Technical Paper No. 407

Whitefish Trends on the Upper Kuskokwim River: Ethnographic Overview and 2012–2013 Nonsalmon Fish Harvests, Nikolai and Lime Village, Alaska

by
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March 2015

Alaska Department of Fish and Game **Division of Subsistence**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Division of Subsistence. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)	
centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)	
cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature	
day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry	
all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General	
Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)	
fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics	
all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	E
greater than	>
greater than or equal to	?
harvest per unit effort	HPUE
less than	<
less than or equal to	?
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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WHITEFISH TRENDS ON THE UPPER KUSKOKWIM RIVER: ETHNOGRAPHIC OVERVIEW AND 2012–2013 NONSALMON FISH HARVESTS, NIKOLAI AND LIME VILLAGE, ALASKA

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The Division of Subsistence Technical Paper Series was established in 1979 and represents the most complete collection of information about customary and traditional uses of fish and wildlife resources in Alaska. The papers cover all regions of the state. Some papers were written in response to specific fish and game management issues. Others provide detailed, basic information on the subsistence uses of particular communities which pertain to a large number of scientific and policy questions.

Technical Paper series reports are available through the Alaska Resources Library and Information Services (ARLIS), the Alaska State Library and on the Internet: http://www.adfg.alaska.gov/sf/publications/. This publication has undergone editorial and professional review.

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ABSTRACT

This report summarizes the results of a harvest survey and ethnographic project that investigated the subsistence uses of nonsalmon fish, particularly whitefish, in the Upper Kuskokwim River region of Interior Alaska. This study occurred in Nikolai, a contemporary Upper Kuskokwim Athabascan community located on the South Fork of the Kuskokwim River, and in Lime Village, a contemporary Dena'ina Athabascan community located on the Stony River. Nonsalmon fish species harvested and used by Nikolai and Lime Village residents include northern pike *Esox lucius*, Arctic grayling *Thymallus arcticus*, longnose sucker *Catostomus catostomus*, sheefish (inconnu) *Stenodus leucichthys*, humpback whitefish *Coregonus pidschian*, broad whitefish *Coregonus nasus*, Bering cisco, *Coregonus laurettae*, least cisco *Coregonus sardinella*, and round whitefish *Prosopium cylindraceum*. For the 2012 study year a combined total of 42 of 54 households (approximately 78%) were surveyed in Nikolai and Lime Village. For the 2009–2010 study year a total of 35 of 55 households (approximately 64%) were surveyed in the 2 communities. Overall findings show that nonsalmon fish continue to be an important wild food resource harvested by Nikolai and Lime Village residents. For the 2 communities combined, an estimated 11,090 lb of nonsalmon fish were harvested during the first study year, and an estimated 7,154 lb of nonsalmon fish were harvested during the second study year. Survey findings also demonstrate that strong food sharing networks continue to operate as an essential part of the subsistence economies in these communities. During the first study year 97% of households used nonsalmon fish while only 76% harvested nonsalmon fish, and during the second study year 92% of households used nonsalmon fish while only 67% harvested nonsalmon fish. For most of the 20th century, an abundance of nonsalmon fish were harvested by these communities not only for human consumption but also to the feed dog teams these communities traditionally utilized for overland transportation. Since the 1980s, overall annual effort by these 2 communities to harvest nonsalmon fish has generally declined in tandem with a transition away from dependence upon dog teams and a new dependence on motorized transport. Additionally, community respondents reported that increasing occurrences of beaver dams on waterways in the region have had a negative impact on whitefish populations and limited the ability for residents to harvest whitefishes. Today, fishing effort by residents of these 2 communities is also affected by rising fuel costs and the inability to afford motor boat fuel for long distance travel. Despite these changes, Lime Village residents maintained a consistent annual effort to harvest nonsalmon fish, including whitefishes during the study period. In 2013, Lime Village residents revived their traditional method of harvesting whitefishes by wooden basket fish traps. Also in 2013, the Nikolai Edzeno' Village Council provided a fish wheel for community members' use in harvesting whitefishes. Construction skills and fishing techniques were shared across generations, and whitefish samples were gathered to assist Alaska Department of Fish and Game in making positive species identifications.

Key words: Upper Kuskokwim River, Stony River, Lime Village, Nikolai, Interior Alaska, Upper Kuskokwim Athabascan, Dena'ina Athabascan, broad whitefish, humpback whitefish, least cisco, sheefish, northern pike, Arctic grayling, subsistence harvests, participant observation, fish traps, set gillnets, fish processing, traditional ecological knowledge, whitefish spawning, whitefish habitat, fishing access, motorized transportation, dog-team transportation, canoe transportation.

1. INTRODUCTION

This report summarizes the results of a harvest survey and ethnographic project that investigated the subsistence uses of nonsalmon fishes, particularly whitefishes, in the upper Kuskokwim River region of Interior Alaska. For the purposes of this report, the authors have defined the upper Kuskokwim River region as the Kuskokwim River drainage from its headwaters to the downstream mouth of the Stony River at approximately river mile 333.[1]

The Kuskokwim River flows approximately 803 river miles from the headwaters of the South Fork Kuskokwim River in the Alaska Range, and 962 river miles from the headwaters of the North Fork Kuskokwim River near Lake Minchumina, to its mouth at Kuskokwim Bay in the Bering Sea on the state's southwestern coast (Brazil et al. 2013:65). The entire Kuskokwim River drainage covers approximately 50,200 mi², transitioning from glacial alpine and boreal forest headwater areas in the Interior, to subarctic tundra of the Yukon-Kuskokwim Delta in western Alaska. Major tributaries of the upper Kuskokwim River include the Stony, Swift, Selatna, Takotna, Big, South Fork Kuskokwim, and North Fork Kuskokwim river drainages. Permanent upper Kuskokwim River region communities include Nikolai, Telida, Takotna, McGrath, and Lime Village, which is the only permanent community within the Stony River drainage.

Two distinct Athabascan groups, Dena'ina Athabascans, who also live in the Cook Inlet and Lake Clark areas, and Upper Kuskokwim Athabascans have inhabited the upper Kuskokwim region since at least historic times (Kari 1983; Stokes 1985). This study occurred in Lime Village, a contemporary Dena'ina Athabascan community located on the Stony River, and in Nikolai, a contemporary Upper Kuskokwim Athabascan community located on the South Fork of the Kuskokwim River (Figure 1-1).

This project was conducted by Alaska Department of Fish and Game (ADF&G) Division of Subsistence during 2013–2014 and was funded as Project # 12-352 by the federal Office of Subsistence Management's 2012 Fisheries Resource Monitoring Program. The purpose of this project was to update subsistence whitefish harvest and use information for these two communities and to document trends in the subsistence harvest of whitefish in the upper Kuskokwim River. This project responds to information needs identified by the Yukon–Kuskokwim Delta and Western Interior Alaska subsistence regional advisory councils, and the Office of Subsistence Management's 2012 Fisheries Resource Monitoring Program's "Priority Information Needs," including the need for nonsalmon fish harvest monitoring and the need to collect traditional ecological knowledge pertaining to whitefish. This project was also guided by the future "Research Recommendations" outlined in *Alaska Fisheries Data Series Number 2012-4, Whitefish Biology, Distribution, and Fisheries in the Yukon and Kuskokwim River Drainages in Alaska: a Synthesis of Available Information* (R. J. Brown et al. 2012).

Whitefishes (Family: Salmonidae, Subfamily: Coregoninae) are among the most important nonsalmon fishes for local subsistence harvests in the upper Kuskokwim River, but subsistence harvest levels have apparently declined over the last several decades for unknown reasons (Ikuta et al. 2014; Kari 1983; Stokes 1985). Whitefish harvests in general are not well understood in this part of Interior Alaska (C. L. Brown et al. 2012; Holen et al. 2006; Williams et al. 2005) This is likely due to the limited availability of harvest information for individual whitefish species, which casual observers often find very difficult to distinguish from one another.

The following description summarizes basic life history characteristics of 6 species of whitefishes present in the Kuskokwim River drainage as described in comprehensive detail by Brown et al. (2012). Whitefish species found within the study area discussed in this report include sheefish (inconnu) *Stenodus leucichthys*,

1. Other sources provide alternative boundaries for the upper Kuskokwim River region. Stokes (1985:3) defines the region as bounded by the Iditarod River drainage to the west, the Nowitna River drainage to the north, the Lake Minchumina/Kantishna River drainage to the east, and by the Alaska Range and Stony River drainage to the south. The Alaska Department of Fish and Game (ADF&G) Division of Commercial Fisheries has defined the upper Kuskokwim River region as the area including all communities within the Kuskokwim River drainage from Crooked Creek upriver to the headwaters (Carroll and Hamazaki 2012:3).

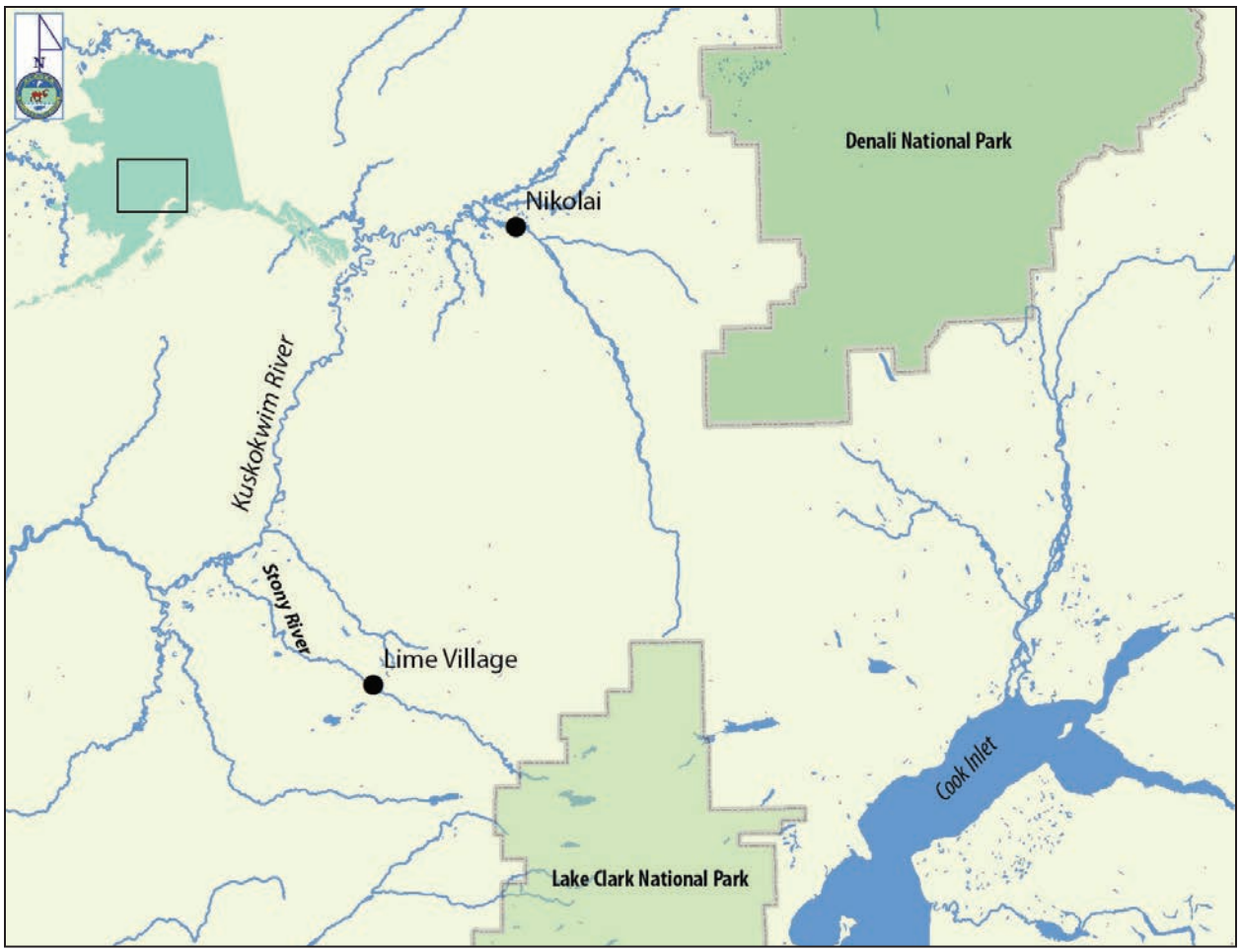

Figure 1-1.–Project study area.

broad whitefish *Coregonus nasus*, humpback whitefish *C. pidschian*[2], Bering cisco *C. laurettae*, least cisco *C. sardinella*, and round whitefish *Prosopium cylindraceum*. Sheefish, broad whitefish, humpback whitefish, Bering cisco, and least cisco share similar life history characteristics in that they are frequently present in fluvial systems and typically migrate over long distances between feeding, spawning, and overwintering habitats. Broad whitefish, humpback whitefish, and least cisco also spend significant portions of their life histories within lake systems, including those of the upper Kuskokwim River area. Sheefish overwinter from the Holitna River drainage downstream to Kuskokwim Bay, and migrate to the Big River and Middle Fork Kuskokwim River where they spawn in the fall. Some populations of sheefish may also spawn in Highpower Creek and at the mouth of Tonzona River; however, spawning activity in these locations has not been verified. Populations of broad whitefish, humpback whitefish, and least cisco also overwinter from the Holitna River drainage downstream to Kuskokwim Bay. In spring these species migrate from overwintering habitats into slower-flowing reaches of tributary rivers and into lake systems to feed. Mature adults of these three species also migrate to spawning habitats in summer. Broad whitefish are known to spawn near the mouths of the Swift and Big rivers. Humpback whitefish and least cisco likely spawn in the Swift and Big rivers as well, with other individuals of these species spawning in the Holitna River and at Ophir Creek in the lower portion of the drainage. Like sheefish, it is also possible that broad whitefish, humpback whitefish, and least cisco spawn in Highpower Creek. There is limited published information describing whitefishes in the Stony River drainage (R. J. Brown et al. 2012:179); however, in addition to results discussed in this

2. Humpback whitefish in North America have historically been referred to by several different common and scientific names including humpback whitefish *C. pidschian*, lake whitefish *C. clupeaformis* and Alaska whitefish *C. nelsonii* (Lindsey 1963; McPhail and Lindsey 1970; Mecklenburg et al. 2002). In this paper we will follow Alt's (1979) recommendation to refer to the species as humpback whitefish *C. pidschian* in Alaska.

report, Kari (Kari 1983:115–118, 1985:120), Holen and Lemons (Holen and Lemons 2010:19, 43), and C. L. Brown et al. (2012:287, 290) report harvests of broad whitefish, humpback whitefish, and least cisco within the Stony River drainage, clearly indicating these species' presence there. Sheefish are not known to be present in Stony River, except within the area of its confluence with the Kuskokwim River. Bering cisco overwinter in brackish and nearshore marine habitats, with juveniles and immature adults likely remaining there year-round. Mature adult Bering cisco migrate upstream in summer months to spawn over gravel substrate in clear water in the South Fork Kuskokwim River. Round whitefish tend to be present primarily in rivers and upland lakes within the drainage. Sheefish feed predominantly on fish, while broad whitefish, humpback whitefish, and round whitefish prey on benthic invertebrates. Bering cisco and least cisco prey upon small swimming invertebrates and small fish.

The current scientific understanding of whitefish life histories, biology, and migratory behavior in Alaska is advancing; however, it is still somewhat limited. Researchers and fisheries managers have identified the need to improve understanding of whitefish populations in the Kuskokwim River drainage for the purpose of developing management plans aimed at sustainability of these species (R. J. Brown et al. 2012:3–4). Documenting annual harvest amounts, contemporary and historical subsistence uses of whitefishes, and local and traditional knowledge of whitefish biology and behavior provide important information that improves the understanding of these species in general. Together biological and social science data sources can complement each other and support the development and implementation of such management goals.

This project aimed to answer the following three key research questions:

- What are the contemporary harvest and use patterns of each whitefish species used by Lime Village and Nikolai?
- What factors have shaped the harvest efforts of each whitefish species over time and why are whitefish harvests declining?
- What factors are influencing the ability of residents to harvest the varied species of whitefish?

The objectives of the project were:

1. Estimate the subsistence harvest of nonsalmon fish by residents of Lime Village and Nikolai in 2012 and 2013.
2. Evaluate the harvest of subsistence nonsalmon fish in terms of species, gear, location, and timing of harvests.
3. Document traditional ecological knowledge (TEK) of each whitefish species, including life history, ecology, environmental and climate-related observations, seasonal movement, spawning areas, interactions with other fish and wildlife, local taxonomies, trends in abundance, and traditional management systems.
4. Describe the characteristics and trends of the whitefish fishery by species.
5. Identify what factors may be influencing the ability of residents to harvest various whitefish species through the ice in the spring.

Chapter 2 will describe the research methods used to achieve the project's objectives.

2. METHODS

In order to meet the research questions, as outlined in the study objectives, the project employed three integrated social science data gathering methods; 1) systematic household surveys, 2) key respondent interviews, and 3) participant observation. In order to accomplish this task, ADF&G researchers made multiple trips to the communities and used more than one study method during each visit.

Prior to field research ADF&G researchers conducted community scoping activities and worked with the study community governments to seek community approval for the project. It was important to ensure that residents understood why this project was occurring and to give them the opportunity to be a part of the process. In each of the study communities local research assistants (LRA) were hired to assist with surveys and to assist with the key respondent interviews. Table 2-1 lists all project participants. The list includes those individuals involved in project management, field research, data entry, data analysis, map production, and report writing.

Systematic Household Surveys

For both the 2012 and 2013 study years, the primary method for collecting harvest information in this project was through a systematic household survey. An attempt was made to survey all households in the study communities. Participation was voluntary. Department researchers accompanied the LRAs to conduct each survey. The LRAs were trained to complete the survey component and, in collaboration with their local governments, were responsible for compiling current household lists for their communities prior to the survey effort.

The survey asked respondents to estimate their households' nonsalmon fish harvests for the calendar year immediately previous to the year during which the surveys were being conducted. The survey consisted of a 7-page form used to collect information from households including basic demographic information for household members, household participation in nonsalmon fish harvesting and processing activities, use of nonsalmon fish by the household, distribution of the nonsalmon fish harvest, nonsalmon fish harvests by species, seasons of nonsalmon fish harvest, gear types used, household assessments comparing the importance of whitefish as a subsistence resource during the study years to its importance in previous years, assessments comparing study year whitefish harvest efforts with effort levels during previous years, and observations by households of any changes in seasons of whitefish harvest over time. In order to ensure proper species identification, survey respondents were provided with detailed color photographs of individual fish representative of six species of whitefish present within the Kuskokwim River drainage. A copy of the survey form is included in Appendix A, and copies of the species identification photographs are included in Appendix B.

The harvest survey was used to meet project objective 1, *estimate the harvest of nonsalmon fish by residents of Lime Village and Nikolai in 2012 and 2013*, and project objective 2, *evaluate the harvest of nonsalmon fish in terms of species, gear, location, and timing of harvests*. Additional contributions to addressing the second objective were achieved through the assessment questions, which attempted to understand variability in whitefish harvests over time, and by obtaining geographic information collected through a mapping component accompanying each household survey. The mapping component recorded the locations of nonsalmon fish harvests by households. The mapping component was open-ended, and thus, any detailed information about local knowledge of whitefish provided by respondents was also recorded.

Survey Data Entry and Analysis

Household survey design followed ADF&G Division of Subsistence household survey methodology used to develop community harvest estimates. Results from surveyed households were expanded to derive

Table 2-1.–Project staff.

Task	Name	Organization
Community Project Coordination	Ursula Graham	Lime Village Traditional Council
	Beverly Gregory, Tribal Administrator	Nikolai Edzeno' Village Council
	Nick Alexia, First Chief	Nikolai Edzeno' Village Council
Northern Regional Program Manager	James Simon	ADF&G Division of Subsistence
Southern Regional Program Manager	Davin Holen	ADF&G Division of Subsistence
Principal Investigator	James M. Van Lanen	ADF&G Division of Subsistence
Data Management Lead	David Koster	ADF&G Division of Subsistence
Administrative support	Jennifer Bond	ADF&G Division of Subsistence
	Maegan Smith	ADF&G Division of Subsistence
	Theresa Quiner	ADF&G Division of Subsistence
	Pam Amundson	ADF&G Division of Subsistence
	Tamsen Coursey	ADF&G Division of Subsistence
	Deanne Lincoln	ADF&G Division of Subsistence
Programmer	David Koster	ADF&G Division of Subsistence
Data entry	Margaret Cunningham	ADF&G Division of Subsistence
	Theresa Quiner	ADF&G Division of Subsistence
	Barbara Dodson	ADF&G Division of Subsistence
	Zayleen Kalalo	ADF&G Division of Subsistence
	Nicholas Jackson	ADF&G Division of Subsistence
Data cleaning/validation	Margaret Cunningham	ADF&G Division of Subsistence
Data analysis	David Koster	ADF&G Division of Subsistence
	Garrett Zimpelman	ADF&G Division of Subsistence
Map Digitization	Margaret Cunningham	ADF&G Division of Subsistence
Cartography	Bronwyn Jones	ADF&G Division of Subsistence
Editorial Review Lead	Adam Knight	ADF&G Division of Subsistence
Production Lead	Adam Knight	ADF&G Division of Subsistence
Field research staff	James M. Van Lanen (Lime Village lead)	ADF&G Division of Subsistence
	Bronwyn Jones	ADF&G Division of Subsistence
	Joshua T. Ream	ADF&G Division of Subsistence
	Cameron Welch	ADF&G Division of Subsistence
	Marylynne L. Kostick	ADF&G Division of Subsistence
	David Runfola (Nikolai lead)	ADF&G Division of Subsistence
	Andrew R. Brenner	ADF&G Division of Subsistence
	Chad Cook	ADF&G Division of Subsistence
	Michelle Gillette	ADF&G Division of Subsistence
	Odin Miller	ADF&G Division of Subsistence
Local research assistants	Fred Bobby	Lime Village
	Ursula Graham	Lime Village
	Rebecca Alexia	Nikolai
	Brandon Esai	Nikolai
	Dante Esai	Nikolai
	Derek Gregory	Nikolai
	Phillip Runkle	Nikolai

community harvest estimates. Fractions of animals result from the expansion procedure and are rounded to the nearest tenth in accompanying report tables.

All data were coded for data entry by Division of Subsistence staff in Anchorage. Surveys were reviewed and coded by the project leads in each community for consistency. Responses were coded following standardized conventions used by the Division of Subsistence to facilitate data entry. Information management staff within the Division of Subsistence set up database structures within Microsoft SQL Server[1] at ADF&G in Anchorage to hold the survey data. The database structures included rules, constraints, and referential integrity to ensure that data were entered completely and accurately. Data entry screens were available on a secured internal network. Daily incremental backups of the database occurred, and transaction logs were backed up hourly. Full backups of the database occurred twice weekly. This ensured that no more than 1 hour of data entry would be lost in the unlikely event of a catastrophic failure. All survey data were entered twice and each set compared in order to minimize data entry errors.

Once data were entered and confirmed, information was processed with the use of Statistical Package for the Social Sciences (SPSS) software, version 21. Initial processing included the performance of standardized logic checks of the data. Logic checks are often needed in complex data sets where rules, constraints, and referential integrity do not capture all of the possible inconsistencies that may appear. Harvest data collected as numbers of animals, or in gallons or buckets, were converted to pounds usable weight using standard factors (see Appendix C for conversion factors).

ADF&G staff also used SPSS for analyzing the survey information. Analyses included review of raw data frequencies, cross tabulations, table generation, estimation of population parameters, and calculation of confidence intervals for the estimates. Missing information was dealt with on a case-by-case basis according to standardized practices, such as minimal value substitution or using an averaged response for similarly-characterized households. Typically, missing data are an uncommon, randomly-occurring phenomenon in household surveys conducted by the division. In unusual cases where a substantial amount of survey information was missing, the household survey was treated as a "non-response" and not included in community estimates. ADF&G researchers documented all adjustments.

Harvest estimates and responses to all questions were calculated based upon the application of weighted means (Cochran 1977). These calculations are standard methods for extrapolating sampled data. As an example, the formula for harvest expansion is

$$H_i = \bar{h}_i S_i \tag{1}$$

$$\bar{h}_i = \frac{h_i}{n_i} \tag{2}$$

where:

H_i= the total estimated harvest (numbers of resource or pounds) for the community i,

$\bar{h}_i$ = the mean harvest of returned surveys,

h_i= the total harvest reported in returned surveys,

n_i= the number of returned surveys, and

S_i= the number of households in a community.

1. Product names are given because they are established standards for the State of Alaska or for scientific completeness; they do not constitute product endorsement.

As an interim step, the standard deviation (SD) (or variance [V], which is the SD squared) was also calculated with the raw, unexpanded data. The standard error (SE), or SD of the mean, was also calculated for each community. This was used to estimate the relative precision of the mean, or the likelihood that an unknown value would fall within a certain distance from the mean. In this study, the relative precision of the mean is shown in the tables as a confidence limit (CL), expressed as a percentage. Once SE was calculated, the CL was determined by multiplying the SE by a constant that reflected the level of significance desired, based on a normal distribution. The value of the constant is derived from student's *t* distribution and varies slightly depending upon the size of the community. Though there are numerous ways to express the formula below, it contains the components of a SD, V, and SE:

$$C.L.\%(\pm) = \frac{t_{\alpha/2} \times \frac{s}{\sqrt{n}} \times \sqrt{\frac{N-n}{N-1}}}{\bar{x}} \qquad (3)$$

where:

s = sample standard deviation,

n = sample size,

$\bar{x}$ = mean harvest of returned surveys,

N = population size, and

$t_{\alpha/2}$ = the number of households in a community.

Small CL percentages indicate that an estimate is likely to be very close to the actual mean of the sample. Larger percentages mean that estimates could be further from the mean of the sample.

The corrected final data from the household survey will be added to the Division of Subsistence CSIS. This publicly-accessible database includes community-level study findings.[2]

Ethnographic Research

Ethnographic research addressed objective 3, *document TEK of each whitefish species, including life history, ecology, environmental and climate-related observations, seasonal movement, spawning areas, interactions with other fish and wildlife, local taxonomies, trends in abundance, and traditional management systems* and objective 4, *describe the characteristics and trends of the whitefish fishery by species*. This was accomplished through semi-structured key respondent interviews and participant observation.

Key respondent interviews covered the following topics:

- Historical and contemporary whitefish fishing effort
- Historical knowledge of whitefish species
- Lifetime observations of whitefish population abundance and whitefish habitat
- Seasonal movements of whitefish
- Whitefish fishing locations
- Whitefish fishing seasons
- Whitefish fishing methods

2. ADF&G Division of Subsistence, Community Subsistence Information System (CSIS): http://www.adfg.alaska.gov/sb/CSIS.

- Traditional methods of managing whitefish
- Whitefish processing and preservation

Traditional knowledge interviews also included a mapping component where geographic locations concerning the topics above were mapped by community respondents.

Researchers identified key respondents in each community during household harvest surveys and through consultation with community members during the community scoping meetings. Key respondents were compensated for their time. A special effort was made to work with elders to understand the historical context and past harvest patterns for whitefishes. Completed key respondent interviews were recorded, transcribed, and coded by project staff. Coded transcriptions were analyzed along with notes taken during the interviews. In order to obtain additional information on certain topics, follow-up correspondence with some of the respondents occurred over telephone.

Department researchers also participated in whitefish harvesting activities with Lime Village and Nikolai residents. Participant observation was useful in meeting Objectives 3 and 4. Notes, photographs, and interviews from participant observation were analyzed and this information has provided an important contribution to the content of this report.

Community Capacity Building

An educational and community capacity building component was also included is this research. According to Brown et al. (2012), the use of harvest monitoring materials that include clear photographs illustrating distinctive differences among whitefish species may resolve identification problems and allow reliable harvest data to be collected. To address this concern, during fieldwork ADF&G researchers disseminated educational whitefish species taxonomy materials to community members in order to improve the accuracy of future harvest reporting. Additionally, in partnership with National Park Service (NPS) and tribal organizations, traditional whitefish knowledge gatherings, geared towards community-wide participation, were organized around whitefish harvesting activities (see below).

Lime Village

Following project approval, research activities in Lime Village were initiated when ADF&G researchers traveled to Lime Village in May 2013 to conduct training for the LRAs and to complete the survey component for study year 2012 of the project. From May 3–4, 2013 ADF&G researchers successfully surveyed 13 of 13 Lime Village households (100% sample). During January 2014, household surveys were administered for study year 2013 in Lime Village. From January 29–30, 2014 ADF&G researchers successfully surveyed 11 of 14 Lime Village households (79% sample) (Table 2-2; plates 2-1 and 2-2).

Between May 2013 and January 2014, ADF&G researchers conducted 5 semi-structured, open-ended ethnographic interviews with residents Lime Village. Of the participating respondents, 4 were elders, (defined in this research those over the age of 60), and 1 was middle aged (defined as those between the age of 40–59) (Table 2-3). The perspectives of both men and women are important in obtaining a thorough understanding of subsistence harvest and use practices. Therefore, gender also played a role in the selection of respondents. Two elder women were interviewed.

Participant observation occurred during October 2013 in Lime Village. Researchers from both ADF&G and Bristol Bay Native Association conducted participant observation by fishing with community residents in Lime Village. Participant observation provided important opportunities for researchers to learn about whitefish and nonsalmon species, including identification issues, which was instrumental in determining species availability.

Table 2-2.–Sample achievement, Lime Village, Alaska, 2012 and 2013.

	2012	2013
Number of dwelling units	13	14
Interview goal	13	14
Households interviewed	13	11
Households failed to contact	0	1
Households declined to be interviewed	0	2
Households moved or nonresident	0	0
Total households attempted to interview	13	14
Refusal rate	0	15.4%
Final estimate of permanent households	13	14
Percentage of total households interviewed	100.0%	78.6%
Interview weighting factor	1	1.3
Sampled population	34	27
Estimated population	34	34.4

Source ADF&G Division of Subsistence household surveys, 2013 and 2014.

Table 2-3.–Key respondent sample achievement, Lime Village, Alaska, 2012 and 2013.

5 key respondents
92 year old male
65 year old male
47 year old male
87 year old female
69 year old female

Source ADF&G Division of Subsistence household surveys, 2013 and 2014.

Plate 2-1.–James M. Van Lanen (ADF&G) and Ursula Graham (LVTC) interview Lime Village elder Katherine Bobby. Photo by Bronwyn Jones, ADF&G.

In Lime Village there was also an education section to the participant observation component of this research. During preliminary discussions with the Lime Village Tribal Council (LVTC), Nondalton Tribal Council (NTC), and Lake Clark National Park anthropologist Karen Evanoff, a plan was formulated to organize an educational whitefish camp for Lime Village residents and Nondalton residents, especially youth and elders. Later, Bristol Bay Native Association (BBNA) also became a partner in this component. This event served as a capacity developing collaboration between the "Whitefish trends on the Upper Kuskokwim" project and the "Whitefish trends in Lake Clark and Iliamna Lake" project (12-452). In partnership with NPS, ADF&G researchers coordinated with LVTC, NTC, and BBNA to implement an educational, knowledge-sharing gathering during fall whitefish fishing activities in Lime Village. The goal of this component was to use a traditional activity, such as whitefish fishing, to promote a better understanding of contemporary and ancestral land and resource use patterns. This fall fishing education component included both traditional and Western methods of learning about whitefish, nonsalmon fish, and their role culturally and nutritionally. Lime Village residents, Nondalton residents, BBNA, and ADF&G staff participated in this event for three days during October 2013 (Plate 2-3). Alongside ADF&G, the following persons facilitated this educational and capacity building activity:

- National Park Service, Lake Clark National Park—Karen Evanoff
- Lime Village Tribal Council—Ursula Graham and Fred Bobby
- Nondalton Tribal Council—Nancy Delkittie, Fawn Sila, Butch Hobson, and Pauline Hobson
- Bristol Bay Native Association—Daniele Stickman

Nikolai

During their December 2012 meeting, Nikolai Edzeno' Village Council granted approval for the ADF&G Division of Subsistence to conduct research in Nikolai for this study. Surveys were conducted in April 2013 for the 2012 study year and in January 2014 for the 2013 study year. Prior to survey activities, the LRAs were trained in survey techniques. The LRAs also provided information that helped researchers identify all households in Nikolai that were potentially eligible for surveying. The LRAs were then deployed to contact all potentially eligible households and set appointments to conduct surveys with an ADF&G staff member. Households were determined to be eligible for

Plate 2-2.–Bronwyn Jones (ADF&G) and Ursula Graham (LVTC) interview Lime Village elder Nick Alexie. Photo by James M. Van Lanen, ADF&G.

surveys if they had resided in the community for at least 3 months during either study year. In April 2013, researchers administered surveys in 29 out of an estimated 40 eligible Nikolai households, a 72.5% sample. In January 2014, researchers administered surveys in 24 out of an estimated 36 eligible Nikolai households, a 66.7% sample (Table 2-4). During December 2012 and April 2013, researchers conducted 4 ethnographic interviews with 5 individuals, 2 female and 3 male. Four key respondents were elders (i.e., older than 60 years of age) and 1 was middle-aged (i.e., aged 49–60 years) (Table 2-5). In October 2013, David Runfola (ADF&G) accompanied one middle-aged male key respondent during several fishing excursions for the purpose of observing whitefish fishing methods typical of those deployed by Nikolai fishermen, as well as discussing factors relevant to understanding the breadth and depth of the fisherman's knowledge of whitefishes and their habitat (Plate 2-4).

In addition to surveys, key respondent interviews, and participant observations, department staff also planned and conducted an educational event for all Nikolai students (grades pre-kindergarten through 12) at the Top of the Kuskokwim School in Nikolai in October 2013. David Runfola (ADF&G Division of Subsistence), a certified teacher in secondary science education in Alaska, organized a half-day thematic unit exploring whitefish and northern pike biology, whitefish life history, and aquatic ecology. Nikolai secondary students

Plate 2-3.–(From left to right) Lime Village resident Fred Bobby and Nondalton residents Butch and Pauline Hobson pose after harvesting a broad whitefish at Trout Lake during an educational and capacity building event held for this project in Lime Village during October 2013. Photo by James M. Van Lanen, ADF&G.

Table 2-4.–Sample achievement, Nikolai, Alaska, 2012 and 2013.

	2012	2013
Number of dwelling units	41	41
Interview goal	40	41
Households interviewed	29	24
Households failed to contact	5	4
Households declined to be interviewed	6	12
Households moved or nonresident	1	1
Total households attempted to interview	35	40
Refusal rate	17.10%	33.3%
Final estimate of permanent households	40	36
Percentage of total households interviewed	72.50%	66.7%
Interview weighting factor	1.4	1.5
Sampled population	82	64
Estimated population	113.1	96.0

Source ADF&G Division of Subsistence household surveys, 2013 and 2014.

Table 2-5.–Key respondent sample achievement, Nikolai, Alaska, 2012 and 2013.

6 key respondents
71 year old male
69 year old female
68 year old male
66 year old female
58 year old male
60 year old male

Source ADF&G Division of Subsistence household surveys, 2013 and 2014.

Plate 2-4.–John Runkle, Nikolai fisherman, with a broad whitefish harvested by set gillnet in the South Fork Kuskokwim River, October 2013. Photo by David Runfola, ADF&G.

accompanied Runfola to a low-gradient slough in the South Fork Kuskokwim River and a boreal forest pond and practiced sampling of aquatic invertebrates. Runfola demonstrated various techniques and gear including D-nets, plankton nets, sediment core sampling, and destructive aquatic vegetation sampling. Students observed various aquatic invertebrates in the field and transported specimens to the school for further investigations. In the school, students sorted invertebrate specimens according to habitat type, and identified them to taxonomic order with the use of magnification instruments, classification keys, and large color photographs. Runfola provided instruction and guided discussion of aquatic invertebrate food types and the river continuum concept. Secondary students assisted younger students, grades pre-kindergarten through 6, in observing invertebrate samples and identifying food types by observations of gross anatomy. All students participated in a fish anatomy lesson which included a demonstration of external and internal fish anatomy, including dissections to explore reproductive biology and diet. Anatomy specimens included several least cisco, broad whitefish, and northern pike donated by a Nikolai subsistence fisherman. Least cisco and broad whitefish specimens included gravid females and males with fully developed testes, which helped demonstrate the reproductive biology of these fishes that were likely in the process of a spawning migration when they were harvested. The northern pike specimens included several species of prey fishes within their stomach contents, which illustrated predation and digestion in a piscivorous species. Two Nikolai elders were in attendance during the dissections and assisted students with handling their fish specimens. They also provided instruction on fish biology and behavior based on their life experiences, which greatly enhanced the educational quality and scope of the activities. Runfola was assisted by Nikolai community members Phillip Esai, Sammy John, Sr., and Amy Cook, teacher-principal at Top of the Kuskokwim School (2013–2014).

3. LIME VILLAGE

Community Background

Lime Village, *Hek'dichen Hdakaq'*, or "Abundance Village" is located in the western foothills of the Alaska Range on the Stony River, 60 miles upriver from its confluence with the Kuskokwim River and sits on the southwest bank of the Stony River just downstream from the Stony River's confluence with *Hek'dichen* or "Abundance Stream" (Plate 3-1).

Lime Village is only accessible by small boat or by chartered air service and is considered to be the most remote Dena'ina Athabascan community (Kari 1983). Lime Village's nearest neighbor is Stony River, a predominately Central Yup'ik community located 2 hours downriver by snowmachine in the winter or boat in the summer. Lime Village has strong kinship and cultural ties to Nondalton, another Dena'ina community located 98 miles to the south. There are many Nondalton residents and families who are originally from Lime Village. Although this portion of Dena'ina Athabascan territory is sparsely populated, it is on the Stony River near the present day Lime Village that the Dena'ina are thought to have originated (Kari and Fall 2003; Kari 1977; Townsend 1981). In Dena'ina, the Stony River-Telaquana Lake people are referred to as *Htsaht'ana*—'the first people' (Kari 1983).

The Dena'ina of Interior Alaska were traditionally a seminomadic people who traveled seasonally to harvest resources at various sites and who repeated this seasonal round each year. Most groups had winter villages

Plate 3-1.–The Stony River and the northern Lime Hills (Nizdlu Dghil'u—"islands are there mountains") as viewed from the shore at Lime Village. Photo by James M. Van Lanen, ADF&G.

where they built permanent semi-subterranean sod houses. According to Ellanna and Balluta (1992:58), the inland Dena'ina consisted of 4 bands organized through kin networks into several winter villages. There was a group that predominantly used the middle to upper reaches of the Stony River, including the settlements known today as *Hłsit* and *Qeghnilen*; a band that predominantly used the area around Telaquana Lake; a band that traveled along the Mulchatna River; and a band that predominantly used the area around Kijik on Lake Clark (Ellanna and Balluta 1992:58). During the late 19th century, probably as a result of an increased reliance on trade goods, these 4 bands consolidated into 2 bands: one that used the Stony River area and another that used the area at Kijik on Lake Clark (Ellanna and Balluta 1992:58, 63).

The people of Stony River were mainly concentrated in the village of Qeghnilen or "Canyon Village." Many residents of Nondalton can trace their descent to ancestors who came from Qeghnilen (Ellanna and Balluta 1992:65). Residents of both Lime Village and Nondalton can also trace their heritage to the village of Hłsit, which was located on a stream flowing from Tishimna Lake (*Hłsit Vena*, or "Whitefish Lake"). Both Qeghnilen and Hłsit dissolved in the 1930s (Ellanna and Balluta 1992:65). These settlements did not have more than 200 residents each at any time.

Priscilla Russell Kari worked in Lime Village in the 1980s (Kari 1983) to document patterns of subsistence harvest; most of her work was qualitative in nature. At that time, Lime Village had a population of 41 residents, almost all of whom used Dena'ina as their primary language (Kari 1983:5).

In terms of quantitative research on harvest patterns, Lime Village is not well documented; in 2007 the Division of Subsistence conducted the first wild foods harvest survey in Lime Village (Holen and Lemons 2010).

Present-day Lime Village is composed of a small group of houses connected by trails, perched atop a small bluff, overlooking the Stony River. The village maintains an aircraft runway, but there is no regular air service; oftentimes no airplanes land for weeks at a time. Mail delivery service occurs approximately 2 times per month. The closest store or fuel source is located at Stony River, which is 2 hours downstream by snowmachine or boat. However, the Stony River is too rocky and shallow for large boat travel and large shipments of supplies must be provided by air, leading to high costs for goods, especially fuel. The remoteness of the community and lack of regular air service means the community relies heavily on subsistence harvests.

There are few operating public buildings in the community. The only running water in the community is in the community washeteria, which has 2 toilets, 1 shower, and laundry facilities. The school and faculty housing, which are now closed due to lack of students, are also plumbed for running water. There is also a diesel-solar generator at the school, but it has fallen into disrepair and has not been fixed because there is no one in the community trained to repair it.

The environment surrounding Lime Village is low growing black spruce forests, permafrost zones, spruce-hardwood forests, interspersed with moist tundra and treeless bogs. Tree species include white spruce, paper birch, aspen, tamarack, willow, cottonwood, and alder. Land mammals include moose, bear, caribou, wolf, hare, marten, lynx, and fox. Spruce grouse, an upland bird species, are also present.

Stony River watershed is part of the greater Kuskokwim River watershed. The Stony River flows approximately 195 miles from its headwaters at the Stony Glacier in the western Alaska Range to its mouth at the Kuskokwim River. Chinook salmon, sockeye salmon, and coho salmon run in the Stony River during the summer months. Several species of nonsalmon fishes are present in the watershed including northern pike, Arctic grayling, longnose sucker, sheefish, humpback whitefish, broad whitefish, and least cisco. Whitefish have always been a food staple for the Stony River Dena'ina, and Kari (1983) speculated that the people may have relocated to Hek'dichen Hdakaq in order to have good access to salmon and whitefish.

Demography, Cash Employment, and Monetary Income

There are no reliable population data for Lime Village in the 2000 census; however, the State of Alaska estimated a population of 47 residents based on workforce data in 2000.[1] In 2007, ADF&G estimated that there was a population of 27 residents in 11 year-round households, of which 88% (24 residents) were Alaska Native (Holen and Lemons 2010). In 2012, ADF&G estimated that there was a population of 34 residents in 13 year-round households, of which 94% (32 residents) were Alaska Native. In 2013, ADF&G estimated that there was a population of 34 residents in 14 year-round households, of which 93% (32 residents) were Alaska Native (Table 3-1). Residents with children must home-school or relocate to other communities for their children to attend school.

In 2007 the mean number of years of residency in Lime Village was 34 years, and the maximum years of residency at 95 years. The largest age cohort for both males and females was young adults between 15 and 19 years old (Holen and Lemons 2010). In 2012 the mean duration of residency in Lime Village was 27 years, and the maximum duration of residency was 93 years. In 2013 the mean duration of residency in Lime Village was 31 years, and the maximum duration of residency was 97 years (Table 3-2). In 2012 the largest age cohorts for males were tied at 20–24, 25–29, and 45–49 years old, and the largest age cohort for women was 20–24. In 2013 the largest age cohorts for males were tied at 20–24, 25–29, 45–49, and 50–54 years old, and the largest age cohorts for women was 20–24 (figures 3-1 and 3-2).

Of the Lime Village household heads interviewed in 2012, 90% were born in Alaska (Table 3-3). Most were born in Lime Village (65%). Other nearby Interior Alaska communities where household heads were born included McGrath (5%), Red Devil (5%), Sleetmute (5%), and Stony River (5%). Of the Lime Village household heads interviewed in 2013, 95% were born in Alaska (Table 3-3). Most were born in Lime Village (53%). Other nearby Interior Alaska communities where household heads were born included McGrath (5%), Red Devil (5%), Sleetmute (5%), and Stony River (5%).

Figure 3-3 displays existing population history data for Lime Village from the U.S. Census Bureau, the Alaska Department of Labor, and from this study and shows that since the 1990s there has been a general trend towards a declining population in the community.

No employment or income data were obtained during 2012 or 2013. However, Table 3-4 summarizes selected findings about employment characteristics of Lime Village in 2007 from systematic household surveys conducted by the Division of Subsistence (Holen and Lemons 2010).

During 2007, 40% of the earned income in Lime Village resulted from jobs with the local government (Table 3-4). Administrative support occupations added 18% to the percentage of earned income, and state government jobs added another 13% of the income. This was followed by income derived from transportation (11%), services (9%), and construction (9%). Most jobs were located in Lime Village (86%), although 1 job was located in McGrath (5%) and 2 jobs (10%) were located outside of Alaska.

In Lime Village in 2007, 42% of adults were employed year-round and 80% of all adults were employed at some time during the year (Table 3-5). Each adult had an average of 2.8 jobs. Households had an average of 4 jobs and 71% of households had at least 1 member who was employed (Table 3-5). In 2007, the per capita income in Lime Village was $6,515, while the average household income was $15,823. The average per capita income in Lime Village in 2007 was well below the average per capita income for the state of Alaska, which in 2000 was $22,660.[2] Therefore, subsistence in Lime Village is an important part of the local economy. In 2007 the per capita harvest of edible wild resources was 936 pounds per person, which is among the highest of any rural community in the state (Holen and Lemons 2010).

1. ADLWD (Alaska Department of Labor and Workforce Development). n.d. *Research and Analysis Homepage: Population*. Juneau: State of Alaska Department of Labor and Workforce Development. http://laborstats.alaska.gov/index.htm.
2. ADLWD (Alaska Department of Labor and Workforce Development). n.d. *Research and Analysis Homepage: Population*. Juneau: State of Alaska Department of Labor and Workforce Development. Accessed November 3, 2014. http://laborstats.alaska.gov/index.htm.

Table 3-1.–Population estimates, Lime Village, Alaska, 2010, 2012, and 2013.

	Census (2010)	5-year American Community Survey (2007–2011)	5-year American Community Survey (2008–2012)	This study 2012	This study 2013
Total population					
Households	11	10.0	6	13.0	14.0
Population	29	22.0	19	34.0	34.4
Alaska Native					
Population	28	22.0	19	32.0	31.8
Percentage	96.6%	100.00%	100.0%	94.1%	92.6%

Sources U.S. Census Bureau (2011) for 2010 estimate; U.S. Census Bureau for American Community Survey 5-year survey estimate; ADF&G Division of Subsistence household surveys, 2013, for 2012 estimate and 2014, for 2013 estimate.

Table 3-2.–Demographic characteristics, Lime Village, Alaska, 2012 and 2013.

Characteristics	Lime Village 2012	Lime Village 2013
Household size		
Mean	2.6	2.4
Minimum	1	1
Maximum	5	5
Age		
Mean	33.0	44.0
Minimum[a]	0	6
Maximum	92	94
Median	24	45
Length of residency		
Total population		
Mean	26.9	31.3
Minimum[a]	1	0
Maximum	93	97
Heads of household		
Mean	40.3	38.8
Minimum[a]	3	3
Maximum	93	97
Alaska Native households[b]		
Number	13.0	14.0
Percentage	100.0%	100.0%

Source ADF&G Division of Subsistence household surveys, 2013 and 2014.

a. A minimum age of 0 (zero) is used for infants who are less than 1 year of age.

b. The estimated number of households in which at least 1 head of household is Alaska Native.

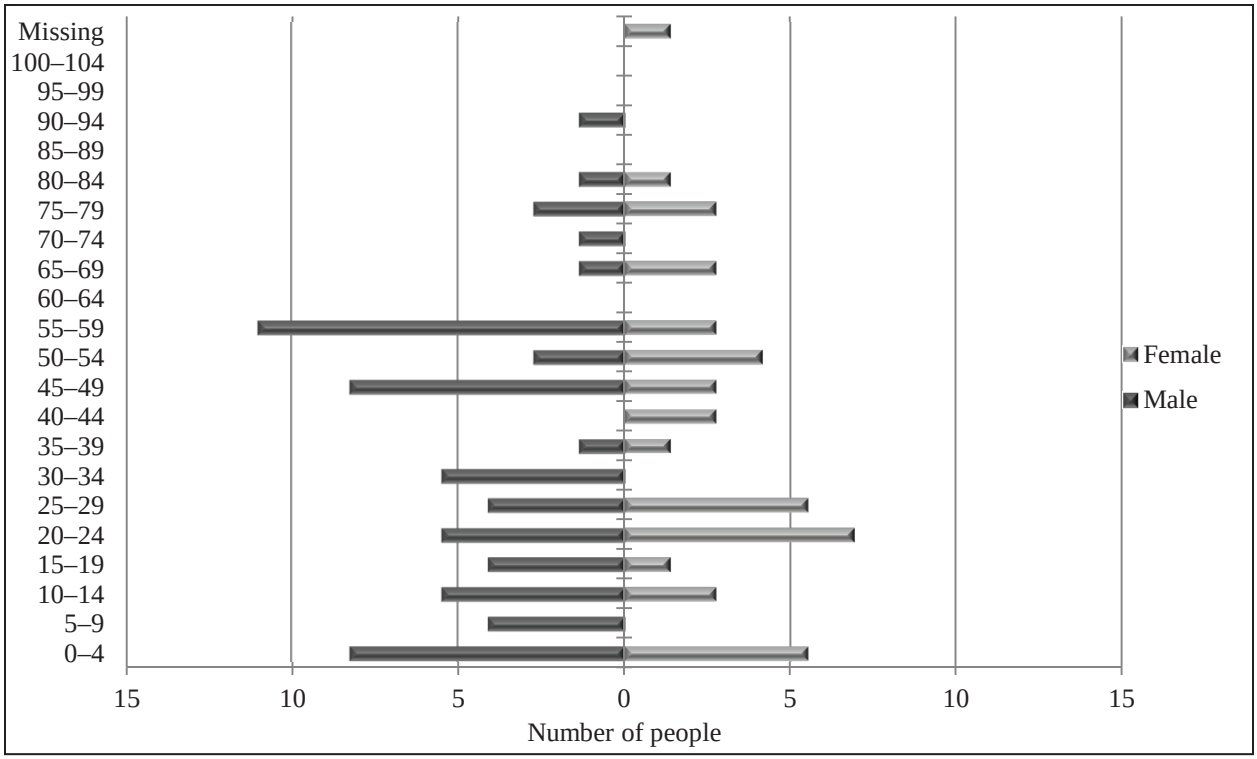

Figure 3-1.–Population profile, Lime Village, Alaska, 2012.

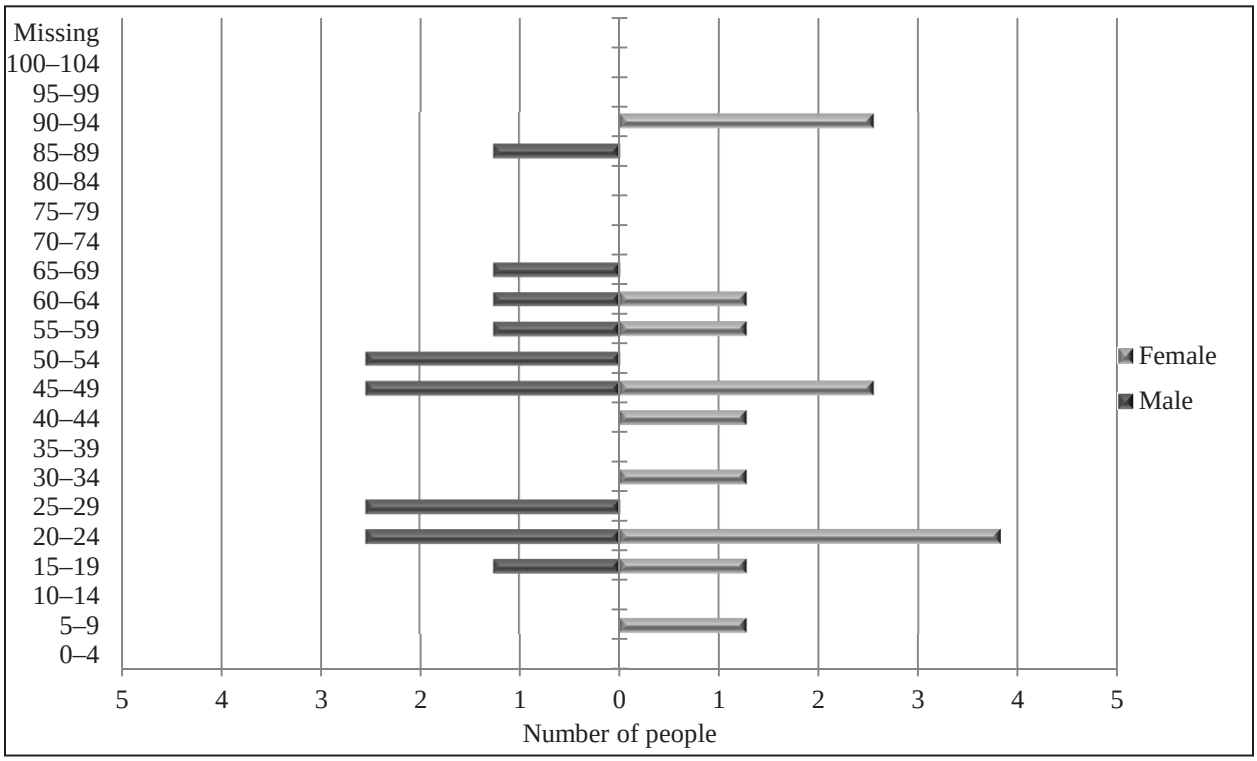

Figure 3-2.–Population profile, Lime Village, Alaska, 2013.

Table 3-3.–Birthplace of household heads, Lime Village, Alaska, 2012 and 2013.

Birthplace	Percentage	
	2012	2013
Anchorage	5.0%	0.0%
Ketchikan	0.0%	5.3%
Kodiak City	0.0%	5.3%
Lime Village	65.0%	52.6%
McGrath	5.0%	5.3%
Red Devil	5.0%	5.3%
Sleetmute	5.0%	5.3%
Stony River	5.0%	15.8%
Other U.S.	10.0%	5.3%

Source ADF&G Division of Subsistence household surveys, 2013 and 2014.

Note "Birthplace" means the place of residence of the parents of the individual when the individual was born.

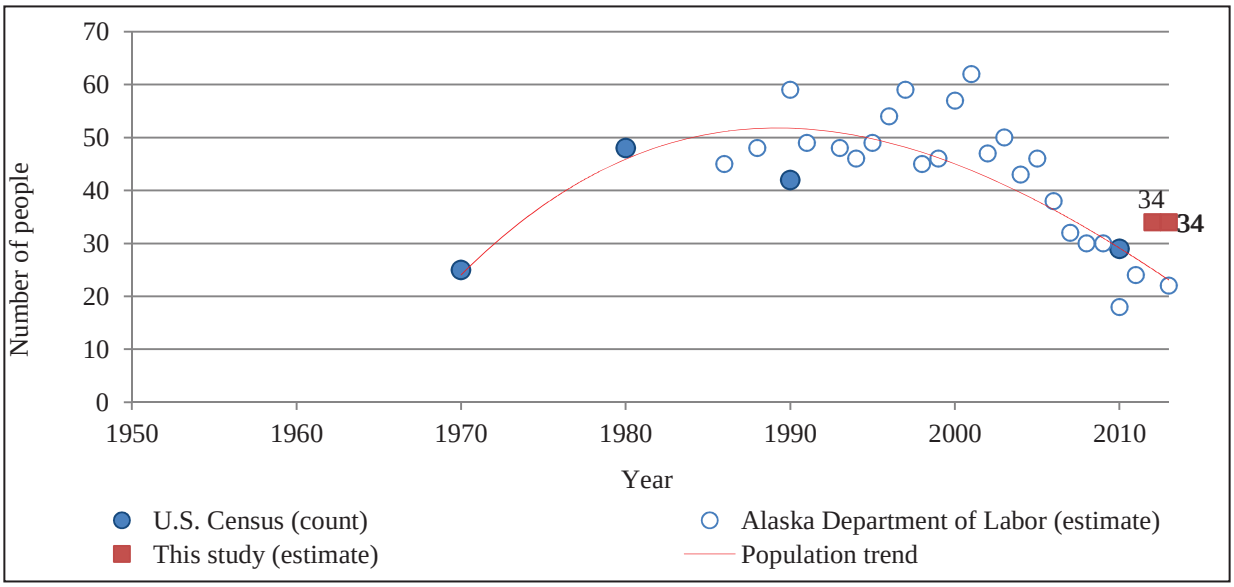

Figure 3-3.–Population history, Lime Village, Alaska.

Table 3-4.–Employment by industry, Lime Village, Alaska, 2007.

	Jobs	Households	Individuals	Percentage of income
Estimated total number [a]	33.0	7.9	18.9	100.0%
State government, total	**14.3%**	**28.6%**	**16.7%**	**12.6%**
Executive, administrative, and managerial	4.8%	14.3%	8.3%	7.2%
Agricultural, forestry, and fishing occupations	4.8%	14.3%	8.3%	1.8%
Transportation and material moving occupations	4.8%	14.3%	8.3%	3.6%
Local and tribal governments, total	**52.4%**	**71.4%**	**66.7%**	**40.4%**
Executive, administrative, and managerial	14.3%	28.6%	16.7%	8.6%
Social scientists, social workers, religious workers, and lawyers	14.3%	42.9%	25.0%	17.0%
Teachers, librarians, and counselors	4.8%	14.3%	8.3%	3.6%
Health diagnosing and treating practitioners	4.8%	14.3%	8.3%	5.4%
Technologists and technicians, except health	14.3%	28.6%	25.0%	5.8%
Construction, total	**9.5%**	**14.3%**	**16.7%**	**9.0%**
Construction and extractive occupations	4.8%	14.3%	8.3%	6.3%
Handlers, equipment cleaners, helpers, and laborers	4.8%	14.3%	8.3%	2.7%
Transportation, communication, and utilities, total	**4.8%**	**14.3%**	**8.3%**	**10.8%**
Production working occupations	4.8%	14.3%	8.3%	10.8%
Finance, insurance, and real estate, total	**4.8%**	**14.3%**	**8.3%**	**18.1%**
Administrative support occupations, including clerical	4.8%	14.3%	8.3%	18.1%
Services, total	**14.3%**	**28.6%**	**25.0%**	**9.0%**
Writers, artists, entertainers, and athletes	9.5%	14.3%	16.7%	7.2%
Mechanics and repairers	4.8%	14.3%	8.3%	1.8%

a. Estimated number of households and individuals includes only those who were employed during the study period.

Source ADF&G Division of Subsistence household surveys, 2008.

Table 3-5.–Employment characteristics, Lime Village, Alaska, 2007.

All adults	
Number	23.6
Mean weeks employed	28.6
Employed adults	
Number	18.9
Percentage	80.0%
Jobs	
Number	33.0
Mean	2.8
Minimum	1.0
Maximum	6.0
Months employed	
Mean	8.3
Minimum	1.0
Maximum	12.0
Percentage employed year-round	41.7%
Mean weeks employed	35.7
Households	
Number	11.0
Employed	
Number	7.9
Percentage	71.4%
Jobs per employed household	
Mean	4.2
Minimum	1.0
Maximum	9.0
Employed adults	
Minimum	1.0
Maximum	4.0
Mean	
Employed households	1.7
Total households	2.4
Mean person-weeks of employment	61.3

Source ADF&G Division of Subsistence household surveys, 2008.

Historical and 2012–2013 Harvests and Uses of nonsalmon fish by lime village residents

Nonsalmon fish, including whitefish, have always played an important role as subsistence resource for the Stony River Dena'ina people, both for human consumption and for use as dog food (Holen and Lemons 2010; Kari 1983). During times in the past when residents relied primarily on dog teams for transportation, nonsalmon fish, including whitefish, were likely just as important for dog food as they were as a source of food for people. However, the adoption of motorized transportation during the late 1960s initiated a decline in Lime Village's use of dog teams and thus a concomitant decline in the community's need to harvest large quantities of nonsalmon fish.

Today very few nonsalmon fish are used for dog food, and all of Lime Village's whitefish harvests are used for human consumption. While in terms of pounds harvested per capita, salmon are the most harvested and used subsistence resource for Lime Village residents—62% of the total pounds of wild resources harvested by Lime Village households in 2007 (Holen and Lemons 2010)—nonsalmon fish, including whitefish, continue to play an important role.

In this chapter, harvest survey results from this study are first presented and then compared to harvest survey results from the 2007 study (Holen and Lemons 2010). The results of the assessment questions from the household survey are then presented. Assessment questions attempt to gauge to what degree whitefish harvest and use patterns by the community have changed over time. Following presentation of these data, the results are contextualized with qualitative information obtained from key respondent interviews and literature review from past studies.

Nonsalmon Fish Harvests and Uses 2012

In 2012, Lime Village residents harvested an estimated total of 571 lb, or 17 lb per capita, of nonsalmon fish (Table 3-6). In terms of total pounds and percentages harvested, most of the harvest was humpback whitefish (252 lb, 7 lb per capita, or 44% of the total nonsalmon harvest), followed by northern pike (175 lb, 5 lb per capita, or 31%), Arctic grayling (93 lb, 3 lb per capita, or 16%), sheefish (34 lb, 1 lb per capita, or 3%), longnose sucker (8 lb, or .2 lb per capita), broad whitefish (7 lb, or .2 lb per capita), and 1 rainbow trout (2 lb, or .1 lb per capita) (Table 3-6, Figure 3-4).

Table 3-7 lists the number and pounds of each nonsalmon fish species harvested by Lime Village residents in 2012 in percentages by gear type. Lime Village residents harvested most of their nonsalmon fish by gillnets (57% of fish); 100% of the humpback whitefish harvest was accomplished by gillnet. Rod and reel methods were used to harvest 27% of the harvest, including most of the Arctic grayling and northern pike. The remaining harvest (14%), also consisting of northern pike and Arctic grayling, was accomplished by jigging through the ice (Figure 3-5).

During 2012, 100% of Lime Village households used nonsalmon fish, 77% harvested nonsalmon fish, 62% shared nonsalmon fish, and 69% reported receiving nonsalmon fish. Whitefish species harvested and used by Lime Village households in 2012 included broad whitefish, and humpback whitefish. Least cisco and sheefish were also used but were not harvested and instead received from outside the community.

Nonsalmon Fish Harvests and Uses 2013

In 2013, Lime Village residents harvested an estimated total of 752 lb, or 22 lb per capita, of nonsalmon fish (Table 3-8). In terms of total pounds and percentages harvested, most of the harvest was least cisco (407 lb, 12 lb per capita, or 54% of the total nonsalmon harvest), followed by northern pike (153 lb, 4 lb per capita, or 20%), broad whitefish (107 lb, 3 lb per capita, or 14%), Arctic grayling (56 lb, 2 lb per capita, or 8%), humpback whitefish (18 lb, 1 lb per capita, or 2%), longnose sucker (7 lb, or .2 lb per capita), and Dolly Varden (4 lb, or .1 lb per capita) (Table 3-8, Figure 3-6, and Plate 3-2).

Table 3-6.–Estimated harvests and uses of nonsalmon fish, Lime Village, Alaska, 2012.

	Percentage of households					Harvest weight (lb)			Harvest amount			95%
		Attempt	Harvest	Receive	Give		Mean				Mean	confidence
Resource	Use %	%	%	%	%	Total	household	Per capita	Total	Unit	household	limit (±)
Nonsalmon fish	**100.0**	**76.9**	**76.9**	**69.2**	**61.5**	**571.3**	**43.9**	**16.8**				**0.0**
Pacific herring	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Gal.	0.0	0.0
Rainbow smelt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Gal.	0.0	0.0
Arctic lamprey	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Alaska blackfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Lbs.	0.0	0.0
Burbot	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Arctic char	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Dolly Varden	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Lake trout	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Arctic grayling	92.3	76.9	76.9	30.8	30.8	93.3	7.2	2.7	133.3	Ind.	10.3	0.0
Northern pike	69.2	61.5	53.8	23.1	23.1	175.0	13.5	5.1	35.0	Ind.	2.7	0.0
Sheefish	30.8	7.7	7.7	23.1	7.7	33.6	2.6	1.0	6.0	Ind.	0.5	0.0
Longnose sucker	30.8	15.4	15.4	15.4	7.7	8.4	0.6	0.2	12.0	Ind.	0.9	0.0
Rainbow trout	23.1	7.7	7.7	15.4	7.7	2.0	0.2	0.1	1.0	Ind.	0.1	0.0
Broad whitefish	30.8	7.7	7.7	23.1	15.4	7.0	0.5	0.2	5.0	Ind.	0.4	0.0
Bering cisco	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Least cisco	23.1	0.0	0.0	23.1	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Humpback whitefish	76.9	38.5	38.5	38.5	30.8	252.0	19.4	7.4	126.0	Ind.	9.7	0.0
Round whitefish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2013.

Note Resources where the percentage using is greater than the combined received and harvest indicate use from resources obtained during a previous yea

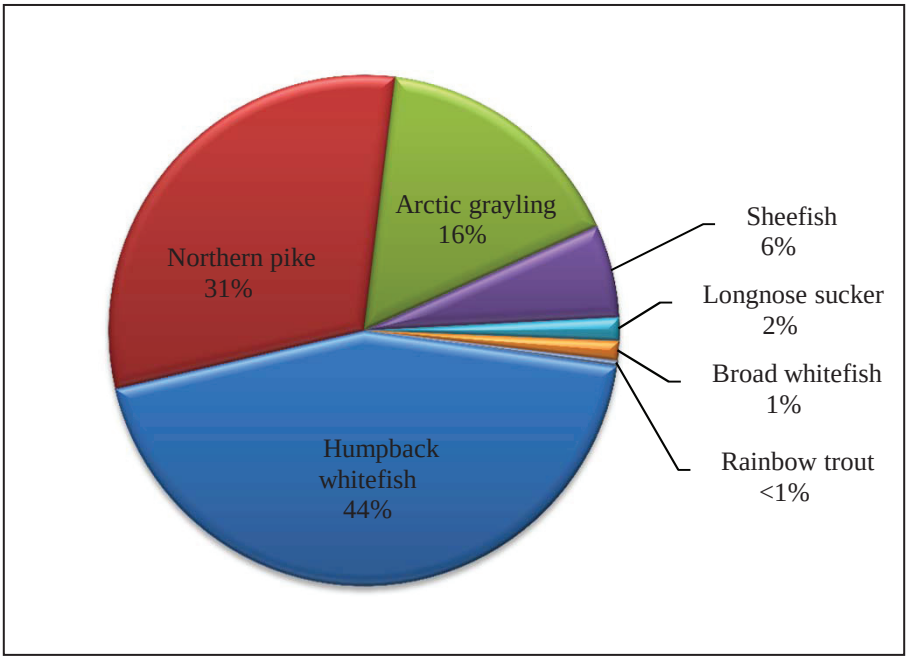

Figure 3-4.–Estimated harvests of nonsalmon fish, Lime Village, Alaska, 2012.

Table 3-7.–Estimated harvest of nonsalmon fish by gear type, resource, Lime Village, Alaska, 2012.

	Subsistence methods																	
	Gillnet or seine		Ice fishing (hook under ice)		Net under ice		Fish trap		Other method		Subsistence gear, any method		Rod and reel		Dip net		Any method	
Resource	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	No.	Lb.	Number	Pounds
Nonsalmon fish	**156.0**	**336.0**	**39.1**	**79.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**195.1**	**415.0**	**123.3**	**156.4**	**0.0**	**0.0**	**318.3**	**571.3**
Pacific herring	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rainbow smelt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arctic lamprey	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alaska blackfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burbot	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arctic char	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dolly Varden	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lake trout	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arctic grayling	12.0	8.4	27.1	19.0	0.0	0.0	0.0	0.0	0.0	0.0	39.1	27.4	94.3	66.0	0.0	0.0	133.3	93.3
Northern pike	7.0	35.0	12.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	19.0	95.0	16.0	80.0	0.0	0.0	35.0	175.0
Sheefish	6.0	33.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	33.6	0.0	0.0	0.0	0.0	6.0	33.6
Longnose sucker	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	8.4	0.0	0.0	12.0	8.4
Rainbow trout	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	2.0	0.0	0.0	1.0	2.0
Broad whitefish	5.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	7.0	0.0	0.0	0.0	0.0	5.0	7.0
Bering cisco	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Least cisco	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Humpback whitefish	126.0	252.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	126.0	252.0	0.0	0.0	0.0	0.0	126.0	252.0
Round whitefish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2013.

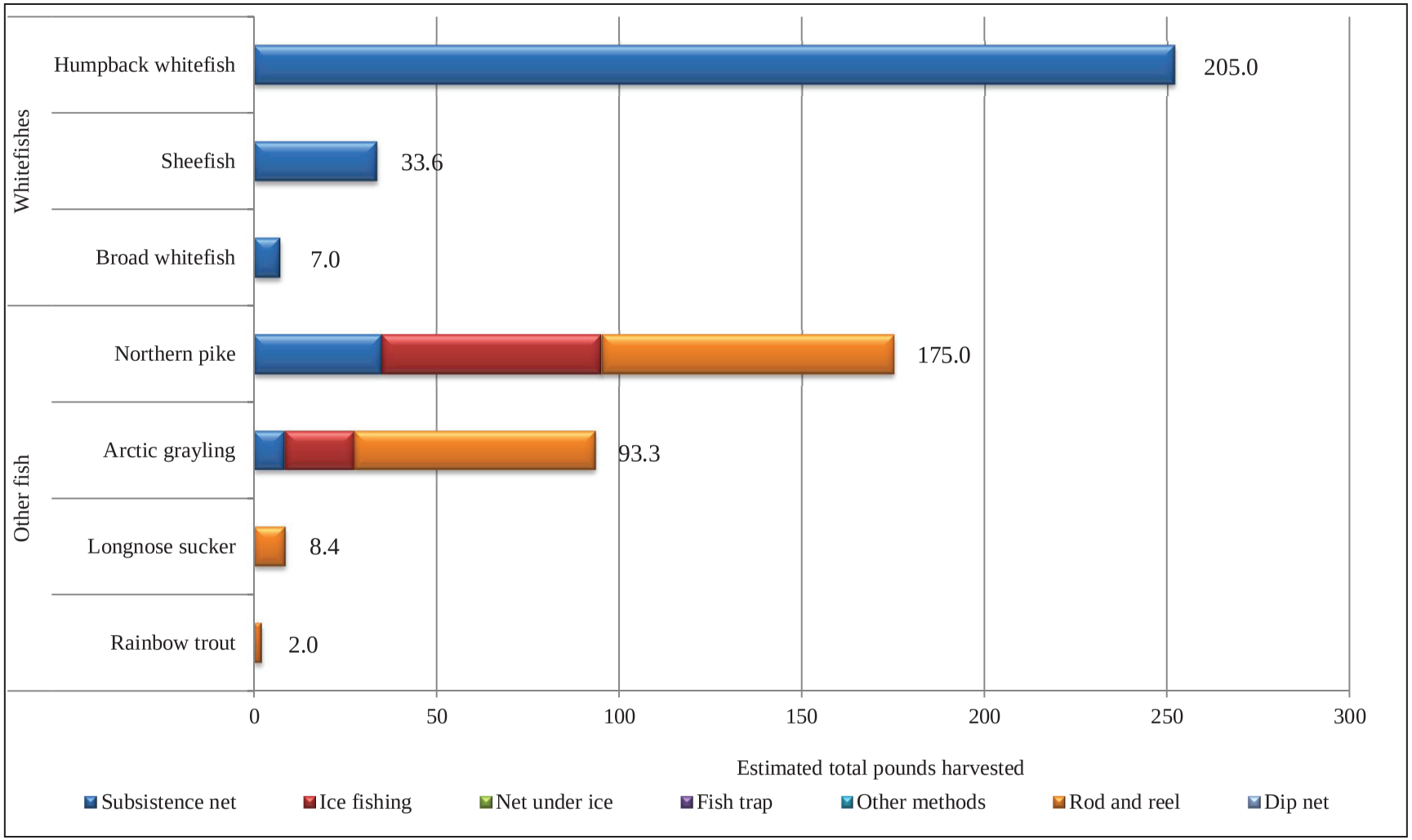

Figure 3-5.–Estimated harvest of nonsalmon fish by gear type, resource, Lime Village, Alaska, 2012.

Table 3-9 lists the number and pounds of each nonsalmon fish species harvested by Lime Village residents in 2013 in percentages by gear type. Lime Village residents harvested most of their nonsalmon fish by fish traps (55% of fish); 100% of the least cisco harvest was accomplished by fish trap. Gillnets were used to harvest 27% of the nonsalmon fish, including all of the broad whitefish and longnose suckers. Rod and reel methods were used to harvest 14% of the harvest, including 3 humpback whitefish. The remaining harvest (4%), consisting of Arctic grayling and northern pike, was accomplished by jigging through the ice (Figure 3-7).

During 2013, 100% of Lime Village households used nonsalmon fish, 64% harvested nonsalmon fish, 36% shared nonsalmon fish, and 73% reported receiving nonsalmon fish. Whitefish species harvested and used by Lime Village households in 2013 included broad whitefish, least cisco, and humpback whitefish. No households reported using sheefish in 2013.

Nonsalmon Fish Harvests and Uses 2007

In 2007 Lime Village's total whitefish harvest was 566 lb, 51 lb per household, or 23 lb per capita (Holen and Lemons 2010). During 2007, 57% of Lime Village households used whitefishes, 57% attempted to harvest whitefishes, 43% harvested, received, and gave away whitefishes. In 2007 least ciscoes made up 26% of Lime Village's nonsalmon fish harvests by weight (346 lb or 13 pounds per capita) and broad whitefish made up 17% of Lime Village's whitefish harvest (220 lb or 8 pounds per capita). In 2007, whitefishes made up 2% of Lime Village's total pounds of resources harvest and 3% of Lime Village's total fish harvest (in total pounds harvested). Salmon made up 60% of the total pounds for all resources (Holen and Lemons 2010).

In 2007, Lime Village residents harvested 864 least ciscoes (346 lb, or13 lb per capita) and harvested 55 broad whitefish (220 lb, or 8 lb per capita). In 2007, 29% of Lime Village households used sheefish. The sheefish used was received from other communities, and no sheefish was harvested by Lime Village residents. No reports of harvesting, attempting to harvest, or using humpback whitefish or round whitefish occurred in 2007 (Holen and Lemons 2010).

Nonsalmon Fish Harvests and Uses Compared to Other Years

Harvests and Uses Compared: 2007, 2012, and 2013

Figure 3-8 compares pounds per capita whitefish harvests and other nonsalmon fish harvests for Lime Village for the years 2007, 2012, and 2013. Overall whitefish harvests declined from 21 lb per capita in 2007 to 8 lb per capita in 2012. In 2013 overall whitefish harvests by the community increased to 15 lb per capita. A decline in overall harvests of other nonsalmon fish represents the largest difference between the three study years. In 2007 Lime Village residents harvested a total of 29 lb of other nonsalmon fish per capita. However in 2012 residents only harvested 9 lb per capita of other nonsalmon fish and in 2013 residents only harvested 6 lb per capita (Figure 3-8).

Figure 3-9 compares lb per capita whitefish harvests by species for Lime Village for the years 2007, 2012, and 2013. Broad whitefish harvests declined from 8 lb per capita in 2007 to less than 1 lb per capita in 2012. In 2013 broad whitefish harvests by the community increased to 3 lb per capita. While in 2012 no least cisco harvests were recorded, in 2007 Lime Village residents harvested 13 lb of least cisco per capita, and in 2013 residents harvested 12 lb of least cisco per capita. No humpback whitefish harvests were reported in 2007, but in 2012 Lime Village residents harvested 7 lb per capita of humpback whitefish. In 2013 humpback whitefish harvests declined to 1 lb per capita (Figure 3-9).

Figure 3-10 compares whitefish use, fishing effort, and harvest success by the percentage of total households in Lime Village for the years 2007, 2012, and 2013. The percentage of Lime Village households using whitefishes increased from 57% in 2007, to 77% in 2012, and then to 100% in 2013. Fishing effort declined,

Table 3-8.–Estimated harvests and uses of nonsalmon fish, Lime Village, Alaska, 2013.

	Percentage of households					Harvest weight (lb)			Harvest amount			95%
		Attempt	Harvest	Receive	Give		Mean				Mean	confidence
Resource	Use %	%	%	%	%	Total	household	Per capita	Total	Unit	household	limit (±)
Nonsalmon fish	**100.0**	**72.7**	**63.6**	**72.7**	**36.4**	**751.5**	**53.7**	**21.9**				**75.1**
Pacific herring	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Rainbow smelt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Arctic lamprey	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Alaska blackfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Burbot	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Arctic char	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Dolly Varden	9.1	9.1	9.1	0.0	9.1	3.6	0.3	0.1	2.5	Ind.	0.2	103.1
Lake trout	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Arctic grayling	36.4	36.4	36.4	0.0	18.2	56.1	4.0	1.6	80.2	Ind.	5.7	66.5
Northern pike	63.6	45.5	45.5	27.3	18.2	152.7	10.9	4.4	30.5	Ind.	2.2	48.9
Sheefish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Longnose sucker	9.1	9.1	9.1	0.0	9.1	7.1	0.5	0.2	10.2	Ind.	0.7	103.1
Rainbow trout	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Broad whitefish	100.0	27.3	27.3	72.7	18.2	106.9	7.6	3.1	76.4	Ind.	5.5	75.4
Bering cisco	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Least cisco	54.5	27.3	9.1	45.5	9.1	407.3	29.1	11.9	407.3	Ind.	29.1	103.1
Humpback whitefish	9.1	9.1	9.1	0.0	9.1	17.8	1.3	0.5	8.9	Ind.	0.6	103.1
Round whitefish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2014.

Note Resources where the percentage using is greater than the combined received and harvest indicate use from resources obtained during a previous yea

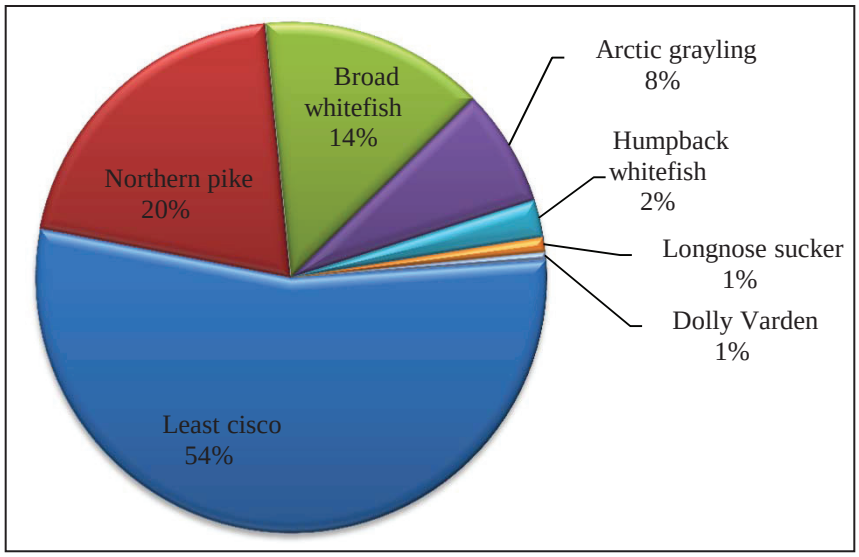

Figure 3-6.–Estimated harvests of nonsalmon fish, Lime Village, Alaska, 2013.

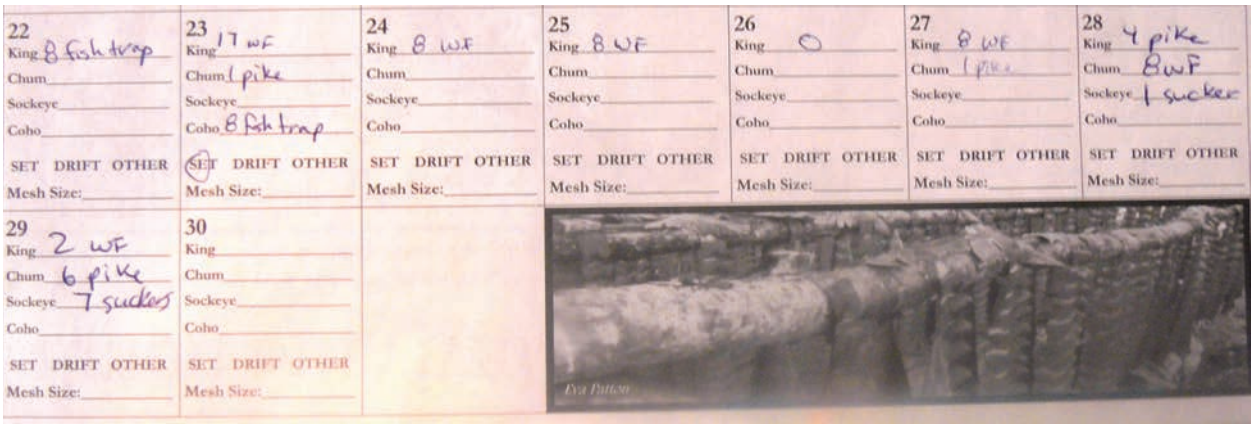

Plate 3-2.–An ADF&G Kuskokwim River salmon harvest calendar being utilized by a Lime Village resident to record household nonsalmon fish harvests during October 2013. Entries marked "fish trap" record least cisco harvests and entries marked as "WF" record broad whitefish harvests. Photo by James M. Van Lanen, ADF&G.

Table 3-9.–Estimated harvest of nonsalmon fish by gear type, resource, Lime Village, Alaska, 2012.

	Subsistence methods																	
	Gillnet or seine		Ice fishing (hook under ice)		Net under ice		Fish trap		Other method		Subsistence gear, any method		Rod and reel		Dip net		Any method	
Resource	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	No.	Lb.	Number	Pounds
Nonsalmon fish	108.2	203.1	6.4	31.8	0.0	0.0	411.1	409.9	0.0	0.0	525.6	644.9	90.4	106.7	0.0	0.0	616.0	751.5
Pacific herring	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rainbow smelt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arctic lamprey	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alaska blackfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burbot	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arctic char	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dolly Varden	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	3.6	0.0	0.0	2.5	3.6
Lake trout	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arctic grayling	0.0	0.0	3.8	2.7	0.0	0.0	0.0	0.0	0.0	0.0	3.8	2.7	76.4	53.5	0.0	0.0	80.2	56.1
Northern pike	15.3	76.4	6.4	31.8	0.0	0.0	0.0	0.0	0.0	0.0	21.6	108.2	8.9	44.5	0.0	0.0	30.5	152.7
Sheefish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Longnose sucker	10.2	7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.2	7.1	0.0	0.0	0.0	0.0	10.2	7.1
Rainbow trout	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Broad whitefish	76.4	106.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	76.4	106.9	0.0	0.0	0.0	0.0	76.4	106.9
Bering cisco	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Least cisco	0.0	0.0	0.0	0.0	0.0	0.0	407.3	407.3	0.0	0.0	407.3	407.3	0.0	0.0	0.0	0.0	407.3	407.3
Humpback whitefish	6.4	12.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.4	12.7	2.5	5.1	0.0	0.0	8.9	17.8
Round whitefish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2014.

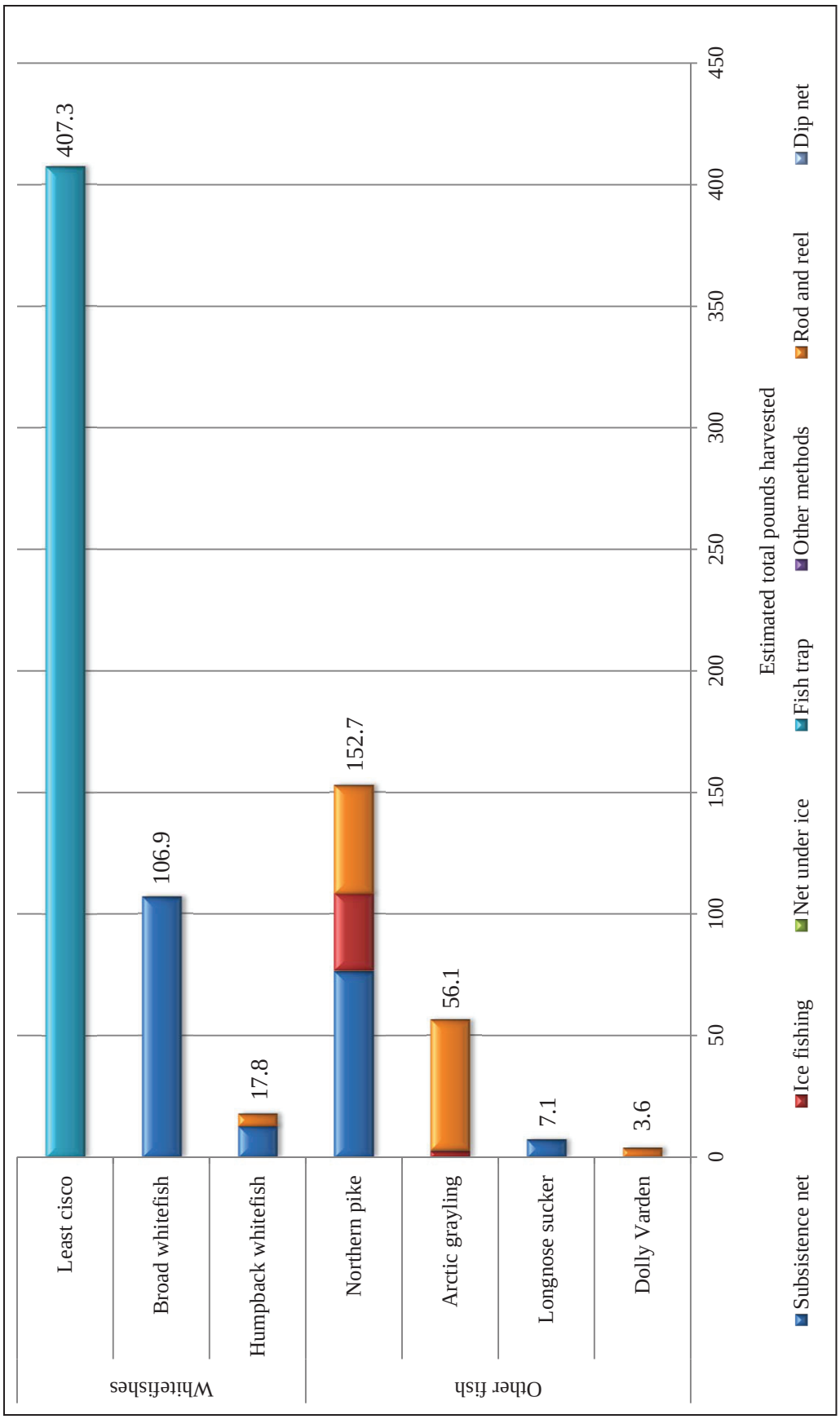

Figure 3-7.–Estimated harvest of nonsalmon fish by gear type, resource, Lime Village, Alaska, 2013.

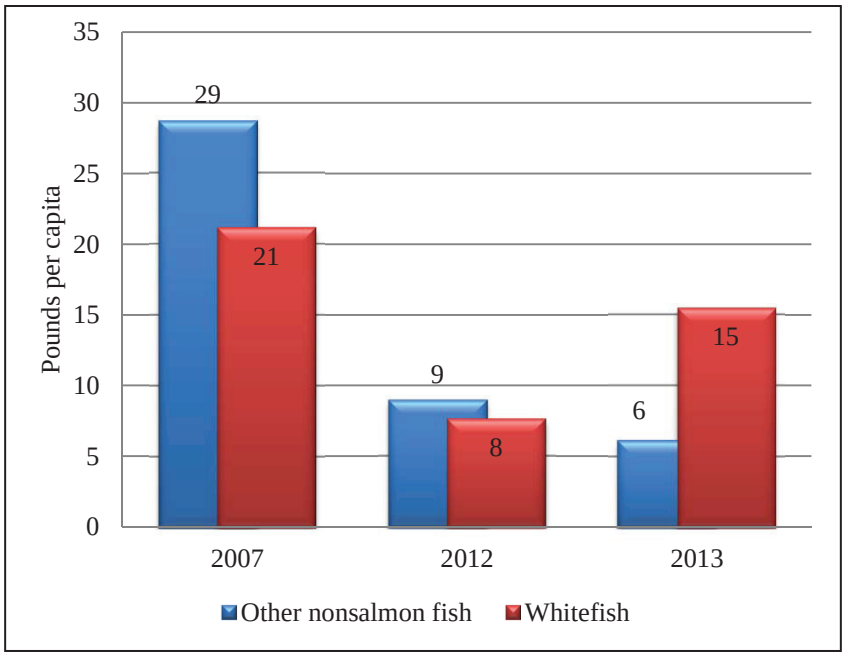

Figure 3-8.–Per capita whitefish and nonsalmon fish harvests, Lime Village, Alaska, 2007, 2012, and 2013.

with 57% of households attempting to harvest whitefishes in 2007, 38% attempting to harvest whitefishes in 2012, and 36% attempting to harvest whitefishes in 2013.

Changes in Whitefish Harvests and Uses: Assessment Results and Ethnographic Results

When Lime Village households were asked how their 2012 whitefish harvest effort compared to their whitefish harvest effort 5 years prior 64% of households reported that their 2012 harvest effort was less (Table 3-10). When asked how their 2012 whitefish harvest effort compared to their whitefish harvest effort 10 years ago 82% of households reported that their 2012 harvest effort was less. When Lime Village households were asked how their 2013 whitefish harvest effort compared to their whitefish harvest effort 5 years prior and 10 years prior 55% of households reported that their 2013 harvest effort was less.

Key respondent discussions regarding whitefish harvest efforts in the past compared to today centered around recollection of experiences traveling to whitefish camps at various lakes in the region and harvesting large amounts of whitefish, sometimes into the thousands, for both human consumption and to feed the many dog teams used by Lime Village residents. Kari (1983) reported that it was common for the community to put away large quantities of whitefish for winter supply each year. Whitefish camps occurred during the spring and fall months. Respondents during this study explained that during most of the 20th century it was normal for Lime Village families to move to whitefish camps and stay there to fish for up to three weeks. Respondents reported that whitefish camps were most often organized around a large scale communal effort to put away fish for the winter months.

According to Kari (1983) large quantities of whitefish were harvested by single or multiple household groups working together, and the harvest was divided up among the people who visited and helped fish. Once the whitefish harvest was brought back to Lime Village from camps, it was further distributed around the community (Kari 1983). Additionally, Lime Village residents have a history sharing subsistence foods with residents of Stony River; when residents travel between the two communities, people normally bring some type of subsistence foods to share with each other (Kari 1983).

Respondents from this study recalled their families harvesting 500–1000 broad whitefish and least cisco per year during the twentieth century, up until the late 1980's. Respondents said that it was often possible to catch hundreds of whitefish at Trout Lake *Hek'dichen Vetnu* and Tishimna Lake *Hłsit Vena* in one day or one night of fishing. Evanoff (2010) cited a Lime Village elder, who recalled that it was traditional for an upper Stony River Dena'ina family to harvest 4,000–6,000 whitefishes (either humpback or broad) at Tishimna Lake during the spring. Kari (1983) reported that if Lime Village people harvested plentiful amounts of salmon in the summer time they may harvest fewer whitefish in the fall (Kari 1983).

Whitefish have always been a food staple for the Stony River Dena'ina (Kari 1983). In fact Kari (1983) reported that, as a food source, most Lime Village residents preferred broad whitefish over salmon. "Because of its flavor and perceived nutritional value," broad whitefish were said to be the preferred fish for Lime Village residents (Kari 1983:118).

Today, Lime Village residents continue to harvest whitefish every year, though not as intensively as in the past. "It used to be that every family had a smokehouse, every family fished [for whitefish]," explained a Lime Village respondent. Yet very few Lime Village fishers relocate to camps for whitefish today. During the study period at least one household did spend a week in camp fishing for whitefish. "I like to go back there, and I'll stay for about a week in the fall," said a Lime Village respondent.

Respondents cited five main reasons for the community's decline in whitefish fishing effort: availability of store-bought food; employment that provides income to purchase store-bought food; the availability of motorized transport such as snowmachines, ATVs, and motorboats and a resulting end of the community's use of dog teams for transportation; increasing levels of beaver dams, which respondents suggest have blocked whitefishes' migration in the creeks where they are normally found; and younger generations not retaining and practicing the traditional patterns of the community.

Some of these factors are interrelated. For example, the older generations were highly dependent on wild resources for survival and thus would make great efforts to ensure adequate harvests. They did not have

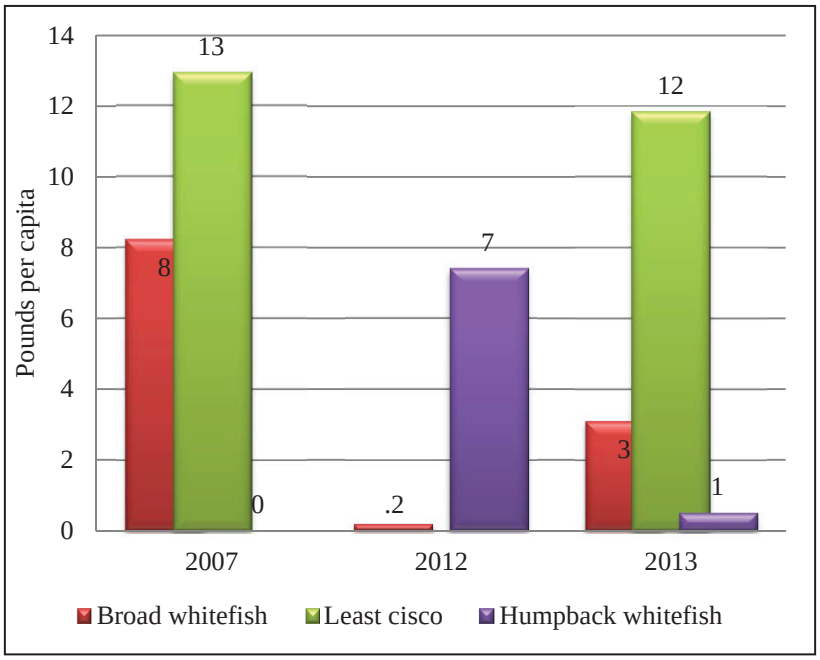

Figure 3-9.–Per capita whitefish harvests by subspecies, Lime Village, Alaska, 2007, 2012, and 2013.

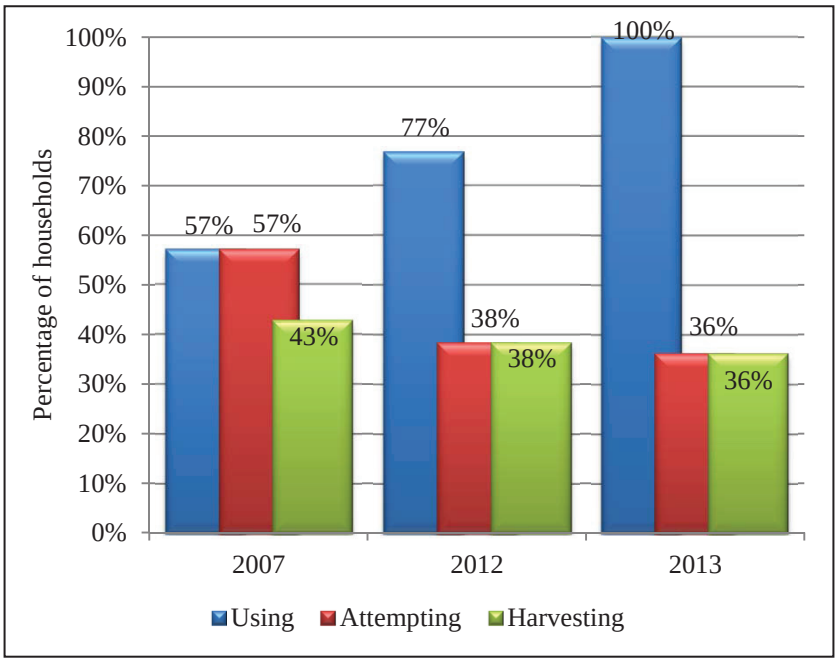

Figure 3-10.–Whitefish use, fishing effort, and harvest success, Lime Village, Alaska, 2007, 2012, and 2013.

Table 3-10.–Household responses to effort in harvesting whitefish, Lime Village, Alaska, 2012 and 2013.

	2012	2013
Percent of households		
using whitefish	58.8%	100.0%
attempting to harvest whitefish	52.9%	36.4%
harvesting whitefish	41.2%	27.3%
Harvest effort compared with … *(percent of households)* [a]		
5 years ago		
No response	0.0%	9.1%
Less effort	63.6%	54.5%
Same effort	27.3%	36.4%
More effort	9.1%	0.0%
10 years ago		
No response	0.0%	9.1%
Less effort	81.8%	54.5%
Same effort	9.1%	18.2%
More effort	9.1%	18.2%
20 years ago[b]		
No response		9.1%
Less effort		27.3%
Same effort		18.2%
More effort		45.5%
30 years ago[b]		
No response		27.3%
Less effort		9.1%
Same effort		18.2%
More effort		45.5%

Source ADF&G Division of subsistence household surveys, 2013 and 2014.

[a] Percentages based upon only households reporting use of whitefish.
[b] Question was not asked in 2012.

the option to forego fishing and to instead purchase large amounts of store-bought food. Similarly, their reliance on dog teams for transportation during subsistence activities meant that it was necessary for the community to harvest large amounts of fish for dog food (Kari 1983). In order to travel the rivers, lakes, and creeks, the Stony River Dena'ina used canoes, and it was necessary to paddle long distances to reach whitefish harvest locations. When motorized transport became available, the transition away from both dog team and canoe transport began, and younger generations were raised without the experiences of using these non-mechanized means of the transportation, and thus became less inclined to put forth as a great of an effort to catch fish.

A Lime Village elder explained:

> When the elders got old most people stopped fishing—it's hard to get back there to the fishing spots, and the elders used to canoe there, but then they got too old for the hard work, and the younger people only want to use motors, so they stopped. Plus kids had to go to school then too.

"I think it's got a lot to do with people got no more dog teams. It's easier for people to go to Anchorage now and go get groceries," said another respondent.

Elder respondents said that while community residents first obtained snow machines around 1970, it was really during the early 1980s that Lime Village residents began transitioning away from reliance on traditional means of transport, such as dog teams and non-motorized boats. Up until that time Lime Village residents remained highly reliant on traditional modes of transport.

In 1983 Kari reported that, while snow machines were becoming more common, "Lime Villagers are known in the Central and Upper Kuskokwim River area for having well-trained, high quality sled dogs" and that "Lime Village is probably one of the few communities in the state where dogs are used significantly more for transportation and work than are snowmachines" (Kari 1983:68–69). Kari (1983) suggested that the community's enduring reliance on dog teams for transport at that time resulted from Lime Village's remote location and high expenses for shipping fuel and parts there. "[B]eing on the fringe of the cash economy as they are, they cannot afford the high cost of fuel to run snowmachines in place of dogs without perhaps significantly altering their present way of life and becoming more involved in the cash economy" (Kari 1983:71).

Respondents explained that harvesting these large amounts of whitefish was primarily important for feeding the numerous sled dogs employed by the community for transportation needs and that the primary reason for the large decline in whitefish harvest efforts by Lime Village residents is that dog teams are no longer employed by the community for transportation. Whitefishes, northern pike, and longnose suckers were always important fish species used for dog food (Kari 1983). Kari (1983) reported that in 1982 there were at least 100 dogs in Lime Village and at least 200–300 fish per dog, per winter was necessary without access to commercial dog food, thus implying that Lime Village residents would need to harvest 20,000–30,000 fish annually just for dog food. Kari (1983) reported that because of this situation Lime Village residents traditionally expended much time and effort obtaining fish to feed their dogs. Kari (1983) reported that more than half of any Lime Village household's annual catch of fish was used for dog food.

Increasing numbers of beaver dams in the local area were another reason often cited by respondents for declines in the community's efforts to harvest whitefish. "A long time ago their used to be no beaver and then lots of whitefish came up," explained a Lime Village elder. Respondents said that, beginning in the 1990s, large declines in whitefish resulting from the increasing number of beaver dams created a situation where local creeks no longer provided enough whitefish harvests to make the investment in time worth the effort. Respondents suggested declines in both beaver trapping and beaver dam removal by the community as reasons for the increase in beaver dams.

Despite these factors, as reported above, whitefish continue to be harvested and used by the community, though not in the quantities reported from the past. The increase in reported harvest effort when compared to the past, discussed above in Table 3-10, likely results from the community's employment of the traditional fish trap method in the fall of 2013.

Household survey respondents were also asked how important whitefish are to their household today and in the past. Despite the community reporting less harvest effort and less use of whitefish overall when compared to the past, in 2012, 91% of households reported that whitefish are as important today as in the past and in 2013, 64% of households reported that whitefish are as important today as in the past (Table 3-11).

When household survey respondents were asked "if you cannot get whitefish what do you do differently?" the primary answers were either to use other subsistence resources or to make do with what they get (Table 3-12). Some respondents said that if they did not get enough whitefish they would normally get enough salmon during the summer to get them through the winter. One respondent said that his household will try to harvest northern pike and Arctic grayling by ice fishing during the winter. An elder respondent explained that if a household does not get enough whitefish there is not much that can be done differently but to wait for spring because salmon and pike are not replacements for whitefish, and fall whitefish season is the last chance to catch whitefish before freeze-up.

Whitefish and Nonsalmon Species Used by Lime Village Residents

As reported above, Lime Village residents harvest and use broad whitefish, humpback whitefish, least cisco, and, to a limited extent, sheefish (Plate 3-3). While Kari (1983) reported that Lime Village residents harvested round whitefish, in 2007 (Holen and Lemons 2010), 2012, and 2013 no reports of harvesting, attempting to harvest, or using round whitefish occurred.

As also reported above, Lime Village residents harvest and use other nonsalmon fish including Arctic grayling, longnose sucker, and northern pike (plates 3-4 and 3-5). These fish are often harvested with whitefish during whitefish harvesting activities. Kari (1983) reported that northern pike ranked third in importance as a subsistence resource for Lime Village residents, behind whitefish and salmon. When Lime Village residents maintained dog teams, northern pike and longnose suckers were important sources of dog food (Kari 1983).

Respondents during the 2012–2013 research often referred to the various whitefish species in their Dena'ina names, especially *telay*—broad whitefish. Dena'ina names for the other whitefish species are humpback whitefish—*hulehga*, least cisco—*ghelghuli*, which Lime Village residents often call "herring", sheefish—*shish*, and round whitefish—*hasten.* The Dena'ina name for northern pike is *ghelguts'i*. Longnose suckers are called *duch'ehdi* (Kari 1977, 1983).

All five of the above species of whitefish, which belong to the family of salmonids, along with Arctic grayling, lake trout, Dolly Varden, and salmon, are present in the upper Kuskokwim River habitat region (R. J. Brown et al. 2012). Additionally, pygmy whitefish are also known to inhabit the upper Stony River watershed (R. J. Brown et al. 2012), however no research conducted with Lime Village residents has established the harvest or use of this species. Bering cisco limit their habitat to the mainstem of the Kuskokwim River and are not found in the Stony River drainage (R. J. Brown et al. 2012).

Broad whitefish, humpback whitefish, and least cisco tend to occupy similar habitats in the Kuskokwim River drainage. "Broad whitefish are routinely identified in flatland lakes open to riverine habitats…" (R. J. Brown et al. 2012:179) but are rare in upstream, "swift flowing, gravel substrate habitats" (R. J. Brown et al. 2012:177). Sheefish "avoid lake habitats and rarely ascend tributary rivers into the swiftly flowing, gravel substrate reaches beyond the Kuskokwim River floodplain" (R. J. Brown et al. 2012:176), which suggests why Lime Village's location far upriver from the floodplain, and the upper Stony River's gravel substrate characteristics, make sheefish mostly unavailable to Lime Village residents. However, sheefish may have been more available to Lime Village residents in the past. According to Brown et al. (2012) Stony River residents recently reported that sheefish used to occur more abundantly further up into the Stony River but that they no longer travel up the river in large numbers and thus as a result Lime Village residents must travel far downstream to harvest them. A Lime Village respondent during this research discussed his occasional sheefish harvest activities:

Table 3-11.–Household responses to the importance of whitefish, Lime Village, Alaska, 2012 and 2013.

	2012	2013
Percent of households using whitefish	84.6%	100.0%
Importance of whitefish to households today		
(percent of households)		
No response	0.0%	0.0%
Not important	0.0%	0.0%
Important	27.3%	54.5%
Very important	72.7%	45.5%
Importance of whitefish to households in the past		
(percent of households)		
No response	0.0%	0.0%
Not important	0.0%	0.0%
Important	27.3%	54.5%
Very important	72.7%	45.5%
Households responding whitefish **less** important today	9.1%	36.4%
Households responding whitefish **more** important today	0.0%	0.0%
Households responding whitefish as important today as in the past	90.9%	63.6%

Source ADF&G Division of Subsistence household surveys, 2013 and 2014.

All percentages are based upon the number of households responding yes to using whitefish.

Table 3-12.–Households reporting what they do differently if they cannot get enough whitefish, Lime Village, Alaska, 2012 and 2013.

	2012	2013
Households providing a response	100.0%	10
Percentage of households reporting that they would …		
Buy subsistence foods	0.0%	0.0%
Buy store foods	9.1%	10.0%
Use other subsistence resources	63.6%	10.0%
Ask others for help	9.1%	0.0%
Make due with what they did get	18.2%	60.0%
Increase effort	0.0%	20.0%
Work more	0.0%	0.0%
Use other foods (unspecified)	0.0%	20.0%
public assistance	0.0%	0.0%
other	0.0%	0.0%

Source ADF&G Division of subsistence household surveys, 2013 and 2014.

All percentages are based upon the number of households responding yes to using whitefish.

> We don't get sheefish here. I usually go down to Stony [Stony River community], probably early June and then we would get probably four or five of them [Sheefish] and then come back up [to Lime Village]. We got like 6 of them in 2012 [received from the Stony River community, not harvested by Lime Village residents].

As reported above, in 2007 Lime Village residents harvested and used broad whitefish, least cisco, and some sheefish (Holen and Lemons 2010). With the exception of sheefish, the species harvested and used in 2007 match those recorded in 2013, but not those recorded in 2012. In 2012 residents did harvest and use small amounts of sheefish but harvested few broad whitefish and no least cisco. This is because during 2012 Lime Village residents did not travel up the creeks and into the lakes to harvest broad whitefish with set gillnets or least cisco with fish traps and instead targeted humpback whitefish in the mainstem of the Stony River.

Key respondent interview data informed this research that of all the whitefish species available in the Kuskokwim region, Lime Village residents prefer broad whitefish as a subsistence resource. Respondents explained that broad whitefish were preferable because of their large size when compared to the other whitefishes available. Kari (1983:118) reported that, as a food source, most Lime Village residents prefer broad whitefish even over salmon "because of its flavor and perceived nutritional value." Respondents also said that the abundance of broad whitefish in the area made them easy to catch. Elders recalled catching hundreds of broad whitefish a day in the past.

Least cisco, which Lime Village residents often refer to as 'herring', is also an important subsistence fish for the community. Respondents said that least cisco are normally very abundant in the smaller creeks connected to lakes in the Lime Village area. Least cisco are especially abundant during late-fall and early winter, just before freeze-up.

Plate 3-3.–Broad whitefish (telay) harvested by Lime Village residents, October 2013. Photos by James M. Van Lanen, ADF&G.

Kari (1983) reported broad whitefish and humpback whitefish, both caught at camps associated with local lakes, to be the most important whitefishes for Lime Village residents. However, during 2012 and 2013 respondents said that humpback whitefish were not harvested and used by community nearly as much as they were in the past. Elder respondents explained that this decline in the harvest and use of humpback whitefish has resulted from residents no longer traveling to the locations and staying for extended periods of time in the traditional camps noted for humpback whitefish harvest activities in the past. A Lime Village elder said that humpback whitefish harvests by residents occurring in recent times, and recorded during the 2012 and 2013 study, are likely more representative of incidental catches, rather than targeted catches. The elder said that when residents put out set gillnets for longnose sucker and northern pike in the mainstem of the Stony River during the spring, "a few humpbacks would end up in the net." During 2012, incidental catches of humpback whitefish in the mainstem of the Stony River were high, explained the elder.

Reports by Kari (1983) on the composition of whitefish species normally harvested and used by Lime Village residents conflict with reports from 2007 (Holen and Lemons 2010) and 2012–2013. Kari (1983) emphasized humpback whitefish as playing a major role in subsistence use patterns of Lime Village residents. As stated above, the shift away from emphasis on humpback whitefish harvests can likely be

explained by residents foregoing seasonal migration to traditional humpback whitefish camps. However, Kari (1983:108) also reported that least cisco was a "minor fish species" only "occasionally harvested by Lime people." Rather than least ciscoes, Kari (1983:116) reported that round whitefish were normally "taken in significant numbers each year" by Lime Village residents.

Based on data obtained from this research, including multiple positive identifications of least cisco by respondents and positive identifications by ADF&G and USFWS fisheries biologists of sampled least cisco obtained from Lime Village fisherman during this research, it is possible that Kari (1983) misidentified the species being harvested and improperly labeled least cisco as round whitefish. However it is also possible that harvest patterns in regards to species composition have changed over the course of the last thirty years.

There is a known history of confusion identifying whitefish species for the casual observer. This confusion is often amplified when trying to identify whitefish species by the names used for them in local languages.

Plate 3-4.–Broad whitefish (telay) and northern pike (ghelguts'i) harvested by Lime Village residents, October 2013. Photo by Fred Bobby.

Plate 3-5.–Longnose sucker (duch'ehdi) harvested by Lime Village residents, October 2013. Photo by James M. Van Lanen, ADF&G.

According to Georgette and Shiedt (2005:26), who completed an extensive study of the subsistence whitefish fishery in the Kotzebue Sound region of northwest Alaska with Inupiaq people:

> [D]ifferentiating the whitefish species in any language is difficult for the casual observer because of the fishes many similarities, sometimes more subtle differences, and tendency to be found mixed together.

Georgette and Shiedt (2005) observed different local fishers referring to least ciscoes by three different Inupiaq names. As a result of the oftentimes noted subtle differences between different species of whitefishes, Georgette and Shiedt (2005) reported that several different Inupiat communities referred to all types of whitefishes under one general name. Because "the different species are typically found mixed together in varying proportions depending on the location and the season," residents often did not classify them by distinct species when keeping track of their harvests (Georgette and Shiedt 2005:30). These

observations from northwest Alaska show that attempts at whitefish identification by local fisherman and/or social scientists are subject to error. In fact, social scientists conducting this research experienced this confusion first hand when they were unable to positively identify whitefish specimens caught by Lime Village residents. In order to positively identify the specimens as least cisco, it became necessary to forward the specimens to ADF&G and USFWS fisheries biologists (Plate 3-6).

Whitefish Movements and Spawning in the Stony River Watershed, and Lime Village Fishing Seasons

Whitefish Movements and Spawning

Lime Village respondents discussed their knowledge of whitefish movements in the region. Respondents explained that during spring whitefish migrate from the main rivers up the smaller creeks to lakes and feed all summer long in shallow water. Respondents said that during late fall whitefish travel downstream to spawn and overwinter in deeper water in the mainstem of the Stony River. Respondents said that as the whitefish began their downstream migration, they bunch up in the creeks and become increasingly abundant, making them easier to catch.

Lime Village local knowledge of whitefish movements and spawning is aligned with that of fisheries biologists. Brown et al. (2012) reports that during spring whitefish in the Kuskokwim habitat region begin a migration from "riverine overwintering habitats to feeding habitats in the slow flowing, lower reaches of tributary rivers or river connected lake systems" and that by mid to late summer whitefish have migrated to "upstream spawning habitats in gravel substrate reaches of the drainage" Whitefish spawn in the fall and then leave the location for downstream overwintering grounds (R. J. Brown et al. 2012). Humpback whitefish spawn late September to early October, and broad whitefish spawn from late October to early November (R. J. Brown et al. 2012). However, "post-spawning migration data are not available for least

Plate 3-6.–Male least cisco (ghelghuli) harvested in a fish trap at Shagelagh by Lime Village residents during the week of October 6, 2014. Photo by Dave Runfola, ADF&G.

cisco, Bering cisco, or round whitefish populations in the Kuskokwim River drainage" (R. J. Brown et al. 2012:181).

In October 2014 a physical specimen of female least cisco carrying eggs was obtained by ADF&G researchers. The specimen was harvested by Lime Village fishers during the week of October 6th in a creek as it was presumably moving downstream towards the mainstem of the Stony River. Due to the advanced stage of the female specimen's ovaries, the sample suggested that the female was approaching spawning readiness (Plate 3-7). Respondents said that it is common for female fish caught at this location to contain eggs as they move downstream during their fall migration.

Whitefish Fishing Seasons

Seasonal Round

> *Yet Qeghnilen hdults'ih ch'u yunit Dilah Vena ku'u hdults'ih.*
> There they stayed at Qeghnilen and upstream at Telequana [*sic*] Lake they also stayed.
>
> *Q'u k'tuleh ghu idi'ełа nishqedeł.*
> Then when fish would run they would come downstream.
>
> *Ch'u yi* łiq›a *qelqit ha yeh hdelts'ih ha q'uyehdi yun'e nuhtedeł ghu.*
> And fish they ate and there they stayed and then they go back upriver.
>
> *K'eldunteh hdi yeh iyeh qut'ana guna k'i yeh qeł nuhtededeł.*
> Sometimes then these local people would go back there again.
>
> Łiq›a *tlegh* łiq›a *tl'egh hdi yeh k'uqu qel'iht.*
> After salmon, after salmon they would go there for game.
>
> *Yeh Dzeł Ken ts'andazdlen yeh Yududuhtnu nih Dunk'elashtnu nihqeł yeh shtun... Shtunqedił nudyi nih.*

Plate 3-7.–Female least cisco (ghelghuli) with eggs harvested in a fish trap at Shagelagh by Lime Village residents during the week of October 6, 2014. Photo by Dave Runfola, ADF&G.

There at the Alaska Range where the streams flow out around Necons Creek or Kristin Creek they hunted sheep.

Tutnutl'ech'a veq'estsiq', yeh nihqeła k'uqu qel'ihch'.
At Two Lakes outlet there they hunted for various game.

Q'uyehdi naqeli gheli t'qit'a idi'eła yeh gudih q'u nishqedeł.
Then when fall time came then they came downriver to here.

Telay uqu qel'ih, shagela nih.
They obtained broad whitefish and various fish.

Ye Łih *Vena qeyłnihi ghin k'i hva qayeh qighila.*
There at 'whitefish lake'[Tishimna Lake] too there was a village for them.

Yi k'i yik'i hya łitl›en *nutdeh ha t'qeyeghił'an.*
There they spent the spring.

Q'et' q'u Nanututset yeh q'u qayeh qighila k'ishi.
Long ago before our times there was a village there it seems.

Ch'u q'uyehdi yi kiq'u gheyeh ghu hdelts'ih ch'u yeh q'u telay uqu qel'ih ye ghini atq'u.
And then also below there they stayed and they went for those broad whitefish.

(Bobby 2010)

Whitefish can be caught year-round in the Stony River watershed. It was the long-time practice of Lime Village residents to move to spring whitefish camps in April, prior to spring breakup. People would haul their gear to the camp location with dog sleds, and later with snow machines, over the late-winter ice and frozen snow. At this time Lime Village residents would target whitefish migrating upstream to their summer feeding habitats (Evanoff 2010; Kari 1983). Whitefish were harvested during April, in the open water at the mouths of streams. By May the streams became ice-free and fishing intensified. Spring whitefish harvests were important because they occurred at a time when winter supplies were often becoming low (Kari 1983). Lime Village respondents reported that harvesting northern pike and longnose suckers is also an important traditional spring activity.

Elder respondents recalled going to spring whitefish camps with their parents and grandparents as children, and then later going to spring whitefish camps on their own as adults. In fact, two of the elder respondents were born at spring fish camps. Respondents explained that it was always important to get some whitefish put away in the spring, prior to the salmon fishing season.

During spring, Lime Village residents caught mostly broad whitefish and humpback whitefish. A respondent said that, in the past, spring was the primary time to target humpback whitefish. Respondents said that, with the exception of some effort to harvest humpback whitefish, little spring whitefish fishing is done today when compared to the past. Residents no longer leave the village to relocate to fish camps in the spring. Residents put out nets on the Stony River during May, at locations close to the village, in an effort to harvest some spring fish. Humpback whitefish are caught at this time, but respondents explained that current humpback whitefish harvests are often more incidental catches than targeted catches because the spring effort is mostly geared towards harvesting northern pike. Least cisco are also caught incidentally at this time. A respondent called ADF&G to report that from the period of April 20–23, 2014 he was catching approximately 6 least cisco per day via set gillnet.

During summer, salmon begin their migration up the Stony River, and Lime Village residents put forth a large effort to harvest salmon at that time. During summer, the community's fishing efforts have always been geared primarily towards salmon, although respondents explained that humpback whitefish, broad whitefish, and sheefish are also occasionally caught incidentally while fishing for salmon. Respondents said that least cisco are never seen in the summer. "I don't know where [least cisco] go….they disappear in the summer, and then in the fall they come out," explained a respondent.

Fall is the primary time that Lime Village residents pursue whitefish (Evanoff 2010; Kari 1983). As whitefish begin to migrate out of lakes and into the creeks for their winter migration downriver residents target them at traditional fall whitefish camp locations. Respondents explained that fall whitefish fishing occurred in tandem with fall moose, caribou, bear, and waterfowl hunting and that whitefish camp locations were simultaneously used as base for fall hunting activities. Fall was an important time for residents to harvest as many resources as possible to put away for the winter. Whitefish fishing was intensive at this time because of the need to put winter food away, because whitefish are abundant during fall, and because fall temperatures allow for better whitefish preservation conditions (Kari 1983).

Respondents explained that it was traditional for the Stony River Dena'ina to relocate to whitefish camps around mid-August. This gave them time to prepare the camps and fishing gear prior to the time the whitefish began running in late August. Respondents said that by mid-September whitefishes, especially broad whitefish, became abundant, and the harvest picked up. An elder respondent explained that the amount of whitefish in the creeks increases as temperatures drop, because as the weather becomes colder, more whitefish travel downstream. "When it started to get cold then the whitefish would come down", said the elder. Another elder respondent said that mostly broad whitefish are caught up until early October "and then later [as it gets colder] the little ones come, *ghelghuli* [least cisco]. Regarding the best season to target least cisco, another respondent said, "It varies. You have to catch them [least cisco] at the right time. Like right before the lake freezes they hit."

Freeze-up usually occurs between mid-October and early November in the Lime Village area. During early October 2013, Lime Village residents began targeting least cisco. On October 1, no least cisco harvests had yet occurred. On October 2 Van Lanen traveled with Lime Village residents up Hungry Creek to Trout Lake in attempt to reach Shagelagh, the 2013 least cisco fishing site, but the party was forced to turn back due to ice that had formed on the water, preventing further travel. Several days later, the ice receded, and the fishing party was ultimately successful in harvesting hundreds of least cisco. The respondent attributed their success to the formation of ice, which drove the fish into a frenzy to travel downstream. (See "Access to Fishing Locations" for a complete account of this activity.)

Kari (1983:25) noted that soft running ice at the beginning of freeze-up can adversely affect subsistence activities for Lime Village residents and that normally they need not worry about such conditions until after the second week of October. Respondents during this research reported that the freeze-up of October 2–3, 2013 was abnormally early for ice formation. Interestingly, Kari (1983:26) reported that during fall 1982 a short freeze-up occurred early at the beginning of October, which effectively shortened the whitefish season.

While it is known that Lime Village residents formerly attempted to fish for whitefish after the formation of hard ice during winter (Evanoff 2010; Holen and Lemons 2010), respondents during this research reported that whitefish are not sought during the winters any longer, however some whitefish are caught incidentally while ice fishing for northern pike during winter. Kari (1983) reported that ice fishing for northern pike by jigging or placing a set gillnet under the ice was an important winter activity for Lime Village residents.

Whitefish Harvest Timing, 2012 and 2013

Table 3-13 displays harvest timing for whitefish harvests by species by Lime Village households during 2012 and 2013. In alignment with the ethnographic data obtained during this research, the majority of whitefish harvests occurred during October. In 2012, 60% of the whitefish harvest occurred during October, and in 2013, 98% of the harvest occurred during October. October least cisco harvests made up 83% of Lime Village's total 2013 whitefish harvest. During 2012, humpback whitefish harvests occurred throughout the spring, summer, and fall, but during 2013, humpback whitefish were only caught during July and August. During 2012, six sheefish were caught during June, and none were caught in 2013.

Table 3-13.–Estimated harvest of whitefishes by month, Lime Village, Alaska, 2012 and 2013.

Resource	Year	Apr	May	Jun	Jul	Aug	Sep	Oct	**Total**
Whitefishes	**2012.0**	**5.0**	**20.0**	**8.0**	**2.0**	**2.0**	**18.0**	**82.0**	**137.0**
	2013.0	**0.0**	**0.0**	**0.0**	**2.5**	**6.4**	**0.0**	**483.6**	**492.5**
Sheefish	2012.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	**6.0**
	2013.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Broad whitefish	2012.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	**5.0**
	2013.0	0.0	0.0	0.0	0.0	0.0	0.0	76.4	**76.4**
Least cisco	2012.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	2013.0	0.0	0.0	0.0	0.0	0.0	0.0	407.3	**407.3**
Humpback whitefish	2012.0	5.0	20.0	2.0	2.0	2.0	13.0	82.0	**126.0**
	2013.0	0.0	0.0	0.0	2.5	6.4	0.0	0.0	**8.9**

Note: There were no reports of any whitefish harvest Jan–Mar, Nov–Dec and no reports of Bering cisco or round whitefish harvests in 2012 or 2013.

Whitefish Fishing Locations: Lime Village

During 2012 and 2013, researchers recorded the nonsalmon fish harvest locations used by Lime Village residents. The 2012 and 2013 mapping results are compared below to mapped data obtained from past studies with Lime Village residents including Kari (1983), Evanoff (2010), and Holen and Lemons (2010).

Whitefish and Nonsalmon Fish Harvest Locations 2012 and 2013

During both the 2012 and 2013 study years, Lime Village respondents reported harvesting broad whitefish in Trout Lake and Hungry Creek (Figure 3-11). Least ciscoes were harvested at Shagelagh, a traditional camp on the creek connecting Kutokbuna Lake with Trout Lake (Figure 3-12); humpback whitefish were harvested in the Stony River (Figure 3-13). During both the 2012 and 2013 study years Lime Village respondents reported harvesting Arctic grayling in the Stony River (Figure 3-14). During both the 2012 and 2013 study years northern pike were harvested in Trout Lake and Tundra Lake (Figure 3-15).

Whitefish Harvest Locations 2007

Research conducted for the 2007 harvest season recorded similar but more diverse whitefish harvest locations (Holen and Lemons 2010). As in 2012 and 2013, during 2007 the entrance to Hungry Creek at Trout Lake was reported as a broad whitefish set gillnet site and Shagelagh was reported as a least cisco harvest location. In 2007 broad whitefish were harvested at Tundra Lake, a location not reported for 2012 and 2013. In 2007 least ciscoes were harvested at the unnamed creek draining from northwest shore of Qedeq Vena and all of Trout Lake was recorded as a least cisco harvest location (Holen and Lemons 2010). Neither of these sites was recorded as least cisco harvest locations during 2012 or 2013.

Historical Whitefish Fishing Locations and Change of Harvest Locations Over time

Overall, the expanse of territory used by Lime Village residents to harvest whitefish has declined since the 1970s and 1980s when James Kari and Priscilla Russell Kari had conducted research in the region. Kari recorded (1983) numerous traditional whitefish fishing locations used in the past by the Upper Stony River Dena'ina and Lime Village residents (Figure 3-16). While few of these sites continue to be used by Lime Village residents today, several of these locations were discussed by respondents during the 2012 and 2013 research. Other traditional whitefish fishing locations documented during past research were not discussed at all during the 2012 and 2013 research.

For instance, Telaquana Lake and Two Lake in the upper Stony River drainage, and Whitefish Lake in the upper Holitna River drainage, were important whitefish harvest locations in traditional times but are no longer in use (Kari 1983). Round whitefish, least cisco, and pygmy whitefish are known to inhabit both Two Lake and Telaquana Lake (R. J. Brown et al. 2012). Whitefish Lake, *Łih Vena,* is the site of an old Upper Stony River Dena'ina village where people fished for broad whitefish in the spring and fall (Evanoff 2010). Kari (1983) documented a traditional nonsalmon fishing site with multiple old fishing cabins, on a tributary creek of the Swift River *Huch'altnu*. Kari (1983) also mapped a nonsalmon fishing site with a cabin on an unnamed lake directly west of the Swift River and mapped the small lake approximately three miles west of Tundra Lake as a nonsalmon fishing site (Figure 3-16). Additionally, Can Creek, or Tin River *Tinch'ghiltnu,* has been recorded as a traditional whitefish fishing location for Lime Village residents (Kari 1983; Koktelash and Koktelash 1987).

The whitefish fishing locations and camps that were discussed by Lime Village residents during this research are all locations of major historical significance for Lime Village people, for fishing, hunting, and trapping (Kari 1983). Several of these locations are the sites of traditional whitefish camps, and a few of these continue to be used today.

Particularly important as harvest locations for whitefish and other nonsalmon fish, both in the past and in contemporary times, are the series of lakes—Trout Lake, Kutokbuna Lake, and Tundra Lake—to the

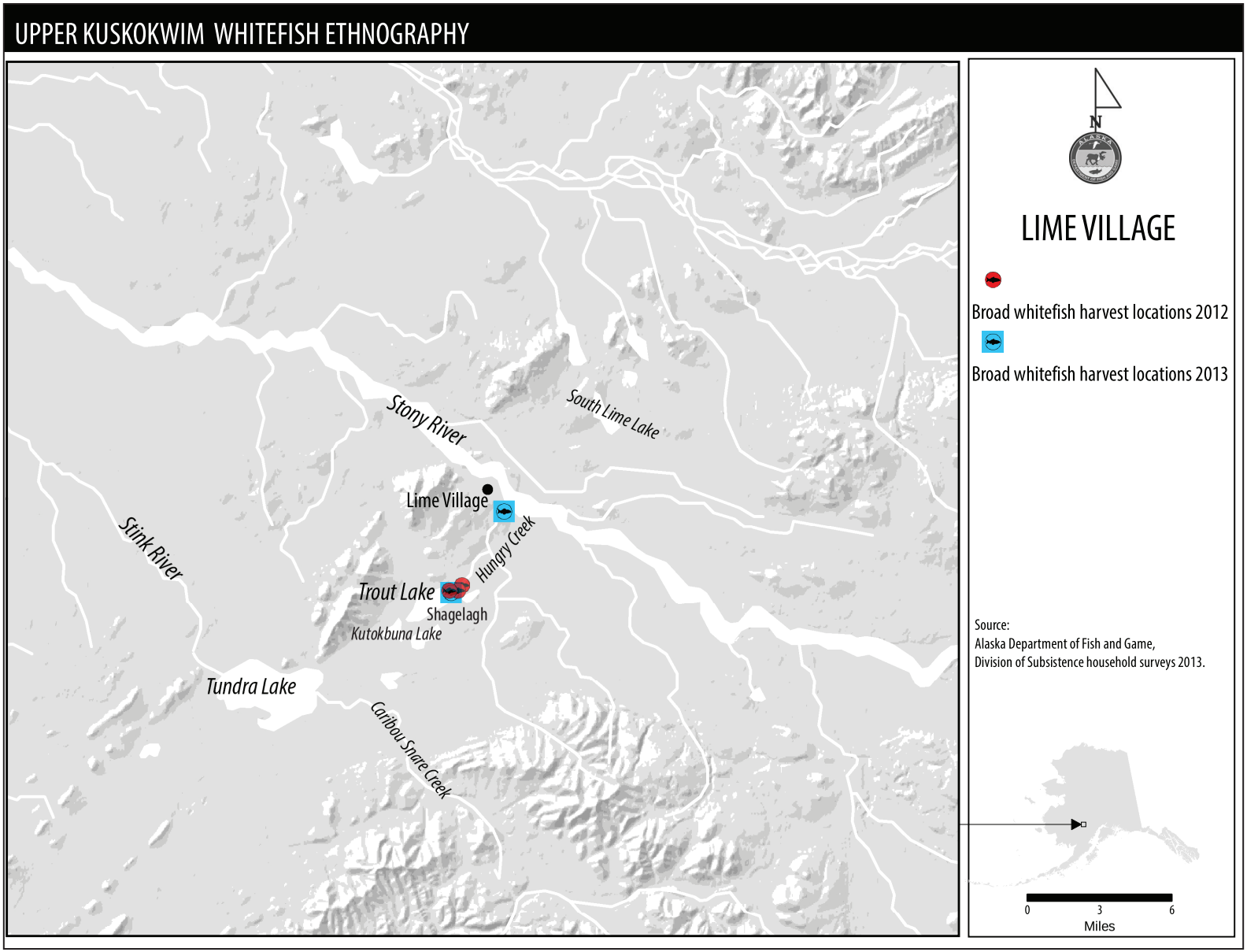

Figure 3-11.–Broad whitefish harvest locations, Lime Village, Alaska, 2012 and 2013.

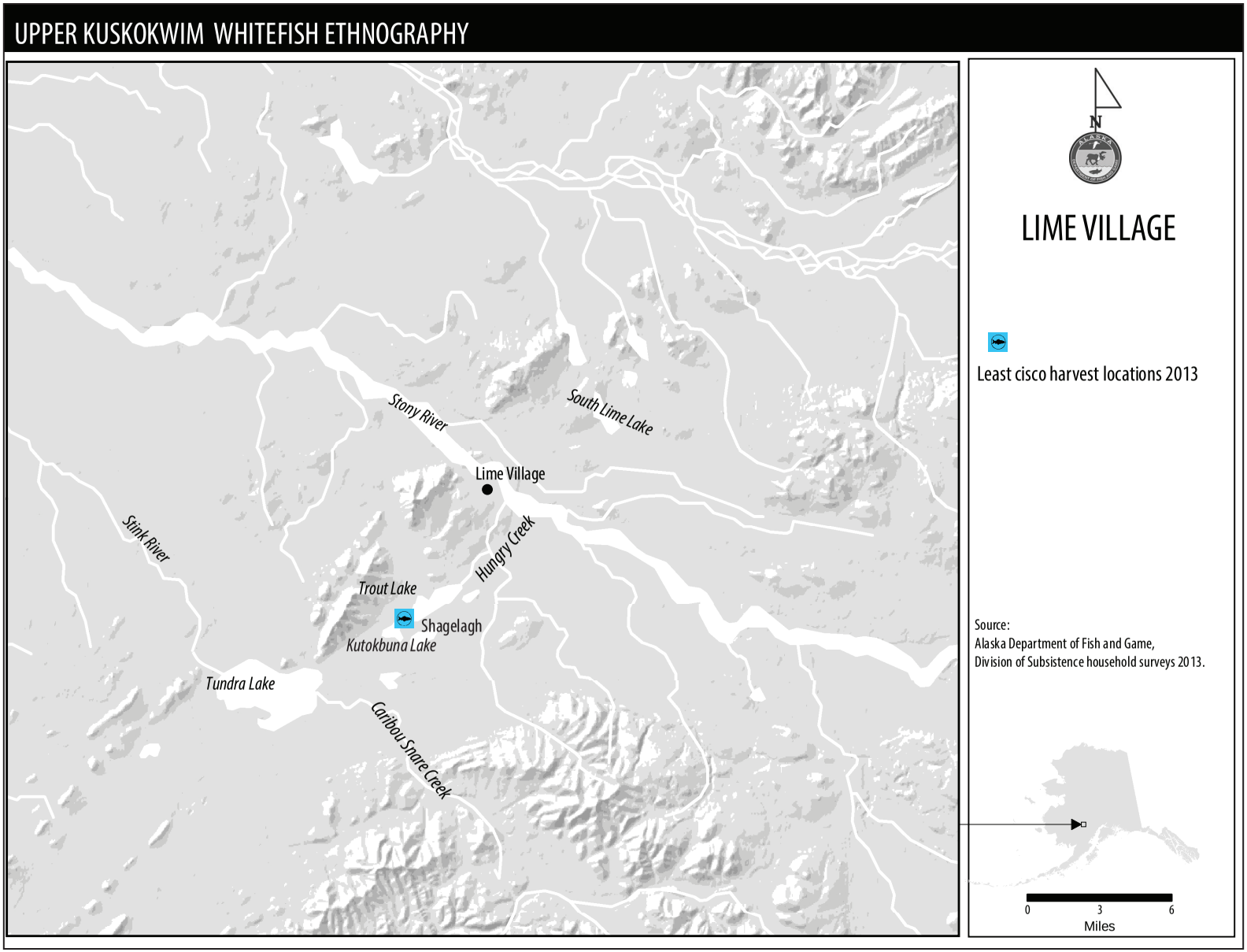

Figure 3-12.–Least cisco harvest locations, Lime Village, Alaska, 2013.

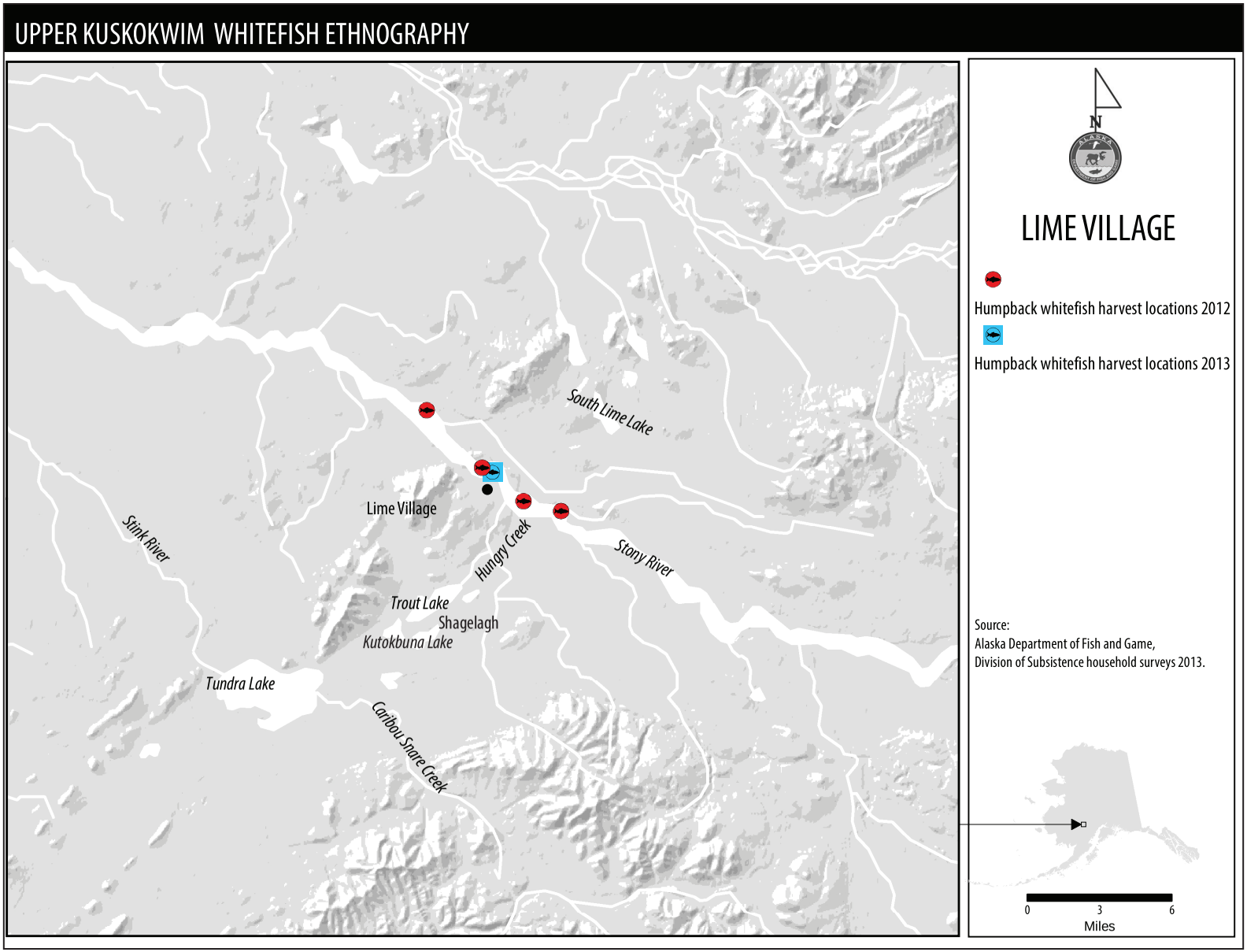

Figure 3-13.–Humpback whitefish harvest locations, Lime Village Alaska, 2012 and 2013.

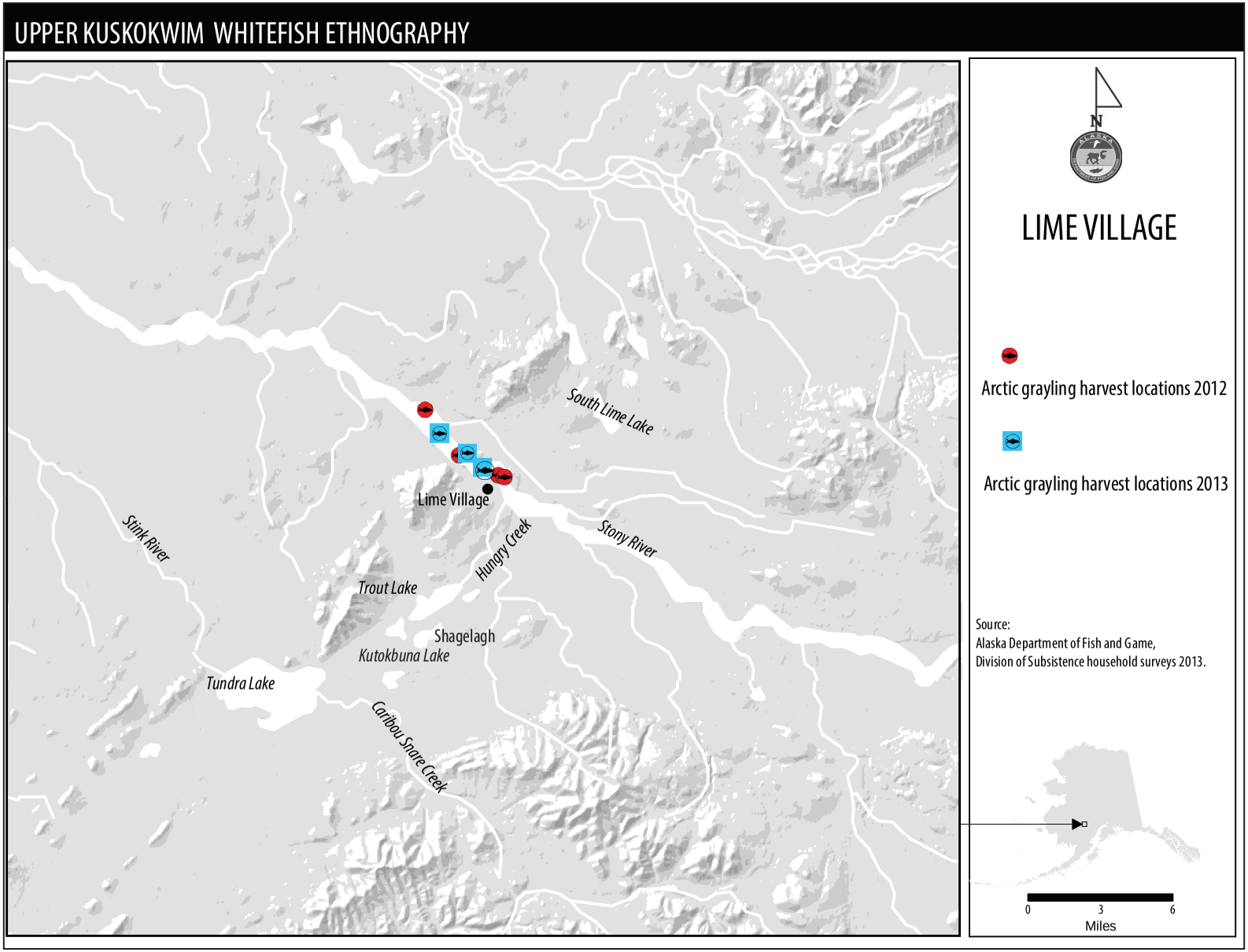

Figure 3-14.–Arctic grayling harvest locations, Lime Village Alaska, 2012 and 2013.

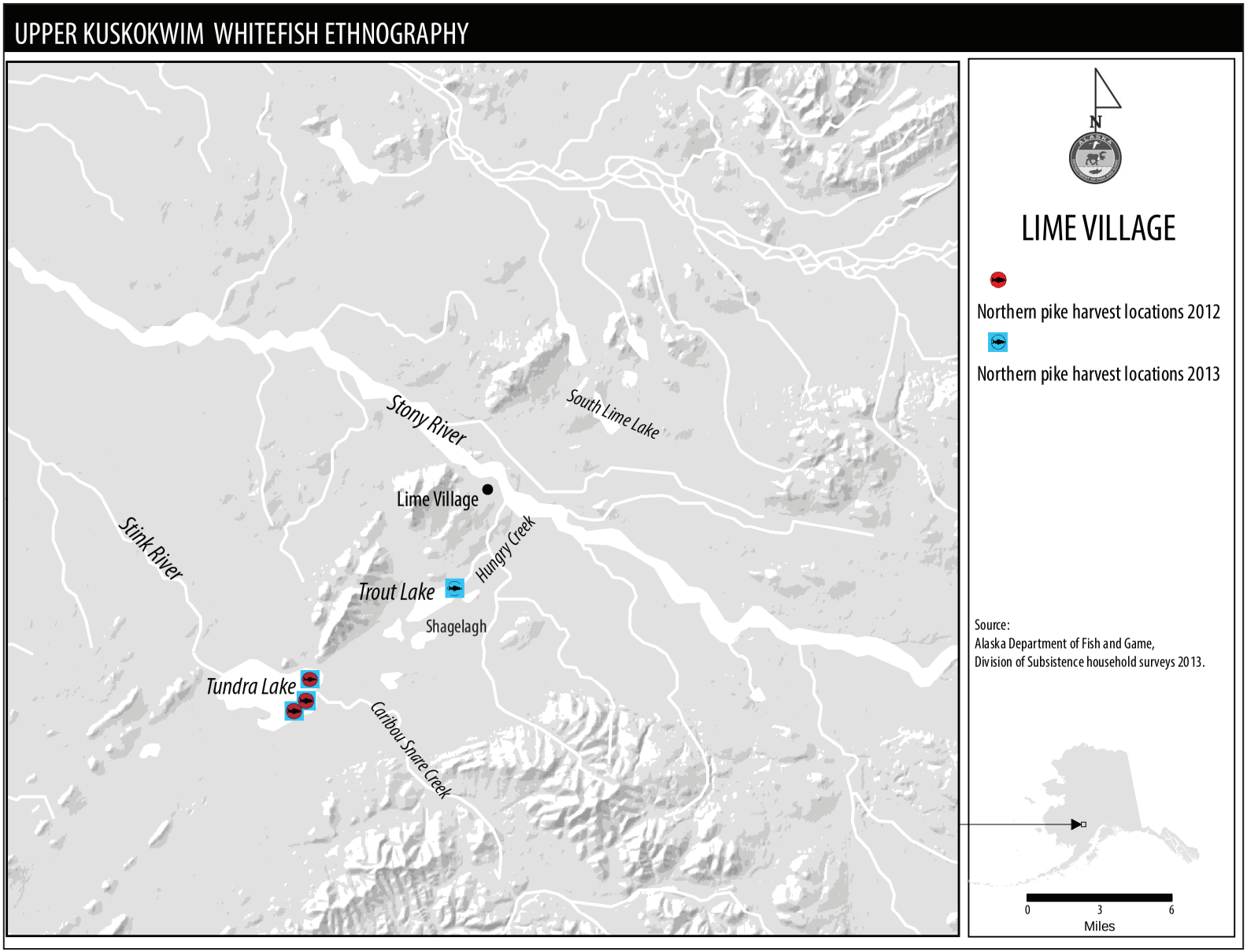

Figure 3-15.–Northern pike harvest locations, Lime Village, Alaska, 2012 and 2013.

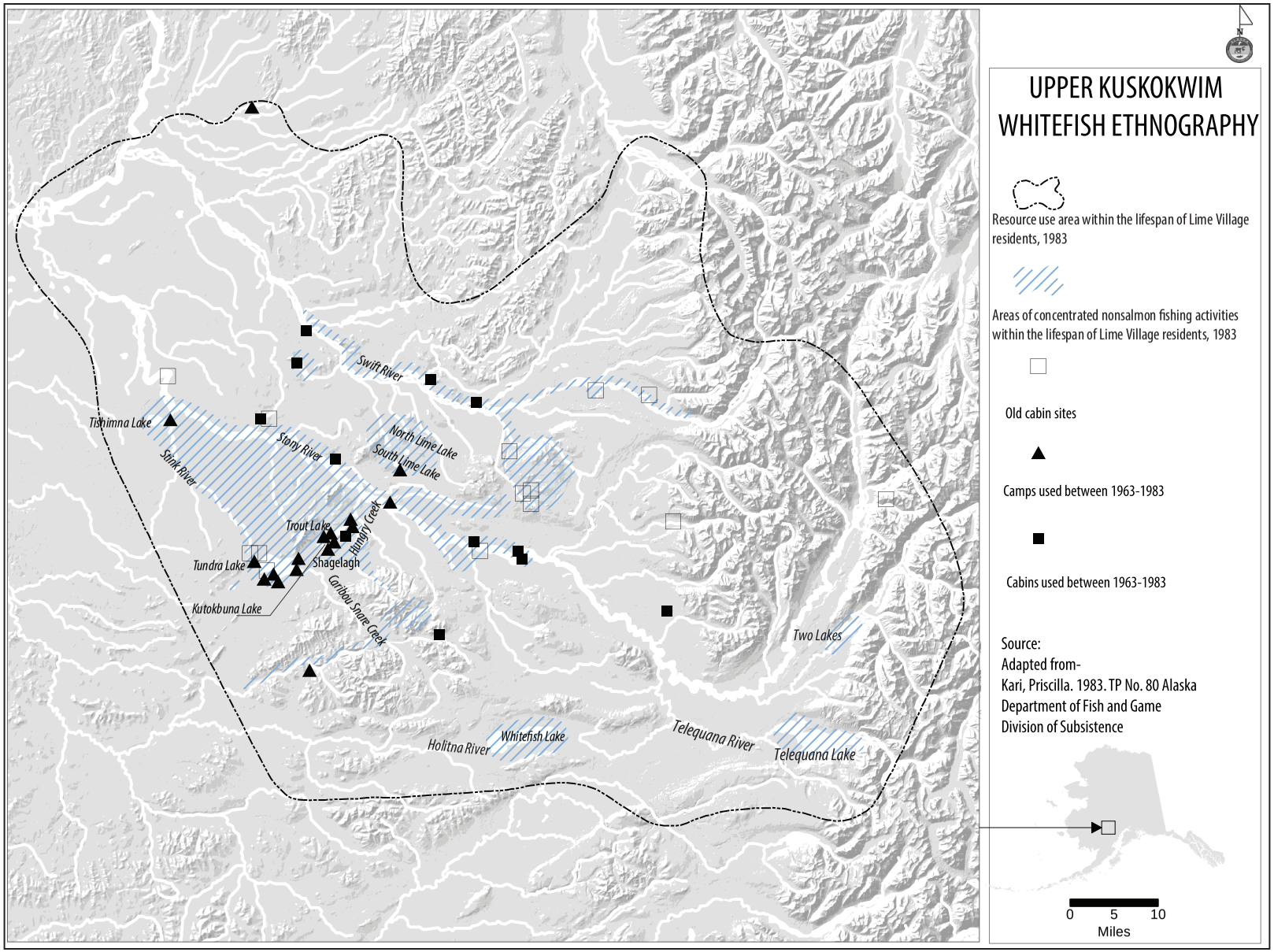

Figure 3-16.–Historical whitefish harvest locations, Lime Village Alaska.

south of Lime Village (Plate 3-8). Historical and contemporary whitefish camps are located on streams close to the outlets of all these lakes, and it has long been the traditional practice of Lime Village residents at springtime to travel to the "lake country south of the village to fish for whitefish, Arctic grayling, pike, and suckers" (Kari 1983:30). During summer, Lime Village residents relocate to the Stony River for salmon fishing but then return to the lakes of the Hungry Creek watershed for whitefish camps during fall (Kari 1983).

Hungry Creek, or *Hek'dichen,* translates to "abundance stream" in Dena'ina, its name given in reference to the abundance of subsistence resources, including broad whitefish, northern pike, Arctic grayling, and waterfowl that the Upper Stony River Dena'ina people could consistently rely on harvesting there when they were hungry. Hungry Creek is known particularly for its abundance of broad whitefish during spring and fall. Lime Village elders interviewed during this research said that large amounts of broad whitefish have always been harvested annually from Hungry Creek. Hungry Creek is also known for containing broad whitefish that are larger in size than those caught in others places in the region (Plate 3-9). A traditional whitefish harvest location and camp at Trout Lake's (*Hek'dichen Vena)* outlet into Hungry Creek *Hek'dichen Q'estsiq* ("abundance outlet") is a particularly important site for Lime Village residents (Kari 1983). This was the primary broad whitefish harvest location for Lime Village residents during the 2012 and 2013 study years (Plate 3-10). A second traditional whitefish camp located on the west shore of Hungry Creek, mapped by Kari (1983) and visited by Van Lanen in 2013, is no longer being used by Lime Village residents as a whitefish harvest location (Figure 3-16). Hek'dichen Q'estsiq is the primary whitefish harvest location for Lime Village residents at Trout Lake. However, another whitefish harvest location at Trout Lake was documented both during this research and by Kari (1983). Lime Village elders discussed a whitefish camp used during the 1970s and 1980s at an unnamed creek originating in the Lime Hills and entering Trout Lake on its northern shore. One elder respondent said that his family used to stay at this location to fish for whitefish during fall. This site was observed in the field by Van Lanen during 2013 and also mapped by Kari (1983) (Figure 3-16).

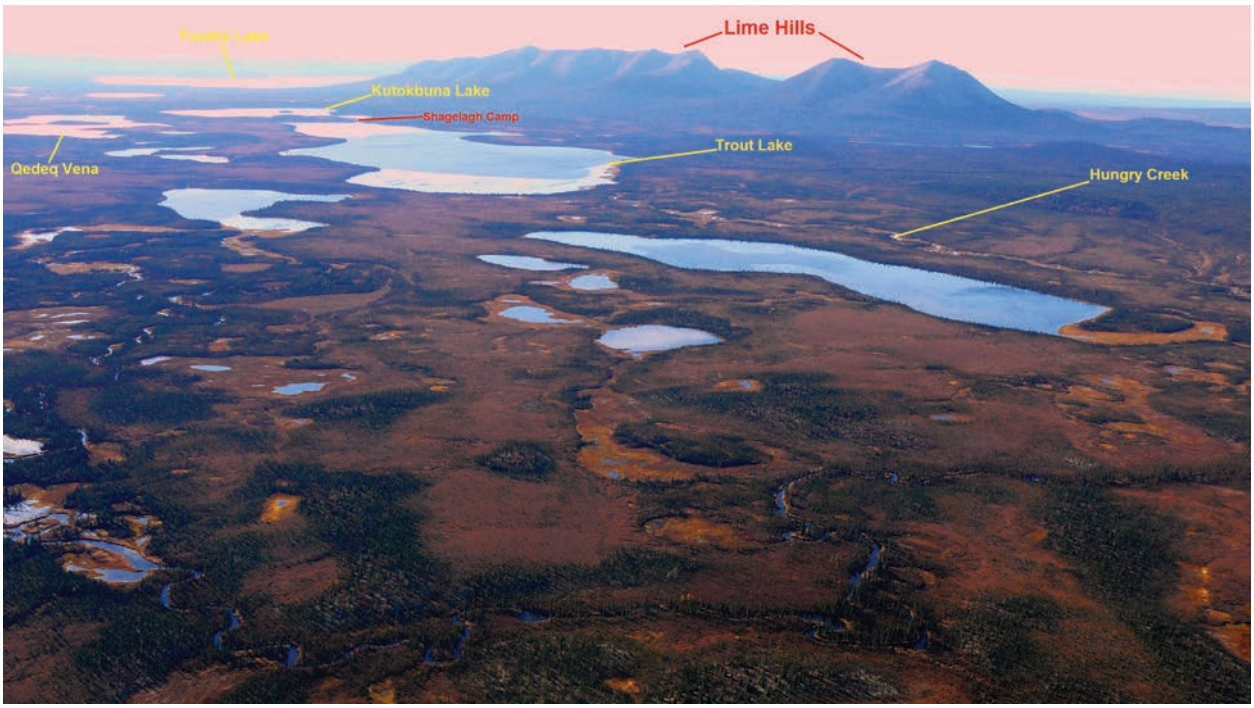

Plate 3-8.–The "lake country" south of Lime Village as viewed from the air October 2013. Hungry Creek, Trout Lake, Kutokbuna Lake, Qedeq Vena, Tundra Lake, and Shagelagh are all important nonsalmon fishing sites for Lime Village residents. Photo by James Van Lanen, ADF&G.

Shagelagh is an important seasonal fish camp on the isthmus between Kutokbuna Lake and Trout Lake. This camp is adjacent to *Niłtudeqniłen* "currents join" creek, which drains from Kutokbuna Lake *Shagela Vena* northward into Trout Lake. Shagelagh has been documented as a primary least cisco harvest location for Lime Village residents (Holen and Lemons 2010; Kari 1983) (Figure 3-11). In 2013 all of Lime Village's least cisco harvest was taken at Shagelagh (Figure 3-11). An elder interviewed during this research was born at Shagelagh in May 1945 during her family's spring fishing activities. This elder's father was also born at Shagelagh, and it was at this location that the respondent's grandparents had taught her to fish for whitefish. An elder respondent said that Shagelagh is also known to contain an abundance of Arctic grayling and said that in the past, high numbers of Arctic grayling were caught in fish traps at this location.

Plate 3-9.–Emma Alexie displays two large broad whitefish harvested from Hungry Creek, September 1982. More harvested broad whitefish can be seen in the grass below. A fence used to lead whitefish into the trap can be seen rising out of the water behind Emma. Photo by Priscilla N. Russell.

Upstream from Shagelagh, at Kutokbuna Lake exist other whitefish harvest locations and seasonal camps used historically by Lime Village residents. Kari (1983) documented a camp on the south shore of Kutokbuna Lake and a camp on the unnamed creek running from Lime Hills and entering Kutokbuna Lake on its northwest shore (Figure 3-16). East of Kutokbuna Lake and south of Trout Lake is Qedeq Vena, the location of a traditional fish camp used historically in the spring and fall to harvest whitefish, Arctic grayling, northern pike, and longnose suckers (R. J. Brown et al. 2012; Kari 1983). An elder respondent said that Qedeq Vena is known for productive northern pike fishing. This site was mapped by Kari (1983) and visited by Van Lanen in 2013 (Plate 3-11 and Figure 3-16).

Approximately three miles to the southwest of Kutokbuna Lake is Tundra Lake *Vindash Vena*, often referred to as "six-o-six" or "six-o" by Lime Village residents. In the past, Tundra Lake was an important broad whitefish, least cisco, Arctic grayling, northern pike, and longnose sucker harvest location for Lime Village residents. Multiple fish camp sites and cabins on Tundra Lake were mapped by Kari (1983). Kari (1983a) reported that following spring breakup (April–June) Lime Village residents would target broad whitefish migrating to their summer feeding habitats in Tundra Lake. According to Kari (1983), during the 1980s, most Lime Village residents stopped traveling to Tundra Lake for spring whitefish camps. During this research, Lime Village respondents often talked about fishing for broad whitefish in the spring and fall at "six-o" in the past. An elder respondent said that it was traditional for her entire family to camp at Tundra Lake during fall for the purpose of catching a winter's supply of broad whitefish. The outlet of Tundra Lake is Stink River,

Plate 3-10.–The least cisco harvest location in the creek at Shagelagh, as viewed from the north looking downstream towards Trout Lake. The posts stabilize the fence during times when a fish trap is being used at this location. Photo by James M. Van Lanen, ADF&G.

which flows northwest for approximately 25 miles to its confluence with Stony River *K' qizaghetnu*. The outlet of Tundra Lake at Stink River was a particularly important traditional whitefish fishing location for Lime Village residents in the past, known for an abundance of broad whitefish. Respondents said that broad whitefish were mostly targeted at this location and that least cisco were often targeted at the mouths of the many small creeks draining into Tundra Lake.

Elder respondents said that people would travel the approximately twenty miles down Stink River, and up a small outlet stream, to fish for whitefish at Tishimna Lake *Htsit Vena*, or "lowland place" (most often referred to as "Whitefish Lake" by Lime Village residents). Tishimna Lake was also reached by traveling approximately 30 miles down the Stony River from Lime Village to the mouth of the Stink River and then approximately 5 miles up the Stink River drainage to the lake. Traditionally important whitefish camps occurred at the east end of Tishimna Lake, at the mouth of the lake's outlet stream on Stink River, and at the mouth of Stink River at its confluence with Stony River (Bobby 1987; Evanoff 2010; Kari 1983). Elders interviewed in this research told of whitefish camps and smokehouses at the mouth of Stink River and at the outlet of Tishimna Lake. These sites were mapped by Kari (1983) (Figure 3-16). The Stink River/Tishimna Lake area was used annually for whitefish fishing during both spring and fall by Lime Village residents. During fall out-migrating whitefish were targeted at these sites (Brown et al. 2012; Kari 1983a). This area was important for harvesting both broad whitefish and humpback whitefish. Regarding humpback whitefish, Evanoff (2010:74) cited comments from a Lime Village resident interviewed in 1973:

> You can get oh, four, five, six thousand of them [humpback whitefish] big, fat fish. Yeah, they smoke and dry 'em; they're really good fish, Whitefish Lake [Tishimna Lake]. Lot of 'em used to be.

The Stink River/Tishimna Lake area has significant importance in Upper Stony River Dena'ina history and their use of whitefish. Kari (1983) reported that, up until the 1930s, a traditional Deg Hit'an I Athabascan village, called *Htsit*, was located on Stink River between Tishimna Lake and Stony River. According to Kari (1983) the Deg Hit'an and the Dena'ina interacted at this time, likely sharing the Stink River/Tishimna Lake area as a whitefish harvesting location. When the village of Htsit dissolved, some of the Deg Hit'an people settled in Lime Village (Kari 1983). In 1981, while digging post holes for a new whitefish smokehouse at Htsit, a Lime Village resident reported finding archeological remains at the site, including charcoal, birch bark, and whitefish scales (Evanoff 2010). The following story told by a Lime Village elder in 1987 discusses finding evidence of prehistoric use of Tishimna Lake, including fish storage pits and house sites:

Plate 3-11.–The remains of a historical Dena'ina nonsalmon fish camp on the shore of Qedeq Vena, including fallen cabins and a dilapidated fish hanging rack (foreground). Photo by James M. Van Lanen, ADF&G.

Whitefish Lake: A Pragmatic Name

> Long time ago, we fishing first up there and then after May through August month…we came down there we fishing over there. My wife's mom, they fishing in there. Fall time... Right in there. Way up that whitefish, though, I gonna show you…all the way down they got holes in there, up the way up to that lake. They make hole in there. They used to be, they don't know how to make cache that time, in the ground that's all, those guys. Lots of hole there. You can see that hole…one, two, three house, not three house but lots of houses, but they used to be lotta house there main river side [Stony River side, or east side, of Tishimna Lake]. (Bobby 1987)

During the 2012 and 2013 research, Lime Village respondents often discussed use of Htsit and other sites in the Stink River/Tishimna Lake area up until the recent past. Respondents said that Lime Village people actively fished at these sites until about 10 or 15 years ago. Respondents said that boat travel to this area has become impractical due to large increases in fuel prices and also that a buildup of beaver dams on Stink River and at the Tishimna Lake outlet stream has made fishing unreliable. Stink River/Tishimna Lake was a primary broad whitefish and humpback whitefish harvest location, but today residents can obtain both species closer to Lime Village.

> For humpback whitefish I can go down Stink [River] but that's just way out of the question. You know, camp down there. It's like probably an hour and a half boat ride. Whereas I can go down to the sawmill [mouth of creek draining from South Lime Lake and community wood cutting location on the Stony River downriver from Lime Village] and it only takes about 5 minutes.

Lime Village residents' use of the Stony River for whitefish harvests is limited to efforts made to harvest humpback whitefish. Respondents explained that occasionally different species of whitefish are caught in the waters of the Stony River during summer while residents are fishing for salmon but that, with the exception of humpback whitefish harvest efforts during spring and fall, whitefish are not targeted in the Stony River. During 2012 and 2013 Lime Village residents fished for humpback whitefish in close proximity

to the village, at the mouths of a few tributary streams that flow into the Stony River from the north. These activities occurred mostly in spring, but some humpback whitefish were also harvested at these locations in the fall. A Lime Village respondent discussed contemporary humpback whitefish harvest locations:

> Last year [2012] I probably got about 70 of them [humpback whitefish]…That was in October. That was about a mile down [Stony River] on the other side where that creek comes out. That's the only place right now that I get the big humpies [humpback whitefish at sawmill site mentioned above]. And then there is another place about two miles upriver. Those are the only two locations that I know of that are pretty good.

The respondent said that the "sawmill" location is a traditional humpback whitefish fishing location for Lime Village residents. Evanoff (2010) reported this location as likely an old Upper Stony River Dena'ina fish camp site called *Nunents'istnik,* or "we hold land again."

Less than ten miles north of Lime Village are South Lime Lake *Tsi'ul Vena* "pillow lake," North Lime Lake *Nizdlu Vena* "islands are there lake," and East Lime Lake *Nulzhida Vena* "sliding down lake," each of which have been documented as locations used by Lime Village residents for harvesting whitefish in the past (R. J. Brown et al. 2012; Kari 1983) (Figure 3-16). Elder respondents said that these lakes were known as good broad whitefish fishing locations. An elder said that during fall, Lime Village people would walk to these lakes and stay in camps. They would hang harvested fish to dry and return to the village. When the snow came they would use dog sleds to travel back to the lakes to retrieve the fish and haul it back to Lime Village.

Plate 3-12.–A spruce framed canoe made by Lime Village residents. This canoe is stored behind a storage cache in Lime Village but is no longer in use. Remains of canvas that once covered the frame can be seen on left side of the canoe. Photo by James M. Van Lanen, ADF&G.

Access to Fishing Locations

Today, Lime Village residents use motorboats equipped with engine lifters, jet boats, and snowmachines to access whitefish harvest locations. Prior to the 1980s, when the community transitioned to complete reliance on motorized transport, Lime Village residents accessed whitefish harvest locations on foot, by canoe, by snowshoe, and by dog team transport. Residents set out for spring whitefish camps prior to breakup, utilizing ice and frozen spring crust snow to efficiently transport themselves and their equipment by dog sled (Kari 1983). Kari (1983) reported that dogs would drag birch bark canoes to whitefish camps on spring crust snow. During May, when the streams became ice-free, residents were then able to travel the waterways by canoe. The canoes were then used to transport the whitefish harvest back to the village following breakup (Kari 1983). To access whitefish camps during fall, residents would need to travel upriver, both by paddling and on foot, portaging the canoes around shallow water areas (Kari 1983). Kari (1983) reported that Lime Village residents stopped using their traditional Athabascan birch bark canoes during 1930s and began building spruce framed canvas canoes, which continued to be used through the 1980s (Plate 3-12). Kari (1983) reported that moose skin boats were also used by Lime Village residents up until the 1960s.

Elder respondents said that to reach Trout Lake, Qedeq Vena, Shagelagh, Kutokbuna Lake, and Tundra Lake,

it was common to travel by dog team in the spring or on foot during the fall. Where possible, canoes were lined or poled up creeks between the lakes, such as Hungry Creek and Niłtudeqniłen. If canoes could not be lined or poled, they would be portaged. No navigable streams connect Kutokbuna Lake with Tundra Lake, and thus, canoes had to be portaged long distances to travel between these two lakes (Kari 1983). Elders explained that, following fishing season, residents would canoe and portage their catch back to Lime Village. Some residents would also travel to and from Trout Lake, Qedeq Vena, and Kutokbuna Lake by foot, utilizing a trail said to be in use by the Upper Stony River Dena'ina since ancient times (Kari 1983). This trail followed Hungry Creek to Trout Lake and then went on to Kutokbuna Lake, Qedeq Vena, and eventually Tundra Lake. In winter and spring dog teams were often used on this trail to reach Tundra Lake (Kari 1983). Elder respondents said that even though Lime Village residents obtained their first boat motors during the 1950's, due to the shallow waters of Hungry Creek and Niłtudeqniłen, canoes continued to be the primary means of transportation for access to these lakes during summer and fall.

In the past, Lime Village residents also traveled to the Tishimna Lake and Stink River whitefish camps by dog team, foot, and canoe (Kari 1983). Elder respondents recalled travelling down Stink River from Tundra Lake to Tishimna Lake in canoes and with dog teams. "At Tundra Lake people camp with their boats waiting for the ice to leave Stink River so that they can travel down it," reported Kari (1983:68). Time would be spent harvesting whitefish at Tundra Lake and then at the Tishimna Lake and Stink River fish camps. Residents fished at each location and then transported their harvest back to Lime Village by a combination of floating, paddling, poling, lining, and portaging their canoes either up Stink River to Tundra Lake, Kutokbuna Lake, Trout Lake and down Hungry Creek or by travelling down Stink River and then approximately 30 miles up the Stony River. Elder respondents said that sometimes people would get to the Tishimna Lake and Stink River fish camps by canoeing down Stony River from Lime Village and then paddling and poling up Stink River. The elder said that the dogs would follow the people wherever they went and that when they were done fishing the dogs would haul all their fish back to Lime Village on a sled. Similarly, Kari (1983) reported that dogs were often used to make the 60 mile round trip between Lime Village and Stink River and also that during times with adequate snow cover, a trail from Lime Village through the Lime Hills leading to Stink River was used.

As explained above, community reliance on dog teams for transport had a significant influence on whitefish fishing effort by Lime Village residents in the past. During the twentieth century Lime Village residents were known for their expertise in the use of dog teams for transportation to facilitate subsistence activities (Kari 1983). In 1982 there were at least 100 dogs in Lime Village. Relying on dog transport for the majority of their transportation meant that Lime Village residents had to spend much time and effort obtaining fish to feed their dogs. Kari (1983) reported that, without access to commercial dog food, at least 200–300 fish per dog per winter was necessary. During this time, snowmachine use for subsistence activities was becoming increasingly common in rural Alaska, but Lime Village's remote location meant high expenses on shipping costs for the fuel and parts required to utilize and maintain motorized equipment (Kari 1983). As a result, residents maintained almost complete reliance on dog teams at this time.

Nevertheless, as elder respondents explained, the traditional Upper Stony River Dena'ina way of life, centered on traveling by foot, canoe, and dog sled was eventually altered by their adoption of motorized transport. As Lime Village residents' use of motorboats and snowmachines increased during the later decades of the 20th century, their use of dog teams for transport fell by the wayside. In 1982, when Kari (1983) visited the community, dog sleds continued to be a primary transportation method. When Holen visited the community in 2007, almost four decades later than Kari, the dog teams were gone (D. Holen, Subsistence Program Manager, ADF&G, Anchorage, 2014, personal communication)..

Moreover, as also explained by elder respondents, the use of canoes for open water travel was also abandoned as Lime Village residents began to rely more on motorboats, and some obtained jet boats that made travel in shallow waters more feasible. Still, as elder respondents explained, shallow waters meant that traditional skills, such as poling and paddling, were required for motorboat use and navigation. Lime Village residents discussed the difficulty of navigating rivers in small motor boats to reach whitefish camps and said it is normal for engine propellers to scrape on rocks in transit. Lime Village residents know the rivers well

and are expert navigators with an in-depth knowledge of the shallow and deep channels of the creeks and rivers. Respondents said that when a party encounters a shallow section in a creek, all of the occupants but the driver will get out of the boat and walk until the driver maneuvers the boat through the shallow water. Hungry Creek, which today is the primary creek Lime Village residents travel to reach whitefish harvest locations, is a meandering, shallow creek that is difficult to travel (Plate 3-13).

During October 2013 fieldwork Van Lanen experienced this firsthand when he traveled with a fishing party up Hungry Creek to Trout Lake. On this trip the boat often got stuck on rocks and the occupants were required to pole through. Additionally the party was required to jump several beaver dams with the boat in order to travel the creek all the way to Trout Lake. Respondents said that it is possible to travel by motor boat from Trout Lake to Kutokbuna Lake through Niłtudeqniłen but that it is even shallower than Hungry Creek. Respondents said that, in terms of navigation, it is much easier to travel by motorboat from Lime Village to Tishimna Lake via Stony River and Stink River but that it is a much longer trip and requires at least one overnight and considerable fuel costs. For this reason, Lime Village residents rarely travel to Stink River and Tishimna Lake to fish for whitefish any longer.

During fall, ice buildup can also hinder motorboat travel on the lakes and creeks. Kari (1983) noted that soft running ice at the beginning of freeze-up can adversely affect access to fishing locations. Kari (1983) reported that if the ice becomes hard running then Lime Village residents will avoid travel in order not to damage their boats or endanger their lives. When the waters freeze quickly and then reopen during this time it can be dangerous. Kari (1983) noted that if the water warms after freezing to the point that the ice planes release, boat travel becomes extremely hazardous, so residents avoid traveling in these conditions.

During 2013 fieldwork Van Lanen and the group of Lime Village residents he was traveling with encountered ice conditions analogous to those described by Kari (1983:25–26). On October 2, 2013, the party had successfully ascended Hungry Creek to Trout Lake with the intention of traveling across Trout

Plate 3-13.–Lime Village residents travel by motorboat up the shallow Hungry Creek to a whitefish harvest location, October 2013. Photo by James M. Van Lanen, ADF&G.

Lake to Shagelagh to camp. However, when the party reached the Hungry Creek outlet on Trout Lake they discovered that lake had frozen over with soft running ice. Because of these conditions the party was forced to turn back or otherwise risk the ice freezing hard overnight and stranding the party. Van Lanen departed Lime Village on October 4 and from the air noticed that the soft running ice had receded across the bulk of the lake but had thickened at the lake's outlet and northeastern shore (Plate 3-14). On October 6 a Lime Village respondent phoned Van Lanen at the ADF&G office in Anchorage to report that the ice had gone out and that the fishing party had again traveled up river in a successful attempt to harvest least cisco.

The above summary of locations documented to be used by Lime Village residents to harvest whitefish, and the methods that have been used to access them, shows that today the area used for whitefish fishing activities has declined significantly from its past extent. Respondents discussed reasons for many of these areas no longer being used, including unaffordable costs of fuel for boat travel; an end to dog team use and thus no need to provide fish for dog food; the availability of store-bought food, offsetting the need for whitefish stores; and increasing beaver dams across the region blocking whitefish runs and making successful fishing difficult. Each of these topics will be discussed further below.

Plate 3-14.–Ice formation on the northeastern shore of Trout Lake as seen from the air on October 4, 2013. This ice event hindered boat travel and fishing efforts on October 2 and October 3. The lake outlet (headwaters of Hungry Creek) is the deepest arm seen on the far right of the frame. The southern Lime Hills are seen in the background. Photo by James M. Van Lanen, ADF&G.

Whitefish Fishing Methods: Lime Village

Tinch'ghiltnu: Fishing for Whitefish at Can Creek

PK: Now we go across right there.

AB: This river here [Dena'ina]?

PK: Um hum. This trail goes all over—what the hell this one there?

AB: That's just, a, uh, that's just a map mark.

[GS is laughing in the background.]

PK: I think I get in somebody's cross.

[Everyone is laughing.]

GS: There's treasure, gold there.

PK: The main trail goes over there, right over here, right over here along the beach and at that spring camp. That's where they use to spend the spring [Dena'ina].

AB: Um hum.

LE: So you would—what all would you get when you were there? What—you get, uh, fish?

PK: Fish.

LE: Fish?

PK: We get the whitefish.

LE: Whitefish?

PK: Whitefish. The whitefish with a dipper with a [inaudible] like a spoon.

LE: Oh.

PK: That's just like that.

AB: With a dip net [Dena'ina].

PK: Dip net, but small [Dena'ina and English].

AB: Dip, dip net.

PK: Small.

LE: A dip net, oh.

PK: Dip, yeah. You got to make your own hanging twine and make it just like a sack.

LE: Oh.

PK: And then they put the, they put the…

AB: Hoop around it, loop.

PK: Put loop just on the river there. There's a door over here.

AB: Oh, you mean a fence across the river [Dena'ina]?

PK: They put a fence in the water across the river [Dena'ina].

AB: Uh huh.

PK: Screen just like a … [English and Dena'ina]

AB: And then there's a door on it and that's where the fish come through [Dena'ina]?

> PK: Yeah, the door's on the bottom, down in the bottom [English and Dena'ina]. When the fish come, they got to hide it there, they're smart, them things [hide the door because the fish are smart]. They're smart [Dena'ina]. (Koktelash and Koktelash 1987)
>
> "Some certain creeks like Whitefish Lake [Lih Vena]…In spring time like this, they used to move in there [Dena'ina people] and there's a creek like that. They put the fence across, fence right across together, they put it like that and there's a big pin right here- a little wide stick in the bottom, then they got a door. And that place there, there's so many whitefish, them big whitefish got big hump about that big. You can get about five to six thousand fish. Oh, maybe from here to there [referring to area], you know. There was this little stick, and the fish go over it at night time. So they had this little fence there, so there was this height under there. The fish all goes in there and fill everything and start jumping. They put this back door in and there's two racks over it. They tie it up and block 'em. They put that over it and block it. Just like to keep it all in there. Then take a scoop, another big fence in the beach, then scoop them out. They get so much, take some out and keep some in there. You can get oh, four, five, six thousand of them big, fat fish. Yeah, they smoke and dry 'em; they're really good fish, Whitefish Lake. Lot of 'em used to be." (Jacko 1973)
>
> … [W]e would put in the fish traps and all the fish would come down and they had a big dip net and they'd just catch them out. Just took turns all night long. And sometimes they would catch like four hundred a night until they got enough…you had like an assembly line going on down there for the dog teams, and for everybody to eat for the whole village."

The methods employed by Lime Village residents to harvest nonsalmon fish include fish traps, dip nets, set gillnets, ice fishing, and rod and reel (R. J. Brown et al. 2012; Holen and Lemons 2010; Kari 1983). During 2012 and 2013 Lime Village residents used rod and reel, fish traps, dip nets, and set gillnets to harvest whitefish (Figure 3-17).

Lime Village residents used set gillnets to take all of their broad whitefish and humpback whitefish harvests during this study (Plate 3-15). During 2007 Lime Village residents reported harvesting both broad whitefish and least cisco by set gillnet (Holen and Lemons 2010).

Traditional set gillnets were made from sinew or willow bark, with large mammal leg bones used as weights (R. J. Brown et al. 2012). Today Lime Village residents use standard nylon mesh nets. During 2012 and 2013 Lime Village residents targeted broad whitefish, humpback whitefish, northern pike, and longnose suckers with set gillnets. Northern pike and longnose suckers are often caught in nets that have been set for broad whitefish, although one respondent commented that humpback whitefish harvests by set gillnet during spring are often more of an incidental catch than a targeted catch. The respondent said that during spring, when residents put out a net for longnose sucker and northern pike, a few humpback whitefish usually end up in the net. Lime Village residents who target humpback whitefish with set gillnets during fall tend catch more at that time. Broad whitefish are the primary whitefish species targeted with set gillnets. During 2013 fieldwork Van Lanen participated in the nonsalmon fish set gillnet fishery with Lime Village residents at the Hungry Creek outlet on Trout Lake. During this time the set gillnet produced consistent catches of broad whitefish, northern pike, and longnose suckers (plates 3-16 and 3-17).

Wooden fish traps are an important traditional method used by the Upper Stony River Dena'ina to capture whitefish (Anchorage Museum Association et al. 2009; Evanoff 2010; Jones et al. 2013; Kari 1983). An elder respondent said that in the past, Arctic grayling were often harvested alongside whitefish with fish traps. During this research elder respondents reported traditional fish traps are the superior method for catching large numbers of whitefish but that the method had largely fallen out of use by the community during the end of the 20th century. Elder respondents commented that most of the younger generation had not learned the skill of constructing traditional Upper Stony River Dena'ina whitefish traps. However, during 2013, Lime Village residents constructed a wooden fish trap and used it to take all of the community's least

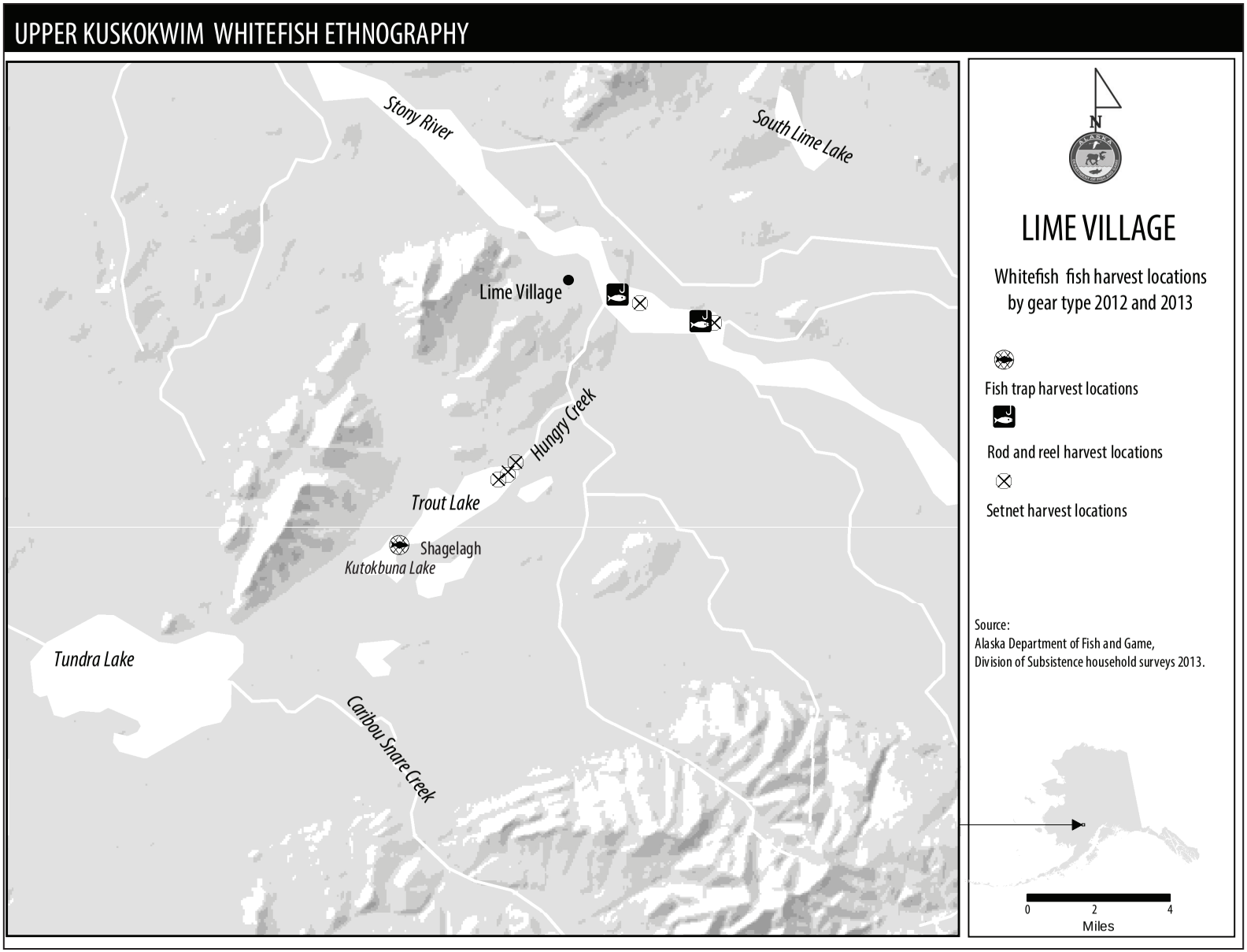

Figure 3-17.–Whitefish harvest locations by gear type, Lime Village, Alaska, 2012 and 2013.

Plate 3-15.–A set gillnet placed at Trout Lake's outlet into Hungry Creek (Hek'dichen Q'estsiq—"abundance outlet"), a particularly important historical and contemporary site utilized by Lime Village residents to harvest nonsalmon fish (Kari 1983, Holen and Lemons 2010). During 2013 broad whitefish, longnose suckers, and northern pike were harvested by set gillnet at this location. Photo by James M. Van Lanen, ADF&G.

Plate 3-16.–Lime Village resident Chris Gusty displays a broad whitefish harvested by set gillnet on Trout Lake at Hek'dichen Q'estsiq ("abundance outlet"), October 2013. Lime Hills are seen in the background. Photo by James M. Van Lanen, ADF&G

Plate 3-17.–Nondalton residents Butch Hobson and Pauline Hobson display a broad whitefish harvested by set gillnet on Trout Lake at Hek'dichen Q'estsiq ("abundance outlet"), October 2013. Photo by James M. Van Lanen, ADF&G.

cisco harvest[3] (Plate 3-18). The remainder of this chapter will describe the strategy, construction and use of traditional Upper Stony River Dena'ina whitefish traps.

Lime Village respondents explained that fish traps are designed to capture whitefish when they leave lakes and travel down narrow, shallow creeks in the fall or when they travel up these creeks to return to lakes in the spring. Fish traps were most often placed at the outlets of lake or the mouths of creeks.

There are two basic styles of fish traps used traditionally by the Upper Stony River Dena'ina. The first is a basket style trap, taz'in, and the second is an open style trap hchił (Kari 2007). Both of these traps employ the use of split spruce fencing that leads fish into an enclosure (Plate 3-19).

The basket style trap, or taz'in, consists of a fence, which simultaneously leads the fish and blocks the creek, and a long and straight cylindrical basket, which the fish enter through the wide end of a separate cone shaped basket (Plate 3-20).

Once the fish enter the larger side of the cone they cannot reverse out of the constriction and are thus trapped in the tube. The reverse side of the cylindrical basket is framed with a trap door which is opened when the basket becomes full of fish. When the door is opened, a person stands guard with a dip net and captures the fish in the net as they try to escape (plates 3-21 and 3-22). A second person operates the door, closing it after each dip in order to ensure that the fish do not escape. Respondents explained that this type of trap was normally built to harvest smaller fish, such as least cisco and Arctic grayling.

The open style trap, or hchił, does not employ a basket and instead consists entirely of fencing. In this configuration, sections of fence are placed in the stream to guide fish through the door of an open enclosure that is made of more sections of fence. An elder respondent said that he was taught to always keep quiet around the trap; otherwise the fish will not enter. Once enough fish have entered the enclosure, the door entrance is closed, trapping the fish. Once trapped, the fish are brought to land with a dip net. "They would use piles of rocks to hold the door closed while they were dipping," explained an elder. Respondents explained that the hchił was normally built to harvest larger fish such as broad whitefish (plates 3-23 and 3-24). An elder respondent said that when Lime Village residents formerly traveled to Tishimna Lake they would build a hchił that blocked the lake's outlet into Stink River and would "dip out hundreds of fish, mostly broad whitefish." Kari (1983) reported that Stony River Dena'ina sometimes even employed a hasty method of capturing whitefish by quickly making a hchił out of piles of brush.

Dip nets were made with a spruce pole for a handle, a spruce sapling for the hoop, and spruce root, sinew, or willow bark for the mesh. In later years Lime Village residents attached modern nylon fish netting to their spruce framed dip nets (Plate 3-25).

Each of the trap elements described above were traditionally made of split spruce lashed with root, although as one respondent explained, in modern times, fences, baskets, and entrance funnels were also sometimes wrapped witch chicken wire rather than with spruce slats. In 2013 wood screws were used to attach the slats to the hoops of the taz'in.

Construction of the traditional Upper Stony River Dena'ina basket style whitefish trap (taz'in) is a detailed process, normally requiring that a family spend multiple days working together to complete the trap. Because of its strength, spruce is the primary material required for construction of the trap. Other woods will not work because they break easy and will rot in the water (Anchorage Museum Association et al. 2009). An intimate knowledge of spruce wood is necessary for selection of proper spruce trees in the field. Spruce used to make the trap must be green and thus come from a live tree. Elder respondents said that the best time to harvest spruce for the trap is during spring "when the snow began melting." Trap makers select only straight grained spruce trees with very few knots, because this is the strongest and most flexible wood. Before the tree is cut, some of the bark is removed, and a piece of the raw trunk is chipped with an axe. If the grain from the chip peels straight when pulled by hand, the tree is straight grained (Anchorage Museum Association et al. 2009).

3. Under State regulation both the open style *hchił* and basket style *taz'in* fish traps are described as *fyke nets* and are a legal method for the harvest of nonsalmon fish in the Kuskokwim River basin.

Plate 3-18.–The basket style (taz'in) fish trap and fence constructed of spruce slats and used by Lime Village residents to harvest least cisco at Shagelagh during 2013. After use the fish trap and fence were removed from the water and stored on the shore of Hungry Creek. Photo by James M. Van Lanen, ADF&G.

Plate 3-19.–The late Vonga Bobby of Lime Village stands beside his whitefish smokehouse at Tishimna Lake (Htsit) with sections of spruce fencing used to trap whitefishes. Note the thatching of the smokehouse with birch leaves and branches (to be discussed below). Photo by Priscilla N. Russell, early 1980s.

Plate 3-20.–A side and front view of the taz'in used to harvest least cisco in 2013. The image on the right shows the entrance to the trap, which consists of a separate element fashioned into a cone that captured fish cannot escape once they pass through it (visible in the left image). Fish are then trapped inside of the cylindrical basket. Photos by James M. Van Lanen, ADF&G.

Plate 3-21.–Lime Village resident Chris Gusty opens the door on a taz'in fish trap full of least cisco while Fred Bobby holds a dip net in place to capture the fish. Photo by Fred Bobby, October 2013.

Plate 3-22.–Lime Village resident Chris Gusty uses a rod to control least cisco exiting the taz'in while Fred Bobby holds a dip net in place to capture them. Photo by Fred Bobby, October 2013.

Once the trees are selected, they are then split into the multiple slats that will make up the basket portion of the trap and the fence portion. The tree used for the basket is selected for length and minimal taper. The ideal tree is about 12 ft long, straight, with few knots, and has a minimally tapered trunk. The tree for the fence can be shorter in length than the tree for the basket. The tree is not cut to length before splitting. Instead the split is started at the base and continues to be wedged and split until it starts to go crooked or hits knots. At this point the trunk is cut at that the desired length for a finished basket, usually about 9 ft. Additionally, a wooden mallet and splitting wedges are made from hard spruce branches. The wedges are approximately 3″ in diameter and tapered to a point so that they can be driven into the split that is first made with an axe. The wood is split by driving in the axe and the wedges with the wooden mallet (Plate 3-26). Even when available, Lime Village people do not use modern table saws or metal wedges and instead use only an axe and spruce

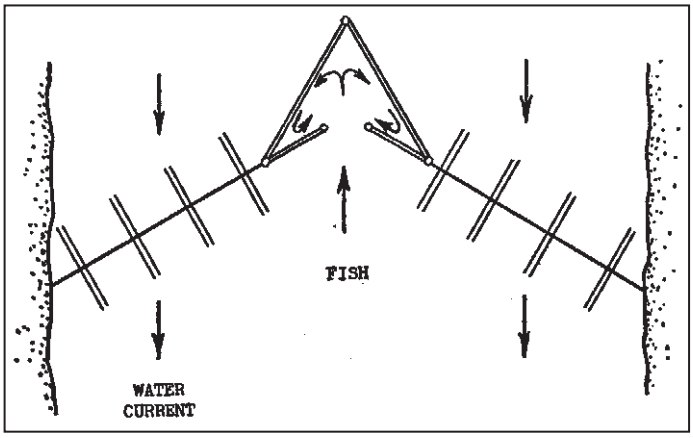

Plate 3-23.–An illustration of a Dena'ina hchił (Osgood 1976rep.).

Plate 3-24.–An elaborately designed hchił used to harvest whitefishes on Hungry Creek (Hek'dichen Vetnu). A dipnet pole rises diagonally from the water in the center of the photo. The hoop portion of the dipnet lies partly submerged next to the trap door. On the left is a platform from which the person netting the fish would stand. While the fence in the foreground is constructed of split spruce, chicken wire is used for the portion of the fence in the background. Photo by Priscilla N. Russell, September 1982.

wedges to split the wood. This is because table saws easily cut across the grain, and slats that are cut across the grain will break (Anchorage Museum Association et al. 2009).

The first step in splitting the log is to peel the bark off to make monitoring the straightness of the split easier. To facilitate splitting, the log is then propped up on another log, which is placed perpendicularly to the log being split. A groove is often chopped into the stabilizing log in order to hold steady the log being split. After the tree is cut to length, the cut end is scored by pounding the axe with the wooden mallet, which creates a groove for the splitting wedge. The goal is to split the tree in half in as straight a line as possible. The split is begun with an axe right on one of the annular rings in the middle of the mass of the wood. This spot is found by feeling for it with your thumbs. After the cut end of the log splits, the long side will start splitting and more wedges are placed in this crack. The formula is to always start the split with the axe and follow the widening split along the log with the wedges, putting in more wedges until the end of the log is reached. The wedges are then pounded deeper until the log splits. The trap maker must monitor the progress of the split to make sure it does not go crooked. If the split starts going crooked, the trap maker leaves a wedge in the original split and begins a new split ahead of it with the axe, working back towards the wedge. This normally corrects the crooked split. After the log splits, many interior crossing fibers will remain attached, and these are chopped away with an axe in order to free the split. At this point the trap maker has split the tree in half. Then, using the same process as described above, the halves of the log are split into quarters, and then eighths, then sixteenths, and so on, until the trap maker has produced a bundle of raw slats.

Once the tree has been sectioned into eighths, the split is started in the middle of the log and then worked out to the ends from each side. As the pieces get smaller careful attention is necessary to be sure the slats are

Plate 3-25.–Emma Alexie uses a handmade spruce dipnet with store bought nylon mesh to harvest broad whitefish from a hchił on Hungry Creek (Hek'dichen Vetnu), September 1982. Photo by Priscilla N. Russell.

split straight. In order to avoid damage to the thinner slats, the axe is used to start the split, and then the wedge is used to finish it. Once the axe has been set into the initial groove, it is pounded in with the mallet. Then, as with the larger pieces, the wedge is inserted into the split and also pounded with the mallet. Once the pieces are too small to be worked with the axe and wedge, they are split with a knife. In this step, the knife creates the initial split and the knife handle is used as the wedge. The trap maker pulls down the knife in a twisting motion which cuts the split. Also, a tapered splitting post is hammered in the ground and the piece being split is pushed against it as the knife is run through. This helps facilitate splitting and allows the split to be done evenly. If the split becomes crooked, the fatter end is pushed against the post to even out the split. The trap maker pushes the slat either to the right or left, depending on which side is fatter, then steers the split back to the middle as it is pushed. The final step is to smooth the slats down into 1″ wide by ½″–¼ ″ tall. Approximately 100 slats are needed to make the trap (Anchorage Museum Association et al. 2009).

Plate 3-26.–Wayne Dick and Bryan Willis on a bank of the Stony River driving wooden wedges into a section of spruce log to make the slats for a tiz'in. Photo by Chris Arend/Anchorage Museum.

Next the slats which will be used for the hoops are selected. These slats need to be worked into shape, so they can be bent into hoops without breaking or splintering. To do this, the trap maker patiently bends the hoop slats around a tree-sized pole in order to flex the grain. Once the bend is established, the slats are bent into hoops, which are tied in the place with spruce roots to hold their shape while they dry. Spruce roots are also carefully selected from a long slender tree with tough branches (and also tested by bending); these trees produce long, slender, strong roots (Plate 3-27).

The hoops used for the cylindrical basket are made of the same diameter. A series of straight slats are lashed with spruce roots onto these hoops. The spaces between these slats should be thumb width and no wider. It is important that all of the long slats sit even and parallel. The long slats are lashed on to each hoop with one continuous length of spruce root (Plate 3-28).

The funnel component of the trap leads the fish into the trap and needs to fit flush into the basket of the trap. The hoops for the funnel component are made in decreasing diameters as they move toward the rear of the cone. The funnel is 3–4 ft wide, square at its entrance and tapered. The slats are lashed to the square entrance and then lashed to the series of hoops. The tail of the cone needs to be tight but still wide enough for the fish to swim through it (Anchorage Museum Association et al. 2009).

The tail of the main basket can be configured in two different ways. The traditional design finished the cylindrical tube with the slats tapered into a cone, which needed to be lashed tightly so the fish could not escape, as described in the previous paragraph. To construct this properly, the tail ends of the slats needed to be thinned down very small in order to allow closure. This is a very tedious task (Anchorage Museum

Association et al. 2009). The second method, described by an elder respondent during this study and used by Lime Village residents during 2013, consists of a removable door on the far end of the cylinder. In 2013, Lime Village residents used an old cooking grill grate as the rear door on their fish trap (Plate 3-29).

To extract fish caught in a taz'in with the closed end configuration, the entrance funnel component of the trap is removed from the basket and the escaping fish are caught with a dip net placed at the open end. Elder respondents explained that with this style of trap sometimes the basket would be so full of fish that people would need to lift the trap in order to dump the fish out. "When the trap was full they would dump the fish, takes a few people to lift," said a Lime Village elder. As the fish were dumped from the trap, they would be caught and landed with dip nets, explained the elder.

During 2013 Lime Village residents used commercially purchased dip nets to harvest fish from their fish trap (Plate 3-21). In the past dip nets were also made with spruce. The dip net frame was made from a long spruce sapling which was thinned at its upper end to facilitate bending. The tree for this was selected carefully for flexibility and strength. Saplings were pulled down and bent to test whether or not they would break. Trees that were impossible to break were selected for the hoop. Immediately after the tree was harvested it was bent into the shape of the dip net frame and lashed so it would dry in place. Dip net poles were also made from spruce and carefully selected for strength. A crosspiece to hold the handle in position

Plate 3-27.–Helen Dick locates a long, strong spruce root (left). Helen Dick displays the harvested spruce roots stripped of their outer layer (right). Photographs by Chris Arend/Anchorage Museum.

on the frame was also made from spruce (Plate 3-25). Dip net pieces were harvested from mid-May to mid-August because this is when it is easiest to peel the bark off of the spruce. It is also easiest to remove the bark in a downward motion starting from the top of the tree, working one's way down the trunk. After the bark was peeled, the parts were smoothed with an axe, and all three parts were lashed together with spruce roots. Finally, a net was attached to the completed frame (Anchorage Museum Association et al. 2009).

Following seasonal use of the fish trap, it is important to store it properly in order to ensure its preservation and function over time. Respondents during this study said that fish traps were always removed from the water before freeze-up. Kari (1983) reported that fences and traps might last for 5 years if they were properly dried in the smokehouse. During late October 2013, Lime Village residents removed their fish trap from the water at Shagelagh and transported it to the banks of Hungry Creek for winter storage (Plate 3-18). An elder respondent said that nets made from spruce roots had to be stored in the water whenever they were not being used, otherwise they would dry out and break:

Plate 3-28.–Wayne Dick lashing the slats to the hoops of the fish trap basket with spruce root (left). Helen and Wayne Dick making certain that slats and hoops are spaced evenly when lashed to the frame (right). Note terminal end of the basket on the far right. In this style of tiz'in, caught fish are extracted from the wide entrance end of the trap. Photographs by Chris Arend/Anchorage Museum.

> They used to make strings out of spruce roots, you know, they used to make dip nets too you know, but you have to keep them in the water all the time, so they don't dry out.

As evident from the discussion above, construction and use of the traditional Upper Stony River Dena'ina whitefish trap requires large amounts of time, labor, and effort. Respondents explained that because of all the processes involved, it is often much easier for them to harvest their whitefish by set gillnet.

> I have used a fish trap before. A fish trap is a lot of work. You have to keep on cleaning it and then a big pike will get in there and make a hole and then…You're always in the water with your boots. So I just use a [set] net pretty much.

Nonetheless, during 2013 Lime Village residents revived the use of the taz'in fish trap for whitefish harvests, and community members reported that they were very happy with the results.

WHITEFISH PROCESSING, PRESERVATION, STORAGE, AND USE

Following harvest, and prior to consumption, whitefish must be processed and preserved (Plate 3-30). Stony River Dena'ina people have traditionally preserved whitefish by smoking and drying or freezing them. The traditional practice is to smoke and dry whitefish harvested during the spring and early part of the fall fishing season and to allow whitefish harvested during the colder, latter part of fall to freeze for winter preservation (Kari 1983). "They smoked the fish in the fall and froze the whitefish whole when the nights were cold enough," explained a Lime Village elder. Kari (1983) reported that because of the superior preservation conditions afforded by colder temperatures and the lack of insects during fall, Lime Village residents preferred to harvest whitefish during fall rather than spring.

Kari (1983) also reported that, for consumption, Lime Village residents prefer whitefish that has frozen fresh in the late fall over dried whitefish from earlier in the season. Lime Village residents informed Kari (1983) that frozen whitefish has greater nutritional value than does dried whitefish. Elder respondents during this research explained that during the months when whitefish could be preserved by freezing they would be frozen whole. Fish that were used for dog food were frozen whole, but according to an elder respondent, residents would often cut the livers out of broad whitefish and humpback whitefish for immediate use before freezing. Because of their small size, least ciscoes were frozen whole. They hung the ciscoes whole on a stick until they were frozen. "They leave them hung up outside during the winter and they stay good. Then they would bring them in and eat them, guts and all," explained an elder respondent. Today Lime

Plate 3-29.–The 2013 least cisco trap viewed from the rear. Lime Village residents used an old cooking grill grate for the removable door on this trap. Photo by James M. Van Lanen, ADF&G.

Village residents normally store their whitefish in commercial freezers, but respondents said that in the past frozen whitefish would be stored in wooden or underground caches. Fish camps contained processing infrastructure such as fish racks, a smokehouse, and a wooden cache (Kari 1983)). Underground pits were used for winter fish storage by the Upper Stony River Dena'ina, likely since prehistoric times (Bobby 1987).

During spring and fall broad whitefish were gutted and split into fillets that were hung to smoke and dry. Fish were hung on both outside racks and inside of smokehouses to dry (Plate 3-31).

Traditionally smokehouses were made with spruce poles and thatched with birch bark and birch branches with their leaves attached (Kari 1987). Whitefish were smoked with alder, willow, birch, or cottonwood. Elder respondents said that historically, large of amounts of broad whitefish, humpback whitefish, and least cisco were dried annually for human consumption. "Least cisco were dried by the hundreds," said a Lime Village elder. The elder also said that broad whitefish were "cut and dried, and sticks were used to hold them open so they will dry thoroughly." Dried whitefish that was not cached in camp was brought back to Lime Village for winter consumption. Sometimes unprocessed whitefish would be brought back to Lime Village to be processed and dried there. For dog food, whitefish was only air dried and not smoked. During 2012 and 2013, harvested whitefish was not being smoked and dried by Lime Village residents. Respondents said that harvested whitefish are normally preserved only by freezing today. "Back in the day we didn't have freezers so we basically had to smoke them," explained a respondent regarding fall-caught whitefish. An elder respondent said that he misses having smoked whitefish:

> My mom used to smoke the whitefish, and we don't do that anymore. They, those people are not doing that, I don't know why. It is not the way that I would like things to go. I like smoked whitefish.

Smoked and dried whitefish is well preserved and can be stored without refrigeration and eaten at any time. Frozen whitefish is thawed and cooked by baking, in a frying pan, or boiled. An elder respondent said that freshly caught whitefish was often cooked on a stick over fire at camp. Another elder respondent told about her grandfather boiling fish in a birch bark basket long ago:

> He make a birch basket, you know, it's like a plate, he would add water and he put cold rocks…clean rocks. He washed the rocks; we had fire you know. He'd put the rocks on the fire; we watched. After them rocks got red, he pick them up and put them in that water; that water pretty soon started boiling inside that basket.

A favorite use of whitefish for Lime Village residents is for *nivagi*, or "Indian ice cream," which, as an elder respondent explained, consists of "fish stirred up with a little grease and a little sugar and berries." The elder said that broad whitefish, "cooked and then stripped off the bones," was often used for nivagi. Likewise, according to Kari (1983), whitefish used for nivagi was prepared by boiling and then mixed with lard rendered from caribou, moose, or black bear, berries, and sugar. Respondents said that whitefish eggs and whitefish livers are also important foods. A traditional dish called *kunkash* was made with "whitefish livers boiled in water for 10 minutes and mixed with smashed blueberries." The elder said that whitefish eggs are often also included in kunkash or that the dish is made using a combination of both whitefish livers and eggs combined with berries. "You can make a kunkash with anything," said the elder. Elder respondents said that whitefish eggs baked in fry bread is also a traditional food:

> They cooked whitefish eggs, and we ate them, and they taste delicious, and then we put it in the bread, and we fry bread with them; put 'em in the flour and mix 'em up in the flour, cook fry bread with grease [in the pan].

The elder said that whitefish eggs used for fry bread are smashed up before they are mixed with the dough.

Whitefish Abundance, Habitat Health, and Community Fisheries Management

During this research Lime Village respondents consistently reported observations that whitefish populations in the region have declined. Respondents who fished said that fewer whitefish are available per level of effort than occurred in the past. Some respondents cited northern pike predation on whitefish as a cause for declines, but the primary reason cited for whitefish declines is an increasing number of beaver dams being built in the creeks fished traditionally by Lime Village residents. Beaver dams are blamed for whitefish losses because they are perceived to block the passage of whitefish up and down the creeks. "There is a problem with beaver dams now. The beaver dams mean less fish," said a Lime Village respondent. "It's hard for fish to go through the dams," said another respondent. In the Kotzebue Sound region of northwest Alaska, increases in the occurrence of beaver dams have also been cited by subsistence fishers as blocking whitefish travel in some rivers and streams, leading to declines in abundance (Georgette and Shiedt 2005).

Lime Village residents said that the increase in the current number of beaver dams is a relatively new phenomenon that began during the 1990s. "A long time ago their used to be no beaver, and then lots of whitefish came up," said a Lime Village elder. Respondents said that the occurrence of beaver dams has increased over time and that the dams have impacted all of the traditional whitefish harvest locations used by Lime Village residents. For this reason, residents no longer attempt to harvest whitefish at many of their traditional fishing locations. Respondents reported that beaver dams have especially had a negative effect on whitefish populations and whitefish fishing activities at Stink River and the tributaries surrounding Tishimna Lake, but that fishing locations at Tundra Lake, Kutokbuna Lake, Trout Lake, and Hungry Creek had all been affected.

Elder respondents pointed out that beaver dams have always created a hindrance for whitefish fishing activities and that controlling beaver dams was a method of actively managing the whitefish fishery in the past. Prior

Plate 3-30.–Mary Bobby processes whitefishes in the early 1980's. Photo by Priscilla N. Russell.

to declines in the economic viability of fur trapping, active beaver trapping was one means by which the negative effects of beaver dams was mitigated in the past. "We used to trap those beaver, and we would eat them. But now there is no trapping," explained an elder respondent. Another elder observed that when residents actively trapped there was noticeable reduction in beaver dams and a noticeable increase in whitefish harvests. Respondents said that removing the beaver dams that disrupted whitefish harvests was once an important annual activity for the community. One respondent explained:

> [Beavers] dam up the creeks… and then the whitefish can't go either up or down, so you have to break the beaver dams. We would break all the beaver dams, and my grandpa and all of us, we would put in the fish traps and all the fish would come down.

Respondents pointed out that a community decline in whitefish harvest effort has simultaneously created a decline in the community's effort to remove beaver dams. An elder respondent remarked:

> Back when people were actively fishing…they would take them [beaver dams] out, but not anymore. There is better technology, and people no longer have dog teams, and beaver dams have taken over, changed the environment.

Nevertheless, during 2013 active Lime Village whitefish harvesters continued to remove beaver dams in order to ensure whitefish harvests for the community. "Right now back at the lake there is a big huge beaver dam and that's trapping all the whitefish so we have to go break that one this fall…Just go in there with your rubber boots and start taking it apart" said a respondent. The respondent explained, however, that sometimes beaver dam removal does not yield the desired result. "You can break the beaver dams and then you wake up the next morning and they [beavers] already got it fixed." Similarly, in the Kotzebue Sound region of northwest Alaska, local residents reported beaver dam removal often released large numbers of whitefish, but also that when dams are taken down beavers tend to build them right back up again (Georgette and Shiedt 2005). Lime Village respondents said that this frustrating occurrence has contributed to declines in their whitefish harvest efforts over recent years.

Contemporary Fishing Effort, Intergenerational Transmission of Traditional Whitefish Knowledge, and Youth Participation in the Whitefish Fishery

The fishing methods described above, especially the construction and use of fish traps, have been passed down since ancient times through multiple generations of Upper Stony River Dena'ina. Whitefish fishing was so important in the Upper Stony River Dena'ina seasonal round that, as some respondents explained, it was not uncommon for a person to be born at a whitefish camp. Lime Village respondents often told stories about learning how to fish for whitefish from their parents, grandparents, and great grandparents. "When I

Plate 3-31.–Matrona and Vonga Bobby at their whitefish camp at Tishimna Lake (Htsit), during fall in the early 1980s. Several whitefishes hang from a drying rack and a smokehouse stands in the background. Photo by Priscilla N. Russell.

was smaller my parents and grandparents taught me [how to harvest whitefish], and they learned when they were small, by doing," said an elder respondent.

Today, Lime Village elders no longer fish for whitefish and instead rely on the few middle-aged residents who do fish, along with their younger helpers, to provide them with stores of fish. One Lime Village household, in particular, puts forth most of the whitefish fishing effort by the community annually, and respondents explained that overall participation by the community has greatly declined. For example, one respondent said:

> When the elders got old, most people stopped fishing. It's hard to get back there to the fishing spots, and the elders used to canoe there, but then they got too old for the hard work, and the younger people only want to use motors, so they stopped. Plus, kids had to go to school then too [and, most adults] they don't fish…they now need to stay home and work.

A middle-aged respondent was asked how many people fish for whitefish today compared to the past. The respondent said:

> Way less, I'd say eighty percent less. People are getting lazy, including myself. Like in my family, I'm the only one that fishes out of all of my mom's kids. And here it used to be that every family had a smokehouse; every family fished right now. I think it's got a lot to do with people got no more dog teams. It's easier for people to go to Anchorage now and go get groceries. So the old ways, it's just not here no more…Nobody doesn't like to go out. We use to go back to the lake and stay for like three weeks, ya know. And

> then come home. Right now you can barely get anyone to go back there to a cabin and go camping, ya know, for a night barely. And I like to go back there, and I'll stay for about a week in the fall [fishing for whitefish], at least a week.

Despite these observations, during 2012 and 2013, at least three Lime Village residents in their twenties and thirties participated in the whitefish fishery. These residents assisted with construction of the whitefish trap and use of the trap for least cisco harvesting activities. During 2013, when Van Lanen participated in the nonsalmon set gillnet fishery with Lime Village residents at the Hungry Creek outlet, two Lime Village residents in their twenties participated and at certain times were the primary operators of the set gillnet.

4. NIKOLAI

Community Background

Plate 4-1.–Nikolai, Alaska viewed from the South Fork Kuskokwim River, August 2014. Photo by Andrew Brenner, ADF&G.

The community of Nikolai (Plate 4-1) is located in the South Fork Kuskokwim River approximately 35 river miles from its junction with the North Fork Kuskokwim River. The South Fork Kuskokwim River is situated within the upper Kuskokwim River basin and joins the North Fork Kuskokwim River to form the mainstem Kuskokwim River at river mile 540, near the historical community of Medfra. The upper Kuskokwim River basin is characterized by glacial streams that drain a portion of the western slopes of the Alaska Range, as well as numerous low-gradient, groundwater-fed streams that drain the lakes, bogs, and mixed spruce and hardwood boreal forest of the flatlands of the region (Arp and Jones 2009:15–30; Brown 1983:12–16; R. J. Brown et al. 2012:172–174) (Figure 4-1).

Hosley (1968) first identified the dialect of the Athabascan people of the region as distinct from others in Alaska. People of Athabascan descent of the area refer to themselves as *Dina'ena* (the people) in this dialect, known as Upper Kuskokwim Athabascan (Collins 2004rev.:8). They also recognize the name of Dichinanek' Hwt'ana, which translates as Timber River people (Collins 2004rev.:8). "Dichinanek" is the Upper Kuskokwim Athabascan name given to the North Fork Kuskokwim River. Historically, autonomous seminomadic bands of Athabascan people were distributed throughout the upper Kuskokwim River basin, approximately from Vinasale on the mainstem Kuskokwim River, upstream into the North Fork Kuskokwim river drainage (Hosley 1968). These bands primarily inhabited the territory of the tributaries on the eastern side of the upper Kuskokwim River, as well as the Takotna River drainage, with recorded sites of habitation located throughout the region (Gudgel-Holmes 1979:10; Hosley 1961, 1968). Trade between these bands and other distant groups was likely common. Miska Deaphon, an early resident of Nikolai, as well as Phillip Esai have described that their ancestors and others travelled from the South Fork Kuskokwim River drainage through Alaska Range passes to the western shore of Cook Inlet to trade with Dena'ina Athabascans living there (Brown 1983:65; Gudgel-Holmes 1979; Phillip Esai, Nikolai, Alaska, personal communication, January 2012).

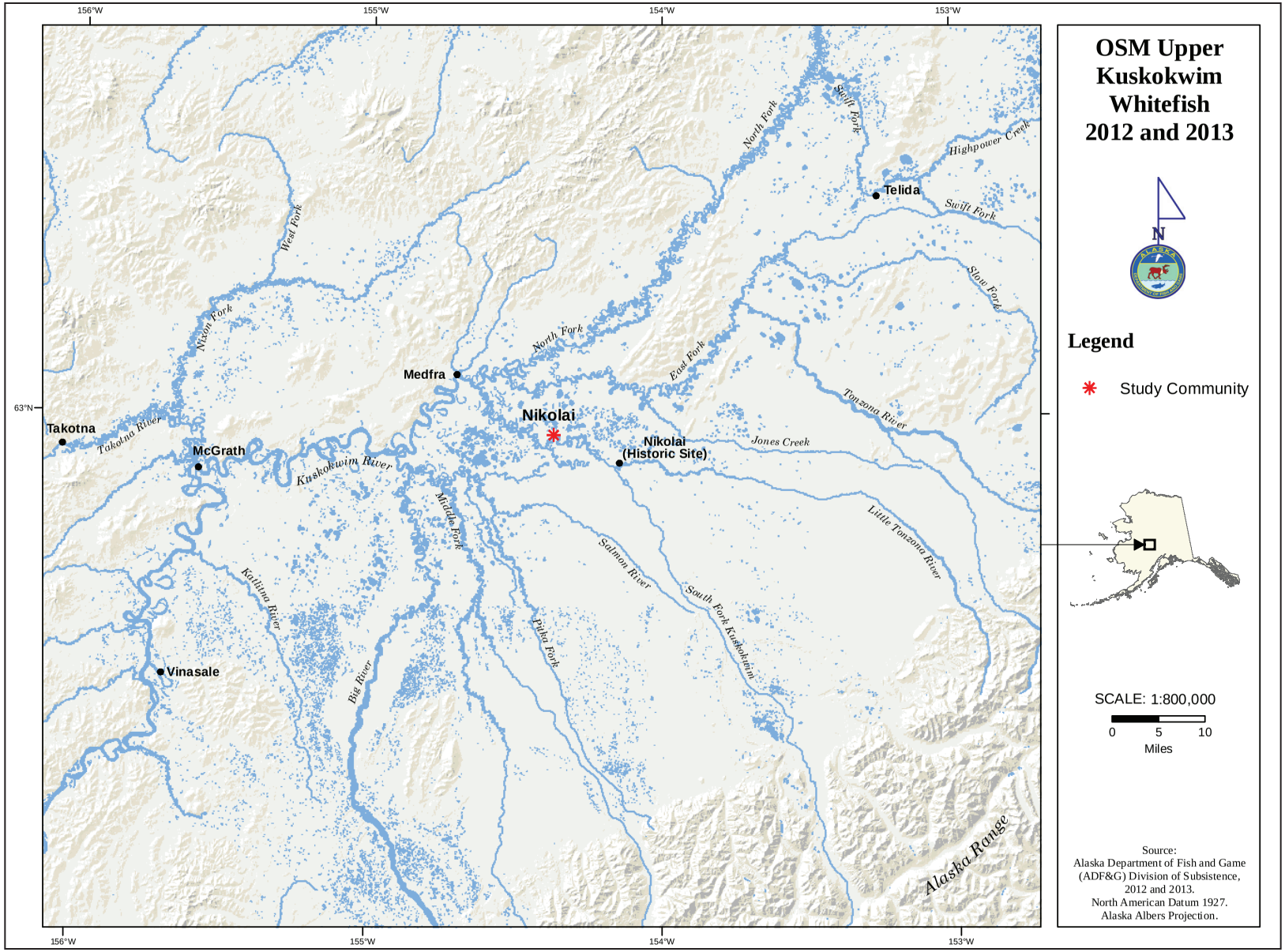

Figure 4-1.–Study area map.

Prior to and after the arrival of Euro-American settlers in the 19th century, the Athabascan inhabitants of the region likely focused most of their food-gathering efforts on hunting large land mammals such as caribou, Dall sheep, black bear, and brown bear (Stokes 1985:67–68). Moose were not plentiful in the region during a period of time prior to the early 20th century. Therefore, moose was likely not a principal species targeted by inhabitants (Collins 2004rev.:41; Snow and Johnson 1985:108). Residents of the area also hunted and trapped small land mammals and upland game birds, and gathered vegetation. Fish harvests were historically important, with harvests of whitefishes consistently occurring in lakes near the village of Telida and other waterways of the North Fork Kuskokwim River drainage (Collins 2004rev.:99); however, fish harvests may have become much more significant following severe declines in caribou populations in the 1920s (Hosley 1968; Stokes 1985:72–73). While many families continued to maintain a semi-nomadic lifestyle during the early 20th century, residents began to spend more time each year in rivers where they were able to harvest larger quantities of fish, particularly salmon. This was likely influenced by the absence of caribou, as well as participation in the trapping and wage labor markets, and the more widespread use of fish wheels and commercially manufactured gillnets in the region (Hosley 1968; Stokes 1985:72).

The original community known as Nikolai was located in the Little Tonzona River, upstream of its confluence with the South Fork Kuskokwim River Figure 4-1. The village site was likely chosen by early inhabitants due to the presence of Chinook salmon that migrated through the area each summer to spawn in the Little Tonzona River (Collins 2004rev.:99). Josiah Spurr of the U.S. Geological Survey visited this seasonal village in July 1898 (Brown 1983:162–163; Collins 2004rev.:41, 100), at which time he met Chief Nikolai, a patriarch of the families living there. United States Army First Lieutenant Joseph Herron also documented the presence of the community after his 1899 journey through the region, and reported that residents of the village of Telida referred to it as "Nikolai's village" (Brown 1983:163; Collins 2004rev.:46, 100). While accounts vary regarding details of the movement of the community to a new location (Brown 1983:159–163; Oswalt 1980:64–66), Collins (2004rev.:99–100) asserts that in 1910, Chief Nikolai moved the village approximately 3 miles downstream on the South Fork Kuskokwim River from the mouth of the Little Tonzona River, to a location near the site where a steamboat captain had established a roadhouse and trading post after deciding to overwinter his vessel there. Also in 1910, a Russian Orthodox priest established St. Nicholas Church at this second site, which was known as Nikolai (Collins 2004rev.:99; Oswalt 1980:65). Because this particular village site was prone to flooding, residents moved in 1916 to the location of the roadhouse and trading post, approximately 2 miles downstream, at the current community's location (Brown 1983:161; Oswalt 1980:65).

During the gold mining era of the early 1900s, Nikolai, situated on the historical Rainy Pass Trail, became increasingly important as a location for travelers and their dog teams to rest while travelling between supply centers near Cook Inlet and gold mining sites in the Ophir mining district. By the 1920s, it was also an important station along the Nenana-McGrath Trail. Trading for furs, fish for dog food, and manufactured goods was an essential commercial activity in which local residents participated at this time. World War II resulted in declines in gold mining throughout Alaska and a decrease in trade along routes such as those passing through Nikolai; however, by this period, Nikolai was an established community. The public school was established in 1948. Nikolai has had a post office since 1949 and an airstrip since 1963. Most Nikolai homes include electric, plumbing, and sewage systems. The community has a health clinic operated by Tanana Chiefs Conference, of Fairbanks, Alaska. Local governmental organizations include the City of Nikolai, incorporated in 1970, and the Nikolai Edzeno' Tribe.[1]

The communities of Nikolai and Telida have been linked for generations by cultural and social ties. Many families in the two communities have a shared ancestry and history. The village of Telida is known to have been established when two women fled their camp after their husbands had been killed by unknown aggressors. They traveled into the region of the headwaters of the Swift Fork Kuskokwim River and settled at a lake where they noticed large numbers of whitefish. The women met other men there whom they later married, and the two families established the village in the area. The community was known to be in a

1. Alaska Department of Commerce, Community, and Economic Development (ADCCED) Division of Community and Regional Affairs, Juneau: "Alaska Community Database Online: Community Information." Accessed December 2014. http://commerce.state.ak.us/cra/DCRAExternal/community

location where whitefish, particularly broad whitefish, were found in abundance. Telida was an established community when it was visited by Lt. Herron in 1899. Residents of the village began sending their children to schools outside of the community sometime in the first half of the 20th century until one was established in Telida in 1975. In 1996, the Alaska Department of Education closed the Telida school due to low student enrollment (Collins 2004rev.:71–82). Some Telida families moved to Nikolai following this event in order to enroll their children in the Nikolai school.

Demography

Surveys conducted in 2013 and 2014, for the study years 2012 and 2013, respectively, attempted a census of all Nikolai households that were residing in the community for at least 6 months of each study year.[2] Survey results estimated a total population of 113 individuals in 2012 and 96 individuals in 2013. The U.S. Census Bureau identified 37 households in Nikolai in the 2010 Decennial Census (2010 Census) with a total population of 94 (Table 4-1). Population data from both U.S. Census and Alaska Department of Labor show a fluctuating population in Nikolai. From 1950 through 2010, decennial census population counts ranged from 88 to 94 people (Figure 4-2). The greatest U.S. Census population count was 112 people in 1970 with the least at 85 people in 1960. Alaska Department of Labor (DOL) has recorded an annual population estimate for the community since 1984, which has also shown some fluctuation ranging from 109 people in 1984 to 93 people in 2012. The greatest DOL population estimate was 126 people in 1986, with the least, 86 people, in 2009.

The 2010 Census recorded an Alaska Native population of 92.6% of the total Nikolai population (Table 4-1). This study estimated an Alaska Native population of 82.9% of total Nikolai population in 2012 and 90.6% of the total in 2013. Recent Division of Subsistence survey projects reported 96 people living in 32 households in Nikolai in 2002 (Holen et al. 2006:67) and 117 people living in 39 households in 2011 (Ikuta et al. 2014:525), with 95.1% of the population reported as Alaska Native in 2002 and 91% in 2011.

The mean Nikolai household size was 2.8 residents in 2012, with 9 members residing in the largest household. The mean age in 2012 was 35.8 years and the median 30 years. The eldest person sampled was 92 years of age in 2012. All households (40) identified at least one household head as Alaska Native in 2012. The mean Nikolai household size was 2.6 residents in 2013, with 9 members residing in the largest household (Table 4-2). The mean age in 2013 was 39.4 years and the median 35 years. The eldest person sampled was 93 years of age in 2013. All households (36) identified at least one household head as Alaska Native in 2013. The mean length of residency among the total Nikolai population was 26.1 years in 2012, and 36.4 years for household heads in the same study year. The mean length of residency among the total Nikolai population in 2013 was 31.8 years, and 42.6 years for household heads in the same study year. In 2012, 53.5% of Nikolai household heads and 63.4% of residents were estimated to have claimed Nikolai as their birthplace. In 2013, 50% of Nikolai household heads and 51.6% of residents were estimated to have had Nikolai as their birthplace (tables 4-3 and 4-4). In both study years, respondents reported that the remaining individuals claimed birthplaces in a variety of regional communities (e.g., Telida, Crooked Creek, or Shageluk) as well as Anchorage and other communities in Alaska and in the continental United States.

The population profiles for Nikolai residents in 2012 and 2013 showed some variability among 5-year age cohorts younger than 70 years (figures 4-3 and 4-4; Appendix D, tables D1 and D2). Some were very small (e.g., 3 individuals in 2012 and approximately 2 individuals in 2013 aged 40–44) or non-existent (e.g., no residents aged 60–64 years in 2012 and 2013, and none aged 5–9 years in 2013). The largest age cohorts in 2012 included residents 0–4 years and 55–59 years, both with approximately 14 individuals. In 2013 the largest age cohort included approximately 11 individuals aged 55–59 years.

2. Harvest and use surveys in Nikolai recorded information regarding the calendar year immediately prior to the year during which the surveys were being conducted. The 2013 survey effort recorded information from 2012, and the 2014 survey effort recorded information from 2013. For clarity, discussions of survey efforts in this section mention both the study years and the years during which surveys were conducted. In subsequent sections of this document, authors will refer to results of the study years 2012 and 2013, except where otherwise noted.

Table 4-1.–Population estimates, Nikolai, 2010, 2012, and 2013.

	Census (2010)	This study 2012	2013
Total population			
Households	37	40.0	36.0
Population	94	113.1	96.0
Alaska Native			
Population	87	93.8	87.0
Percentage	92.6%	82.90%	90.6%

Sources U.S. Census Bureau (2011) for 2010 estimate; ADF&G Division of Subsistence household surveys, 2013 and 2014, for 2012 and 2013 estimates.

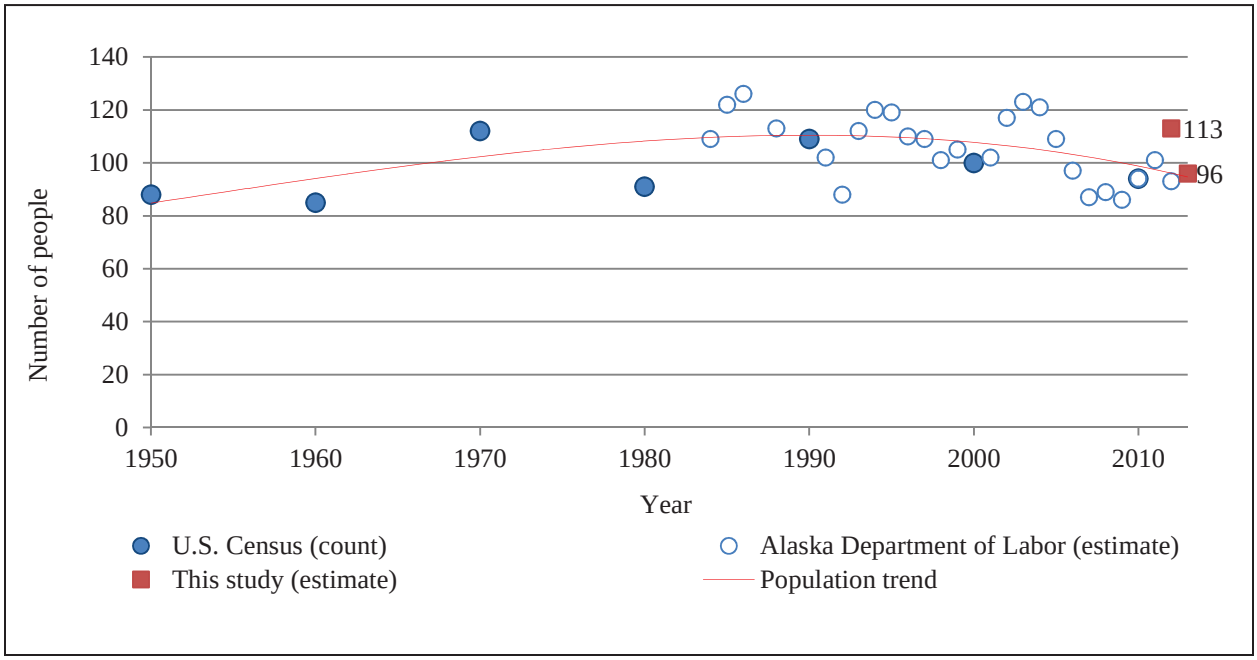

Figure 4-2.–Population history, Nikolai, Alaska.

Table 4-2.–Demographic characteristics, Nikolai, Alaska, 2012 and 2013

Characteristics	Nikolai 2012	Nikolai 2013
Household size		
Mean	2.8	2.6
Minimum	1	1
Maximum	9	9
Age		
Mean	35.8	39.4
Minimum[a]	0	0
Maximum	92	93
Median	30	35
Length of residency		
Total population		
Mean	26.1	31.8
Minimum[a]	1	1
Maximum	85	86
Heads of household		
Mean	36.4	42.6
Minimum[a]	1	1
Maximum	85	86
Alaska Native households[b]		
Number	40	36.0
Percentage	100.00%	100.0%

Source ADF&G Division of Subsistence household surveys, 2013 and 2014.

a. A minimum age of 0 (zero) is used for infants who are less than 1 year of age.

b. The estimated number of households in which at least 1 head of household is Alaska Native.

Table 4-3.–Birthplaces of household heads, Nikolai, Alaska, 2012 and 2013

Birthplace	Percentage	
	2012	2013
Anchorage	2.3%	2.9%
Chefornak	0.0%	2.9%
Chitina	2.3%	0.0%
Crooked Creek	4.7%	8.8%
McGrath	0.0%	2.9%
Medfra	0.0%	2.9%
Nikolai	53.5%	50.0%
Pedro Bay	2.3%	0.0%
Shageluk	2.3%	0.0%
Telida	2.3%	8.8%
Upper Kuskokwim	9.3%	0.0%
Other Alaska	0.0%	14.7%
Other U.S.	20.9%	5.9%

Source ADF&G Division of Subsistence household surveys, 2013 and 2014.
Note "Birthplace" means the place of residence of the parents of the individual when the individual was born.

Table 4-4.–Birthplaces of residents, Nikolai, Alaska, 2012 and 2013

Birthplace	Percentage	
	2012	2013
Akiak	0.0%	1.6%
Anchorage	2.4%	4.7%
Chefornak	0.0%	1.6%
Chitina	1.2%	0.0%
Crooked Creek	2.4%	6.3%
Fairbanks	3.7%	0.0%
McGrath	4.9%	1.6%
Medfra	0.0%	1.6%
Nikolai	63.4%	51.6%
Nome	1.2%	4.7%
Pedro Bay	1.2%	0.0%
Shageluk	1.2%	0.0%
Telida	1.2%	7.8%
Upper Kuskokwim	4.9%	0.0%
Missing	1.2%	3.1%
Other Alaska	0.0%	7.8%
Other U.S.	11.0%	6.3%

Source ADF&G Division of Subsistence household surveys, 2013 and 2014.
Note "Birthplace" means the place of residence of the parents of the individual when the individual was born.

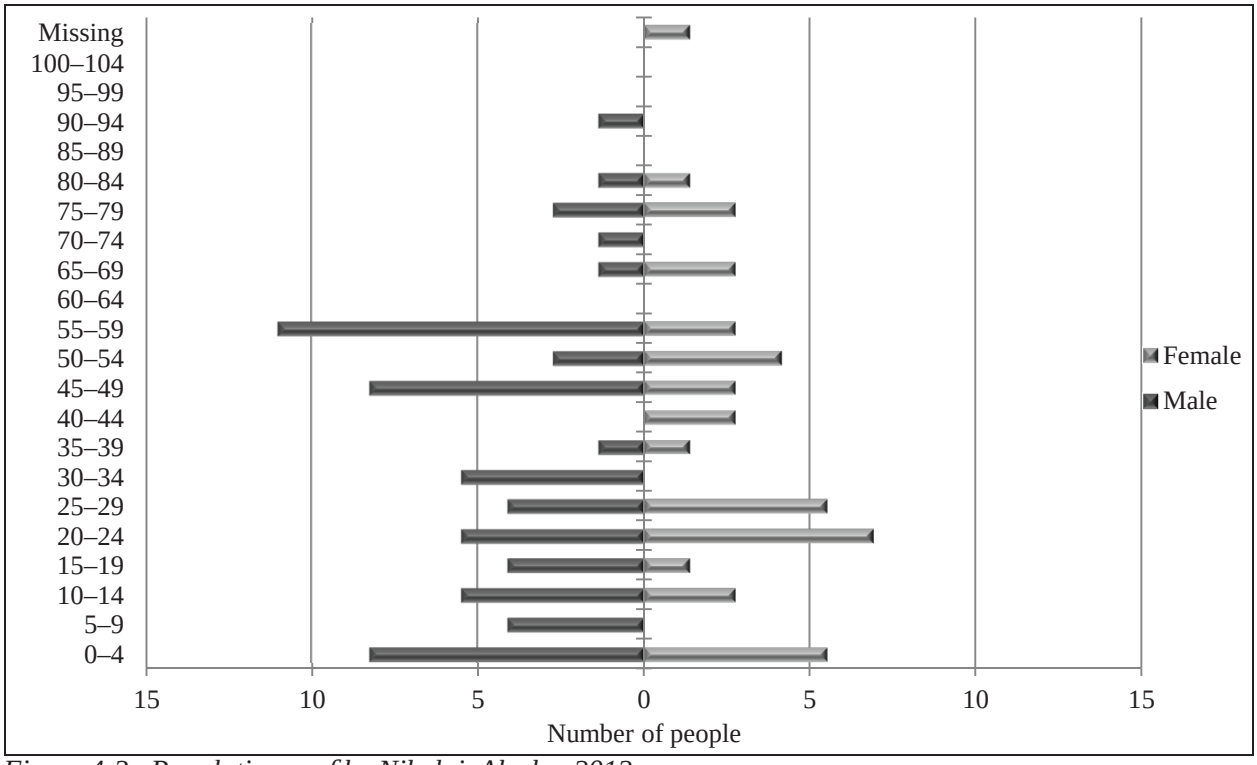

Figure 4-3.–Population profile, Nikolai, Alaska, 2012.

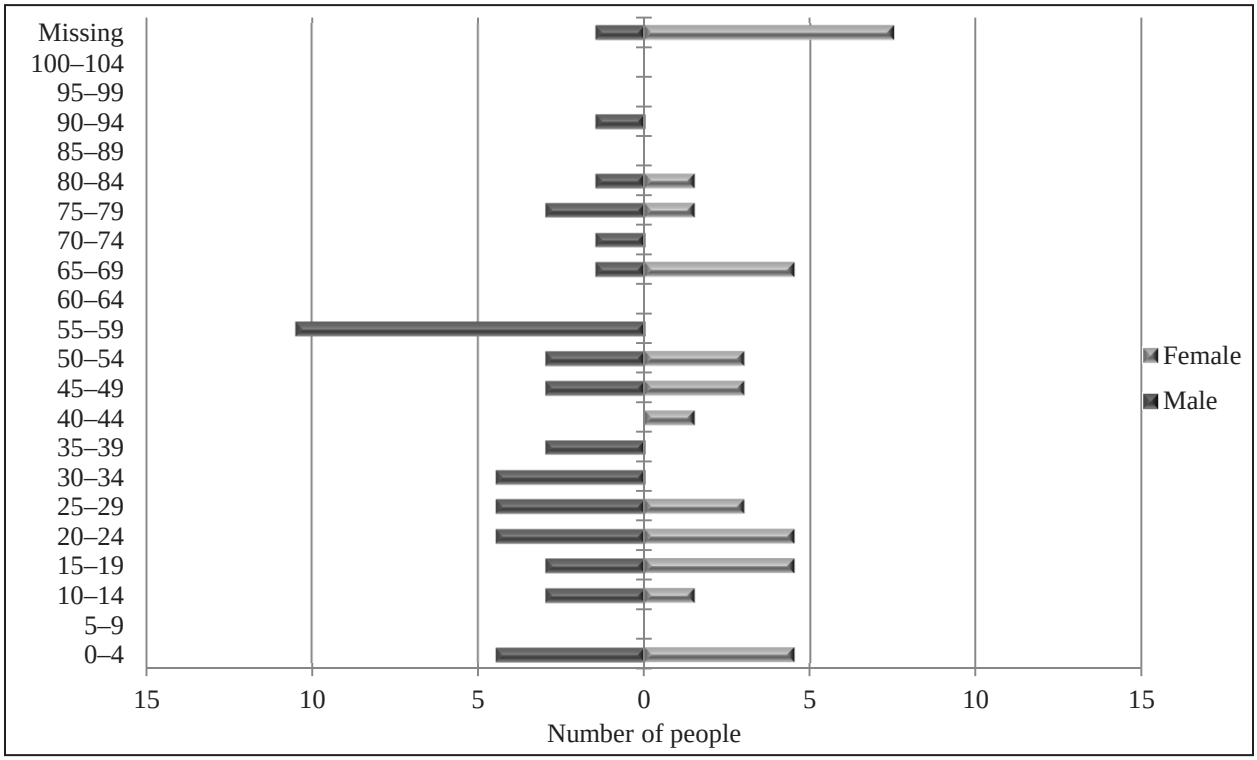

Figure 4-4.–Population profile, Nikolai, Alaska, 2012.

Historical and 2012–2013 Harvests and Uses of nonsalmon fish by Nikolai residents

Residents of Nikolai have historically relied upon a diverse harvest of wild resources each year that ranges from large land mammals such as moose and Dall sheep to a number of Pacific salmon species, several species of nonsalmon fishes, and a variety of birds and vegetation (Holen et al. 2006; Ikuta et al. 2014; Stokes 1985). Previous studies have recorded salmon as composing a large portion of the total weight of all wild food harvests by residents of Nikolai and the greatest proportion of all fish harvests. While nonsalmon fishes have historically represented a much smaller percentage of total harvests in Nikolai, they provide an important source of food due to their availability year-round, unlike salmon, which are generally harvested from June through October. This study and previous studies have shown that whitefishes and northern pike are the nonsalmon fish species that are harvested in greatest quantity by Nikolai residents. Historical harvests of these and other species may have been much higher than in recent years due to their use as food for dogs when dog teams were the principal means of winter transportation in the region.

This section presents survey results from this study and compares these results to those of previous harvest studies that documented information from similar harvest surveys in 1984 (Stokes 1985), 2002 (Holen et al. 2006), and 2011 (Ikuta et al. 2014). Data presented here include amounts of various nonsalmon species harvested in Nikolai, as well as information regarding the sharing and use of these resources. This section also presents information about the methods, seasons, and locations of whitefish harvests, as well as survey respondents' assessments of the importance of and changes to harvests of whitefishes throughout the community. Ethnographic interview data provide additional information that complements both the historical and contemporary information provided by harvest surveys.

Nonsalmon Fish Harvests and Uses 2012

In 2012, Nikolai residents harvested an estimated total of 10,519 lb, or 93 lb per capita, of nonsalmon fish (Table 4-5). Humpback whitefish was the species that was harvested in the largest amount by weight (2,726 lb, 24 lb per capita, or 26% of the total nonsalmon harvest by weight) (Figure 4-5). Other species harvested included Bering cisco (1,825 lb, 16 lb per capita, and 17% of harvest), followed by northern pike (1,676 lb, 15 lb per capita, and 16% of harvest), sheefish (1,282 lb, 11 lb per capita, and 12% of harvest), broad whitefish (1,020 lb, 9 lb per capita, and 10% of harvest), round whitefish (972 lb, 9 lb per capita, and 9% of harvest), least cisco (552 lb, 5 lb per capita, and 5% of harvest), and longnose sucker (317 lb, 3 lb per capita, and 3% of harvest). Nikolai households also reported relatively small harvests of Arctic grayling (135 lb), Dolly Varden (12 lb), and burbot (3 lb). Survey results also recorded other aspects of uses of subsistence harvests of nonsalmon fishes, such as the prevalence of sharing by community members. In 2012, 93% of Nikolai households used nonsalmon fish, 76% harvested nonsalmon fish, 48% gave nonsalmon fish to other households, and 76% received nonsalmon fish from other households. Table 4-5 provides percentages of Nikolai households that reported giving various species of nonsalmon fishes away to other households or receiving them from other households.

Table 4-6 lists the number and pounds of each nonsalmon fish species harvested by Nikolai households in 2012 in percentages by gear type. Nikolai residents harvested the majority of their nonsalmon fish by gillnets (87% of edible weight in lb of nonsalmon fish); 100% of broad whitefish, Bering cisco, least cisco, humpback whitefish, and round whitefish were harvested by gillnet. Nikolai households used gillnets to harvest 76% of sheefish and longnose sucker, and 47% of northern pike. Nikolai fishers used rod and reel gear to harvest 68% of Arctic grayling, 28% of northern pike, and 24% of sheefish. As an additional method, Nikolai residents harvested 25% of edible pounds of Arctic grayling and 13% of northern pike with a hook and line under the ice. Table 4-6 and Figure 4-6 depict these harvests by gear type in terms of the total edible pounds harvested for each species (*see also* Appendix D, Table D3).

Table 4-5.–Estimated harvests and uses of nonsalmon fish, Nikolai, Alaska, 2012.

	Percentage of households					Harvest weight (lb)			Harvest amount			95%
		Attempt	Harvest	Receive	Give		Mean				Mean	confidence
Resource	Use %	%	%	%	%	Total	household	Per capita	Total	Unit	household	limit (±)
Nonsalmon fish	**93.1**	**82.8**	**75.9**	**75.9**	**48.3**	**10,518.9**	**263.0**	**93.0**				**40.2**
Pacific herring	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Gal.	0.0	0.0
Pacific herring roe	3.4	0.0	0.0	3.4	0.0	0.0	0.0	0.0	0.0	Gal.	0.0	0.0
Rainbow smelt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Gal.	0.0	0.0
Pacific halibut	3.4	0.0	0.0	3.4	3.4	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Arctic lamprey	3.4	0.0	0.0	3.4	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Alaska blackfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Lbs.	0.0	0.0
Burbot	6.9	10.3	3.4	3.4	0.0	3.3	0.1	0.0	1.4	Ind.	0.0	107.4
Arctic char	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Dolly Varden	6.9	3.4	3.4	3.4	0.0	11.6	0.3	0.1	8.3	Ind.	0.2	107.4
Lake trout	3.4	0.0	0.0	3.4	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Arctic grayling	44.8	31.0	27.6	20.7	3.4	135.2	3.4	1.2	193.1	Ind.	4.8	40.8
Northern pike	44.8	46.4	41.4	13.8	24.1	1,675.9	41.9	14.8	335.2	Ind.	8.4	36.0
Sheefish	69.0	37.9	34.5	51.7	31.0	1,282.2	32.1	11.3	229.0	Ind.	5.7	35.1
Longnose sucker	27.6	24.1	24.1	10.3	6.9	316.7	7.9	2.8	452.4	Ind.	11.3	43.6
Rainbow trout	6.9	3.4	0.0	6.9	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Broad whitefish	48.3	31.0	27.6	31.0	20.7	1,019.6	25.5	9.0	728.3	Ind.	18.2	46.3
Bering cisco	41.4	20.7	20.7	27.6	6.9	1,824.8	45.6	16.1	1,303.4	Ind.	32.6	49.5
Least cisco	17.2	10.3	10.3	10.3	3.4	551.7	13.8	4.9	551.7	Ind.	13.8	60.0
Humpback whitefish	41.4	24.1	24.1	27.6	13.8	2,725.5	68.1	24.1	1,362.8	Ind.	34.1	46.5
Round whitefish	27.6	17.2	17.2	17.2	10.3	972.4	24.3	8.6	648.3	Ind.	16.2	51.5
Unknown whitefishes	6.9	0.0	0.0	6.9	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2013.

Note Resources where the percentage using is greater than the combined received and harvest indicate use from resources obtained during a previous yea

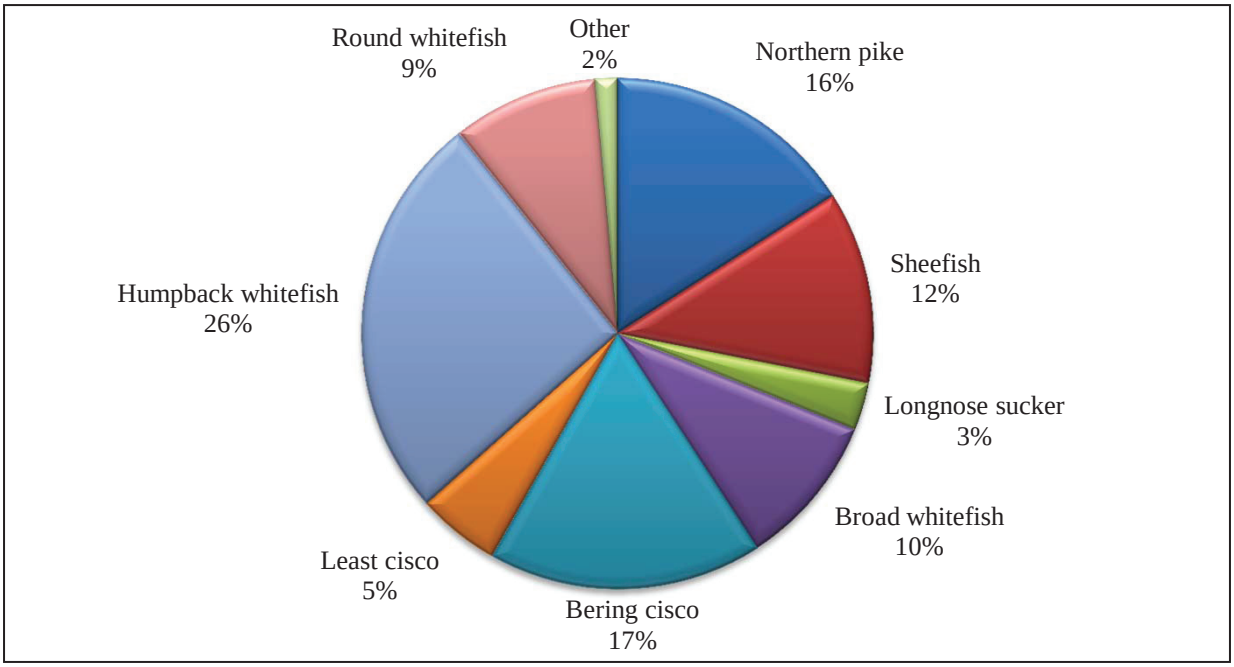

Figure 4-5.–Estimated harvests of nonsalmon fish, Nikolai, Alaska, 2012.

Table 4-6.–Estimated percentages of nonsalmon fish harvested by gear type, resource, and total nonsalmon fish harvest Nikolai, Alaska, 2012.

Resource	Percentage base	Gillnet or seine		Ice fishing (hook under ice)		Net under ice		jig		Other		Subsistence gear, any method		Rod and reel		Dip net		Any method	
		Number	Pounds	Number	Pounds	No.	Lbs.	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Nonsalmon fish	Gear type	100.0%	100.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	0.0%	0.0%	100.0%	100.0%
	Resource	90.9%	86.6%	1.6%	2.4%	0.0%	0.0%	0.0%	0.0%	2.5%	2.7%	95.0%	91.6%	5.0%	8.4%	0.0%	0.0%	100.0%	100.0%
	Total	90.9%	86.6%	1.6%	2.4%	0.0%	0.0%	0.0%	0.0%	2.5%	2.7%	95.0%	91.6%	5.0%	8.4%	0.0%	0.0%	100.0%	100.0%
Pacific herring	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pacific herring roe	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Rainbow smelt	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Pacific halibut	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Arctic lamprey	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Alaska blackfish	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Burbot	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Arctic char	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Dolly Varden	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.8%	1.3%	0.0%	0.0%	0.1%	0.1%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	100.0%	100.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.0%	0.0%	0.1%	0.1%
Lake trout	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Arctic grayling	Gear type	0.3%	0.1%	53.0%	13.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	0.5%	44.8%	10.4%	0.0%	0.0%	3.3%	1.3%
	Resource	7.1%	7.1%	25.0%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	32.1%	32.1%	67.9%	67.9%	0.0%	0.0%	100.0%	100.0%
	Total	0.2%	0.1%	0.8%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	0.4%	2.3%	0.9%	0.0%	0.0%	3.3%	1.3%
Northern pike	Gear type	3.0%	8.6%	47.0%	86.4%	0.0%	0.0%	0.0%	0.0%	28.6%	74.1%	4.4%	12.5%	32.1%	53.0%	0.0%	0.0%	5.8%	15.9%
	Resource	46.9%	46.9%	12.8%	12.8%	0.0%	0.0%	0.0%	0.0%	12.3%	12.3%	72.0%	72.0%	28.0%	28.0%	0.0%	0.0%	100.0%	100.0%
	Total	2.7%	7.5%	0.7%	2.0%	0.0%	0.0%	0.0%	0.0%	0.7%	2.0%	4.2%	11.5%	1.6%	4.5%	0.0%	0.0%	5.8%	15.9%

-continued-

Table 4-6.–Page 2 of 2.

Resource	Percentage base	Subsistence methods: Gillnet or seine Number	Gillnet or seine Pounds	Longline or skate Number	Longline or skate Pounds	Net under ice No.	Net under ice Lbs.	jig Number	jig Pounds	Other Number	Other Pounds	Subsistence gear, any method Number	Subsistence gear, any method Pounds	Rod and reel Number	Rod and reel Pounds	Dip net No.	Dip net Lbs.	Any method Number	Any method Pounds
Sheefish	Gear type	3.3%	10.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.1%	10.1%	18.9%	34.9%	0.0%	0.0%	3.9%	12.2%
	Resource	75.9%	75.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	75.9%	75.9%	24.1%	24.1%	0.0%	0.0%	100.0%	100.0%
	Total	3.0%	9.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.0%	9.3%	0.9%	2.9%	0.0%	0.0%	3.9%	12.2%
Longnose sucker	Gear type	6.5%	2.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	71.4%	25.9%	8.1%	3.3%	1.4%	0.3%	0.0%	0.0%	7.8%	3.0%
	Resource	76.2%	76.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	22.9%	22.9%	99.1%	99.1%	0.9%	0.9%	0.0%	0.0%	100.0%	100.0%
	Total	5.9%	2.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	0.7%	7.7%	3.0%	0.1%	0.0%	0.0%	0.0%	7.8%	3.0%
Rainbow trout	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Broad whitefish	Gear type	13.8%	11.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	13.2%	10.6%	0.0%	0.0%	0.0%	0.0%	12.5%	9.7%
	Resource	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
	Total	12.5%	9.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	12.5%	9.7%	0.0%	0.0%	0.0%	0.0%	12.5%	9.7%
Bering cisco	Gear type	24.7%	20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	23.6%	18.9%	0.0%	0.0%	0.0%	0.0%	22.4%	17.3%
	Resource	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
	Total	22.4%	17.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	22.4%	17.3%	0.0%	0.0%	0.0%	0.0%	22.4%	17.3%
Least cisco	Gear type	10.4%	6.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.0%	5.7%	0.0%	0.0%	0.0%	0.0%	9.5%	5.2%
	Resource	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
	Total	9.5%	5.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	9.5%	5.2%	0.0%	0.0%	0.0%	0.0%	9.5%	5.2%
Humpback whitefish	Gear type	25.8%	29.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	24.7%	28.3%	0.0%	0.0%	0.0%	0.0%	23.4%	25.9%
	Resource	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
	Total	23.4%	25.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	23.4%	25.9%	0.0%	0.0%	0.0%	0.0%	23.4%	25.9%
Round whitefish	Gear type	12.3%	10.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.7%	10.1%	0.0%	0.0%	0.0%	0.0%	11.2%	9.2%
	Resource	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
	Total	11.2%	9.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	11.2%	9.2%	0.0%	0.0%	0.0%	0.0%	11.2%	9.2%
Unknown whitefishes	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source ADF&G Division of Subsistence household surveys, 2013.

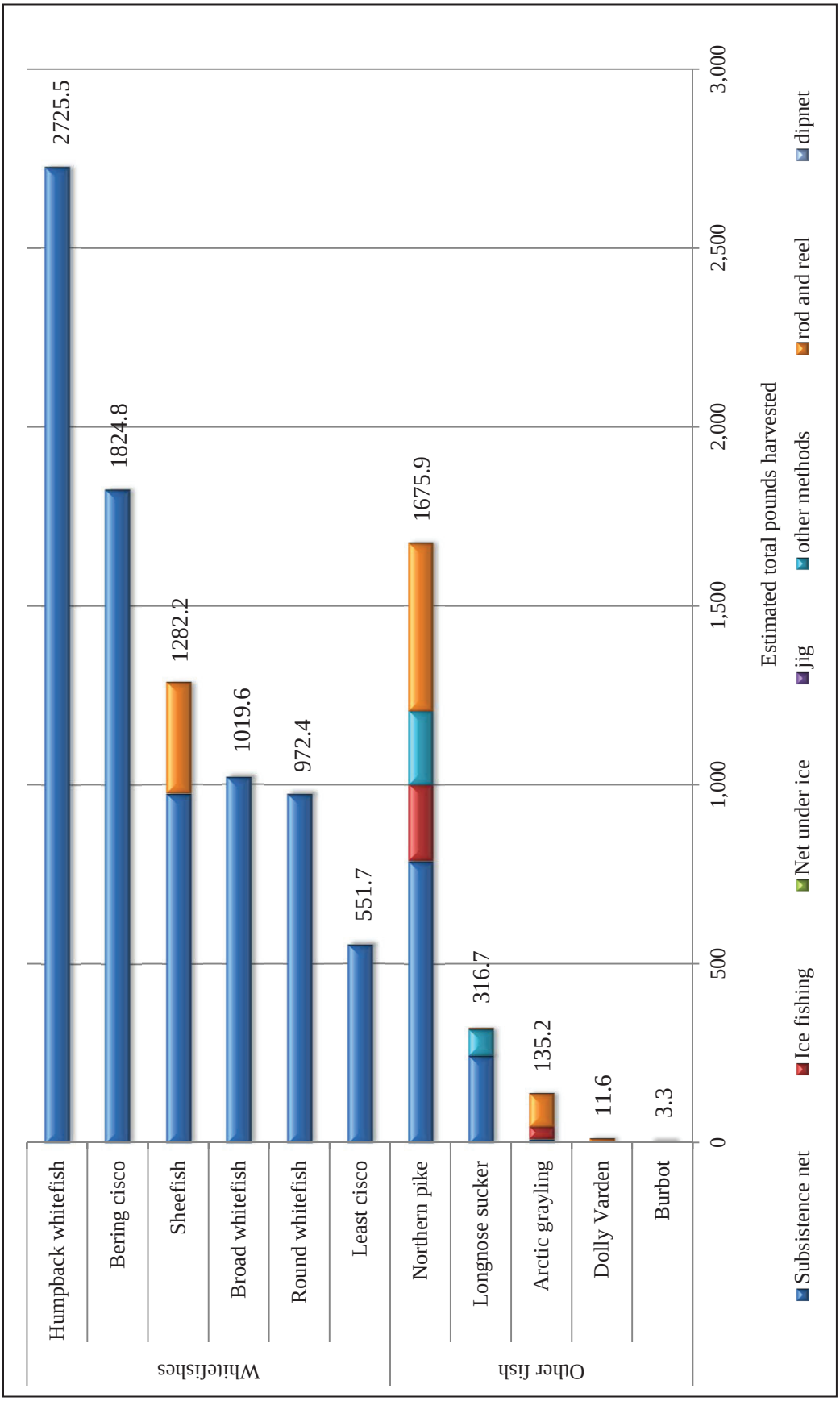

Figure 4-6.–Estimated harvest of nonsalmon fish by gear type, resource, Nikolai, Alaska, 2012.

Nonsalmon Fish Harvests and Uses 2013

In 2013, Nikolai households harvested an estimated total of 6,448 lb, or 67 lb per capita, of nonsalmon fish (Table 4-7). Northern pike was the species that was harvested in the largest amount by weight (2,565 lb, 27 lb per capita, or 40% of the total nonsalmon harvest by weight) (Figure 4-7). Other species harvested included sheefish (899 lb, 9 lb per capita, and 14% of harvest), followed by humpback whitefish (642 lb, 7 lb per capita, and 10% of harvest), Bering cisco (1050 lb, 11 lb per capita, and 16% of harvest), broad whitefish (464 lb, 5 lb per capita, and 7% of harvest), longnose sucker (488 lb, 5 lb per capita, and 8% of harvest), least cisco (137 lb, 1 lb per capita, and 2% of harvest), and round whitefish (113 lb, 1 lb per capita, and 2% of harvest). Nikolai households also reported relatively small harvests of Arctic grayling (59 lb), burbot (22 lb), and Dolly Varden (11 lb). Survey results also recorded other aspects of uses of subsistence harvests of nonsalmon fishes, such as the prevalence of sharing by community members. In 2013, 83% of Nikolai households used nonsalmon fish, 71% harvested nonsalmon fish, 46% gave nonsalmon fish to other households, and 75% received nonsalmon fish from other households. Table 4-7 provides percentages of Nikolai households that reported giving various species of nonsalmon fishes away to other households or receiving them from other households.

Also in 2013, the Nikolai Edzeno' Tribal Council provided a fish wheel for use by the community. The fish wheel was constructed and operated by Nikolai community members and was located at the left bank of the South Fork Kuskokwim River immediately across the river from Nikolai during July through September, 2013. Representatives of the tribal council assumed the primary responsibility of operating the fish wheel as a source of fish for all Nikolai households and for the purpose of providing an educational opportunity for the community, particularly students in grades kindergarten through 12 and young adults. When Division of Subsistence staff conducted household surveys for the 2013 calendar year, community members indicated that they did not consider the fish they received from the fish wheel as household harvests. Rather, respondents explained that the fish wheel belonged to the community and that all harvests were communal. During surveys, respondents were asked whether they received any fish from the community fish wheel. Those who did were asked to enumerate the species and individual fish that they received. The number and edible pounds of fish received by each household from the community fish wheel was attributed to the total harvest for the community in analysis. These harvest amounts were not recorded as a harvest or an attempt to harvest for each individual household; however, they were counted as resources received by individual households and are included within the reported percentages of households receiving these resources (Table 4-7).

In 2013, the community of Nikolai harvested 1,672 lb of nonsalmon fish (17 lb per capita) from the fish wheel with 67% of households receiving fish caught in the wheel (Table 4-8). These harvests included Bering cisco (714 lb, 7 lb per capita, with 42% of households receiving these fish), longnose sucker (347 lb, 4 lb per capita, with 8% of households receiving them), broad whitefish (258 lb, 3 lb per capita, distributed to 33% of households), and humpback whitefish (258 lb, 3 lb per capita, with 21% of households receiving these fish). Nikolai households also received relatively small amounts of northern pike (75 lb), least cisco (18 lb), and Dolly Varden (2 lb) from the fish wheel.

Table 4-9 lists the number and pounds of each nonsalmon fish species harvested by Nikolai households in 2013 in percentages by gear type. Nikolai residents harvested the majority of their nonsalmon fish by gillnets (47% of edible weight in lb of nonsalmon fish), 44% of broad whitefish, 87% of least cisco, 60% of humpback whitefish, 100% of round whitefish, and 29% of longnose sucker were harvested by gillnet. Nikolai households used gillnets to harvest 32% of Bering cisco, 55% of northern pike, 33% of sheefish, and 5% of Arctic grayling. Nikolai fishers used rod and reel gear to harvest 95% of Arctic grayling, 67% of sheefish, 29% of northern pike, and 100% of burbot and 80% of Dolly Varden. As an additional method, Nikolai residents harvested 13% of edible pounds of northern pike with a hook and line under the ice. Table 4-9 and Figure 4-8 depict these harvests by gear type in terms of the total edible pounds harvested for each species (*see also* Appendix D, Table D4).

Table 4-7.–Estimated harvests and uses of nonsalmon fish, Nikolai, Alaska, 2013.

	Percentage of households					Harvest weight (lb)			Harvest amount			95%
		Attempt	Harvest	Receive	Give		Mean				Mean	confidence
Resource	Use %	%	%	%	%	Total	household	Per capita	Total	Unit	household	limit (±)
Nonsalmon fish	**83.3**	**70.8**	**70.8**	**75.0**	**45.8**	**4,743.2**	**131.8**	**49.4**				**70.1**
Pacific herring	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Rainbow smelt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Arctic lamprey	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Alaska blackfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Burbot	16.7	8.3	4.2	12.5	0.0	21.6	0.6	0.2	9.0	Ind.	0.3	119.4
Arctic char	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Dolly Varden	12.5	8.7	4.2	4.3	4.2	8.4	0.2	0.1	6.0	Ind.	0.2	119.4
Lake trout	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Arctic grayling	50.0	33.3	33.3	20.8	12.5	58.8	1.6	0.6	84.0	Ind.	2.3	47.2
Northern pike	54.2	50.0	50.0	16.7	25.0	2,415.0	67.1	25.2	483.0	Ind.	13.4	74.4
Sheefish	45.8	41.7	29.2	29.2	16.7	898.8	25.0	9.4	160.5	Ind.	4.5	53.1
Longnose sucker	20.8	12.5	12.5	8.3	0.0	141.8	3.9	1.5	202.5	Ind.	5.6	89.8
Rainbow trout	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ind.	0.0	0.0
Broad whitefish	70.8	33.3	25.0	58.3	16.7	205.8	5.7	2.1	147.0	Ind.	4.1	86.1
Bering cisco	50.0	20.8	20.8	33.3	8.3	378.0	10.5	3.9	270.0	Ind.	7.5	92.9
Least cisco	25.0	16.7	12.5	12.5	4.2	118.5	3.3	1.2	118.5	Ind.	3.3	92.4
Humpback whitefish	41.7	25.0	16.7	25.0	8.3	384.0	10.7	4.0	192.0	Ind.	5.3	93.6
Round whitefish	8.3	4.2	4.2	8.3	4.2	112.5	3.1	1.2	75.0	Ind.	2.1	119.4

Source ADF&G Division of Subsistence household surveys, 2014.

Note Resources where the percentage using is greater than the combined received and harvest indicate use from resources obtained during a previous year. Totals do not include community fish wheel harvests.

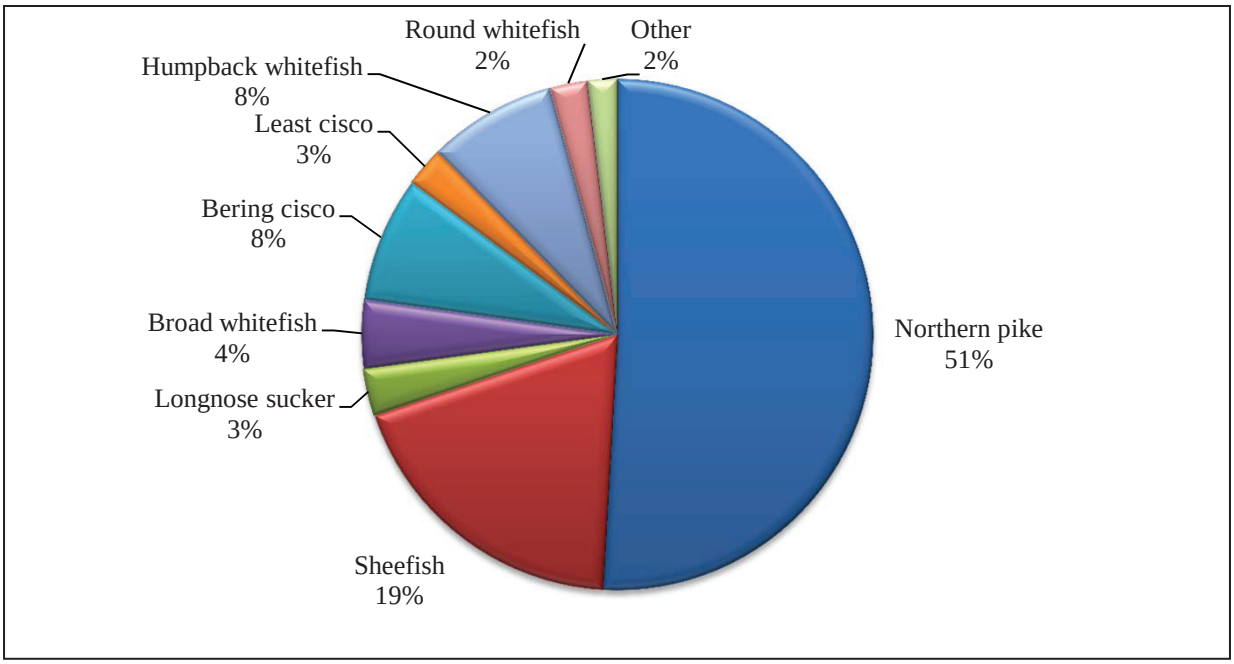

Figure 4-7.–Estimated harvests of nonsalmon fish, Nikolai, Alaska, 2013.

Table 4-8.–Estimated community fish wheel harvest, Nikolai, Alaska, 2013.

	Percentage of HH obtaining fish from fishwheel	Harvest weight (lb)			Harvest amount		
Resource	%	Total	Mean household	Per capita	Total	Unit	Mean household
Nonsalmon fish	**66.7**	**1,659.3**	**46.1**	**17.3**			
Dolly Varden	4.2	2.1	0.1	0.0	1.5	Ind.	0.0
Northern pike	4.2	75.0	2.1	0.8	15.0	Ind.	0.4
Sheefish	4.2	8.4	0.2	0.1	1.5	Ind.	0.0
Longnose sucker	8.3	346.5	9.6	3.6	495.0	Ind.	13.8
Broad whitefish	29.2	258.3	7.2	2.7	184.5	Ind.	5.1
Bering cisco	37.5	714.0	19.8	7.4	510.0	Ind.	14.2
Least cisco	8.3	18.0	0.5	0.2	18.0	Ind.	0.5
Humpback whitefish	20.8	237.0	6.6	2.5	118.5	Ind.	3.3

Source ADF&G Division of Subsistence household surveys, 2014.
Note Includes only estimates of harvest from the community fish wheel.

Table 4-9.–Estimated harvest of nonsalmon fish by gear type, resource, Nikolai, Alaska, 2013.

		Subsistence methods																			
		Gillnet or seine		Ice fishing (hook under ice)		Net under ice		Jig		Fish wheel		Other		Subsistence gear, any method		Rod and reel		Dip net		Any method	
Resource	Percentage base	Number	Pounds	Number	Pounds	No.	Lbs.	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Nonsalmon fish	Gear type	100.0%	100.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	100.0%	100.0%	100.0%	100.0%	0.0%	0.0%	100.0%	100.0%
	Resource	42.6%	46.7%	2.2%	5.2%	0.0%	0.0%	0.0%	0.0%	43.9%	25.9%	0.0%	0.0%	88.7%	77.9%	11.3%	22.1%	0.0%	0.0%	100.0%	100.0%
	Total	42.6%	46.7%	2.2%	5.2%	0.0%	0.0%	0.0%	0.0%	43.9%	25.9%	0.0%	0.0%	88.7%	77.9%	11.3%	22.1%	0.0%	0.0%	100.0%	100.0%
Pacific herring	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Rainbow smelt	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Arctic lamprey	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Alaska blackfish	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Burbot	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.6%	1.5%	0.0%	0.0%	0.3%	0.3%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	100.0%	100.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.3%	0.0%	0.0%	0.3%	0.3%
Arctic char	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Dolly Varden	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.0%	0.0%	0.1%	0.0%	1.7%	0.6%	0.0%	0.0%	0.2%	0.2%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	20.0%	20.0%	0.0%	0.0%	20.0%	20.0%	80.0%	80.0%	0.0%	0.0%	100.0%	100.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.1%	0.0%	0.0%	0.2%	0.2%
Lake trout	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Arctic grayling	Gear type	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.1%	22.7%	3.9%	0.0%	0.0%	2.7%	0.9%
	Resource	5.4%	5.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.4%	5.4%	94.6%	94.6%	0.0%	0.0%	100.0%	100.0%
	Total	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	2.6%	0.9%	0.0%	0.0%	2.7%	0.9%
Northern pike	Gear type	21.6%	47.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	1.1%	4.5%	0.0%	0.0%	13.4%	36.4%	42.1%	51.6%	0.0%	0.0%	16.6%	39.8%
	Resource	55.3%	55.3%	13.2%	13.2%	0.0%	0.0%	0.0%	0.0%	2.9%	2.9%	0.0%	0.0%	71.3%	71.3%	28.7%	28.7%	0.0%	0.0%	100.0%	100.0%
	Total	9.2%	22.0%	2.2%	5.2%	0.0%	0.0%	0.0%	0.0%	0.5%	1.2%	0.0%	0.0%	11.9%	28.4%	4.8%	11.4%	0.0%	0.0%	16.6%	39.8%
Sheefish	Gear type	4.0%	9.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	5.9%	30.9%	42.4%	0.0%	0.0%	5.2%	13.9%
	Resource	32.7%	32.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	32.7%	32.7%	67.3%	67.3%	0.0%	0.0%	100.0%	100.0%
	Total	1.7%	4.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.7%	4.6%	3.5%	9.4%	0.0%	0.0%	5.2%	13.9%
Longnose sucker	Gear type	15.4%	4.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	36.6%	20.7%	0.0%	0.0%	25.5%	9.7%	0.0%	0.0%	0.0%	0.0%	22.6%	7.6%
	Resource	29.0%	29.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	71.0%	71.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
	Total	6.6%	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	16.0%	5.4%	0.0%	0.0%	22.6%	7.6%	0.0%	0.0%	0.0%	0.0%	22.6%	7.6%

-continued-

Table 4-9.–Page 2 of 2.

Resource	Percentage base	Subsistence methods: Gillnet or seine Number	Gillnet or seine Pounds	Longline or skate Number	Longline or skate Pounds	Net under ice No.	Net under ice Lbs.	Jig Number	Jig Pounds	Fish wheel Number	Fish wheel Pounds	Other Number	Other Pounds	Subsistence gear, any method Number	Subsistence gear, any method Pounds	Rod and reel Number	Rod and reel Pounds	Dip net No.	Dip net Lbs.	Any method Number	Any method Pounds
Rainbow trout	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Broad whitefish	Gear type	11.2%	6.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	13.6%	15.4%	0.0%	0.0%	12.1%	9.2%	0.0%	0.0%	0.0%	0.0%	10.7%	7.2%
	Resource	44.3%	44.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	55.7%	55.7%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
	Total	4.8%	3.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.0%	4.0%	0.0%	0.0%	10.7%	7.2%	0.0%	0.0%	0.0%	0.0%	10.7%	7.2%
Bering cisco	Gear type	18.2%	11.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	37.7%	42.7%	0.0%	0.0%	27.4%	20.9%	0.0%	0.0%	0.0%	0.0%	24.3%	16.3%
	Resource	32.0%	32.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	68.0%	68.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
	Total	7.8%	5.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	16.5%	11.1%	0.0%	0.0%	24.3%	16.3%	0.0%	0.0%	0.0%	0.0%	24.3%	16.3%
Least cisco	Gear type	9.0%	3.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	1.1%	0.0%	0.0%	5.0%	2.7%	0.0%	0.0%	0.0%	0.0%	4.4%	2.1%
	Resource	86.8%	86.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	13.2%	13.2%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
	Total	3.8%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.3%	0.0%	0.0%	4.4%	2.1%	0.0%	0.0%	0.0%	0.0%	4.4%	2.1%
Humpback whitefish	Gear type	14.6%	12.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	9.5%	15.4%	0.0%	0.0%	11.7%	12.8%	0.0%	0.0%	0.0%	0.0%	10.4%	10.0%
	Resource	59.8%	59.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	40.2%	40.2%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
	Total	6.2%	6.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.2%	4.0%	0.0%	0.0%	10.4%	10.0%	0.0%	0.0%	0.0%	0.0%	10.4%	10.0%
Round whitefish	Gear type	5.7%	3.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.7%	2.2%	0.0%	0.0%	0.0%	0.0%	2.4%	1.7%
	Resource	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
	Total	2.4%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.4%	1.7%	0.0%	0.0%	0.0%	0.0%	2.4%	1.7%

Source ADF&G Division of Subsistence household surveys, 2014.

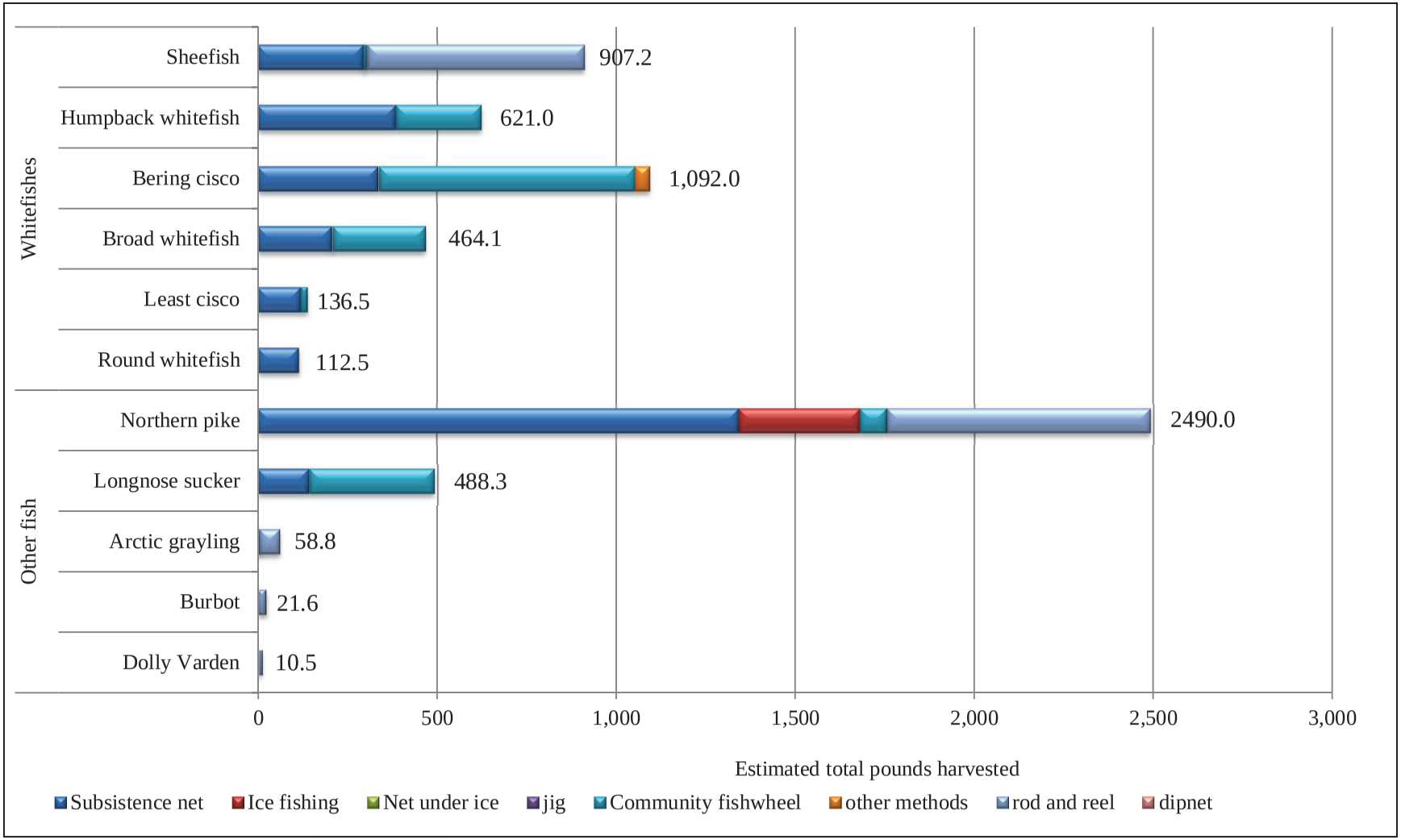

Figure 4-8.–Estimated harvest of nonsalmon fish by gear type, resource, Nikolai, Alaska, 2013.

Nonsalmon Fish Harvests and Uses 1984, 2002, and 2011

Division of Subsistence staff completed a study documenting Nikolai community's use of natural resources in 1984 (Stokes 1985), as well as comprehensive harvest surveys in Nikolai in 2002 (Holen et al. 2006) and 2011 (Ikuta et al. 2014). Stokes (1985) recorded extensive information regarding harvests and uses of nonsalmon fishes in 1984, as well as information about historical subsistence practices; however, he did not record harvest amounts in his report. These surveys recorded harvest and use of salmon and nonsalmon fishes, land mammals, birds, and vegetation by Nikolai households during those study years. In 2002 Nikolai's total whitefish harvest was 1,673 lb, or 17 lb per capita (Holen et al. 2006). These harvests included 997 lb of sheefish and 676 lb of other whitefishes (i.e., broad whitefish, humpback whitefish, Bering cisco, least cisco, and round whitefish). Together, sheefish and other whitefishes represented 59% of all nonsalmon fish harvests in 2002 in Nikolai. During 2002, 41% of Nikolai households used sheefish, 33% harvested sheefish, 15% gave sheefish away, and 15% received sheefish from other households. Also in 2002, 56% of Nikolai households used whitefishes other than sheefish, 48% harvested whitefishes, 30% gave whitefishes away, and 15% received whitefishes from other households. In 2002, the remaining harvests of nonsalmon fishes included 725 lb of northern pike (8 lb per capita), 286 lb of Arctic grayling (3 lb per capita), 110 lb of burbot (1 lb per capita), and 36 lb of Dolly Varden (less than 1 lb per capita). Harvests of all nonsalmon fishes composed 7% of total harvests by weight of all wild resources in Nikolai in 2002.

In 2011 Nikolai households harvested an estimated total of 8,883 lb of nonsalmon fishes, including 5,479 lb of whitefishes (Ikuta et al. 2014). Nikolai households harvested an estimated 2,134 lb of sheefish (18 lb per capita), 1,683 lb of humpback whitefish (14 lb per capita), 716 lb of Bering cisco (6 lb per capita), 360 lb of round whitefish (3 lb per capita), 315 lb of broad whitefish (3 lb per capita), and 272 lb of least cisco (2 lb per capita). In 2011 Nikolai households also harvested an estimated 2,895 lb of northern pike (25 lb per capita), 171 lb of longnose sucker (2 lb per capita), 150 lb of rainbow trout (1 lb per capita), as well as 88 lb of Arctic grayling, 88 lb of Dolly Varden, and 11 lb of burbot. Among all Nikolai households in 2011, 58% used whitefish, 42% harvested whitefish, 31% gave whitefish away, 42% received whitefish. In addition, 70% of Nikolai Households used northern pike in 2011, 58% harvested northern pike, 35% gave northern pike away, and 27% received northern pike (Ikuta et al. 2014).

Nonsalmon Fish Harvests and Uses Compared to Other Years

Harvests and Uses Compared: 2002, 2011, 2012, and 2013

Figure 4-9 compares pounds per capita whitefish harvests and other nonsalmon fish harvests for Nikolai for the years 2002, 2011, 2012, and 2013. Overall whitefish harvests have shown some variability with the least harvest rate occurring in 2002 at 17 lb per capita, and the greatest harvest rate at 74 lb per capita in 2012. Harvest rates of other nonsalmon fishes remained relatively similar throughout each study year, ranging from lows of 12 lb per capita in 2002 and 19 lb per capita in 2012 to highs of 29 lb per capita in 2011 and 33 lb per capita in 2013 .

Figure 4-10 compares lb per capita whitefish harvests by species for Nikolai in 2011, 2012, and 2013. Data from 2002 does not appear in this figure because surveys in that study year did not ask respondents to distinguish among whitefish species other than sheefish. In 2012, harvest rates of broad whitefish (9 lb per capita), humpback whitefish (24 lb per capita), Bering cisco (16 lb per capita), least cisco (5 lb per capita), and round whitefish (9 lb per capita) were greatest in comparison to other study years. In 2011, the harvest rate of sheefish was greatest at 18 lb per capita, with similar harvest rates in 2012 and 2013 at 11 lb per capita and 9 lb per capita, respectively.

Figure 4-11 compares whitefish use, fishing effort, and harvest success by the percentage of total households in Nikolai for the years 2002, 2011, 2012, and 2013. The percentages of Nikolai households using whitefishes were similar during 2002 and 2011 at 56% and 54%, respectively. Use of whitefishes was highest in 2012 with an estimated 83% of households using these fish. Percentages of households attempting to harvest

and successfully harvesting whitefishes were similar among all study years, with 35–48% of households harvesting whitefishes and 38–54% attempting to harvest whitefishes.

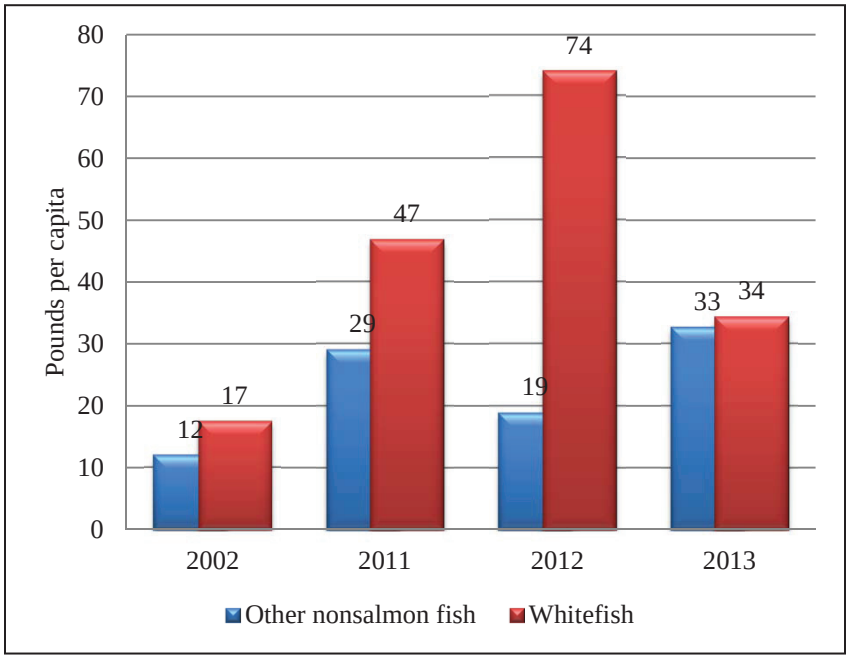

Figure 4-9.–Per capita whitefish and nonsalmon fish harvests, Nikolai, Alaska, 2002, 2011, 2012, and 2013.

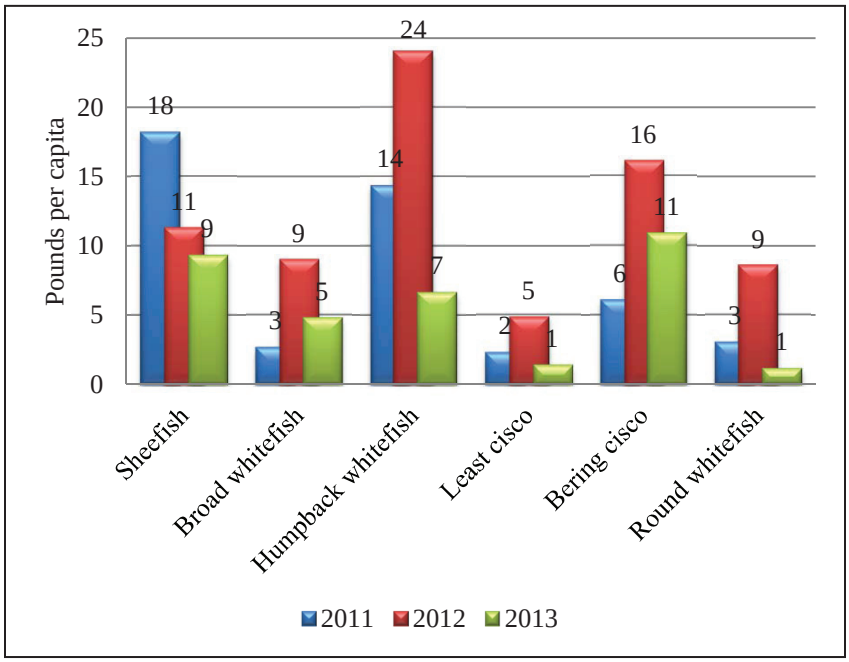

Figure 4-10.–Per capita whitefish harvests by species, Nikolai, Alaska, 2011, 2012, and 2013.

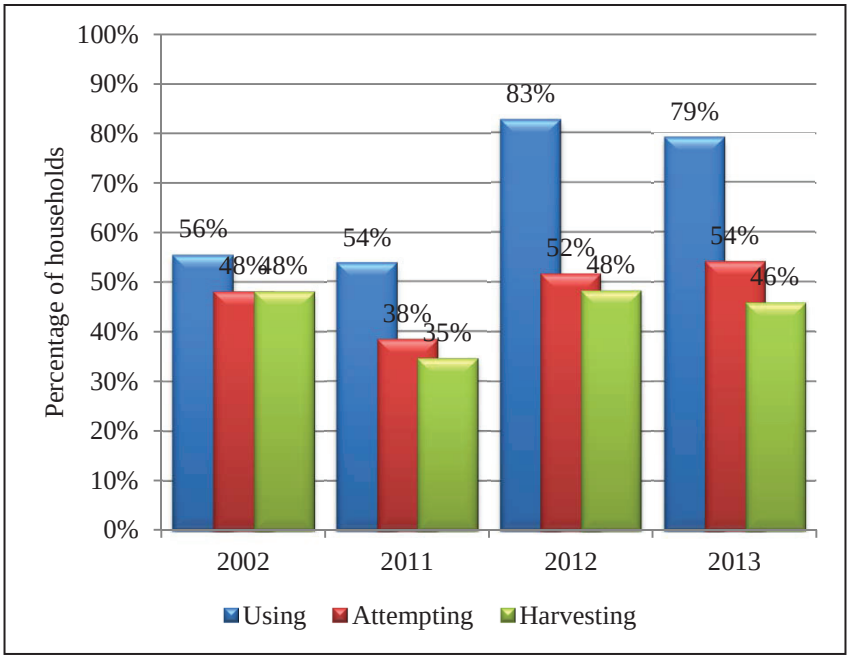

Figure 4-11.–Whitefish use, fishing effort, and harvest success, Nikolai, Alaska, 2002, 2011, 2012, and 2013.

Harvests and Uses Compared: Nonsalmon Fish Harvests and Uses Compared to Other Years

When Nikolai households that reported use of whitefishes were asked how their 2012 whitefish harvest effort compared to their whitefish harvest effort 5 years prior 41% of households reported that their 2012 harvest effort was less (Table 4-10). When asked how their 2012 whitefish harvest effort compared to their whitefish harvest effort 10 years ago 56% of households reported that their 2012 harvest effort was less. When Nikolai households were asked how their 2013 whitefish harvest effort compared to their whitefish harvest effort 5 years prior 25% of households reported that their 2013 harvest effort was less. Thirty-five percent of households reported that their whitefish harvest effort was less in 2013 than 10 years prior. In 2012 approximately one third of Nikolai households reported that their whitefish harvest effort was the same as it had been 5 years and 10 years prior. In 2013, 45% of households reported that their harvest effort was the same as it had been 5 years prior, and 40% reported that their harvest effort was the same as it had been 10 years prior. In 2012 and 2013, some households also reported that their whitefish harvest effort in the study years was greater than it had been 5 years and 10 years prior. In 2012, 22% of households reported that their effort had increased from 5 years prior, while 11% reported that it had increased from 10 years prior. In 2013, 15% of households reported that their effort had increased from 5 years prior, and 10% reported that it had increased from 10 years prior.

In 2013, survey respondents were also asked to assess whether their whitefish harvest effort had changed since 20 and 30 years prior to the study years. Forty-five percent of households reported that their effort had decreased from 20 years prior, and 40% reported that it had remained similar. Also in 2013, 55% of households reported that their effort had decreased from 30 years prior, while 25% reported that it had remained similar.

Survey respondents were also asked how important whitefishes were to them during the study years and in the past. In 2012, 41% of Nikolai households reported that whitefish were important at that time as well as in the past, while 37% reported that whitefish were very important in 2012 as well as in the past. In 2013, 45% of Nikolai households reported that whitefish were important at that time as well as in the past, while 50% reported that whitefish were very important in 2013 as well as in the past. In 2012, 74% of households and in 2013, 85% of households reported that whitefishes were as important during the study years as they were in the past (Table 4-11).

Table 4-10.–Household responses to effort in harvesting whitefish, Nikolai, Alaska, 2012 and 2013.

	2012	2013
Percent of households		
using whitefish	58.8%	79.2%
attempting to harvest whitefish	52.9%	54.2%
harvesting whitefish	41.2%	45.8%
Harvest effort compared with … *(percent of households)* [a]		
5 years ago		
No response	0.0%	15.0%
Less effort	40.7%	25.0%
Same effort	33.3%	45.0%
More effort	22.2%	15.0%
10 years ago		
No response	0.0%	15.0%
Less effort	55.6%	35.0%
Same effort	29.6%	40.0%
More effort	11.1%	10.0%
20 years ago[b]		
No response		15.0%
Less effort		45.0%
Same effort		40.0%
More effort		0.0%
30 years ago[b]		15.0%
No response		55.0%
Less effort		25.0%
Same effort		0.0%
More effort		0.0%

Source ADF&G Division of subsistence household surveys, 2013 and 2014.

[a] Percentages based upon only households reporting use of whitefish.

[b] Question was not asked in 2012.

Table 4-11.–Household responses to the importance of whitefish, Nikolai, Alaska, 2012 and 2013.

	2012	2013
Percent of households using whitefish	93.1%	83.3%
Importance of whitefish to households today		
(percent of households)		
No response	3.7%	5.0%
Not important	18.5%	0.0%
Important	40.7%	45.0%
Very important	37.0%	50.0%
Importance of whitefish to households in the past		
(percent of households)		
No response	3.7%	5.0%
Not important	18.5%	0.0%
Important	40.7%	45.0%
Very important	37.0%	50.0%
Households responding whitefish **less** important today	18.5%	10.0%
Households responding whitefish **more** important today	7.4%	5.0%
Households responding whitefish as important today as in the past	74.1%	85.0%

Source ADF&G Division of Subsistence household surveys, 2013 and 2014.
Note All percentages are based upon the number of households responding yes to using whitefish.

Table 4-12.–Households reporting what they do differently if they cannot get enough whitefish, Nikolai, Alaska, 2012 and 2013.

	2012	2013
Households providing a response	26	17
percentage of households reporting that they would …		
Buy subsistence foods	0.0%	0.0%
Buy store foods	19.2%	0.1%
Use other subsistence resources	50.0%	0.5%
Ask others for help	0.0%	0.0%
Make due with what they did get	30.8%	0.1%
Increase effort	3.8%	0.0%
Work more	0.0%	0.0%
Use other foods (unspecified)	3.8%	0.0%
public assistance	0.0%	0.0%
other	0.0%	0.1%

Source ADF&G Division of subsistence household surveys, 2013 and 2014.
All percentages are based upon the number of households responding yes to using whitefish.

Both in 2012 and in 2013, when survey respondents were asked "if you cannot get whitefish what do you do differently?" the primary answers were either to use other subsistence resources or to make do with what they got (Table 4-12). Some respondents said that if they did not get enough whitefish they would purchase more store-bought foods. A small percentage of households responded that they would either increase their effort to harvest whitefish or that they would use other food sources.

Whitefish and Nonsalmon Species Used by Nikolai Residents

Whitefishes and nonsalmon fishes represent a substantial portion of fish harvests by residents of Nikolai. In 2011, Division of Subsistence harvest surveys documented that nonsalmon fishes composed an estimated 37% of all fish harvests by edible pounds, with whitefishes making up the majority of the harvest of nonsalmon fishes (Ikuta et al. 2014:182). During the ethnographic interview phase of this study, one key respondent noted the importance of whitefishes to members of his household. He stated that "whitefishes are the main fish…We catch more whitefish than any other species of fish." (NIK-1) Six species of whitefishes occur within the upper Kuskokwim River region. Whitefish species of the region include sheefish (inconnu), broad whitefish, humpback whitefish, least cisco, Bering cisco, and round whitefish (R. J. Brown et al. 2012:174). These species are known locally in Upper Kuskokwim Athabascan as *zidlaghe* (sheefish) (Plate 4-2), *tilaya* (broad whitefish) (Plate 4-3), *tsendude* (humpback whitefish) (Plate 4-3), *tokomidza* (least cisco) (Plate 4-3), *dilmije* (Bering cisco) (Plate 4-4), and *hwstin'* (round whitefish) (Plate 4-5). As a group, all species of whitefishes other than sheefish are known as *sajila*. Nikolai fishers typically harvest a variety of other nonsalmon fishes throughout the region. These include northern pike (*ch'ighilduda* in Upper Kuskokwim Athabascan), Arctic grayling (*ts'odat'ana*), burbot (*ts'onya*), longnose sucker (*donts'oda*), and Dolly Varden (*hoch'ilmoya*) (Stokes 1985:374).

Whitefish Movements and Spawning in the Upper Kuskokwim Watershed, and Nikolai Fishing Seasons

Whitefish Movements and Spawning

The upper Kuskokwim River drainage includes a variety of aquatic habitats; consequently, these species are not similarly distributed throughout the region. Sheefish generally make annual migrations into the region from lower reaches in the Kuskokwim River and Kuskokwim Bay with spawning likely occurring at several locations in the drainage (R. J. Brown et al. 2012:176–177). Spawning populations of sheefish in the Big River and Middle Fork Kuskokwim River are known to area residents who have named the Big River after this species. This stream is known in Upper Kuskokwim Athabascan as *Zidlaghe Zigashno'*, in English "sheefish harvest river" (Stokes 1985:358). Fishers also reported historical harvests of sheefish in the East Fork Kuskokwim River drainages in the area near its confluence with the Tonzona River. Significant sheefish harvests also historically occurred in the Swift Fork drainage, particularly at the mouth of Highpower Creek and vicinity.

The name of the community of Telida derives from the Upper Kuskokwim Athabascan word *tilaya'da*, which translates as "lake (broad) whitefish place" (Stokes 1985:58). This community was established primarily due to its proximity to areas with an abundance of broad whitefish (Collins 2004rev.:12; Stokes 1985:58). Broad whitefish harvests near Telida occurred particularly in the spring and fall in outlet streams of Lower Telida Lake and Upper Telida Lake, as well as in outlet streams of smaller lakes in the area. In such locations, fishers would harvest broad whitefish as well as humpback whitefish and least cisco as they migrated into the lakes in spring and out of the lakes in fall. Fishers deployed a variety of gear at these fishing sites, including fences, traps, and dip nets.

Broad whitefish are also found throughout the upper Kuskokwim River drainage including the North Fork and South Fork Kuskokwim rivers, Big River, and the mainstem Kuskokwim River. Other species harvested in the area include humpback whitefish and least cisco, which are also abundant in the North Fork

Plate 4-2.–Sheefish (inconnu) (zidlaghe). Each square on ruler indicates 1 cm. Photo by Randy Brown, U.S. Fish and Wildlife Service.

Plate 4-3.–Whitefishes harvested in South Fork Kuskokwim River by Nikolai resident, October 2013, least cisco (tokomidza) [top], humpback whitefish (tsendude) [middle], and broad whitefish (tilaya) [bottom]. Numbers on measuring tape indicate centimeters. Photo by David Runfola, ADF&G.

Plate 4-4.–Bering cisco (dilmije) harvested with dip net in South Fork Kuskokwim River, August 2014. Numbers on ruler indicate cm. Photo by Andrew Brenner, ADF&G.

Plate 4-5.–Round whitefish (hwstin'). Each square on ruler indicates 1 cm. Photo by Randy Brown, U.S. Fish and Wildlife Service.

and South Fork Kuskokwim rivers, Swift Fork, and Slow Fork drainages (R. J. Brown et al. 2012:177–180). Additionally, fishers discussed both historical and contemporary harvests of round whitefish in similar locations. One key respondent noted that round whitefish are typically found in the vicinity of spawning salmon, and when caught at these locations they are often engorged with salmon roe (NIK-1). Finally, a significant number of Bering cisco migrate through the South Fork Kuskokwim River during late summer and early fall, presumably spawning in braided reaches of the river approximately 40 to 50 river miles upstream of Nikolai, 1 of only 3 known spawning locations of this species worldwide (Alt 1973; R. J. Brown et al. 2012:178–179).

Whitefish Fishing Seasons

Seasonal Round and Fishing Methods

Nikolai key respondents described the typical seasonal round of whitefish harvest very similarly to that reported by Stokes (1985:273–281). In spring, immediately following river ice break-up, fishers travelled from Nikolai to the mainstem Kuskokwim River to harvest whitefishes. The now abandoned community of Medfra, situated near the junction of the South Fork Kuskokwim River and the North Fork Kuskokwim River, was the historical location of a seasonal camp in spring and summer established by upper Kuskokwim River residents. One key respondent explained that his ancestors from Telida would travel there in spring: "They would move down to the Medfra area. That's when they had a tent town. Maybe fifty years ago" (NIK-2).

Fishers would deploy set gillnets during May and June to target several species of whitefishes as they migrated through the area. One key respondent noted:

> In the early spring we would go downriver to where the North Fork and South Fork [split]. That's where we used to start catching [broad whitefish]….Later on when they had a fish wheel down there they used to catch all these other fish too, [humpback whitefish, and round whitefish]. That's in May and June when they're in the river…When [people were] down there, they catch sheefish in maybe mid-May, early June. (NIK-1)

Another key respondent discussed a similar pattern, explaining that her family would travel to Medfra in the spring: "[We would go to] Medfra for [broad whitefish]…We start fishing right after break-up. What we caught right after break-up was some whitefish, [humpback whitefish] and [broad whitefish]" (NIK-3). Another key respondent also describing spring fishing at Medfra explained:

> Right after North Fork break-up. The river melts away down to the fork here first. We're usually down there watching the North Fork go. There's a lot of these [broad whitefish] there. They're skinny, but we used to put a lot of them up in spring time down there. (NIK-4)

Stokes (1985:274) describes similar activities occurring after ice moves out of the Kuskokwim River in the Medfra area, and that Nikolai fishers would deploy set gillnets to target whitefishes as they migrated from riverine to lacustrine habitats. This activity would take place over the span of approximately 3 weeks.

Following spring harvests, many whitefish were incidentally caught during salmon fishing activities (Stokes 1985:275, 285). Until the early 1960s, area residents constructed large fish weirs in area streams primarily for the harvest of Chinook salmon, but also for other species such as chum and coho salmon, as well as several species of whitefishes. These traps had likely been in use since the era prior to contact with Euro-Americans, and were abandoned due to regulatory changes that prohibited their use following Alaska statehood (Stokes 1985:224–225). Weirs were constructed of pickets spanning the width of a salmon-spawning stream, with a central pen that had an opening on the downstream side. Fish would swim into the opening of the pen, turn around when they could not pass further upstream, and then be guided by the configuration of the pen into a funnel trap attached to the sides of the pen. All fish large enough to be

blocked by the spacing of the pickets, pen, and trap could be enclosed within the device, and were likely used by the fishers (Stokes 1985:383).

Of whitefish species, the traps primarily harvested sheefish, broad whitefish, and humpback whitefish due to these fishes' larger average size. Fishers used these traps to harvest large quantities of sheefish, particularly in Big River and Middle Fork Kuskokwim River. Residents located their traps at these sites due to the large numbers of Chinook salmon that migrated through each summer; however, these rivers were also well known to be sites of large sheefish migrations. Contemporary fishing at these locations includes set gillnets and rod-and-reel fishing. One key respondent described fishing for sheefish in summer: "About June people still go there to fish. They rod-and-reel. There's so many fish there" (NIK-1). Another key respondent and his extended family typically harvest salmon and whitefishes in summer in Big River. He described that they harvest a variety of species with set gillnets, including sheefish, broad whitefish, humpback whitefish, and round whitefish. He also described using rod-and-reel gear to harvest sheefish and other nonsalmon species (NIK-5). Survey respondents also discussed sheefish harvests in the Salmon River by rod and reel (Appendix D, figures D-1 and D-2). Households that travel to Salmon River fish camps during the Chinook salmon fishing season limit their fishing gear to rod-and-reel. Historically, these camps were locations of fish traps (Stokes 1985:227); however, in the current era, fishers in Salmon River have typically deployed rod-and-reel gear because the clear water makes it the only feasible gear type for harvesting Chinook salmon. While targeting these fish, Salmon River fishers are also attempting to harvest sheefish (Stokes 1985:285). Two key respondents discussed their family's harvest of sheefish at their Salmon River fish camp site, explaining that rod-and-reel gear is the only useful fishing method there due to the clarity of the water. They explained that Chinook salmon, sheefish, and other fish will avoid a set gillnet if they can see it in the clear water, but they will strike a lure (NIK-4, NIK-6).

Summer fishing for whitefish also historically occurred in the mainstem Kuskokwim River and South Fork Kuskokwim River with fish wheels and set gillnets. These gear types became most prevalent during the mining era of the early 20th century, due to the increased demand for salmon to provide food for dog teams, the principal means of winter transport (Schneider 1985). Fish wheels were commonly deployed into the late 20th century and came into disuse likely due to the prevalence of snowmachines as replacements for dog teams (Ikuta et al. 2014:212). Key respondents all described the presence of fish wheels in the area until the recent past and that they were used to harvest sheefish, broad whitefish, humpback whitefish, least cisco, and, in the South Fork Kuskokwim River, Bering cisco. Residents used fish wheels in the South Fork Kuskokwim River following the Chinook salmon fishing season to target coho salmon and whitefishes, particularly Bering cisco, which are present in great abundance from July through September during their spawning migration to areas upriver from Nikolai. Key respondents explained that historically there was a fish wheel across the river from Nikolai and another slightly downstream of the community. There was also a fish wheel located at the mouth of Big River (Stokes 1985:285). The Nikolai Edzeno' Tribal Council has assisted the community in constructing and deploying fish wheels in recent years. One such wheel was used in summer 2004, and another in summer 2013 (Plate 4-6). In both years the primary nonsalmon fish harvests were composed of Bering cisco, broad whitefish, and humpback whitefish.

In fall, many area residents would travel to lakes in order to target primarily broad whitefish. A suggestion of the important role that broad whitefish played in the fall for residents of the region is revealed in the Upper Kuskokwim Athabascan name for the month of September: *Tilayano'o'*, which translates as "the month for broad whitefish." This species is known by local fishers to migrate from mainstem river habitats into lakes following the time of breakup. Many will have spent the summer in lakes or stream-connected lake systems and will migrate out in the fall to return to rivers and, for some individuals, brackish coastal areas in Kuskokwim Bay (R. J. Brown et al. 2012:177; Harper et al. 2012). Fishers historically would target broad whitefish as they were departing lakes through small outlet streams in the fall and harvest them with use of a fish trap. One method was to construct a pair of fences out of wooden stakes or staves, with the upstream fence built in a v- or sigmoid shape with an open space or gate in the center, and the downstream fence built around the former so as to block fish passage. When in place in an outlet stream, fishers would intercept fish milling between the fences either by hand or with a dip net. A similar method required the construction of a fence across a stream with funnel trap. Fish captured in the funnel trap could be removed by hand. One

Plate 4-6.–A slightly damaged fish wheel removed from the South Fork Kuskokwim River and positioned on a gravel bar at Nikolai, October 2013. Community members had used this fish wheel during summer 2013 for harvests of chum salmon, coho salmon, whitefishes, and other nonsalmon fishes. Photo by David Runfola, ADF&G.

key respondent described the construction of such a trap, in which he remembered participating when he was a young man:

> Carl Seseui used to make what they call fish trap. He would look at a timber and know which one to get. 'Cause the grains are straight and, he has no problem splitting them. He just tells us what to do, and we do what he tell us. And we'd split the whole thing. Spruce, one of those big timbers. Make it about 8 foot long. The grains are so straight it's just like size of your thumb when you split it. From a big round of spruce about 8 feet long, maybe a foot-and-a-half across. He used to take the core out of there and remove the outside part. One time Miska Deaphon was up there right in September, I think. He was, going up to check Highpower Creek. He was on his way up by boat and came back to Telida and told me and my brother he just saw good timber for fish-trap. So he took us over there. We cut that tree down for him. Cut it 8 foot long. He told us what to do, how to take the core out of that tree. And he would remove the other part. I don't know how he knows that it was a good tree. Up to this day, I still don't know how. To split it they make their own wedge out of [part of] a big tree limb, like on a dry timber. They would use the limb and shape it like a wedge. They used the limb 'cause it's harder. And they would make their own wooden mallet out of birch. They had this little axe. They would tap it in. Then it would start cracking and then they put that wooden wedge right in the crack, with the wooden mallet, too. But when you're first starting off, you have to hit it really good. When it's down to the fragile part you kind of tap it in. (NIK-2)

He continued by describing the use of the trap as seen in a photograph provided to him during the interview. The photograph showed a fish trap placed in an outlet stream at Lower Telida Lake in the 1960s:

> I've been standing right here before. That's right at Telida Creek. That was Carl Seseui's [fish trap]. Carl Seseui, my uncle. This is the way we used to use it, you know, make

> a funnel. They would sharpen [the ends] right there where the fish will go in. Make it, pointed. Just enough space for fish to go through, but not to go back out. It would cover the whole creek. They would have it, in the water till freeze-up. And after freeze-up they would pull the back fence out, and the fish would go all the way through [and out of the trap]. You could leave the fence part in the river all winter long and just take the funnel out of it. You could replace [the fence] easy. But not the fish-traps. You gotta save those. And if you took care of it, [the trap would] probably last three or four years. (NIK-2)

In addition to these constructed traps, fishers also used beaver dams in a similar fashion, as described by another key respondent:

> That's where they used go fishing too, for all these species, they used to find a beaver dam in the fall and then they cut little channels through the beaver dam and water starts running and then all these fish, in some way they sense that the water is dropping and they all start coming down. We just grab it by hand and just throw it out. Or when I was young we used chicken wire down below the beaver dam and [the whitefish] go in there and we can catch it that way. (NIK-1)

Fishers also continued to use set gillnets in rivers to harvest whitefish through the fall until freeze-up. There were a number of set gillnet sites maintained in the South Fork Kuskokwim River near and just downstream from Nikolai where fishers harvested broad whitefish, humpback whitefish, least cisco, Bering cisco, and round whitefish. During fieldwork in October 2013, a Division of Subsistence researcher accompanied a key respondent while setting and tending gillnets within an approximately 2-mile stretch of the river downstream from Nikolai. During these trips the fisherman harvested a number of each of these species as well as northern pike. Stokes (1985:285) describes a method of seining on gravel bars for sheefish in Big River that Nikolai fishers deployed historically. A variation of this was also described by one key respondent in 2013:

> They were up somewhere around Big River and there was lots of sheefish on the river, late in the fall when the ice started running. One guy was walking on the sand bar, and the rest of the guys were in the boat and they had a net and they drifted down, then pulled it in. They had a whole boat load of sheefish. (NIK-1)

In winter Nikolai residents historically practiced set gillnet fishing for nonsalmon under ice. Typically fishers used the same nets that they would deploy for chum and coho salmon. In this way they were able to target larger individual fish while using the net under the ice (Stokes 1985:276). By the 1970s, snowmachines provided such reliable and easy transportation as compared to dogsleds that access to more distant areas in winter allowed under-ice fishing with set gillnets to become quite common (Stokes 1985:275–276). This practice has apparently decreased as indicated by the fact that neither survey respondents nor key respondents reported harvesting fish by this method in 2012 or 2013.

There has been documented historical use of a variety of other gear types by Nikolai fishers to harvest whitefishes. These include dip nets, spears with bone points, hooks fashioned of beaver bone, beach seines, and small cast nets (Stokes 1985:273, 285). Early nets were made of animal sinew, willow bark, or spruce roots. One Nikolai key respondent described his family members making snares of willow bark affixed to long poles and using these to catch very large broad whitefish as they passed through small gaps in a fish fence on their migration out of lakes near Telida (NIK-2).

Whitefish Harvest Timing, 2012 and 2013

Survey respondents were asked to report the months during which their households harvest whitefish. In 2012, all species were harvested from May through October, with the exception of Bering cisco and least cisco being absent from October harvests. In 2013, the majority of whitefish harvests occurred during August and September, including those of the community fish wheel (Table 4-13). Some species were also harvested in smaller quantities in June, July, and November of 2013. Broad whitefish, humpback whitefish, Bering cisco, and least cisco were also harvested in October 2013.

Table 4-13.–Estimated harvest of whitefishes by month, Nikolai, Alaska, 2012 and 2013.

Resource	Year	May	Jun	Jul	Aug	Sep	Oct	Nov	Unk	**Total**
Whitefishes	**2012**	**390.3**	**463.4**	**742.1**	**1,089.70**	**455.2**	**358.6**	**0.0**	**1,324.10**	**4,823.40**
	2013	**0.0**	**39.0**	**82.5**	**106.5**	**420.0**	**255.0**	**60.0**	**0.0**	**963.0**
Sheefish	2012	19.3	41.4	64.8	40	15.2	6.9	0.0	41.4	**229.0**
	2013	0.0	31.5	70.5	52.5	6.0	0.0	0.0	0.0	**160.5**
Broad whitefish	2012	24.8	27.6	51	27.6	114.5	303.4	0.0	179.3	**728.3**
	2013	0.0	0.0	4.5	0.0	37.5	75.0	30.0	0.0	**147.0**
Bering cisco	2012	137.9	137.9	164.1	380.7	137.9	0.0	0.0	344.8	**1,303.4**
	2013	0.0	0.0	0.0	43.5	196.5	30.0	0.0	0.0	**270.0**
Least cisco	2012	69	69	69	69	69	0.0	0.0	206.9	**551.7**
	2013	0.0	0.0	0.0	6.0	82.5	30.0	0.0	0.0	**118.5**
Humpback whitefish	2012	70.3	104.8	310.3	462.1	35.9	34.5	0.0	344.8	**1,362.8**
	2013	0.0	7.5	7.5	4.5	22.5	120.0	30.0	0.0	**192.0**
Round whitefish	2012	69	82.8	82.8	110.3	82.8	13.8	0.0	206.9	**648.3**
	2013	0.0	0.0	0.0	0.0	75.0	0.0	0.0	0.0	**75.0**

Source ADF&G Division of Subsistence household surveys, 2013 and 2014.

Note There were no reports of any whitefish harvest Jan.–Apr. and Dec. in 2012 and 2013.

Survey respondents also reported harvesting other nonsalmon species throughout the calendar years of this study. Many fishers harvested northern pike, Arctic grayling, and Dolly Varden in setnets and by rod-and-reel in summer months of 2012 and 2013. Many additional harvests of northern pike occurred by hook and line under the ice in lakes immediately north of Nikolai.

Whitefish Fishing Locations: Nikolai

During both the 2012 and 2013 study years, Nikolai respondents reported harvesting nonsalmon fishes in the South Fork Kuskokwim River, Big River, and Salmon River. Respondents also reported some harvests occurring in the mainstem Kuskokwim River from the mouth of Big River to the confluence of the North Fork Kuskokwim River and the East Fork Kuskokwim River. Broad whitefish (Figure 4-12), humpback whitefish (Figure 4-13), and round whitefish (Figure 4-14) were harvested in the South Fork Kuskokwim River near Nikolai and in the lower portion of Big River. Respondents reported harvesting sheefish in Salmon River, at the mouth of the Middle Fork Kuskokwim River, in the lower portion of Big River, as well as in the mainstem Kuskokwim River and South Fork Kuskokwim River (Figure 4-15). Similarly, Nikolai households also harvested northern pike in each of these areas except Middle Fork Kuskokwim River. Nikolai respondents also reported harvesting northern pike in lakes north and east of Nikolai (Figure 4-16). Survey respondents reported harvesting least cisco (Figure 4-17) and Bering cisco (Figure 4-18) in the South Fork Kuskokwim River near Nikolai and just downstream of the community. Bering cisco were also harvested in the mainstem Kuskokwim River near the mouth of Big River. In 2012 and 2013, Nikolai fishers used set gillnets to harvest whitefishes and other nonsalmon fishes in the South Fork Kuskokwim River and in the lower portion of the Big River (Appendix D, figures D-1, D-2, D-3, and D-4). Fishers also used rod and reel gear to harvest these fishes in Salmon River and Big River, and they fished for northern pike under the ice in lakes near Nikolai. Earlier studies reported similar harvest locations for Nikolai fishers in 2002 (Holen et al. 2006:83–84) and in 2011 (Ikuta et al. 2014:188–191).

Historical Whitefish Fishing Locations and Change of Harvest Locations Over Time

Stokes (1985:271–272) reported that during the period from 1967 through 1983, whitefish harvests by Nikolai residents occurred in much the same areas that respondents reported harvesting whitefishes in 2012 and 2013; however, historical harvests were more widespread and occurred in additional locations. Fishing in the period from 1967 through 1983 was concentrated in the South Fork Kuskokwim River near Nikolai and downstream to the mainstem Kuskokwim River, as well as in the mainstem Kuskokwim River near and downstream of Medfra. Other whitefish harvests occurred historically in Big River, Pitka Fork, and Salmon River.

Fishers historically harvested whitefishes in the North Fork, Swift Fork, and Slow Fork Kuskokwim rivers drainages, and Highpower Creek, as well as in the lakes surrounding Telida and in lakes north of Highpower Creek. Sheefish was the primary species that fishers targeted in Highpower Creek from 1967 through 1983, as was also discussed by 2 key respondents in this study. It is important to note that Telida residents conducted much of the fishing that occurred historically in the upper North Fork and Swift Fork Kuskokwim rivers, Telida lakes, and Highpower Creek (Stokes 1985:274). Nikolai residents with familial or other social ties to Telida would also have fished in these areas. One Nikolai key respondent described that he and others now residing in Nikolai historically harvested whitefishes, and sheefish in particular, in the area of the confluence of the Tonzona River and the East Fork Kuskokwim River. While discussing this location on a map, this key respondent noted, “They used to have a village right here, and that’s where they used to catch whitefish [and] sheefish” (NIK-1). Another key respondent had formerly resided in Telida and had raised his family there before relocating to Nikolai following closure of the Telida school in 1996. He described fishing for whitefish in the Telida area:

> There’s a lot of whitefish in Lower Telida Lake…I would usually go fishing right there, around Lower and Upper Telida Lake, or mouth of Highpower Creek where I’ve got a cabin. Usually catch quite a few whitefish in there. You get [broad whitefish] right

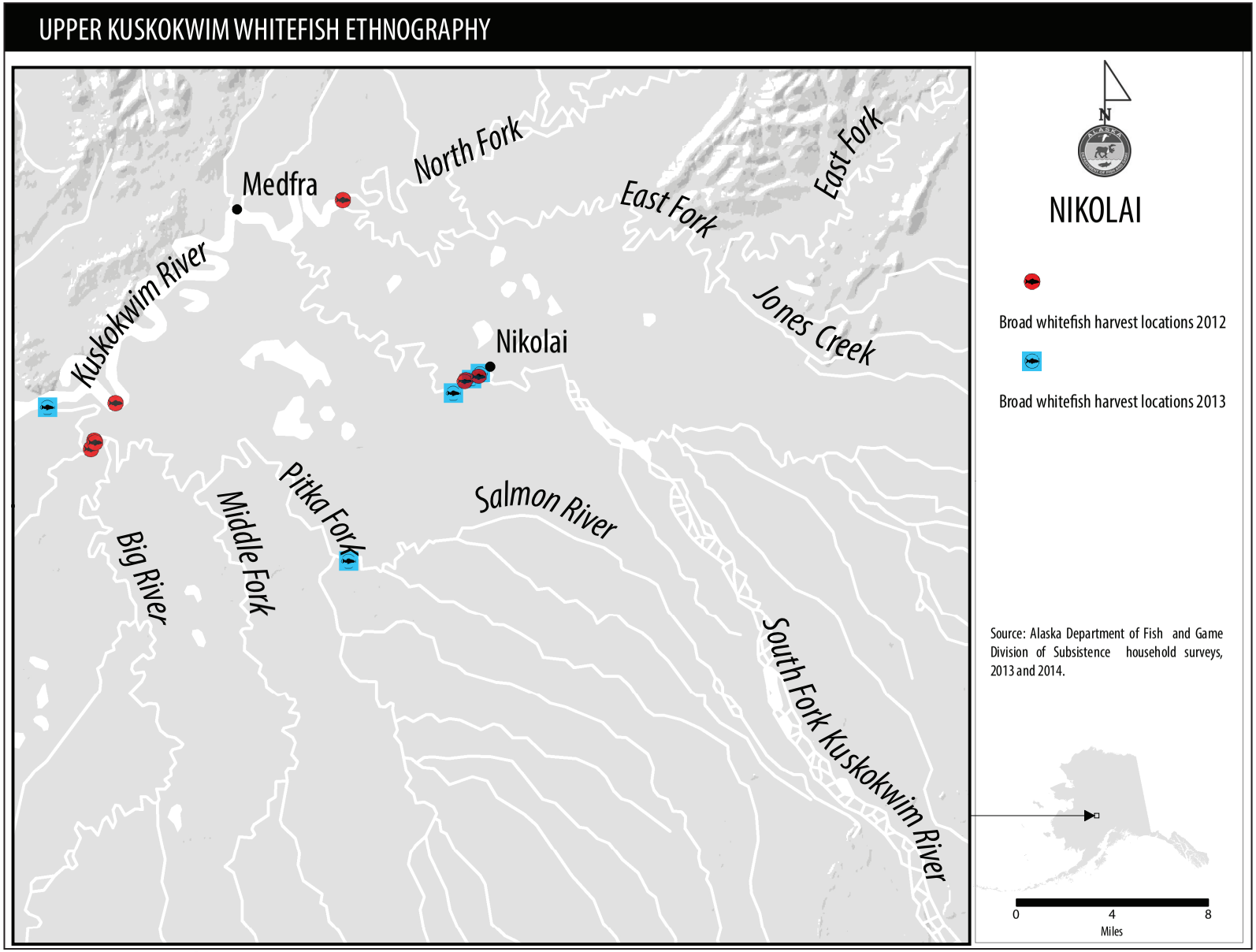

Figure 4-12.–Broad whitefish harvest locations, Nikolai, Alaska, 2012 and 2013.

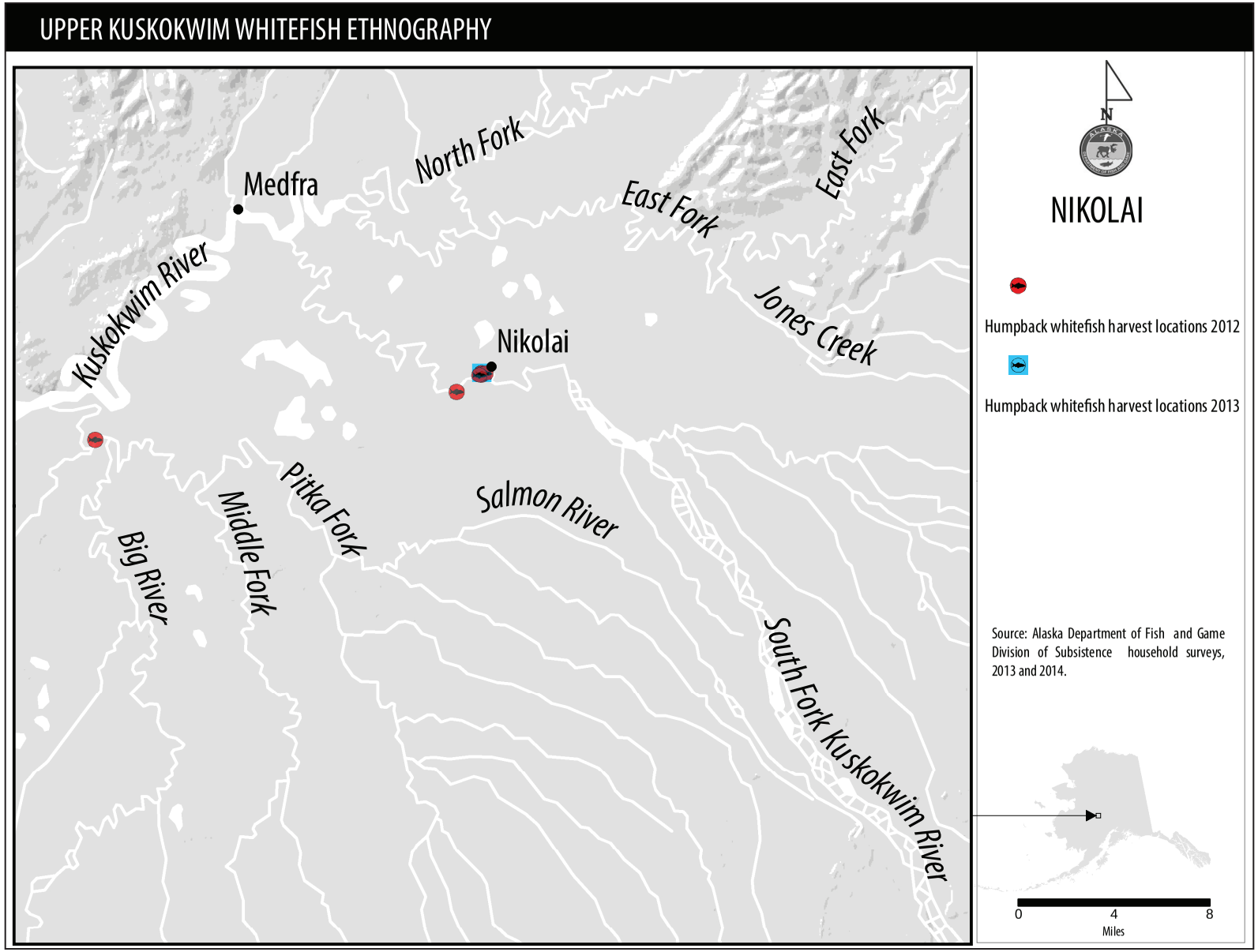

Figure 4-13.–Humpback whitefish harvest locations, Nikolai, Alaska, 2012 and 2013.

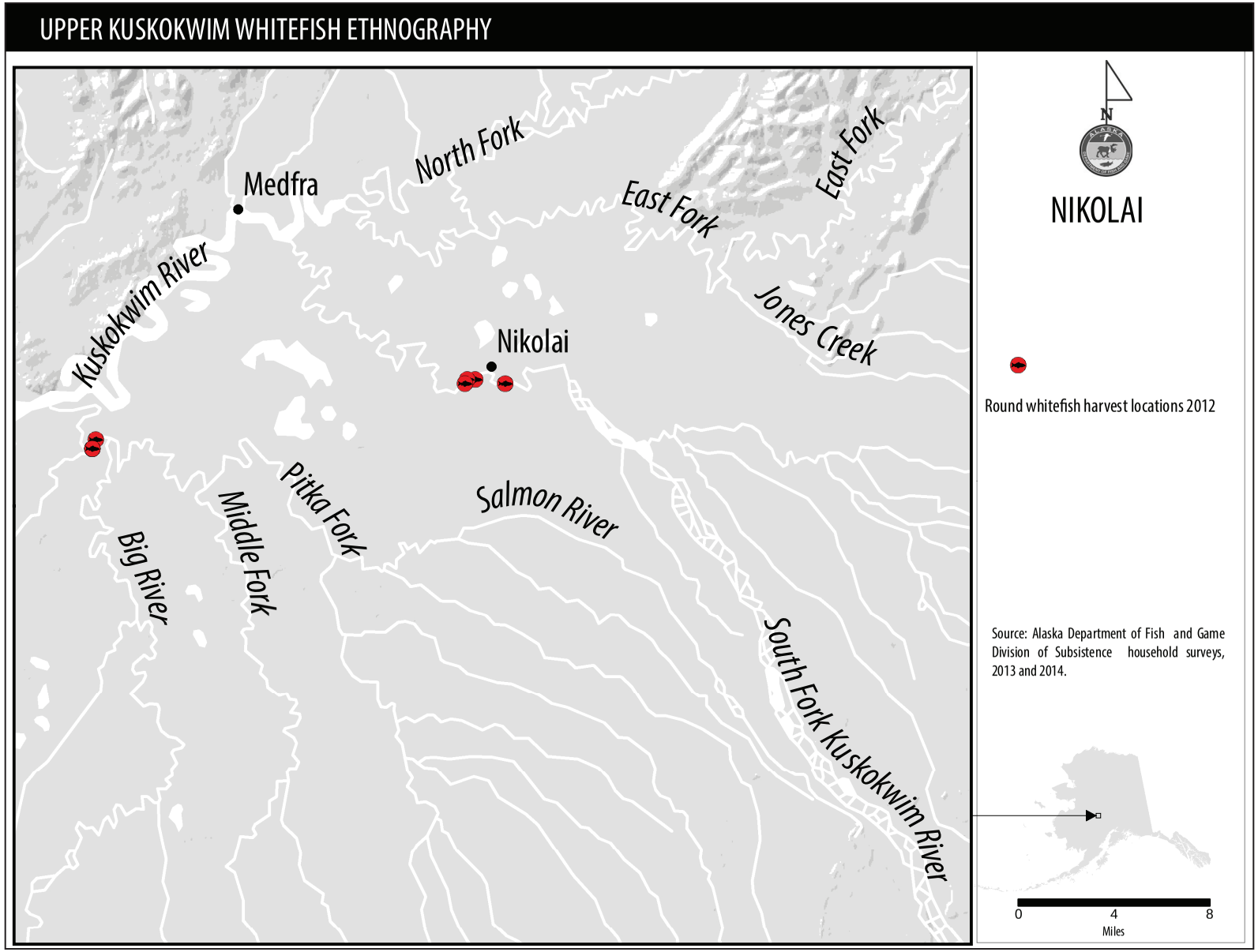

Figure 4-14.–Round whitefish harvest locations, Nikolai, Alaska, 2012.

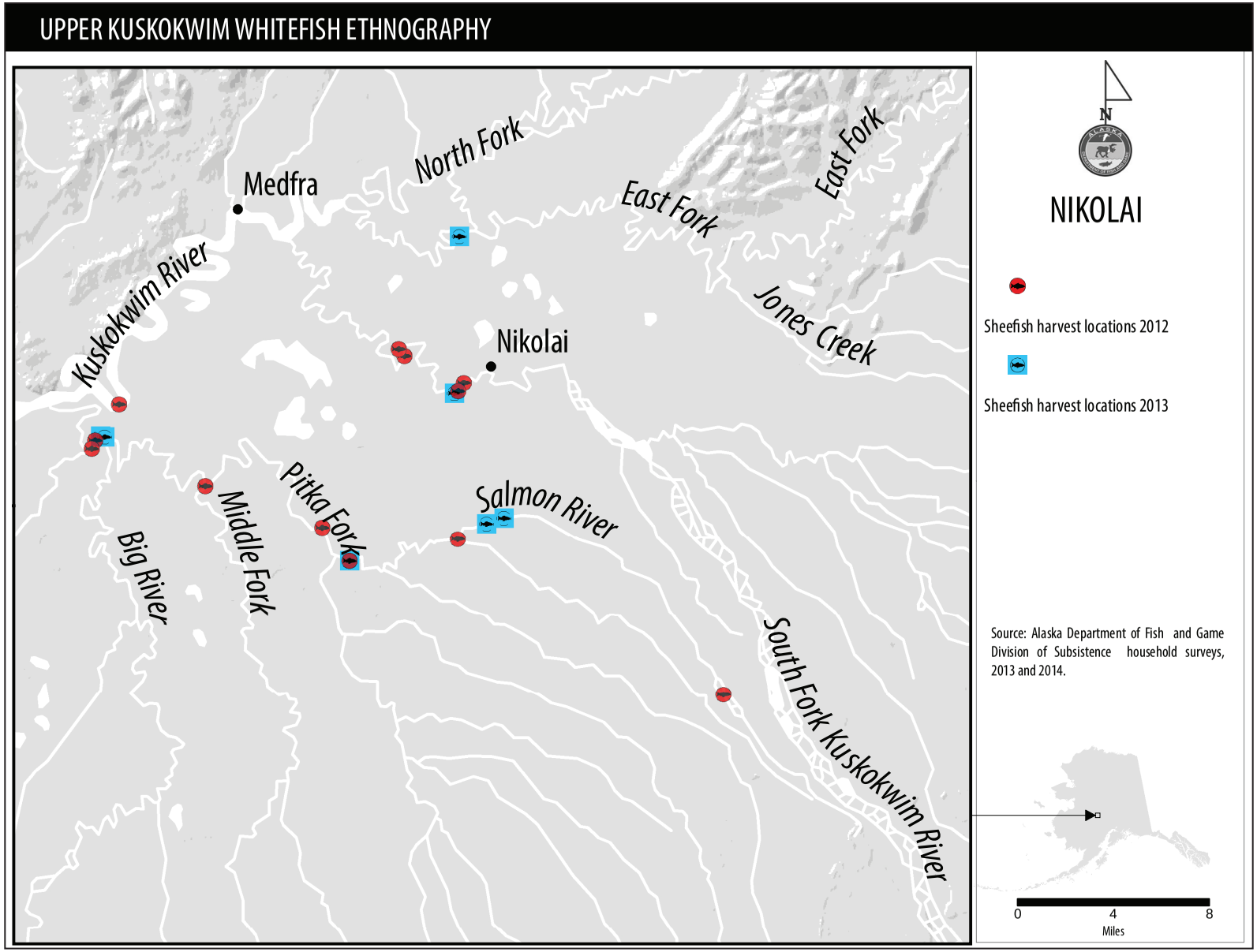

Figure 4-15.–Sheefish harvest locations, Nikolai, Alaska, 2012 and 2013.

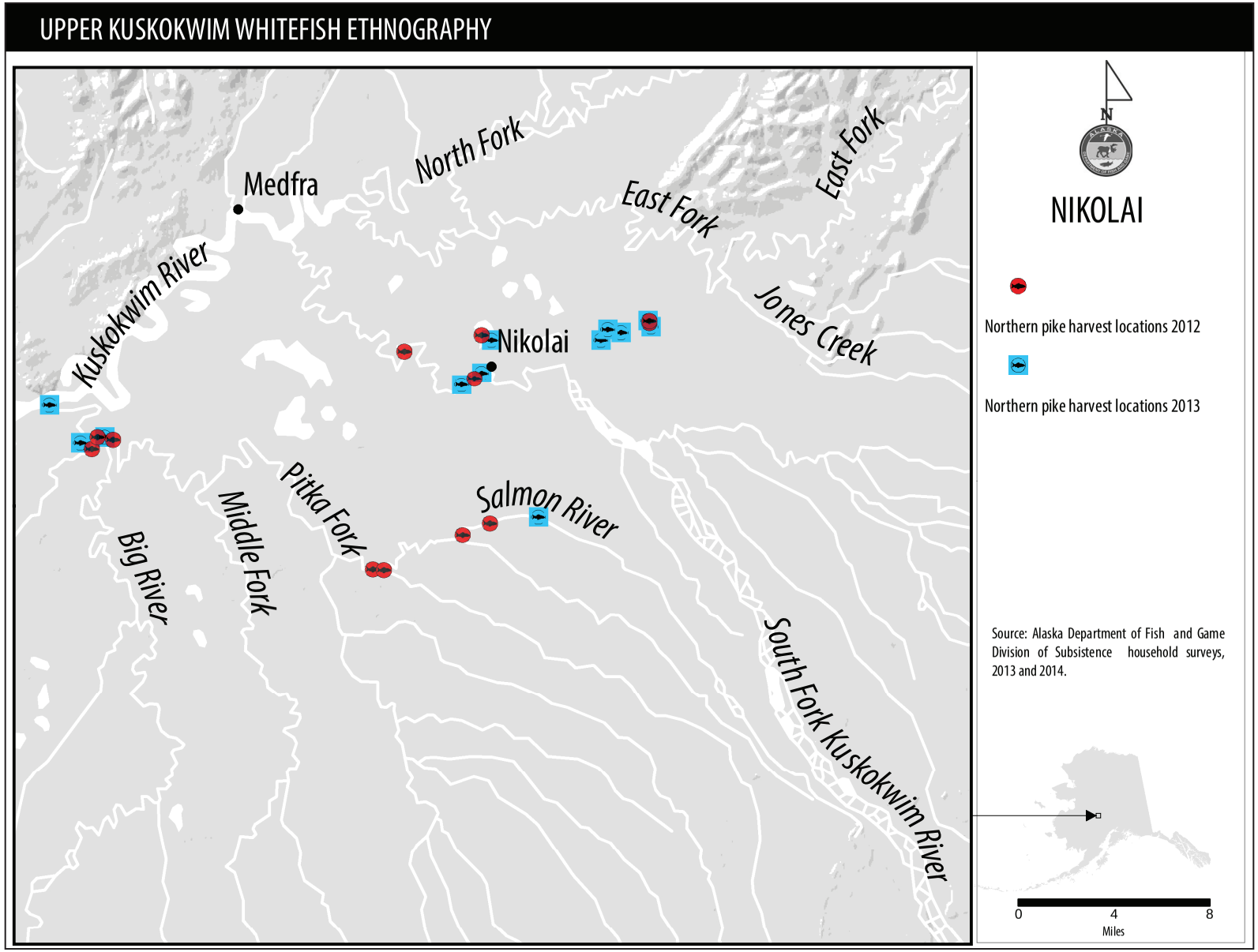

Figure 4-16.–Northern pike harvest locations, Nikolai, Alaska, 2012 and 2013.

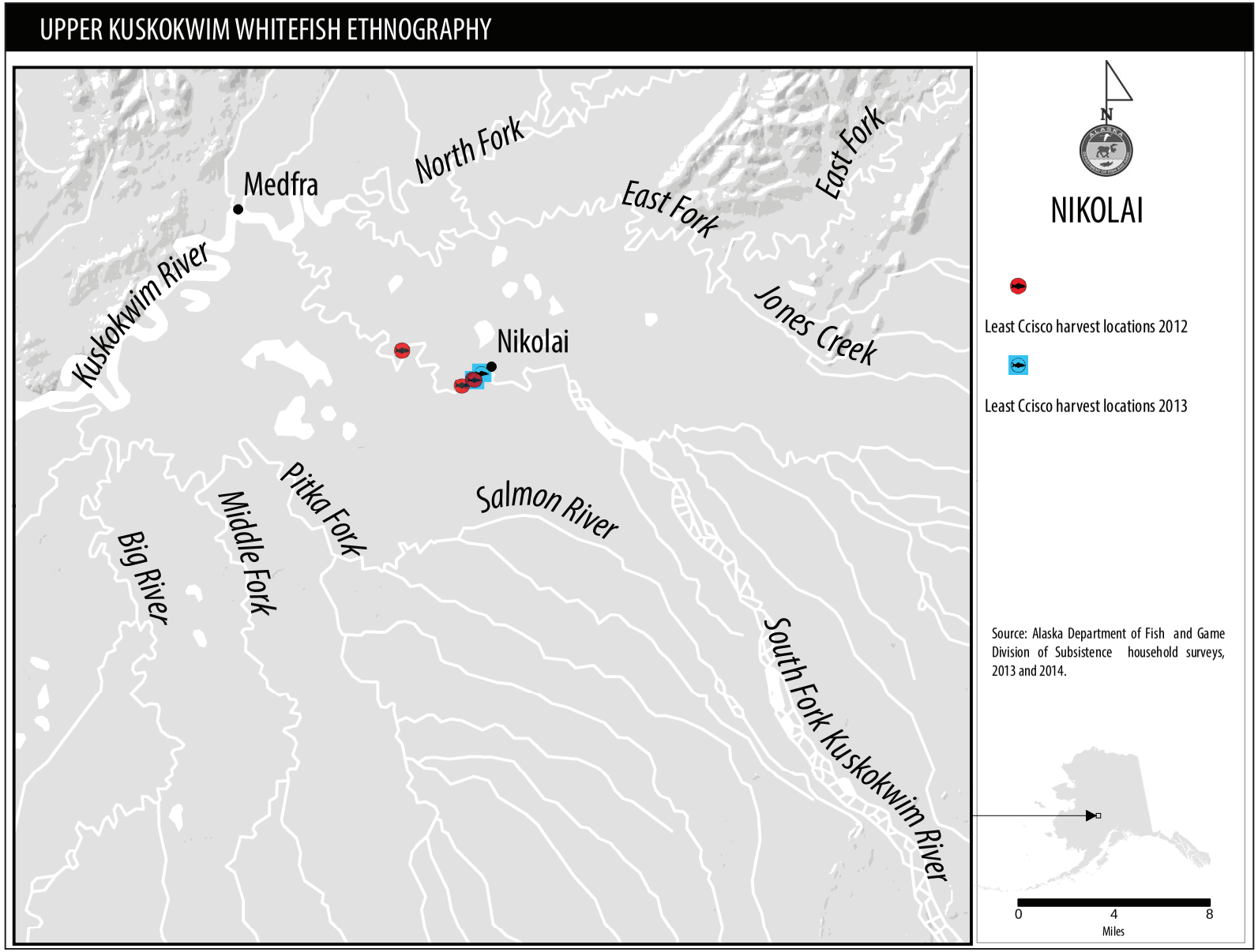

Figure 4-17.–Least cisco harvest locations, Nikolai, Alaska, 2012 and 2013.

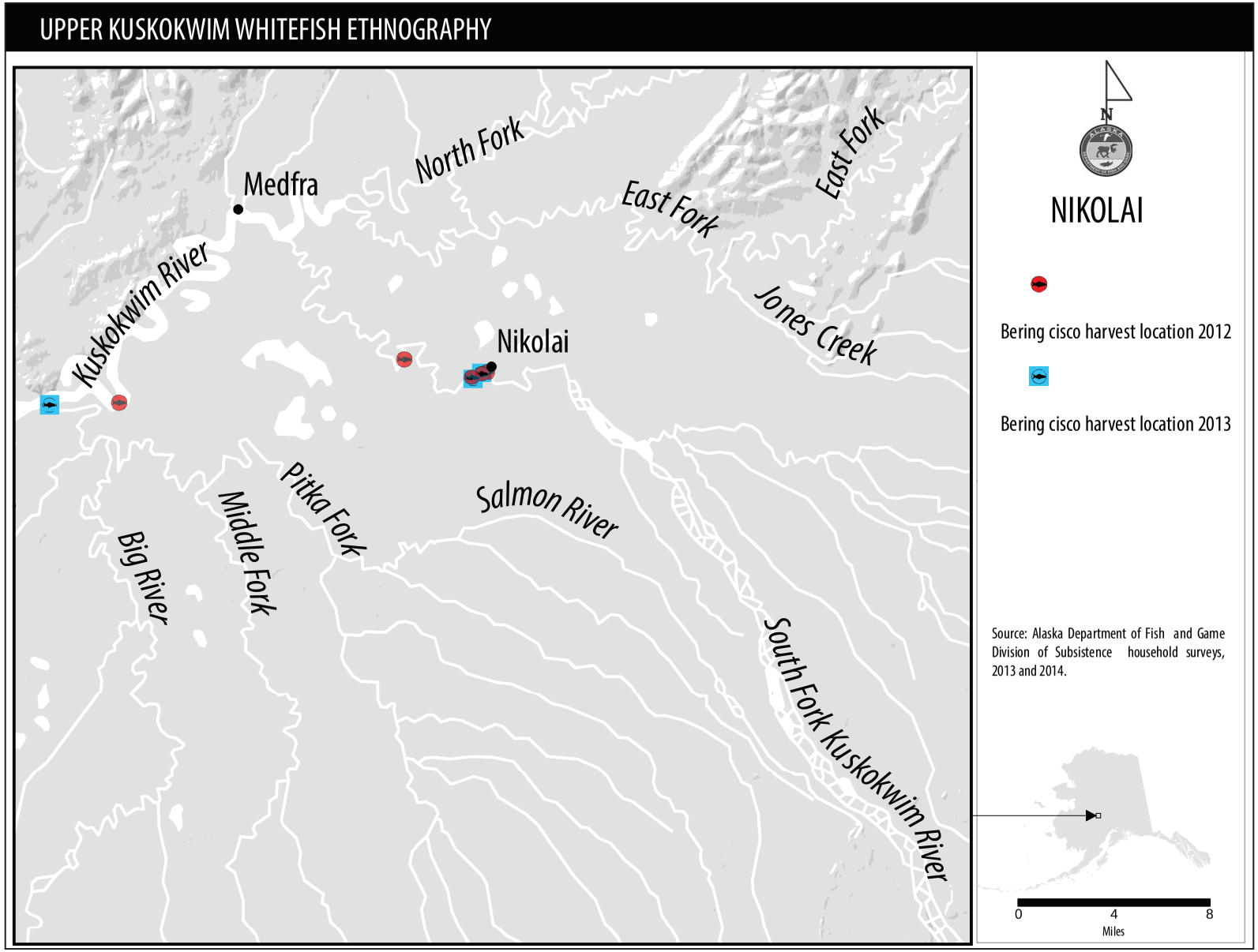

Figure 4-18.–Bering cisco harvest locations, Nikolai, Alaska, 2012 and 2013.

> there at the creek that's coming out from Lower Telida Lake down to the main river… Whitefish, they're right at the mouth of Highpower Creek right in September. [Least cisco] I catch too, once in a while. We used to catch a lot of [sheefish] at Highpower, mouth of Highpower, but not anymore. (NIK-2)

Others described spending more time during summer in the mainstem Kuskokwim River near Medfra and in the North Fork Kuskokwim River:

> My mom and dad, they had camps all over, up and down the river, even up North Fork. By the sloughs or by the lakes at the mouth of the creek they would set their nets and we would go by those camps every summer. Just mom and us kids when dad [went] firefighting. It's just that we had camped all of the time, just catching [whitefish] for the dogs and for us to eat. (NIK-6)

Another key respondent explained an area formerly used by travelers as a waterway between North Fork and East Fork Kuskokwim rivers, or as a shortcut from Nikolai into these drainages, and that he had used this area to harvest whitefish:

> We set a net on an oxbow lake too. Me and my brother had a net on that lake and we got big [broad whitefish] in there. It's on the North Fork. It had a name…*Netane'o Mina'*. It means that the lake goes all the way through from North Fork to East Fork. The lake is all the way. You could go all the way through with a canoe. Without getting out of the canoe they could go all the way from East Fork until they got to North Fork. (NIK-1)

These same key respondents describe travelling long distances in the past in order to harvest subsistence resources, including whitefishes, as well as to travel between communities. Travel in the North Fork and Swift Fork Kuskokwim rivers was much more common among Nikolai residents prior to closure of the school in Telida. Furthermore, the high cost of gasoline has reduced the likelihood that people will embark on long-distance travels. Some survey respondents and key respondents did describe traveling into the North Fork Kuskokwim River area during moose hunting season, and one key respondent described relatively frequent travel between Nikolai and Telida to care for family elders. Still, these individuals indicated that their travel in the area has been greatly reduced.

Whitefish Processing, Preservation, Storage, and Use: Nikolai

Key respondents described that a substantial portion of whitefish harvests are typically eaten fresh or dried. Nikolai households that traveled to spring fish camps after breakup harvested large quantities of fresh broad whitefish and other species. One key respondent explained what his practice was this time of year:

> [We'd catch whitefish, sheefish] just for daily use in the spring. Just to eat, you know. If I wanted fish I'd go down there and set a fish net and then I get enough to eat and then put them up. We'd have dogs there [and we'd catch fish for] the dogs that we keep. (NIK-1)

Most key respondents explained that they would cut and hang whitefish to dry, and that they would save the heads and entrails for dogs; however, one also noted that this is becoming less common, likely due to the fact that fewer people are harvesting whitefishes in the summer months when the weather permits proper drying. She explained:

> It's less common now because, I think the only people that dry fish now are like (*family name*) and people at Salmon River. They'll go fishing at Salmon River and [dry fish] because they stay there a long time. When I go over for fish I am only there for about a week, so it's not enough time to cut and dry fish. (NIK-3)

There still exists at least one dog team in Nikolai, and the owners use the team to operate their trap lines each winter. Division of Subsistence staff accompanied a member of this family during whitefish harvest outings. The fisherman cut and hung many of the whitefish that he harvested at this time, along with other fishes he was also catching, including northern pike, chum salmon, and coho salmon. These he was preserving

for his dog team in large quantities (Plate 4-7). Traditionally, whitefishes were also aged for long-term storage. This is a fermented food that is not commonly consumed in Nikolai. One key respondent described the process of making this food:

> A long time ago they used to put [whitefish] underground. That's before my time too. They used to put it in a basket, a birch bark basket, and put it underground. I mean, mostly they, that one they use the king salmon up there, that that's kind of big. They're kind of big. The one I'm talking about is [small] with birch bark basket. And they put it in where there's muskeg, where there's permafrost, they put it under there and it keeps cool and [it ages]…[The cache] is called a *nin'tso*. (NIK-2)

One very popular method of preparing whitefish is in the dish known locally as *nemaje*. A similar delicacy known throughout Alaska is popularly referred to as fish ice cream, Eskimo ice cream, or Indian ice cream. Nemaje as it is prepared in Nikolai uses a large proportion of boiled, flaked whitefish flesh, such that the final product is mostly fish. This is mixed with a small amount of moose tallow or vegetable shortening, sugar, and berries. Other, perhaps older, recipes did not include sugar or fat. One key respondent described a dish he had eaten a long time in the past:

Plate 4-7.–A Nikolai fish drying rack with whitefishes, chum salmon, coho salmon, and northern pike hanging to dry. Harvested in October, these were partially frozen. The fisherman was processing these fish for food for his dog team. Photo by David Runfola, ADF&G.

> Some other things they used to do with whitefish, they used to mix it up with the blueberries. They used to bone it and then, [make it] almost like nemaje, but they didn't add [any] grease to it. Just the berries and the fish meat. That was when I was growing up long, long time ago. They don't have it no more. (NIK-2)

Another popular dish in Nikolai, *k'untsagasr*, is prepared with mashed, slightly whipped whitefish roe mixed with mashed cranberries. Whitefish roe was also dried on racks to be kept for longer periods of storage. Whitefish were also boiled, and the fat from the cooking fish was skimmed and saved in a separate container. This grease, łuk'a *gha'*, was used for cooking and for adding to other foods. "They used to make fish grease. They would let it, simmer. All the grease comes on top and they use a spoon to spoon it out. And they used to put that in a jar. They would save that for mashed cranberries." (NIK-1)

Whitefish Abundance, Habitat Health, and Community Fisheries Management: Nikolai

The primary concern that key respondents expressed to researchers regarding whitefish was the apparently detrimental effect of a perceived increase in the beaver population and the resulting increased number of beaver dams in the area. The perception among a number of key respondents was that beaver dams

block fish passage at critical times in their annual migrations. The prevalence of dams seems to prevent whitefishes from exiting lakes in the fall when they normally move into riverine habitats for spawning migrations or to access overwintering habitats. One key respondent observed that:

> The big whitefish, they'll go to those lakes and feed. But lately there's so many beaver that they dam up all the creeks that go into the river…I've seen big fish behind the beaver dam. Water is low, below little beaver dam. That was in the fall. They were trying to come out. Maybe spring time when it's a little higher water they can get in there, but then when the water lowers [in the fall] they can't get out. In the springtime when the ice is going out, the water [rises] above the beaver dam and they can go in. But they want to get out of there and [when it's] too low water and the beaver dam is too high then they can't come back out again. (NIK-1)

While key respondents described concern about beaver dams blocking passage of whitefish in many waterways, overall there were no concerns about whitefish abundance or health. The general understanding expressed by key respondents was that all whitefish species seem to have a high abundance; however, there may be locations where they are not as prevalent as in the past. Two such locations are at the mouth of Tonzona River at its confluence with the East Fork Kuskokwim River, and another is in Highpower Creek. Key respondents discussed the historical presence of whitefishes in these locations, particularly sheefish, and that they do not seem to be present in the same population sizes. One explanation offered was the presence of an unusually large log jam near the mouth of Highpower Creek that local residents suspect is a major obstacle to fish passage (NIK-1; NIK-2). Two previous studies have documented the presence of sheefish in these locations, with both studies indicating the possibility that these represented spawning populations of sheefish (Alt 1972:4; Stuby 2010:14–19). While researchers have yet to verify these observations, they are corroborated by long-term observations made by residents of the upper Kuskokwim River region. Brown et al. (2012:219) identified an update of the status of a possible spawning population of sheefish in Highpower Creek as a high priority research need in the field of whitefish population studies.

In addition to information about spawning sheefish, Nikolai residents also described the presence of spawning populations of broad whitefish and least cisco in the South Fork Kuskokwim River. Fishers described

Plate 4-8.–Broad whitefish harvested in subsistence set gillnet in South Fork Kuskokwim River near Nikolai, Alaska. Presence of nuptial tubercles suggests possible spawning readiness. Photo by David Runfola, ADF&G.

harvesting what appeared to be spawning-ready or near spawning-ready individuals of these 2 species in the South Fork Kuskokwim River in the fall. During fieldwork, staff observed Nikolai residents harvesting least cisco, approximately 10 of which appeared to be gravid females that expressed eggs when handled. In addition, we also observed 3 female broad whitefish in similar condition from the same harvest location in the South Fork Kuskokwim River. Several of the broad whitefish also possessed nuptial tubercles, also suggesting spawning readiness (Plate 4-8). These individuals were harvested in October 2013.

5. DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

Lime Village

Discussion and Conclusions

This project met its intended objectives of estimating the subsistence harvest of nonsalmon fish by residents of Lime Village in 2012 and 2013, evaluating the harvest of subsistence nonsalmon fish in terms of species, gear, location, and timing of harvests; documenting TEK for each whitefish species, including life history, ecology, environmental and climate-related observations, seasonal movements, spawning areas, interactions with other fish and wildlife, local taxonomies, trends in abundance, and traditional management systems; describing the characteristics and trends of the whitefish fishery by species; and identifying what factors appear to influence the ability of residents to harvest various whitefish species.

The results of this research provide useful information for understanding the subsistence nonsalmon fish harvest and use patterns of Lime Village residents—particularly regarding whitefishes. The results of the ethnographic research conducted during this project suggest that harvests and uses of whitefishes by Lime Village residents have declined when compared to historical levels. Respondents cited five main reasons for the community's decline in whitefish fishing effort: availability of store-bought food; employment that provides income to purchase store-bought food; the availability of motorized transport such as snowmachines, ATVs, and motorboats and a resulting end of the community's use of dog teams for transportation; increasing numbers of beaver dams, which respondents suggest have blocked whitefishes' migration in the creeks where they are normally found; and younger generations not retaining and practicing the traditional patterns of the community.

Today, Lime Village residents use motorboats, ATVs, and snowmachines for transport when conducting subsistence activities. Prior to the 1980s, when the community transitioned to complete reliance on motorized transport, Lime Village residents traveled the land on foot, by canoe, by snowshoe, and by dog team. Community reliance on dog teams for transport had a significant influence on whitefish fishing effort in the past. The need to procure large amounts of dog food for the community's many sled dogs was a primary driver of the annual nonsalmon fishing effort overall. Relying on dog transport for the majority of their transportation meant that Lime Village residents had to spend much time and effort obtaining fish to feed their dogs. Kari (1983) reported that in 1982 there were at least 100 dogs in Lime Village and at least 200–300 fish per dog, per winter were necessary without supplemental access to commercial dog food, thus implying that Lime Village residents would need to harvest 20,000–30,000 fish annually just for dog food. Kari (1983) reported that because of this situation Lime Village residents traditionally expended much time and effort obtaining fish to feed their dogs. Whitefishes, northern pike, and longnose suckers were always important fish species used for dog food (Kari 1983). As Lime Village residents' use of motorboats and snowmachines increased during the later decades of the 20th century, their use of dog teams for transport fell by the wayside. The elimination of dog teams for transportation meant a large reduction in the need for dog food; thus, it also greatly reduced annual nonsalmon harvest requirements for the community.

Additionally, during this research Lime Village respondents consistently reported observations that whitefish populations in the region have declined. Respondents said that fewer whitefishes are available per level of effort than occurred in the past. Northern pike predation on whitefishes was cited as a cause for declines, but the primary reason cited for whitefish declines is an increasing number of beaver dams being built in the creeks fished traditionally by Lime Village residents. Beaver dams are blamed for whitefish losses because they block the passage of whitefishes up and down the creeks. While beaver dams and other potential threats to fish populations may result in locally significant and temporary changes in whitefish

distributions, there seems to be little or no evidence that whitefishes of the Kuskokwim River drainage are experiencing any noticeable population decline (R. J. Brown et al. 2012:193–196). However, whitefish population data throughout Alaska are very limited, so accurate understandings of population changes, either local or drainage-wide, are elusive (R. J. Brown et al. 2012:217–228).

Elders explained that beaver dams have always created a hindrance for whitefish fishing activities and that controlling beaver dams was a method of actively managing the whitefish fishery in the past. Active beaver trapping was one means by which the negative effects of beaver dams were mitigated in the past. During 2013 active Lime Village whitefish harvesters continued to remove beaver dams in order to ensure whitefish harvests for the community. However, beaver dam destruction has not continued at many of the traditional whitefish fishing locations used by Lime Village residents, and this is one reason why these sites are no longer used.

Today, Lime Village residents continue to harvest whitefishes every year, though not as intensively as in the past, due to the series of factors discussed above. As reported above, 82% of households surveyed during this study said that their 2012 effort to harvest whitefish was less when compared to their effort to harvest whitefish 10 years ago (in 2013 55% of households reported that their 2013 harvest effort was less). Respondents during this study recalled their families harvesting 500–1,000 broad whitefish and least cisco per year during the 20th century, up until the late 1980s, and Evanoff (2010) cited a Lime Village elder, who recalled that it was traditional for an upper Stony River Dena'ina family to harvest 4,000–6,000 whitefish during the spring.

Despite these declines, and despite variability in total whitefish harvests by species over the 3 years for which harvest data is available (2007, 2012, and 2013), this study has shown that whitefishes and other nonsalmon fish remain important resources for Lime Village residents today. In 2012, 91% of households reported that whitefishes are as important today as in the past, and in 2013, 64% of households reported that whitefishes are as important today as in the past. This research has documented Lime Village residents' continued annual efforts to harvest whitefishes as a food resource for the community, particularly broad whitefish and least cisco. Residents' efforts to revive use of the taz'in fish trap for harvesting least cisco, as documented during this study, portrays a strong interest by some Lime Village residents to continue harvesting large amounts of whitefishes by traditional methods. Moreover, even though some elder respondents commented that younger residents are not learning the skills to harvest whitefishes and other nonsalmon fish, this study documented at least three Lime Village residents in their twenties and thirties participating in the whitefish fishery during 2013. The continued importance of the harvest of whitefishes and other nonsalmon fish to residents of Lime Village communities has been clearly documented by this research.

Brown et al. (2012:216) identified that whitefish fisheries in the Kuskokwim River area are data deficient, and that sustainable management plans for whitefishes require additional species-specific harvest information for all species. Surveys such as the ones conducted in Lime Village provide 2 consecutive years of whitefish harvest data for the community. The principal whitefish species harvested by Lime Village residents in 2012 and 2013 were least cisco, broad whitefish, and humpback whitefish. Nearly all of these harvests occurred in the fall. This is similar to historical harvest information documented by Kari (1983:115). Understanding whitefish harvest patterns by Lime Village households provides basic information regarding the locations of these species within the drainage and at specific times of year.

Currently, there exists a paucity of verified biological and population data regarding these species within the Stony River drainage. Lime Village harvests of these species as well as fishers' harvest timing and location choices offer opportunities for researchers to expand knowledge of broad whitefish, humpback whitefish, and least cisco population abundance and migratory behavior within the Stony River drainage. A more complete understanding of migratory patterns of whitefishes within the Stony River drainage and between Stony River and other drainages will support whitefish management goals and increase the likelihood of maintaining sustainable whitefish fisheries in the Kuskokwim River region.

Discussion and Conclusion

This study quantified subsistence harvests of 11 nonsalmon fish species by residents of Nikolai in 2012 and 2013 through expanded estimates, and also recorded information on harvest gear, location, and timing. It documented environmental observations related to whitefish, as well as species-specific local and traditional knowledge of whitefish life histories, ecology, seasonal movements, and local taxonomy.

Harvest data from the 2012 and 2013 study years demonstrate the large contribution of nonsalmon fishes, particularly whitefishes and northern pike, to Nikolai residents' subsistence harvests. Although some of the ethnographic information shared during key respondent interviews indicated changes in patterns of whitefish harvest over time, survey results demonstrate that whitefish and other nonsalmon fishes remained an important fishery resource for many Nikolai families during the study years.

According to key respondents, significant changes in harvest and use of whitefishes over time are partly related to changes in residency patterns of Nikolai families. Historically, many Nikolai families relocated to seasonal camps each year at locations including Big River, Medfra, and the North Fork Kuskokwim drainage; some families living in Nikolai during the study period formerly lived in other permanent communities such as Telida. Many of these seasonal or permanent settlements were located near significant whitefish feeding concentrations or spawning migrations in spring and fall months, and families living at these locations often harvested large numbers of whitefish. In contrast to this historical pattern, in the study period most families maintained more permanent residence in Nikolai throughout the year, and locations remote from Nikolai that were formerly used to harvest large numbers of whitefish are less regularly used for this than in the past. For example, because most Nikolai residents typically no longer travel to summer-long fish camps at Medfra, harvests of whitefish in spring immediately following river ice break-up may have decreased overall for the community. Similarly, during this study no Nikolai survey respondents or interview subjects described constructing fish weirs or other traps to target whitefish migrations out of lakes in the fall near Telida in recent years. It is possible that these two examples of changing harvest patterns among Nikolai residents during the previous 2 to 3 decades represent significant decreases in total annual whitefish harvests; however, historical whitefish harvest information for the community is sparse for years prior to 2011. Therefore, it is impossible to assess quantitative changes in total community harvests over time with any certainty.

Although many Nikolai households have altered their patterns of seasonal travel to fish camps and other locations where historical harvests occurred, large harvests of whitefishes did take place in 2012 and 2013 at some of the community's traditional fishing sites. Several Nikolai families reported traveling to Big River in summer months where they harvested large numbers of whitefish while also fishing for salmon. Other families traveled to Salmon River fish camps during salmon fishing season where they harvested sheefish, as well as other whitefishes and nonsalmon fishes. In addition, significant whitefish harvests continue to occur in South Fork Kuskokwim River near Nikolai. Several households deployed set gillnets in this river during the study years and harvested large numbers of whitefishes at these sites. Households also reported that they shared portions of harvests from these contemporary fishing sites with other families within the community and elsewhere.

Perhaps the use of a fish wheel in South Fork Kuskokwim River in 2013 represents the most significant change in Nikolai's whitefish harvest patterns in recent years. The use of fish wheels began to decline in the latter half of the 20th century following the adoption of snowmachines as the principal means of winter travel, and virtually ceased over the three decades prior to this study. In summer 2013 the Nikolai Edzeno' Village Council acquired funding to purchase materials for construction of a fish wheel. Nikolai residents constructed and deployed the fish wheel at the bank directly across the South Fork Kuskokwim River from Nikolai. Community members operated the fish wheel in July, August, and September 2013 and harvested significant amounts of whitefishes, particularly Bering cisco. Key respondents reported that one of the incentives for deploying a fish wheel in South Fork Kuskokwim River was to target Bering cisco, harvests

of which had decreased in recent decades in Nikolai. One key respondent discussed his use of hardware cloth (Plate 4-6) in construction of the fish wheel specifically to prevent Bering cisco from escaping the baskets (NIK-4). The fish wheel was maintained as a community operation, and harvests of fish were shared throughout the village. As a result, many Nikolai households received Bering cisco in quantities that exceeded those used in recent years.

Nikolai key respondents discussed the historical and contemporary importance of Bering cisco as a food source, including the value of this species and its roe in traditional diets. Bering cisco, an anadromous species that spawns in the fall in the South Fork Kuskokwim River upstream of Nikolai represents an important and abundant nutrient-rich marine food resource that is predictably available each year on the South Fork Kuskokwim River near Nikolai. Continued operation of fish wheels by the community would give Nikolai access to reliable and abundant harvests of this valued fish.

Nikolai fishers are active in a region of the Kuskokwim River drainage where a number of whitefish species aggregate to spawn each year. The entire population of Kuskokwim River Bering cisco migrates past Nikolai in a river channel that is approximately 200 to 300 yards wide when these fish are present in late summer each year. Contemporary harvests of whitefishes by Nikolai residents also occur in the Big River drainage, one of the principal spawning streams of Kuskokwim River sheefish and broad whitefish. In addition, in the South Fork Kuskokwim River in October 2013 a Division of Subsistence researcher participated in harvests of broad whitefish and least cisco that were nearing spawning-readiness, suggesting that Nikolai fishers may be harvesting from other potentially undocumented spawning populations of whitefishes in their area.

Nikolai fishers regularly harvest whitefishes near several of the limited number of whitefish spawning locations in the Kuskokwim River drainage. Aggregations at these locations near Nikolai represent large portions of the total Kuskokwim River spawning populations of individual whitefish species each year. Because of this, Nikolai fishers may be able to perceive changes in whitefish populations that occur as a result of distant or drainagewide factors. Specifically, in the event that Kuskokwim River Bering cisco, sheefish, or broad whitefish populations suffer declines in abundance due to factors such as habitat loss, disease, environmental degradation, or overfishing, Nikolai fishers could possibly be in a position to experience such declines before any other fishers or fisheries researchers will have had an opportunity to detect them. This is particularly noteworthy considering the potential effects on whitefish populations in the Kuskokwim River region posed by proposed large-scale gold mining, increased barge traffic, liquefied natural gas pipeline construction and operation, as well as possible increased subsistence uses of whitefishes as fishers downriver from Nikolai supplement declining Chinook salmon harvests.

Recommendations

Harvest survey and ethnographic interview results from the Nikolai and Lime Village suggest the following recommendations for federal and state funded subsistence fishery management and research:

1. Continue nonsalmon harvesting monitoring efforts in Nikolai and Lime Village.

Fisheries researchers have compiled limited data regarding annual whitefish harvest amounts for Nikolai, Lime Village, and other communities within the Kuskokwim River drainage. Fisheries resource management agencies should continue to record annual harvest amounts by species, possibly through the ADF&G Division of Commercial Fisheries annual subsistence salmon harvest surveys and calendars. Additionally, periodic surveys similar to those of this study that record only harvests of whitefishes and other nonsalmon fishes may be necessary to document complete and accurate harvest amounts.

Alternative survey strategies may include recruitment of a sample of fishers to record their household harvests regularly and to be contacted at regular intervals to transfer their harvest data to agency staff, perhaps monthly or seasonally. Efforts to educate survey technicians, fishers, and their families to positively

identify each whitefish species will be critical to assuring quality survey results with high levels of accuracy in documenting harvests by species. Long-term harvest data for Nikolai and Lime Village, together with regular incorporation of local knowledge, has the potential to identify changes in population abundance and fish health for several fish species important throughout the Kuskokwim River drainage.

2. Continue efforts to document local and traditional knowledge, and incorporate resulting information into future research and management decisions.

This study recorded ecological information that was previously undocumented or only recently documented in formal biological investigations. For example, Division of Subsistence researchers observed that Lime Village fishers harvested least cisco in lake systems near Lime Village; this species had not been previously documented as present in this portion of the Stony River drainage, and the lake habitat in this area was not typical of that expected for least cisco.

In Nikolai, a number of fishers with long-term experience harvesting whitefishes over broad areas of the upper Kuskokwim River region possess extensive knowledge of seasonal movements of several whitefish species. During the ethnographic research of this study, key respondents identified species-specific migratory patterns and spawning areas with a high level of confidence, some of which has been corroborated by fisheries researchers (Alt 1972; Harper et al. 2012; Stuby 2010) and some of which may be undocumented by the scientific community.

Information such as this may prove useful in future decisions that require knowledge of whitefish distribution, ecology, or abundance in the Kuskokwim River drainage, and could also be useful in identifying new directions for research. More broadly, results such as this highlight that the continued documentation of local and traditional knowledge is relevant to fisheries management.

3. Support community efforts to maintain or develop strategies that involve younger generations in the fishery.

If fisheries resource monitoring agencies supported community efforts to involve younger generations in the fishery, such as through the construction of a community fish wheel in Nikolai or continued documentation of traditional fish trap technology in Lime Village, such actions could assist communities in maintaining food security, economic sustainability, labor force skills and capacity development, and facilitation of cultural heritage education programs.

In Nikolai and Lime Village, elder residents have the experience and skills necessary to construct and operate fish wheels or fish traps, but frequently they lack the physical strength or stamina to do so without assistance from youth. Limited wage employment opportunities in both communities result in frequent cash shortages, and the communities' remoteness makes transportation of hardware and other goods from population centers difficult and very costly.

The Nikolai Edzeno' Village Council has demonstrated excellent administrative capacity and has shown willingness to support this effort, including organization of youth and adult volunteers for construction and daily operation of the fish wheel; however, funding for such operations may be limited, intermittent, or otherwise unavailable. In addition, the community lacks reliable access to heavy equipment for deployment and removal of a large fish wheel each season. Funding such a fish wheel annually for an introductory period of several years may provide the community with the capacity development necessary for private citizens to reinstate the use of fish wheels more permanently without dependence upon outside funding sources. Furthermore, fish wheel operations in the region will provide opportunities for monitoring and research of salmon, whitefishes, and other species by fisheries management agencies.

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APPENDIX A–SURVEY

WHITEFISH WILD FOOD HARVEST SURVEY

LIME VILLAGE, ALASKA

January to December, 2012

This survey is used to estimate harvests of wild foods and to describe community subsistence economies. We will publish a summary report, and send it to all households in your community. We share community information with the Alaska Department of Fish and Game, the U.S. Fish and Wildlife Service and the National Park Service. We work with the federal Regional Advisory Councils and with local Fish and Game Advisory Committees to better manage subsistence and to implement federal and state subsistence priorities.

We will NOT identify your household. We will NOT use this information for enforcement. Participation in this survey is voluntary. Even if you agree to be surveyed, you may stop at any time.

HOUSEHOLD ID:		
COMMUNITY ID:	**LIME VILLAGE**	**212**
RESPONDENT ID:		
INTERVIEWER:		
INTERVIEW DATE:		
START TIME:		
STOP TIME:		
DATA CODED BY:		
DATA ENTERED BY:		
SUPERVISOR:		

COOPERATING ORGANIZATIONS

BRISTOL BAY NATIVE ASSOCIATION
NATURAL RESOURCES DEPARTMENT
P.O. BOX 310
DILLINGHAM, AK 99576
907-842-6243

LAKE CLARK
NATIONAL PARK AND PRESERVE
240 W 5TH AVENUE
ANCHORAGE, AK 99501
907-644-3638

DIVISION OF SUBSISTENCE
ALASKA DEPT OF FISH & GAME
333 RASPBERRY ROAD
ANCHORAGE, AK 99518
907-267-2353

HOUSEHOLD MEMBERS

HOUSEHOLD ID

Between JANUARY and DECEMBER, 2012…
…who lived in your household?

ID#	IS THIS PERSON ANSWERING QUESTIONS *ON THIS SURVEY?* *(circle)*	MALE OR FEMALE? *(circle)*	ALASKA NATIVE? *(circle)*	IN WHAT YEAR WAS THIS PERSON BORN? *(year)*	WHERE WERE PARENTS LIVING WHEN THIS PERSON WAS BORN? *(ak city or state)*	HOW IS THIS PERSON RELATED TO HOUSEHOLD HEAD 1? *(relation)*	HOW MANY YEARS HAS THIS PERSON LIVED IN LIME VILLAGE? *(number)*
HEAD 1	Y N	M F	Y N				YRS
01							
Enter spouse or partner next. If household has a SINGLE HEAD, leave HEAD 2 blank.							
HEAD 2	Y N	M F	Y N				YRS
02							
Enter children (oldest to youngest), grandchildren, grandparents, brothers, sisters, or anyone else living full-time in this household.							
03	Y N	M F	Y N				YRS
04	Y N	M F	Y N				YRS
05	Y N	M F	Y N				YRS
06	Y N	M F	Y N				YRS
07	Y N	M F	Y N				YRS
08	Y N	M F	Y N				YRS
09	Y N	M F	Y N				YRS
10	Y N	M F	Y N				YRS
11	Y N	M F	Y N				YRS
12	Y N	M F	Y N				YRS
13	Y N	M F	Y N				YRS
14	Y N	M F	Y N				YRS
15	Y N	M F	Y N				YRS

PERMANENT HH MEMBERS: 01 **LIME VILLAGE: 212**

FISHERY PARTICIPATION **HOUSEHOLD ID**

WHITEFISH

Note: this section of the survey is meant to assess changes in the availability, abundance and use of WHITEFISHES, including SHEEFISH.

Do members of your household USUALLY fish for WHITEFISH for subsistence?..... Y N

Between JANUARY and DECEMBER, 2012 did members of your household FISH FOR WHITEFISH for subsistence?..... Y N

PARTICIPATION IN FISHERIES AND COMMUNITY

Does your household use WHITEFISH?..... Y N

How important is the use of WHITEFISH to your household **today**? Not-important important very important?

How important was the use of WHITEFISH to your household in the **past**? Not-important important very important?

If you cannot get the WHITEFISH you need, what do you do differently?

Now we are going to discuss your Household's harvest effort of whitefish

Thinking about your WHITEFISH fishing this year, how would you compare your fishing **effort** to

… the past 5 years? L S M

… the past 10 years? L S M

Between JANUARY and DECEMBER, 2012 when did members of your household fish for WHITEFISH?

J F M A M J J A S O N D *(circle all that apply)*

Thinking about fishing 5 years ago, what months would members of your household usually have fished for WHITEFISH?

J F M A M J J A S O N D *(circle all that apply)*

Thinking about fishing 10 years ago, what months would members of your household usually have fished for WHITEFISH?

J F M A M J J A S O N D *(circle all that apply)*

Over the past 10 years, have you observed changes in the best time for catching WHITEFISH? Y N

If so, could you describe those changes?

HARVESTS: WHITEFISH

HOUSEHOLD ID

IF household responded NO to the harvest AND use questions on the previous page, skip this page.

If WHITEFISH, including SHEEFISH were used or harvested, continue on this page…

Please estimate how many whitefish ALL MEMBERS OF YOUR HOUSEHOLD HARVESTED in 2012. INCLUDE whitefish you gave away, ate fresh, fed to dogs, lost to spoilage, or got by helping others. If fishing with others, report ONLY YOUR SHARE of the catch.

	IN 2012 DID MEMBERS OF YOUR HH…						IN 2012, HOW MANY _____ DID MEMBERS OF YOUR HOUSEHOLD HARVEST?												
	USE?	TRY TO HARVEST?	HARVEST?	RECEIVE?	GIVE AWAY?	GEAR USED ?	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	UNKNOWN	UNITS
	(circle)						*(enter number by month of take)*													*(ind)*
SHEEFISH	Y N	Y N	Y N	Y N	Y N	SETNET														IND
125600000						NET UNDER ICE														
						ROD & REEL														
						ICE FISHING														
						DIPNET														
						OTHER														
						SETNET														
						NET UNDER ICE														
						ROD & REEL														
						ICE FISHING														
						DIPNET														
						OTHER														
BROAD WHITEFISH	Y N	Y N	Y N	Y N	Y N	SETNET														IND
126404000						NET UNDER ICE														
						ROD & REEL														
						ICE FISHING														
						DIPNET														
						OTHER														
						SETNET														
						NET UNDER ICE														
						ROD & REEL														
						ICE FISHING														
						DIPNET														
						OTHER														
HUMPBACK WHITEFISH	Y N	Y N	Y N	Y N	Y N	SETNET														IND
126408000						NET UNDER ICE														
						ROD & REEL														
						ICE FISHING														
						DIPNET														
						OTHER														
						SETNET														
						NET UNDER ICE														
						ROD & REEL														
						ICE FISHING														
						DIPNET														
						OTHER														

Continue on next page

HARVESTS: WHITEFISH

HOUSEHOLD ID

... CONTINUED from previous page

Please estimate how many whitefish ALL MEMBERS OF YOUR HOUSEHOLD HARVESTED in 2012. INCLUDE whitefish you gave away, ate fresh, fed to dogs, lost to spoilage, or got by helping others. If hunting or trapping with others, report ONLY YOUR SHARE of the catch.

	IN 2012 DID MEMBERS OF YOUR HH...						IN 2012, HOW MANY _____ DID MEMBERS OF YOUR HOUSEHOLD HARVEST?												
	USE?	TRY TO HARVEST?	HARVEST?	RECEIVE?	GIVE AWAY?	GEAR USED ?	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	UNKNOWN	UNITS
	(circle)						*(enter number by month of take)*													*(ind)*
ROUND WHITEFISH	Y N	Y N	Y N	Y N	Y N	SETNET														IND
126412000						NET UNDER ICE														
						ROD & REEL														
						ICE FISHING														
						DIPNET														
						OTHER														
						SETNET														
						NET UNDER ICE														
						ROD & REEL														
						ICE FISHING														
						DIPNET														
						OTHER														
LEAST CISCO	Y N	Y N	Y N	Y N	Y N	SETNET														IND
126406060						NET UNDER ICE														
						ROD & REEL														
						ICE FISHING														
						DIPNET														
						OTHER														
						SETNET														
						NET UNDER ICE														
						ROD & REEL														
						ICE FISHING														
						DIPNET														
						OTHER														
BERING CISCO	Y N	Y N	Y N	Y N	Y N	SETNET														IND
126406040						NET UNDER ICE														
						ROD & REEL														
						ICE FISHING														
						DIPNET														
						OTHER														
						SETNET														
						NET UNDER ICE														
						ROD & REEL														
						ICE FISHING														
						DIPNET														
						OTHER														

Continue on next page

HARVESTS: OTHER FISH (NON-COMMERCIAL)

HOUSEHOLD ID

Do members of your household USUALLY harvest OTHER FISH ?..... Y N

Between JANUARY and DECEMBER, 2012…

…Did members of your household USE or TRY TO HARVEST other fish?..... Y N

IF NO to both questions, go to the next harvest page.

If YES, continue on this page…

Please estimate how many other fish ALL MEMBERS OF YOUR HOUSEHOLD HARVESTED in 2012, including with a rod and reel. INCLUDE other fish you gave away, ate fresh, fed to dogs, lost to spoilage, or got by helping others. If fishing with others, report ONLY YOUR SHARE of the catch. Do not include fish caught and released

	IN 2012 DID MEMBERS OF YOUR HH…					IN 2012, HOW MANY _____ DID YOUR HOUSEHOLD…				
	USE?	TRY TO HARVEST?	HARVEST?	RECEIVE?	GIVE AWAY?	…HARVEST WITH GILL NET OR SEINE?	…HARVEST WITH ROD AND REEL?	… HARVEST WITH ICE FISHING	… HARVEST WITH OTHER GEAR?	UNITS
	(circle)					*(number taken by each gear type)*				*(ind, lbs)*
NORTHERN PIKE	Y N	Y N	Y N	Y N	Y N					LBS
125500000										
BURBOT	Y N	Y N	Y N	Y N	Y N					IND
124800000										
LAMPREY	Y N	Y N	Y N	Y N	Y N					IND
122000000										
GRAYLING	Y N	Y N	Y N	Y N	Y N					IND
125200000										
RAINBOW TROUT	Y N	Y N	Y N	Y N	Y N					IND
126204000										
ARCTIC CHAR	Y N	Y N	Y N	Y N	Y N					IND
125002000										
DOLLY VARDEN	Y N	Y N	Y N	Y N	Y N					IND
125006000										
SUCKER	Y N	Y N	Y N	Y N	Y N					IND
126000000										
HERRING	Y N	Y N	Y N	Y N	Y N					GAL
120200000										
BLACKFISH	Y N	Y N	Y N	Y N	Y N					LBS
124600000										
RAINBOW SMELT	Y N	Y N	Y N	Y N	Y N					GAL
120406000										
LAKE TROUT	Y N	Y N	Y N	Y N	Y N					IND
125010000										

These columns should include all the harvests: other fish HARVESTED by members of this household in 2012.

OTHER FISH: 06 **LIME VILLAGE: 212**

COMMENTS

HOUSEHOLD ID

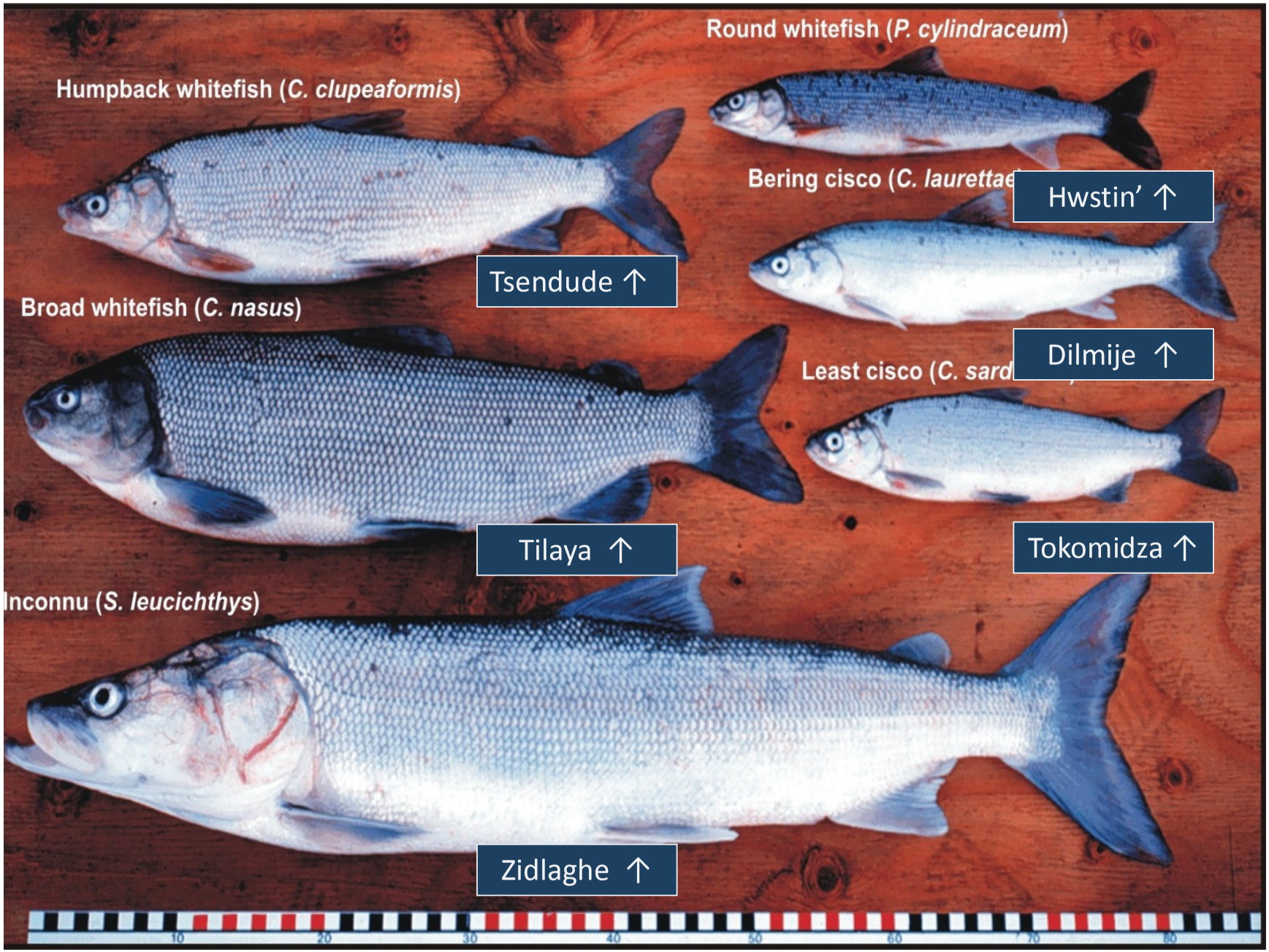
DO YOU HAVE ANY QUESTIONS, COMMENTS, OR CONCERNS?

INTERVIEW SUMMARY:

BE SURE TO FILL IN THE STOP TIME ON THE FIRST PAGE!!!!

COMMENTS: 30 **LIME VILLAGE: 212**

APPENDIX B–WHITEFISH SPECIES IDENTIFICATION GUIDE


Round whitefish (P. cylindraceum)
Humpback whitefish (C. clupeaformis)
Bering cisco (C. laurettae
Hwstin' ↑
Tsendude ↑
Broad whitefish (C. nasus)
Dilmije ↑
Least cisco (C. sard
Tilaya ↑
Tokomidza ↑
Inconnu (S. leucichthys)
Zidlaghe ↑

APPENDIX C–CONVERSION FACTORS

Appendix C–Conversion factors for Lime Village and Nikolai, Alaska, 2012–2013.

Resource	Reported Units	Conversion to pounds
Herring	Gal.	6.0
Herring roe	Gal.	27.5
Rainbow smelt	Gal.	6.0
Halibut	Ind.	21.2
Lamprey	Ind.	0.6
Blackfish	Lbs.	1.0
Burbot	Ind.	2.4
Arctic char	Ind.	1.4
Dolly Varden	Ind.	1.4
Lake trout	Ind.	1.4
Grayling	Ind.	0.7
Northern pike	Ind.	5.0
Sheefish	Ind.	5.6
Sucker	Ind.	0.7
Rainbow trout	Ind.	2.0
Broad whitefish	Ind.	1.4
Bering cisco	Ind.	1.4
Least cisco	Ind.	1.0
Humpback whitefish	Ind.	2.0
Round whitefish	Ind.	1.5
Unknown whitefish	Ind.	1.6

Source ADF&G Division of Subsistence.

APPENDIX D–ADDITIONAL TABLES AND FIGURES

Table D-1.– Population profile, Nikolai, Alaska, 2012.

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	8.3	12.0%	12.0%	5.5	12.5%	12.5%	13.8	12.2%	12.2%
5–9	4.1	6.0%	18.0%	0.0	0.0%	12.5%	4.1	3.7%	15.9%
10–14	5.5	8.0%	26.0%	2.8	6.3%	18.8%	8.3	7.3%	23.2%
15–19	4.1	6.0%	32.0%	1.4	3.1%	21.9%	5.5	4.9%	28.0%
20–24	5.5	8.0%	40.0%	6.9	15.6%	37.5%	12.4	11.0%	39.0%
25–29	4.1	6.0%	46.0%	5.5	12.5%	50.0%	9.7	8.5%	47.6%
30–34	5.5	8.0%	54.0%	0.0	0.0%	50.0%	5.5	4.9%	52.4%
35–39	1.4	2.0%	56.0%	1.4	3.1%	53.1%	2.8	2.4%	54.9%
40–44	0.0	0.0%	56.0%	2.8	6.3%	59.4%	2.8	2.4%	57.3%
45–49	8.3	12.0%	68.0%	2.8	6.3%	65.6%	11.0	9.8%	67.1%
50–54	2.8	4.0%	72.0%	4.1	9.4%	75.0%	6.9	6.1%	73.2%
55–59	11.0	16.0%	88.0%	2.8	6.3%	81.3%	13.8	12.2%	85.4%
60–64	0.0	0.0%	88.0%	0.0	0.0%	81.3%	0.0	0.0%	85.4%
65–69	1.4	2.0%	90.0%	2.8	6.3%	87.5%	4.1	3.7%	89.0%
70–74	1.4	2.0%	92.0%	0.0	0.0%	87.5%	1.4	1.2%	90.2%
75–79	2.8	4.0%	96.0%	2.8	6.3%	93.8%	5.5	4.9%	95.1%
80–84	1.4	2.0%	98.0%	1.4	3.1%	96.9%	2.8	2.4%	97.6%
85–89	0.0	0.0%	98.0%	0.0	0.0%	96.9%	0.0	0.0%	97.6%
90–94	1.4	2.0%	100.0%	0.0	0.0%	96.9%	1.4	1.2%	98.8%
95–99	0.0	0.0%	100.0%	0.0	0.0%	96.9%	0.0	0.0%	98.8%
100–104	0.0	0.0%	100.0%	0.0	0.0%	96.9%	0.0	0.0%	98.8%
Missing	0.0	0.0%	100.0%	1.4	3.1%	100.0%	1.4	1.2%	100.0%
Total	**69.0**	**100.0%**	**100.0%**	**44.1**	**100.0%**	**100.0%**	**113.1**	**100.0%**	**100.0%**

Source ADF&G Division of Subsistence household surveys, 2013.

Table D-2.– Population profile, Nikolai, Alaska, 2013.

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	4.5	8.3%	8.3%	4.5	11.1%	11.1%	9.0	9.5%	9.5%
5–9	0.0	0.0%	8.3%	0.0	0.0%	11.1%	0.0	0.0%	9.5%
10–14	3.0	5.6%	13.9%	1.5	3.7%	14.8%	4.5	4.8%	14.3%
15–19	3.0	5.6%	19.4%	4.5	11.1%	25.9%	7.5	7.9%	22.2%
20–24	4.5	8.3%	27.8%	4.5	11.1%	37.0%	9.0	9.5%	31.7%
25–29	4.5	8.3%	36.1%	3.0	7.4%	44.4%	7.5	7.9%	39.7%
30–34	4.5	8.3%	44.4%	0.0	0.0%	44.4%	4.5	4.8%	44.4%
35–39	3.0	5.6%	50.0%	0.0	0.0%	44.4%	3.0	3.2%	47.6%
40–44	0.0	0.0%	50.0%	1.5	3.7%	48.1%	1.5	1.6%	49.2%
45–49	3.0	5.6%	55.6%	3.0	7.4%	55.6%	6.0	6.3%	55.6%
50–54	3.0	5.6%	61.1%	3.0	7.4%	63.0%	6.0	6.3%	61.9%
55–59	10.5	19.4%	80.6%	0.0	0.0%	63.0%	10.5	11.1%	73.0%
60–64	0.0	0.0%	80.6%	0.0	0.0%	63.0%	0.0	0.0%	73.0%
65–69	1.5	2.8%	83.3%	4.5	11.1%	74.1%	6.0	6.3%	79.4%
70–74	1.5	2.8%	86.1%	0.0	0.0%	74.1%	1.5	1.6%	81.0%
75–79	3.0	5.6%	91.7%	1.5	3.7%	77.8%	4.5	4.8%	85.7%
80–84	1.5	2.8%	94.4%	1.5	3.7%	81.5%	3.0	3.2%	88.9%
85–89	0.0	0.0%	94.4%	0.0	0.0%	81.5%	0.0	0.0%	88.9%
90–94	1.5	2.8%	97.2%	0.0	0.0%	81.5%	1.5	1.6%	90.5%
95–99	0.0	0.0%	97.2%	0.0	0.0%	81.5%	0.0	0.0%	90.5%
100–104	0.0	0.0%	97.2%	0.0	0.0%	81.5%	0.0	0.0%	90.5%
Missing	1.5	2.8%	100.0%	7.5	18.5%	100.0%	9.0	9.5%	100.0%
Total	**54.0**	**100.0%**	**100.0%**	**40.5**	**100.0%**	**100.0%**	**94.5**	**100.0%**	**100.0%**

Source ADF&G Division of Subsistence household surveys, 2014.

Table D-3.– Estimated harvest of nonsalmon fish by gear type, resource, Nikolai, Alaska, 2012.

	Subsistence methods																	
	Gillnet or seine		Ice fishing (hook under ice)		Net under ice		jig		Other method		Subsistence gear, any method		Rod and reel		Dip net		Any method	
Resource	Number	Pounds	Number	Pounds	Number	Pounds	No.	Lb.	Number	Pounds	Number	Pounds	Number	Pounds	No.	Lb.	Number	Pounds
Nonsalmon fish	5,285.5	9,107.9	91.0	247.6	0.0	0.0	0.0	0.0	144.8	279.3	5,521.4	9,634.8	292.4	884.1	0.0	0.0	5,813.8	10,518.9
Pacific herring	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pacific herring roe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rainbow smelt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pacific halibut	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arctic lamprey	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alaska blackfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burbot	1.4	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	3.3	0.0	0.0	0.0	0.0	1.4	3.3
Arctic char	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dolly Varden	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3	11.6	0.0	0.0	8.3	11.6
Lake trout	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arctic grayling	13.8	9.7	48.3	33.8	0.0	0.0	0.0	0.0	0.0	0.0	62.1	43.4	131.0	91.7	0.0	0.0	193.1	135.2
Northern pike	157.2	786.2	42.8	213.8	0.0	0.0	0.0	0.0	41.4	206.9	241.4	1,206.9	93.8	469.0	0.0	0.0	335.2	1,675.9
Sheefish	173.8	973.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	173.8	973.2	55.2	309.0	0.0	0.0	229.0	1,282.2
Longnose sucker	344.8	241.4	0.0	0.0	0.0	0.0	0.0	0.0	103.4	72.4	448.3	313.8	4.1	2.9	0.0	0.0	452.4	316.7
Rainbow trout	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Broad whitefish	728.3	1,019.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	728.3	1,019.6	0.0	0.0	0.0	0.0	728.3	1,019.6
Bering cisco	1,303.4	1,824.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,303.4	1,824.8	0.0	0.0	0.0	0.0	1,303.4	1,824.8
Least cisco	551.7	551.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	551.7	551.7	0.0	0.0	0.0	0.0	551.7	551.7
Humpback whitefish	1,362.8	2,725.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,362.8	2,725.5	0.0	0.0	0.0	0.0	1,362.8	2,725.5
Round whitefish	648.3	972.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	648.3	972.4	0.0	0.0	0.0	0.0	648.3	972.4
Unknown whitefishes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2013.

Table D-4.– Estimated harvest of nonsalmon fish by gear type, resource, Nikolai, Alaska, 2013.

	Subsistence methods													
	Gillnet or seine		Ice fishing (hook under ice)		Community fishwheel		Other method		Subsistence gear, any method		Rod and reel		Any method	
Resource	Number	Pounds	Number	Pounds	No.	Lb.	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Nonsalmon fish	1,315.5	3,013.2	67.5	337.5	1,353.0	1,671.9	0.0	0.0	2,736.0	5,022.6	349.5	1,425.5	3,085.5	6,448.1
Pacific herring	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rainbow smelt	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arctic lamprey	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Alaska blackfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burbot	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	21.6	9.0	21.6
Arctic char	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dolly Varden	0.0	0.0	0.0	0.0	1.5	2.1	0.0	0.0	1.5	2.1	6.0	8.4	7.5	10.5
Lake trout	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arctic grayling	4.5	3.2	0.0	0.0	0.0	0.0	0.0	0.0	4.5	3.2	79.5	55.7	84.0	58.8
Northern pike	283.5	1,417.5	67.5	337.5	15.0	75.0	0.0	0.0	366.0	1,830.0	147.0	735.0	513.0	2,565.0
Sheefish	52.5	294.0	0.0	0.0	0.0	0.0	0.0	0.0	52.5	294.0	108.0	604.8	160.5	898.8
Longnose sucker	202.5	141.8	0.0	0.0	495.0	346.5	0.0	0.0	697.5	488.3	0.0	0.0	697.5	488.3
Rainbow trout	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Broad whitefish	147.0	205.8	0.0	0.0	184.5	258.3	0.0	0.0	331.5	464.1	0.0	0.0	331.5	464.1
Bering cisco	240.0	336.0	0.0	0.0	510.0	714.0	0.0	0.0	750.0	1,050.0	0.0	0.0	750.0	1,050.0
Least cisco	118.5	118.5	0.0	0.0	18.0	18.0	0.0	0.0	136.5	136.5	0.0	0.0	136.5	136.5
Humpback whitefish	192.0	384.0	0.0	0.0	129.0	258.0	0.0	0.0	321.0	642.0	0.0	0.0	321.0	642.0
Round whitefish	75.0	112.5	0.0	0.0	0.0	0.0	0.0	0.0	75.0	112.5	0.0	0.0	75.0	112.5

Source ADF&G Division of Subsistence household surveys, 2014.

Note Net under ice, jig, and dipnet were asked, there no reports of harvest with these gear types.

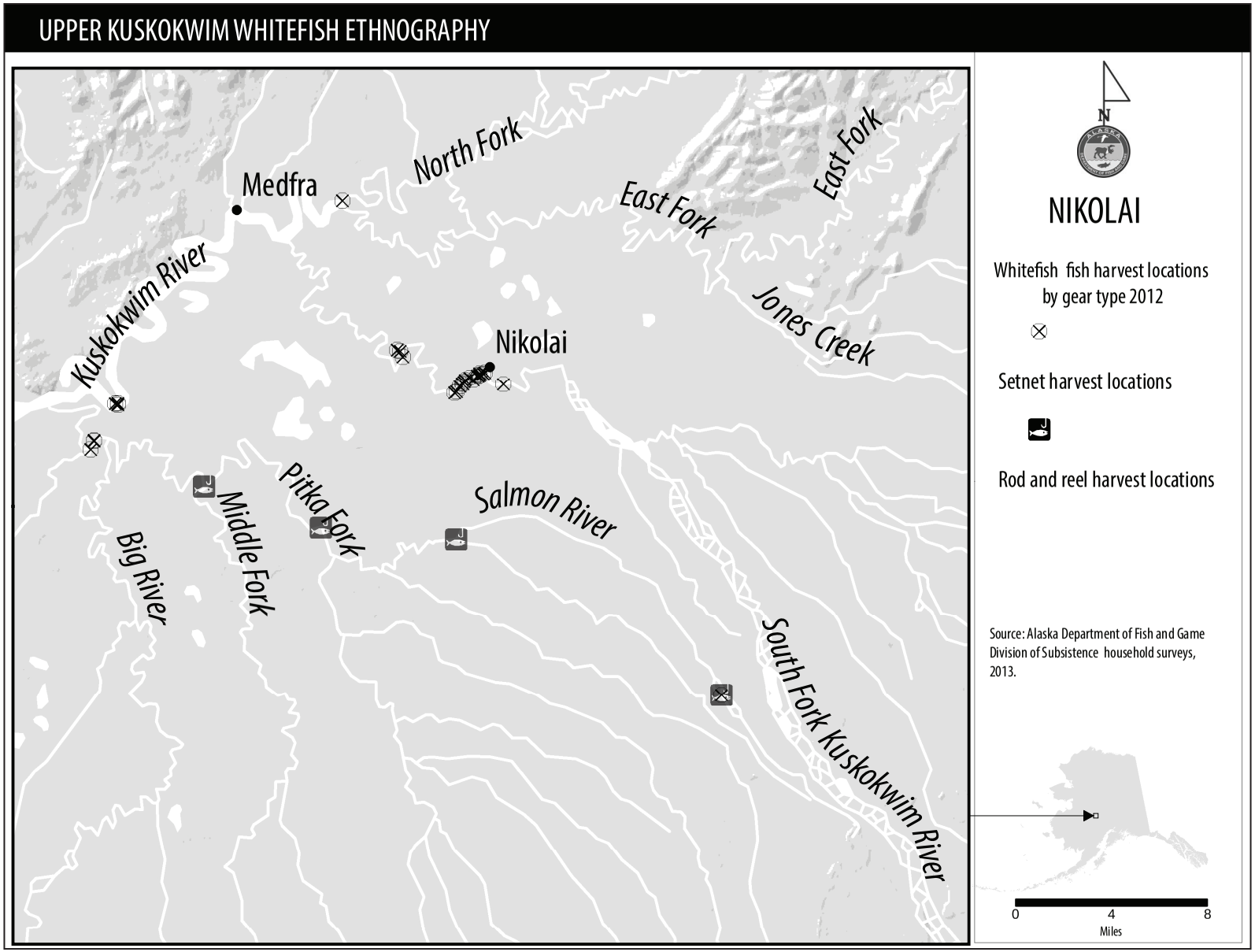


Figure D-5.– Whitefish harvest locations by gear type, Nikolai, Alaska, 2012.

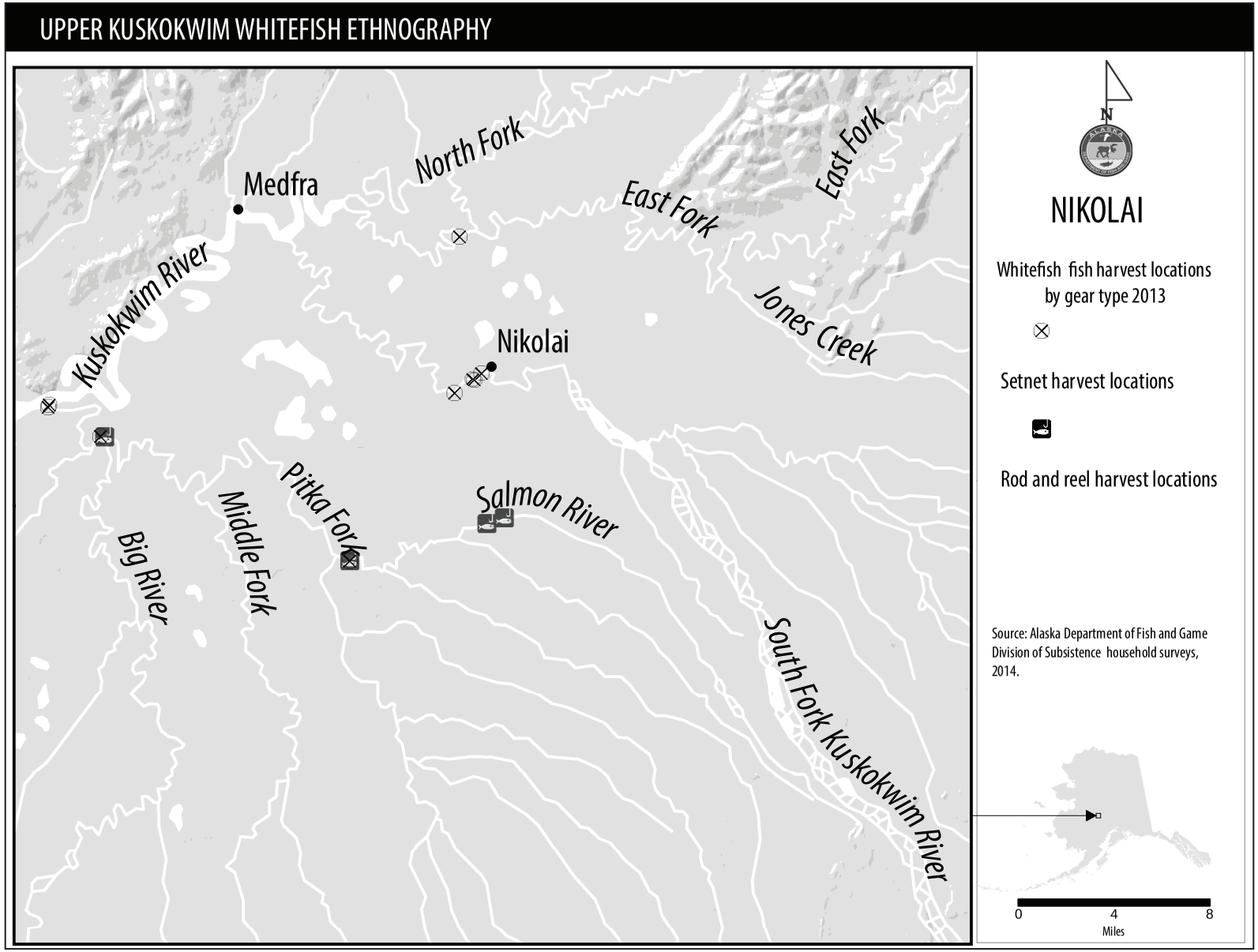


Figure D-6.– Whitefish harvest locations by gear type, Nikolai, Alaska, 2013.

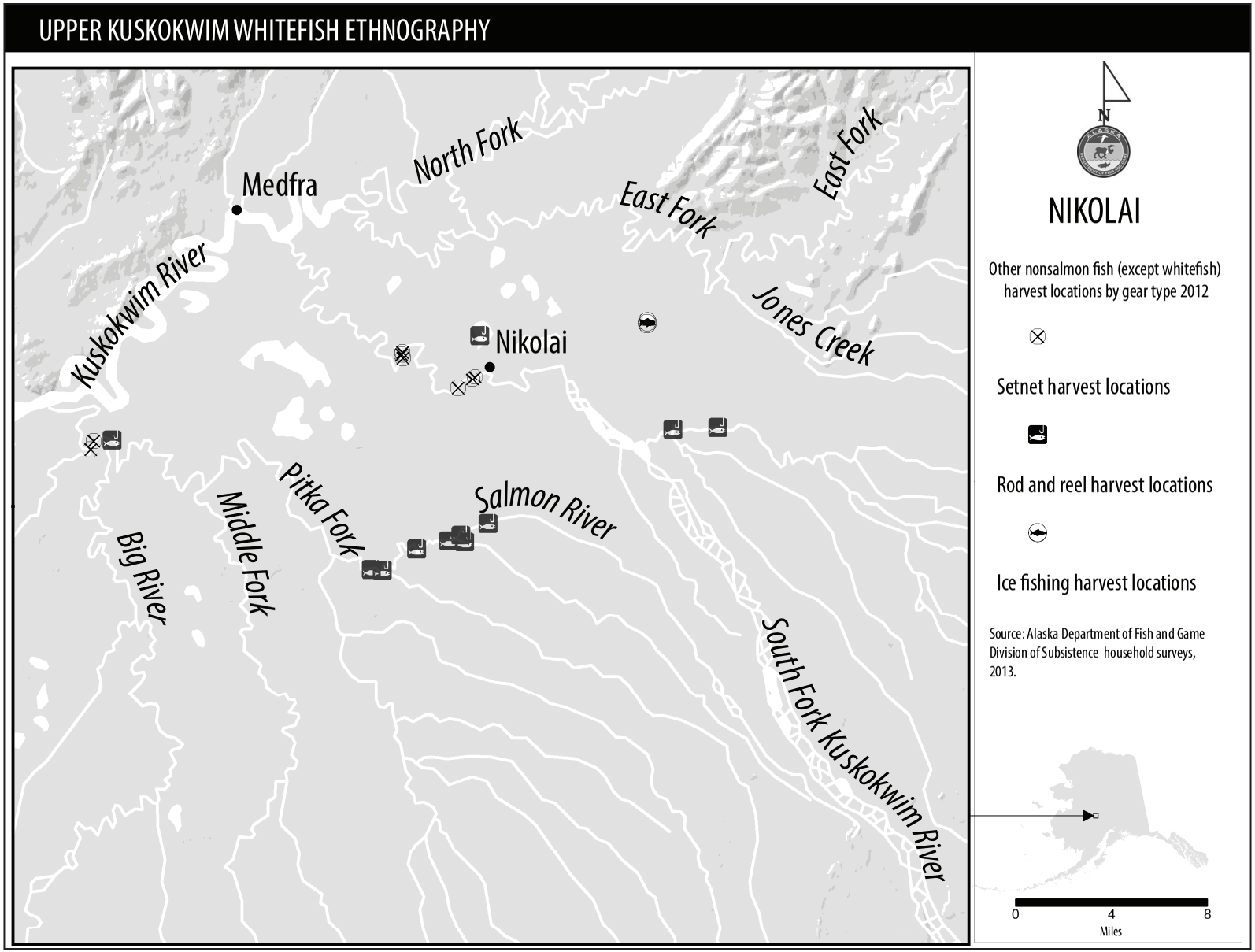


Figure D-7.– Other nonsalmon fish (except whitefish) harvest locations by gear type, Nikolai, Alaska, 2012.

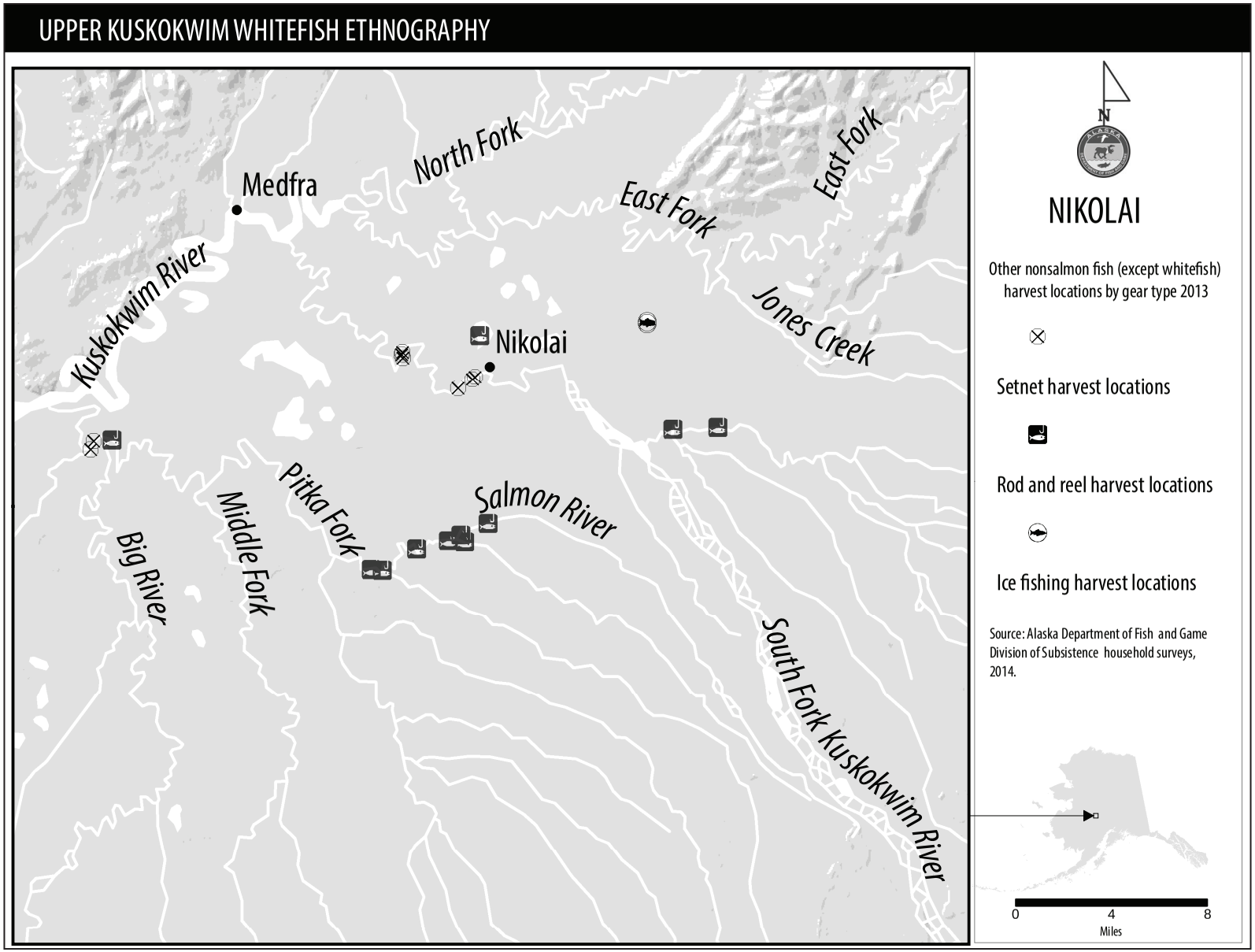


Figure D-8.– Other nonsalmon fish (except whitefish) harvest locations by gear type, Nikolai, Alaska, 2013.