by Andersen, the extensive Upper Kuskokwim Athabascan taxonomy of whitefish would provide productive input comparison for WBS researchers in classifying whitefish samples.

Another important implication for management was illuminated in the CAKN inventory:

"Many of the anadromous fishes within these systems have significant economic value (mainly salmon) and have been previously documented, whereas the majority of resident freshwater fishes are neither economically important nor have they been documented" (Markis et al 2004: 4). This statement highlights the misconception that subsistence fisheries have no economic value. The statement also underscores the fact that most state management is paid for through license and permit fees paid by commercial and sport fishers and through built-in taxes on gear and ammunition used by all harvesters. Research on subsistence species that are not valuable for sport or commercial interests, much like non-game species, is under funded.

The importance of the application of TEK to management is shown by the fact that the CAKN fish species inventory and the list of fish discussed in this USFWS FRMP TEK report are virtually identical. In order for managers to maintain healthy populations of the fish species that "have significant economic value", the whole ecosystem must be considered, not just a couple of fish species. The fish species that are not harvested by commercial or sport fishers are integral parts of the same ecosystem as the species that receive management attention. All fish species (and others) in a watershed or ecosystem are in some way interdependent and serve as indicators

of environmental change and habitat health. Integrating the TEK from this USFWS FRMP funded report that includes information about almost all the species in the watershed with information from the CAKN inventory provides a holistic picture of the entire ecosystem and its health. This holistic picture provides a comprehensive view for managers to consult when they write management plans and could help them to address fishery issues before they become fishery problems.

Current and Traditional Fisheries Use in Lake Minchumina

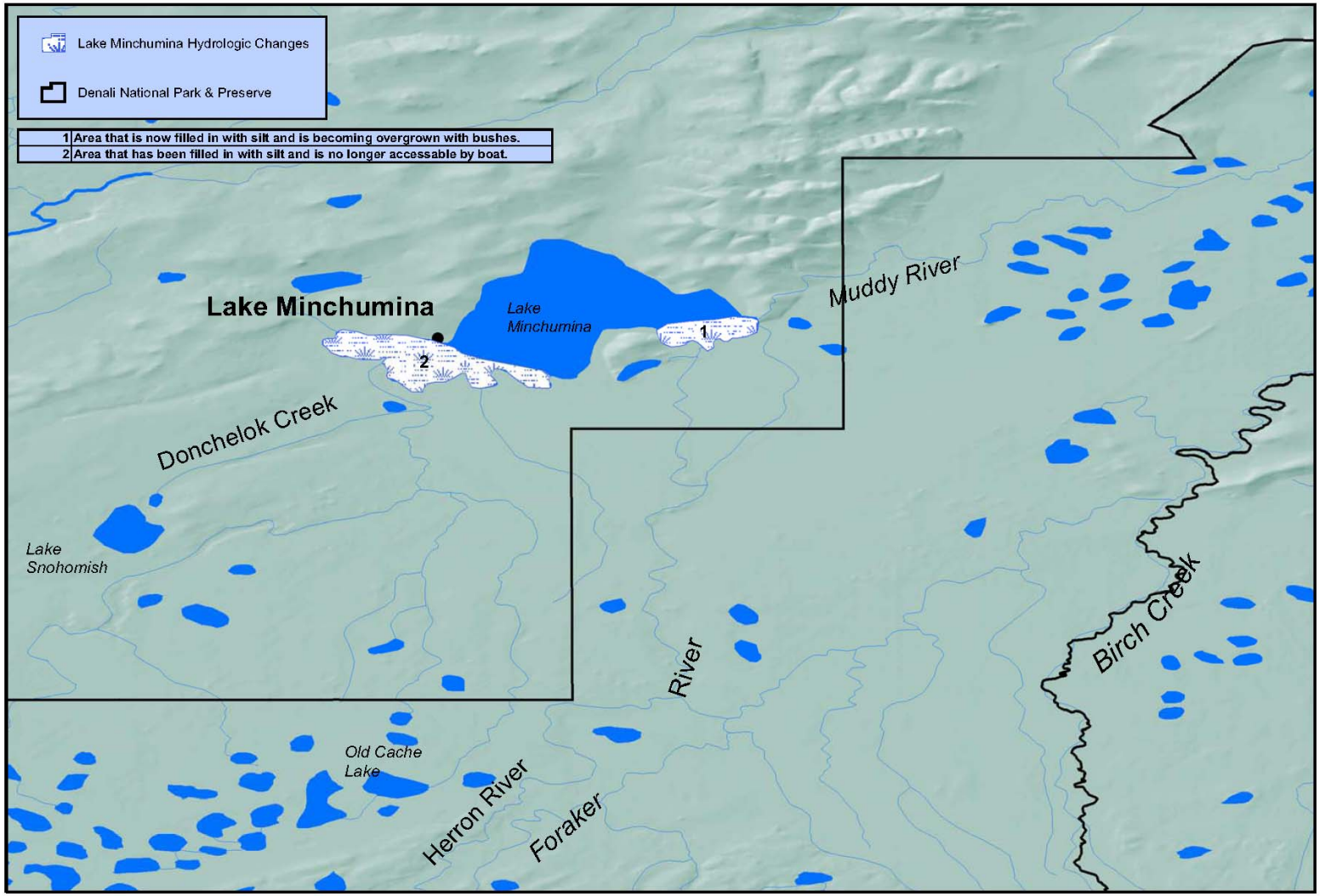
According to a resident of Lake Minchumina who grew up there, perhaps a third of the lake cannot be traveled by boat. In the last 20 years, what was once a rock-laden lake with marsh near the edge for whitefish to feed in, has become shallow near the shore where silt has filled in over the rocks (area 2, Figure 4.4). This means less fish and, because of that, less opportunity for subsistence harvesting. A clear stream and gravel-laden lake bottom (area 1, Figure 4.4) where a local family was once able to pull its boat right up to its house is now filled in with silt and overgrown with small bushes. Changes in the environment, warmer winters, shifting river channels, and melting permafrost coupled with changing community demography and non-local recreational users entering the area are all affecting the way people live in Lake Minchumina.

In addition to wildlife resources and wild plants, residents of Lake Minchumina rely mainly on freshwater fish for subsistence uses. Only a few salmon make it upstream to Lake Minchumina, so the discussion below relates mainly to freshwater fish. Although they prefer certain fish for consumption, residents reported that they do not specifically target particular species when utilizing nets, their primary harvest tool. The information in this section therefore presents freshwater fish species as a single subsistence resource. The only exception to this is burbot, which are targeted using hooks.

Fish Locations and Spawning Habitat

Many community residents have knowledge of the patterns of fish movements or migrations in and around Lake Minchumina. For example, they know whitefish can be caught in the late fall with a net under the ice; that in October-November fish are usually spawning near shore; and that in the winter whitefish are found in the deep part of the lake (Figure 4.5). Pike, another main species that is used for subsistence, spawn at the end of May on the west end of the lake in shallow water (Figure 4.5). Pike move into the Foraker River in late fall, and move into the river system during the winter.

Two species that community residents catch incidentally that are less favored for subsistence are Arctic Cisco and lamprey. Cisco spawn between August and September, and lamprey spawn in May and June on Birch Creek and on the north fork of Baker Creek (Figure 4.5) although they are rarely seen. Longnose suckers are not a popular species for food; local residents believe they

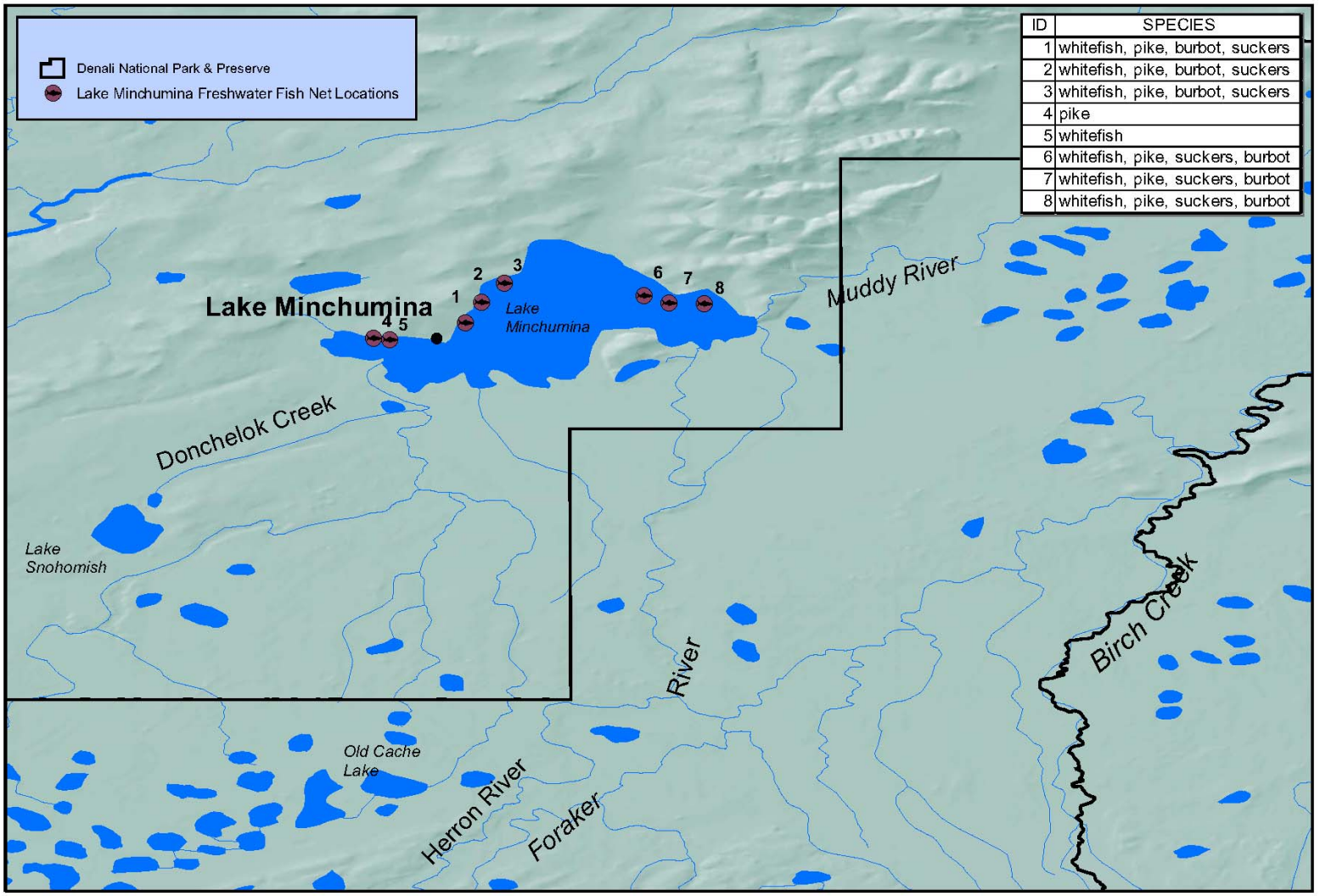


Source: Division of Subsistence,
Alaska Department of Fish and Game,
Household Interviews 2002-2003
Davin L. Holen, ADF&G Division of Subsistence

0 1.5 3 6 9 12 Miles

Figure 4.4

1:350,000



Source: Division of Subsistence,
Alaska Department of Fish and Game,
Household Interviews 2002-2003
Davin L. Holen, ADF&G Division of Subsistence

0 1.5 3 6 9 12 Miles

Figure 4.5

1:350,000

spawn in May, but are not sure of the exact locations. Although Lake Minchumina residents also caught both blackfish and sculpin, fishers that were interviewed did not know the spawning times of these two fish species. Burbot, locally called "cod," is a favored subsistence species at Lake Minchumina. Residents stated that burbot used to be seen near the Muddy River when it flowed clear in the past, but did not report the spawning location of this species. The areas of the lake where burbot can be caught vary with the season. In the summer they are caught towards the middle of the lake where the water is cooler, and they are found nearer to the shore in the fall.

Preferred Fish Species

Only a few salmon reach the watersheds around Lake Minchumina. These fish are extremely red and well into their spawning when they arrive and their flesh is bleached out. One resident observed that the meat of these salmon is less fishy tasting than other salmon and the color of the meat is almost white. He said he wouldn't be able to tell if the salmon are sockeye or coho due to their advanced state of degeneration. However, most residents relate that they do not eat these salmon and typically feed them to their dogs.

Of those fish harvested from the lake with a net, the species residents prefer are whitefish, pike, and sheefish. The rest of the fish caught in the net go to feed the dogs. Those residents who still have dog teams rely on fish for a significant portion of their dogs' diet. In addition to fish, commercially available dog food is also used to feed sled dogs. Aside from being used for subsistence and dog food, fish are also sometimes used as bait on trap lines. Both burbot and pike are used as bait and they are also fed to dogs. The necessity of store bought dog food has much to do with not only the decline of fish abundance but the decline in trapping as well. In a 1975-1976 study Bishop (1978) found that there were three households in Lake Minchumina with active sled dog teams. These residents reported needing 3,000 fish a year for household consumption and to feed teams comprised of 7-8 dogs. Dogs were also fed beaver carcasses rom trapping which is still done. However, with the decline of fish abundance, even an increased harvest of beaver (219 beaver in 2002 compared to 128 in 1976) (Bishop 1978) cannot fully make up for the lack of fish.

Most residents say that they see no difference in the quality of fish from one season to another. Of all the various species taken from Lake Minchumina for food, most residents prefer burbot. Until the early 1980's, large three-foot long burbot were not uncommon. Presently, people are only catching much smaller burbot.

Fish Abundance in Lake Minchumina

While fishing used to be a major source of subsistence food for the residents of Lake Minchumina during both winter and summer, this has changed over the past 10-20 years. As noted, the quality of the water in Lake Minchumina has changed in the last two decades, going

from clear to turbid. In 1992, the Foraker River shifted channels and began dumping silt into the lake. This created soil for weed beds to grow. One resident explained that the water subsequently became oxygen starved. Consequently, residents who once took 100 to 120 fish in a single night using nets now catch only a few, and reportedly these fish are smaller than they used to be. According to residents, this change in water quality did not affect just one species; rather, all fish species were equally affected. Two years ago, the Foraker River shifted back and stopped dumping as much silt into the lake. As a result, the fish population is slowly starting to rebuild. The two dominant species of fish in the lake continue to be pike and whitefish.

Contemporary Fishing Technology

According to one resident, fish have become mostly a summer food, although they are still taken in the winter under the ice with nets. Nets are put out in the spring for whitefish when they are running; the whitefish are generally smoked. Pike and burbot are also caught in nets during the summer.

October is the primary harvest month for burbot. The main technology used to catch burbot in the fall is a set of 5 or 6 hooks. Many residents say that extra effort is focused on catching burbot because they are a preferred species.

Burbot are located close to the lakeshore in winter and in the deep part of the lake during the summer. One winter a resident dug a hole in the ice too close to shore by mistake. Although he suspected that the hole was too close to shore to catch anything, he needed to thaw out some beaver meat that was frozen to a hook so he dropped it in the hole to thaw out overnight. With only a foot of water under that hole he found a burbot on the hook in the morning. Because burbot lie in the deep water during the summer, another resident said that in the future he is going to try a deep net to target this species.

Many residents have a schedule for setting fish nets throughout the year. In May, they put out a net in the ice when it is just about to go out. One family indicated that they always set the net off the spit and beach near their home. In the past this family also put a net on the Muddy River; now, however, there are too many boats in this river for a net to be set. This family primarily nets whitefish and a few pike, suckers, and burbot. They also catch one to four coho salmon, one Chinook salmon, and a sheefish every four years or so. These are all fed to the dogs except sheefish, which people eat and enjoy. The nets are returned to the water under the ice starting in October when the ice has set for the winter. Hooks are also used to catch burbot and occasionally pike.

Conservation Measures Related to Subsistence Fishing

Local residents interviewed for this project reported that in general they comply with fishing regulations because they provide adequate opportunity to harvest what they need. The human

population of the lake is too small now to create a large impact on fisheries resources, yet there are still three households with dog teams residing around the lake, two of which still feed small amounts of fish to their dogs. However, because their owners also fly in store-bought food for their dogs, these two dog teams have little impact on local fisheries resources.

Western conservation ideas are built into subsistence knowledge and practice at Lake Minchumina, including an understanding of the carrying capacity of the watershed. This may reflect the fact that three residents who were interviewed have studied biology or natural resource management at a university. In addition, residents expressed the opinion that subsistence regulations are in place for a reason and should be obeyed. One resident said that while she does not disapprove of residents of other communities failing to follow subsistence regulations if adequate opportunity is not provided, she does believe that Lake Minchumina residents need to follow those rules. Residents are able to fly in supplies when they are unable or less able to harvest subsistence resources, or when it is not the regulatory season.

As an example of the conservation ethic endorsed by community members, one resident commented that fish from the lake cannot support her dog team of 60 dogs, so she buys commercial dog food. She said that while her neighbor has many fewer dogs and is able to feed them fish part of the year, her own team is too big and feeding them fish would have too big an impact on fish abundance. At this woman's former home on the Yukon River, her 11 dogs ate 1100 salmon a year. At Lake Minchumina, however, there are almost no salmon and the current freshwater fish abundance is not adequate to feed her dogs.

According to Lake Minchumina residents interviewed for this project, too many non-local people are coming into the area for recreation. Both snow machines and dog teams are starting to reach Lake Minchumina from urban Alaska; recreational hunters are moving closer every year. The Bryce Trail traveling northeast from Lake Minchumina was built in 1989 to bring in equipment and supplies to work on the runway. The trail gives recreational users better access to the community. There is a proposal to open up the trail as a recreational trail for snow machine users to reach McGrath by way of Lake Minchumina.

Much of the concern about the effects of increasing non-local pressure on subsistence resources has to do with trapping because new trails may become a more efficient conduit for linking to the outside world. The potential impact of increased access to the community on fishing cannot be determined yet because few non-local recreational fishermen are currently using the area's lakes and rivers. However, the opening of trails from Nenana and Denali National Park and Preserve to Lake Minchumina could change the relationship between subsistence and recreational use in the Lake Minchumina area.

Discussion: Lake Minchumina

Residents report that the winters in the Lake Minchumina area have become milder over the past 30 years, a general trend seen in many parts of interior Alaska (Alaska Regional Assessment

Group 1999). Permafrost has been melting in low-lying areas and ponds and marshy areas are drying up (Nikolai residents noted a similar trend on the Salmon River).

The winters in 2001-2002 and 2002-2003 were very mild. The warming trend that has occurred has not yet changed the landscape much in regard to the distribution of tree species. Residents who have been living in Lake Minchumina for over 30 years have not noticed any changes in tree species abundance and composition. However, they do note that many trees are stressed, especially the cottonwood, tamarack, and spruce trees.

The major change observed by residents relates to water, but it also affects the land. As the permafrost melts the water table has changed significantly. Ponds and lakes are drying up, eliminating habitat where freshwater fish formerly thrived. Low water has also had an adverse affect on berries, which need abundant groundwater to thrive; berry abundance is a local indicator of a healthy ecosystem.

In addition, according to a local resident, the water level in the lake dropped eight feet after the 1964 earthquake, resulting in a decline of fishing for all freshwater species. The drop in water level also drained the swamp surrounding Lake Minchumina; the swamp had been a prime habitat for whitefish, one of the dominant species in the lake. In October 2002 another earthquake occurred, and since then the lake has dropped another two feet. One resident believes it is possible that these two events are connected, since she knows water levels dropped after the 1964 earthquake. The recent drop in water level could also be due to the limited snowfall during winter 2002-2003, as well as the lack of rain in those years. These factors are adversely impacting whitefish, a major subsistence resource, because these fish do not thrive in shallow turbid water.

In addition to the drop in water level, the main source of water for the lake, the Foraker River, shifted channels and started dumping silt into Lake Minchumina beginning in 1992. In 2001, the river shifted back to the old channel, the water has become less turbid, and now local residents say the fish populations are starting to recover. But the addition of large amounts of soil material in the lake has created thicker weed beds. This can be beneficial for some species, such as pike, that thrive in a weedy habitat. However, too much vegetation growth in the lake can decrease the amount of oxygen in the water, which will kill fish, or at least make certain areas much less productive. Residents have observed this trend for other species such as burbot, whitefish, and pike.

Two residents mentioned another indicator of climatic change. Throughout the 1960's and the mid 1990's, they put their garden in on the 1st of June and as of this report, 2003, they do this a week earlier, on the 25th of May. Spring was late in 2004, and they had to wait until June. When they compare today's gardening to the 1960s, however, they still see a clear trend toward an earlier spring.

The ability of Lake Minchumina's ecosystem to support the local population with freshwater fish has diminished over the past 20 years. Residents still rely upon the lake as their main source of fish for subsistence use and have an intimate knowledge of the local lake ecosystem. The human population of the community of Lake Minchumina has declined over the past 10 years. With

fewer residents – and fewer dogs – the lake has been able to sustain these populations despite the diminishing fishery resources. Impacts from non-local users on fishery resources have yet to be observed, since few non-local people reach the lake. The only local lodge, Denali West Lodge, is small, housing only 10-12 guests at a time, and activities there are not focused on sport fishing.

According to local people, climatic and local ecosystem change will be determining factors regarding freshwater fish abundance in Lake Minchumina in the foreseeable future. Residents point to a gradual increase in fish abundance, but so far the fish are still smaller than in the past, and the numbers caught in nets overnight are far lower than harvests reported in the past. Many residents still enjoy fishing. They will continue to fish as a subsistence activity in order to continue living in the community of Lake Minchumina.

Current and Traditional Fisheries Use in Cantwell

Summer subsistence activities for the residents of Cantwell include traveling outside the area to fish for salmon and fishing for resident freshwater species around Cantwell. The variety of fish available to residents of Cantwell is listed in Table 3-1.

Salmon Harvests

In 1999-2000 there were no subsistence fisheries located near Cantwell, and most Cantwell residents caught salmon or non-salmon species using rod and reel under sport fishing regulations (Figure 4.6). Cantwell residents generally fish for salmon in different areas of the state, such as the Copper River. The nearest subsistence salmon fishery accessible by road is located on the Copper River, and the types of gear allowed in that fishery are limited to fish wheels and dip nets. The nearest fish wheel salmon fishery is located on the Copper River while the closest dip net subsistence salmon fisheries are located on the Copper River and the Kenai Peninsula.

The most widely used and harvested salmon species was Chinook, followed by sockeye and silver, or coho, salmon. Far fewer households said they harvested either pink or chum salmon. Though most people used rod and reel to catch salmon, by weight more salmon was caught using subsistence gear. For example, more pounds of sockeye were caught using a dip net than rod and reel. At least one household in Cantwell had access to a set net that was used to catch sockeye and this provided the bulk of the salmon catch for the community.

Freshwater Fish Harvests

Cantwell people said that during the early spring (April and May), they fished for several kinds of freshwater fish such as trout, grayling, and Dolly Varden. Approximately 20 percent of the households in Cantwell said they fished for freshwater fish within the boundaries of Denali National Park. The harvest of non-salmon fish was composed primarily of grayling, halibut, char, and lake trout. Except for halibut and char, which are not local species, most of the non-salmon fish were harvested close to Cantwell, either in lakes or streams off the Parks or the Denali highways (Figure 4.6). The majority of freshwater fish were caught using rod and reel in the summer or by ice fishing in the winter**.**

According to some Cantwell residents, freshwater fish were more abundant in the past than they are now. One resident said,

> Back about 40 years, no matter what creek you go into you catch grayling. But now you go out and you're lucky to get one or two… In the old days, [there were] probably thousands, you drop your line in the water you got fish. Every one of these streams, like Jack Creek and Fish Creek used to be real packed.

Table 3-1. Species of fish harvested and used by residents of Cantwell, 1999-2000

Chum Salmon	Halibut
Coho Salmon	Rockfish
Chinook Salmon	Sablefish (black cod)
Pink Salmon	Burbot
Sockeye Salmon	Dolly Varden
Smelt	Lake Trout
Eulachon (hooligan)	Grayling
Cod Pike	Rainbow Trout
Pacific Cod (gray)	Whitefish
Flounder	Starry Flounder
Greenling	
Lingcod	

Source: Alaska Department of Fish and Game, Division of Subsistence, Household Surveys, 2000.

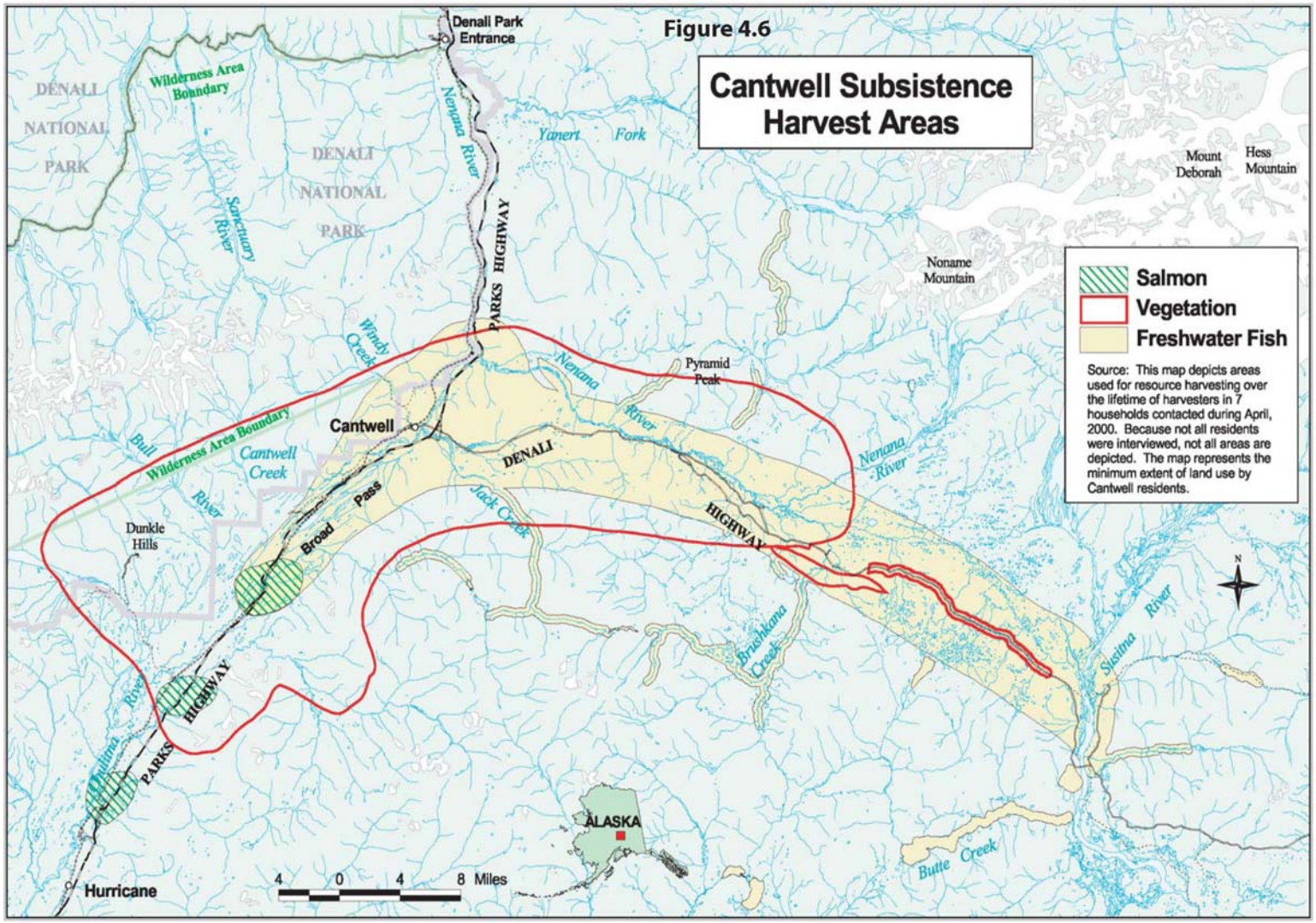


Figure 4.6
Cantwell Subsistence Harvest Areas
Salmon
Vegetation
Freshwater Fish
Source: This map depicts areas used for resource harvesting over the lifetime of harvesters in 7 households contacted during April, 2000. Because not all residents were interviewed, not all areas are depicted. The map represents the minimum extent of land use by Cantwell residents.
Denali Park Entrance
Wilderness Area Boundary
DENALI NATIONAL PARK
Nenana River
Yanert Fork
Sanctuary River
PARKS HIGHWAY
Mount Deborah
Hess Mountain
Noname Mountain
Windy Creek
Pyramid Peak
Nenana River
Cantwell
Bull River
Cantwell Creek
Wilderness Area Boundary
DENALI HIGHWAY
Nenana River
Dunkle Hills
Broad Pass
Jack Creek
Brushkana Creek
Susitna River
Hurricane
ALASKA
Butte Creek
4 0 4 8 Miles
N

Local Concerns

The National Park. In the 1980s, the expansion of the park under the provisions of ANILCA did not sit well with some residents of Cantwell. There were vocal demonstrations against the expansion, including some serious threats of violence to individuals. As one person interviewed for this project remarked, everyone had learned to live with the old park and had realized its importance. Expanding the park was viewed as an infringement on local freedoms based on an agenda driven by eastern environmentalists who had no understanding of, or sympathy with, local concerns. One person put it this way: "One of the problems that the park has, and you see it so commonly in the environmental movement, is the fact that somehow human beings are not part of the ecology. Ecology is for trees, bugs, and bears."

Another problem is the NPS policy of ecosystem management that creates a situation in which the park, at least in some Cantwell residents' view, is always trying to expand its influence, even beyond the boundaries of the park. One respondent remarked:

> I think the park service has a real bad problem with this expanding area of concern. And that makes me very nervous because they apparently can't be content with what they have. And they can always find an area where, well ya, the bumble bees down here actually live over here a part of the year so we need to have some control on the other side of the line because they are our bumble bees. But they are just going to have to accept the fact when they are over on that side of the street they are someone else's animals. NPS objectives are so opposed to those communities that are outside of the park.

Today, while most Cantwell residents have come to accept the park's expansion, many seem ambivalent about the situation. For many residents the provisions in ANILCA that allowed subsistence hunting within the new park boundaries are welcome because they give them an advantage over urban hunters who are not allowed to hunt within the park. One resident put it this way:

> [It is] important for us to have the ability to hunt, pick berries, and so forth in the monument/new park because of all the competition in the rest of Game Management Unit 13E from out-of-town hunters (non-locals). And rural preference should be given to rural people over city folks for hunting/fishing because we depend on it.

Other residents echoed this sentiment:

> Too many people not from around here are hunting and making it difficult for local hunters. They're using up our resources. The reason I got meat last year was because of illegal kills by non-locals [meat confiscated from hunters because of illegal hunting].

On the other hand, one resident noted that ANILCA ironically did not really provide the community with anything since these areas were available to local hunters before ANILCA (it should be noted, however, that these areas are now closed to non-local residents, providing some protection to local subsistence uses).

Although the ANILCA provisions have provided Cantwell residents with an advantage, by closing off NPS land to non-local hunters and fishers, several were quick to note that there are problems with the park boundary. Private land abuts the National Park boundaries and hunting on this land is regulated by the State of Alaska while the federal government regulates hunting on the other side of the line. Non-local hunters are not allowed to hunt on federal lands. As one Cantwell resident noted,

> The preserve/monument [park] boundary line needs to be properly marked and mapped. Even the enforcement officials have a hard time distinguishing it. The preserve is our backyard and our traditional hunting and gathering area of choice.

Another person said:

> The State says the boundary is one place, but no one can tell…. People have moved [their hunting] from [the] Denali Highway to [the] new park, where there's game and much less competition. [We] have real concerns with camps set on the boundary of new park - people from Glennallen, Wasilla – we had to get the park to maintain the boundary.

Uncertainty over the exact location of the park boundary has caused problems with enforcement as hunters claim they killed game in the park while state enforcement officers claim it was killed on private or state land. One person said:

> The Fish and Game need to be better equipped with the knowledge of the boundaries and the area of which they are enforcing. [There are] concerns that the locals are being harassed.

There is also the view that Cantwell is not wilderness and therefore the park and adjacent lands should not be managed as though they were wilderness. For example, some Cantwell residents interviewed for this project believe NPS should not try to destroy all evidence of human activity within park boundaries. They believe that although visitors come to Denali to see animals, they do not mind seeing human ruins. Instead of managing the park as wilderness, NPS should manage it like an attraction such as Disney Land.

Subsistence as a Way of Life. Cantwell residents offered opinions about subsistence in the course of responding to harvest interviews. Those who did express an opinion about subsistence seemed to agree that, as one person put it,

> This community sustains itself on people passing meat back and forth. I think subsistence is absolutely essential to the area.

A number of people elaborated on the theme that subsistence was necessary for rural people. There was the practical view, expressed by many rural residents, that:

> We don't have Safeway, Carrs, or Fred Meyer where we live. Our grocery store is here where we choose to live.

Other people appealed to tradition:

> Tradition is a way of life, as is subsistence, and a way of life that works in balance with [pause], after all it's a way of life [that] has been passed from generation to generation, and all has been good, how many laws have been passed only to be changed or done away with, because they didn't work? How many laws are still being used hundreds of years later?

Respondents also expressed the view that urban hunting should be curtailed in favor of rural subsistence users and that the only reason there are problems with wolves is because urban hunters demand more game.

> Subsistence hunting should ONLY be for those who want it and need and use it. I feel that the trappers are having to manage the wolves because of the sport hunters who come to kill. We wouldn't have to manage the wolves if ONLY the true subsistence hunters were harvesting large game. There would be plenty for subsistence users and the wolves. I feel true subsistence hunters shouldn't have to hunt in specific seasons, but instead whenever they need it. We need to shut down the sport hunters who hunt to kill and waste.

This view was echoed by another resident, who said:

> Rural areas should have subsistence priority. I don't feel they should allow the military subsistence hunting or fishing. I think more land should be closed to motorized hunting. There should be a season or an area for traditional non-motorized hunting. Spike fork or 50" regulation SHOULD BE ABOLISHED because it is causing waste. Trophy hunting should be closed to allow herd development. Our wolf management program is ineffective. First time hunting license recipients should have to attend a hunters' safety course.

Discussion: Cantwell

Cantwell residents feel squeezed between urban Alaska and Denali National Park and Preserve. Pressure from urban hunters has, according to local residents, caused game populations to dwindle, especially in areas that were once traditionally used by the residents of Cantwell. As a consequence many Cantwell residents now conduct subsistence activities almost exclusively on

national park lands, which are closed to urban residents. As members of a resident zone community, Cantwell residents can conduct subsistence activities on land added to Denali National Park under ANILCA. Cantwell residents are also concerned about the effect of ATV and snow machine traffic on the landscape and some local people have gone so far as to advocate restricting the use of ATVs.

CHAPTER FIVE: CONCLUSION

The communities of Nikolai, Telida, Lake Minchumina, and Cantwell have a long history of subsistence fish and wildlife harvest in and around the present boundaries of Denali National Park and Preserve. In all four communities, subsistence resources continue to be a central aspect of the local economy and people harvest a wide variety of resources. Subsistence harvest patterns change over time. The aim of this project was to provide a report on current subsistence fishery issues, C&T, TEK, and local capacity building for participation in subsistence fishery management. The purpose of this report is to inform federal management as it fulfills the ANILCA mandate of maintaining subsistence priority, subsistence resource conservation and local input and participation in subsistence resource management.

In Nikolai the fish species harvested included three species of salmon, several species of whitefish, sheefish, grayling, Dolly Varden, burbot, pike, sucker, eel, blackfish, lake trout, and freshwater mussels. Some resources are considered to be more important than others. A resident of Nikolai put it this way: moose and salmon (primarily Chinook) are the two most important animals for food. They provide the staples while other wild foods, such as caribou, are eaten on special occasions. Lake Minchumina residents do not have ready access to salmon, so they concentrate on harvesting pike and whitefish. The residents of Cantwell, the only study community on the road system, have access to a wide variety of fish, including salmon and several saltwater species, which they harvest at various locations outside their immediate area.

Residents of all the study communities reported a general decline in all local fish populations which they attribute to changing environmental factors and competition from outsiders. Long-time residents of Cantwell voiced concerns over the decline of local non-salmon species in their region. They reported in 1999, that fish populations in local creeks and rivers had recently declined compared to the abundance seen in an earlier era. Nikolai residents expressed concern that salmon populations were declining on the upper Kuskokwim because of lower river and Kuskokwim Bay commercial fisheries. They said competition from non-local users was making it even more difficult for them to harvest adequate amounts of salmon. In addition, some people feel that restrictions on using fish traps, which are the traditional method for harvesting salmon, make it hard for people to catch adequate amounts of salmon. As one Nikolai woman said, rod and reel, which is the only practical legal gear for Chinook salmon harvest at Salmon River, "is not the Athabascan way to catch fish." But it is not only salmon populations that are declining. Nikolai residents also pointed to drastic declines in whitefish and other non-salmon fish species. According to Nikolai residents, whitefish are declining because of an increased number of beaver dams blocking whitefish passage and a lower water table attributed to a general warming and drying trend associated with global warming. People in Lake Minchumina made a similar observation. They said the lake had changed due to a change in course of the Foraker River that emptied silt into the lake and made it less hospitable for whitefish.

In his 2000 publication, *Dichinanek' Hwt'ana, A History of the People of the Upper Kuskokwim who live in Nikolai and Telida*, Ray Collins (2004) commented on the future of the Denali SRZ communities:

> Telida and Nikolai [also Lake Minchumina and Cantwell] were recognized as Subsistence Resident Zone Communities under ANILCA. This was based on their historic use of the lands added to DNP by ANILCA. In the future, this could prove very significant to these communities being able to continue their subsistence activities. Subsistence hunting is characterized by economy of effort. With the establishment of schools,…families were required to stay in Nikolai and Telida if they wanted to keep the family together while the children attended school. As long as subsistence needs can be met near their communities there is no need to travel into the park lands (DNP). It is not practical because of the effort and time this would require. However, this could easily change in the future.
>
> Should a road be built into the Kuskokwim drainage it would open this area to greatly increased hunting pressure. If this happens, having subsistence preference in the park lands may prove significant to future subsistence opportunities. This is not unlike the situation that now prevails in Cantwell, an SRZ community, where much of their former hunting area is on state land, and open to increased hunting pressure. Cantwell people are already exercising their subsistence rights within the Park; Nikolai and Telida [Lake Minchumina] may find it necessary to do so in the future.
>
> If subsistence preference for rural residents is not established on state land this will have a continued negative impact on residents of Nikolai and Telida as they are surrounded by state land. In this case, having protected subsistence rights in federal park lands becomes more important even if access is limited (Collins 2004: 184).

A hypothesis under which this research was conducted is that SRZ communities depend on subsistence fishery resources. The information compiled in this report supports the hypothesis and indicates that the people of Nikolai, Lake Minchumina, Telida and Cantwell believe that the subsistence fishery resources upon which they depend are in decline. The Fisheries Resource Monitoring Program is charged with addressing gaps in the information needed for the effective management of subsistence fishery resources in federal conservation units. The reported declines of salmon, whitefish and other fish species warrant a thorough investigation of the reasons cited for the declines and what can be done to address them.

CHAPTER SIX: RECOMMENDATIONS

Nikolai and Telida

The information presented in this study represent a picture of Nikolai and Telida residents' knowledge of the subsistence fishery resources they depend upon and around which their lives revolve. The observations presented in this study are the results of generations of acquired information specifically applied to the harvest of fish. As detailed in this report, the people who participated in this study suspect a wide array of factors is at work in the declines of fish. Based on the recommendations of the people in Nikolai and Telida, further studies listed below would provide information that might address some of the declines. Nikolai and Telida respondents requested that local residents should be involved in all studies.

Recommendations for future studies in the Nikolai area:

1. Install another weir or Didson sonar at Salmon River to study salmon escapement.
2. Conduct genetic studies of all salmon runs in the Upper Kuskokwim area.
3. Conduct a study specifically about whitefish and track beaver-whitefish relationships.
4. Document climate and habitat changes.

Recommendations for application of results in the Nikolai area:

1. Facilitate regulatory change in response to requests from the community; specifically, allow the use of small fish traps for subsistence salmon fishing as these are traditional and would not necessarily threaten salmon populations.
2. Facilitate more participation by community residents in regulatory processes.
3. Ensure that all federal and state studies in the area are coordinated.

Lake Minchumina

The transformation in the community from one relying on subsistence hunting, fishing, and trapping to a recreational and retirement community is troubling for some longtime residents of Lake Minchumina. In addition, proposals to open up a trail to the road system, and the use of trap line trails by recreational users, will bring considerably more traffic through the area in the future. This may lead to the appearance of more recreational users in the area surrounding the lake, and on the lake itself. A future study to address these socio-economic factors and what could be done to improve subsistence opportunities at Lake Minchumina could be helpful to community residents and resource managers.

The second concern relates to changes in Lake Minchumina itself. What is most troubling to residents is the filling in of the lake from silt deposits from the Foraker River, and the lowering of the water table not just in Lake Minchumina, but in surrounding lakes as well. This is creating

habitat that is not suitable for freshwater fish species, a major resource for residents. Further study could determine the causes and effects of local ecosystem change in more detail. Residents of Lake Minchumina have considerable knowledge based on many years of observing the environment they rely upon for subsistence. Presently, studies in this geographic and topical area are limited.

In regard to subsistence regulations, residents of Lake Minchumina report that current regulations allow for an adequate harvest of fisheries resources. As noted, fishery abundance had diminished in Lake Minchumina. However; residents have the opportunity to harvest the fish they need. They will take what they can in Lake Minchumina and in other locations, and fly in provisions when necessary. During this study, 2002-2003, the residents of Lake Minchumina felt that no regulatory changes were needed. However, if access to this area opens up to other users in the future, this situation could change.

Cantwell

Cantwell residents have expressed concern over the decline in local fish stocks. One recommendation is to assess current abundance of freshwater fish stocks in local streams.

As members of a SRZ, Cantwell residents can conduct subsistence activities on land added to Denali National Park. The recent influx of new residents to the community, however, has put pressure on park resources. Therefore some Cantwell residents have suggested that new residents should have to wait one year before becoming eligible to hunt in the Park.

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APPENDIX A

This list of questions was used to guide many of the key-informant-interviews conducted in Nikolai. In addition, at the request of a few of the elders, we left this document with them for their review before the interview. Arrangements were made to return a day or two later to talk over the questions.

Nikolai
Local Knowledge of Subsistence Fish
Denali National Park and Division of Subsistence ADF&G

September/October 2002

We would like to learn about and document local knowledge of subsistence fish. We are collecting the information to update and supplement Jeff Stokes' 1985 report and to provide information to fishery managers that will help them protect fish.

We would like to learn about fish used for subsistence:

Salmon (king, dog salmon-chum, red)	Pike
	Sheefish
	Whitefish
	Dolly Varden
Blackfish	Long nose suckers
Lush	Grayling
Eels	Freshwater clams

(please tell us if we missed some).

We would like to learn about changes you have noticed in fish.

These are the types of things we would like to know about, they are just examples, we aren't expecting people to answer each individual question. Thanks for your help.

We would like to learn about the life and behavior of all the subsistence fish:

- Where do they spawn?
  Streams or lakes?

- Do some types of salmon/whitefish etc. spawn in different places than other salmon/ whitefish etc?

- Where do newborn fish spend their first moments?

- Where do they go after they are born?
- How long before they return?
- Which fish come first in the summer?
- Are there names for different kinds of fish stocks? Are there names for salmon that go into the Little Tonzona, into the Salmon and Pitka forks, into High Power Creek?
- How do fish navigate the rivers? Do kings swim in the same places that dog salmon or reds do. Or, where do kings swim in the river? Where do dog salmon swim in the river?
- Are there places where fish hold up in the river? Eddies or deep places?
- Does water temperature influence the movement of fish?
- Do fish like cold water or warm water?
- How do beaver dams affect fish travel?
- Are there other animals that affect fish?
- Has the number of fish changed since you were a child? Are there more or less, are they bigger or smaller?
- Did elders tell you stories about how many fish they used to catch before non-natives came to the area?
- Has your harvest of fish changed lately? Why has it changed?

Fishing: past and present:

How does fishing fit into the seasonal round of activities – in the past and now?

- When and how did/do you get ready to fish for all the different types of fish?
- What time of year did/do you begin to fish for each type of fish?
- Could anyone fish wherever they wanted, or did families have certain places they fished year after year?

- How far do you travel to harvest each type of fish? Do you travel more or less for fish than you used to? Why?

- How were fish distributed in the past, or shared? Were there certain relatives you shared with? (please don't tell us names, just their relationship to you, brother, aunt, etc?)

- How did you decide when enough fish were caught? Who decided when to stop fishing?

- Were there rules for fishing? What kinds of things would cause kids to get in trouble at fish sites? How did kids learn how to fish properly? Do people still follow the old rules? What happened if people didn't follow the rules?

- When you moved to different communities, were there different rules about different fish?

- Did you do anything special after you caught the first fish of the season, a dance, sharing with a certain person, a song?

- What kinds of fish did people want to catch? Did they want to catch males or females, or did they care? If they just wanted to catch males, what did they do when they caught females?

- Were you taught not to waste fish? Why?

- What kinds of gear did you use to fish for the different types of fish when you were a kid?

- What kinds do you use now?

- Where were the old time fishing sites? Are fishing sites in different places now? How come they moved?

- What kinds of foods did you make from fish? Dry fish, fermented fish? What else? What is your favorite?

- What parts of fish besides flesh do people like to eat? What are the Athabascan words for these parts? Do some of them need to be prepared or cleaned in a certain way? Are there stories about certain parts of fish?

- Where did people store dried fish in the old days.

- What do people do with fish now?
- What are things to look for to know if a person is a good fish cutter or not so good?

Are there any stories about fish and people?

Is there a story about the first fish?

Of all these fish, which did your family use the most of and which do they use most now? Has it changed? If it changed, why did it, moving? Taste preferences? Availability? How did each type of fish fit into your seasonal subsistence cycle?

Issues

How do sport fishers affect your fishing?

What fish regulation changes do people think about?

What regulations bother people, why?

What are some of the causes of changes in fish and fishing?

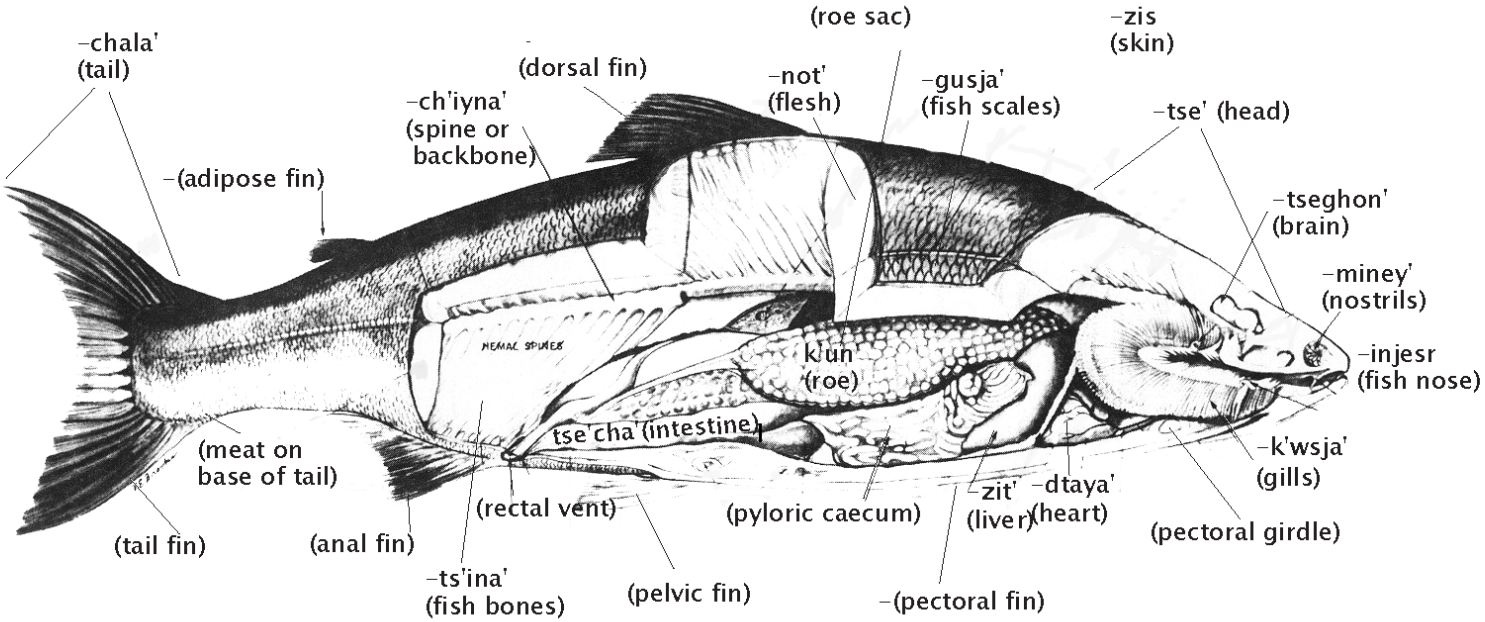
What about fish would you like to see in the report that we did not ask?

Thank you.

APPENIDX B

Upper Kuskokwim Anatomical Lexicon for Salmon Anatomy

Upper Kuskokwim Anatomical Lexicon for Salmon Anatomy, Oncorhynchus sp.



Semidiagrammatic drawing of an adult female salmon, with portions cut away, showing the location and identity of various internal features. (From l. S. Smith and G.R. Bell 1975)
Upper Kuskokwim vocabulary compiled by Betty Petruska.
Diagram Compiled by Chelsie Venechuk

APPENDIX C

TAPE	DATE	INTERVIEWEE & DESCRIPTION	INTERVIEWER
A1	8.2002	Hunting beaver with his brother	**LW**
A2	8.08.2002	Cash economy hinders subsistence, fish info, advice for next generation	**LW, CV**
A3	8.09.2002	Lots of fish info, fishing under ice, guiding stories	**LW, CV**
A4	8.09.2002	Salmon bones dug up by wolf, "Learned by looking at map from white people"	**LW, CV**
A5	8.10.2002	Mapping, Telida and Nikolai fishing information	**LW, CV**
A6	8.12.2002	Fishing as a child; beaver dams preventing whitefish from spawning	**LW**
A7	08.13.2002	Marten song, "Don't change religion" said dad on his deathbed	**LW**
B1	10.04.2002	Public talk given regarding trip to Kodiak for Russian Orthodox conference, Advice to kids	
B2	10.06.2002	Answering fish questions, "No more whitefish, beaver mess it all up"	**LW**
B3	10.07.2002		**LW**
B4	10.09.2002	Grease and ice cream in birch bark baskets, fish trap information	**LW, WS**
B5	10.09.2002	Voice activated recording, didn't pick up much, spears for fish and bear	**LW**
B6	10.09.2002	Answering fish questions, talking about fish around Nikolai	**CV**
B7	10.10.2002	Fish Trap words, Fish eggs in river to manage ecology, Caribou Song	**LW**
B8	10.2002	Compares Yupik & Athabascan ways, *akutaq* to *nemaje* with household 28	**LW**
B9	10.10.2002	Answering fish questions	**CV**
B10	10.2002	Ecology and historical fisheries information, life a long time ago	**CV, WS**

Continued

Continued from previous page

TAPE	DATE	INTERVIEWEE & DESCRIPTION	INTERVIEWER
B11	10.2002	Family travels, traplines, sheep hunting in the Alaska Range	**CV**
C1	1.08.2003	Church Singing	
C2	1.08.2003	Starring	
C3	1.10.2003	Church Singing (A) 1.10.2003 (A) – 1.12.2003 (B) Health aide, Guiding stories, Beaver rules	**LW**
D1	10.30.2003	One Athabascan word at Blackwater with Liz; Several Athabascan words in Anchorage with Chelsie	**CV**