Technical Paper No. 352

The Kvichak Watershed Subsistence Salmon Fishery: An Ethnographic Study

by

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March 2010

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 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

all commonly-accepted abbreviations; e.g., Mr., Mrs., AM, PM, etc.	
all commonly-accepted professional titles; e.g., Dr., Ph.D., R.N., etc.	
Alaska Administrative Code	AAC
Alaska Department of Fish and Game	ADF&G
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
approximately	~
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.
mean	$\bar{x}$
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
plus or minus	±
population size	N
probability	P
sample size	n
second (angular)	"
standard deviation	σ or s
standard error (of the mean)	$s_{\bar{x}}$
type I error probability	P_a
type II error probability	P_b
variance	σ^2 or s^2

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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 State Library and on the Internet: http://www.subsistence.adfg.state.ak.us. This publication has undergone editorial and professional review.

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ABSTRACT

This final report presents the results of an ethnographic project that investigated how families in 4 communities of the Kvichak District of the Bristol Bay Management Area of Southwest Alaska develop subsistence fishing strategies, such as when to fish, where to fish, who to fish with, and how much to harvest, in response to changing sociocultural, economic, and environmental circumstances. Research methods included participant observation at fish camps, key respondent interviews, family case studies, and systematic household surveys. This report describes case examples of summer subsistence fishing for sockeye salmon *Oncorhynchus nerka*, examples of subsistence fishing in the fall for spawning sockeye salmon, and a review of the use of seine nets as a subsistence sockeye salmon fishing method at Nondalton. The report concludes that the subsistence fishery is vital to the way of life of the study communities, and is accomplished in an efficient and sustainable manner informed by traditional knowledge. Annual and long term variations in the fishery are shaped by a complex set of environmental, economic, cultural, and personal factors. Also, findings based on household surveys and permit returns suggest that relying solely on permit returns results in an underestimate of subsistence sockeye salmon harvests. Additional outreach is necessary to encourage households to obtain permits and keep accurate records of their harvests.

Key words: Kvichak District, Kvichak River, Nondalton, Iliamna, Newhalen, Port Alsworth, Sixmile Lake, Iliamna Lake, Newhalen River, Bristol Bay, Southwest Alaska, Pacific salmon, sockeye salmon, *Oncorhynchus nerka*, subsistence fishing, subsistence salmon processing methods, subsistence harvests, case study method, fish camps, traditional ecological knowledge.

INTRODUCTION

This report presents the results of an ethnographic project that investigated how families in 4 Kvichak District communities in the Bristol Bay Management Area, Southwest Alaska, develop subsistence fishing strategies, such as when to fish, where to fish, who to fish with, and how much to harvest, in response to changing sociocultural, economic, and environmental circumstances. Prior to this study, such ethnographic data about contemporary community patterns of subsistence uses and adaptation in Kvichak District communities were lacking, although they are essential for the effective management of fisheries providing for subsistence uses. The study communities are Iliamna, Newhalen, Nondalton, and Port Alsworth (Figure 1). These communities had a combined estimated population of 581 people in 172 households in 2007 and 584 people in 175 households in 2008 (Table 1). Project partners were the Alaska Department of Fish and Game Division of Subsistence (ADF&G), the Bristol Bay Native Association (BBNA), and the Lake Clark National Park and Preserve (National Park Service; NPS).

Table 1.–Population of study communities, 2000, 2007, and 2008.

	2000		2007		2008	
	Households	Population	Households [a]	Population	Households [a]	Population
Iliamna	35	102	30	87	33	95
Newhalen	39	160	45	185	39	162
Nondalton	68	221	60	194	62	202
Port Alsworth	34	104	38	115	41	125
Total	**176**	**587**	**172**	**581**	**175**	**584**

a. Number of households for 2007 and 2008 estimated based on average household size in 2000.

Source ADLWD 2009.

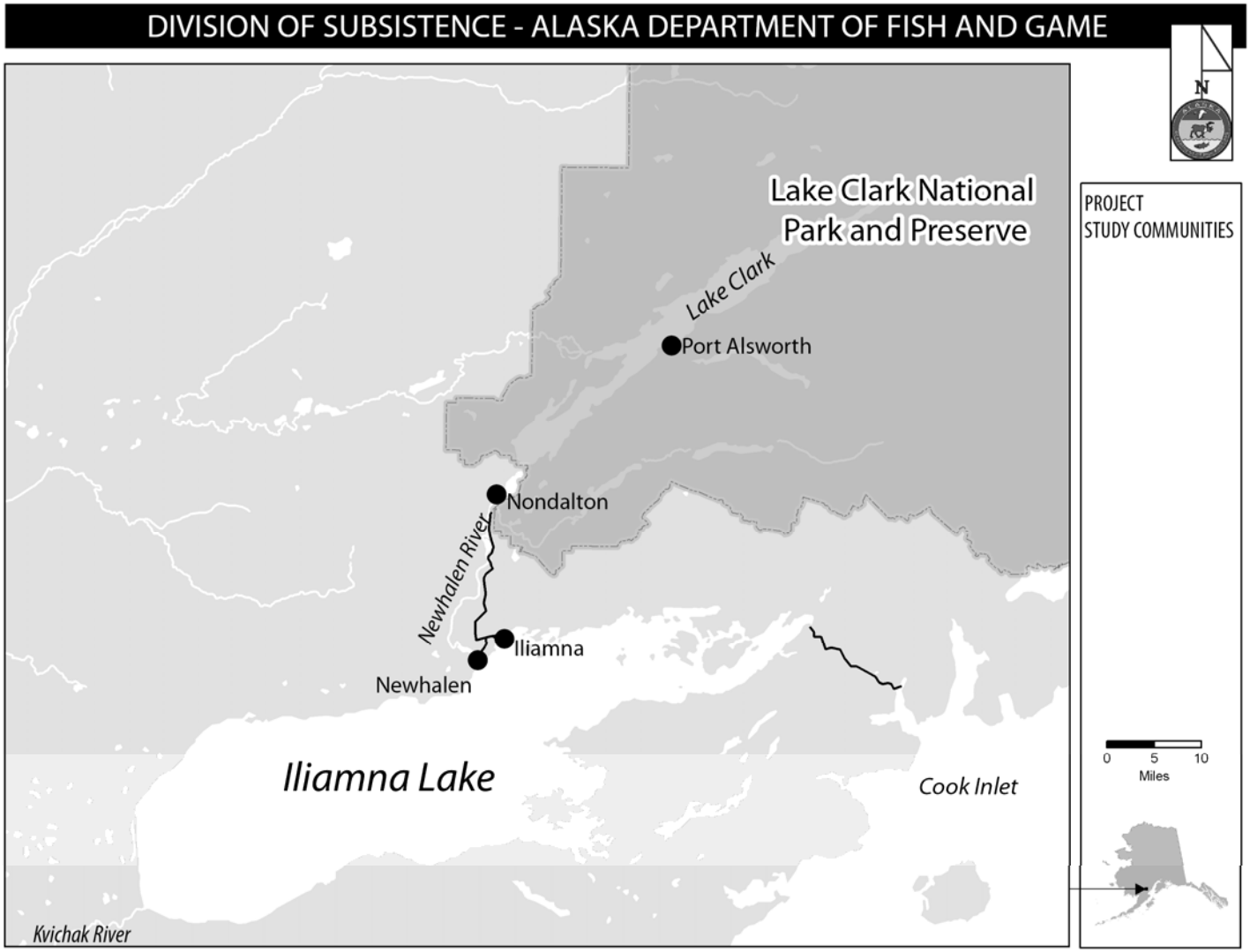

Figure 1.–Map of project study communities.

Before this study began, an analysis of state subsistence permit data[1] showed that subsistence harvests of sockeye salmon *Oncorhynchus nerka* in the Kvichak District declined from 1990 to 2006 (Table 2). From 2000 to 2006, estimated harvests were below the range of 55,000–65,000 sockeye salmon established by the Alaska Board of Fisheries (BOF) as the amount necessary for subsistence uses under 5 AAC 01.336(b)(1). From the mid 1960s to the 1990s, the 5 year running average of estimated subsistence sockeye salmon harvests in the Kvichak District ranged from 70,000 to 80,000 fish. A steady decline began in the mid 1990s, and the 5 year running average harvest bottomed out at approximately 35,000 sockeye salmon in 2004 before rising in 2005 and 2006 (Figure 2). In addition, from 1963 to 2006, per capita subsistence harvests of sockeye salmon declined in each study community (Figure 3), although the level and rate of decline varied by community.[2] Poor sockeye salmon returns were likely a factor responsible for low subsistence harvests in some years;[3] reports prepared by the Division of Subsistence suggest that socioeconomic and sociocultural factors may also be responsible for the trend towards lower harvests (Fall et al. 2001; Fall et al. 2003; Fall et al. 2006; Krieg et al. 2009) (Figure 4).

Correspondingly, Stickman et al. (2003) recorded traditional ecological knowledge (TEK) about sockeye salmon through interviews with 18 Nondalton residents and identified several factors that, in the view of these respondents, resulted in reduced subsistence sockeye salmon harvests. These factors included lower sockeye salmon returns, socioeconomic changes (such as more summer cash employment opportunities), and warmer, wetter summers, which inhibited traditional methods of processing sockeye salmon. Respondents also said lower numbers of sockeye salmon were a result of the proliferation of beaver dams blocking access to spawning locations, the disturbance of spawning areas by jet boats, increasing sockeye salmon mortality by catch-and-release sport fisheries, and overharvests in the Bristol Bay commercial fishery (Stickman et al. 2003:18, 31, 34–35, 36–37). Several respondents said that Nondalton residents were spending much less time at fish camps than 20 years ago because of lower harvest goals, the use of outboard motors to access fishing sites, and more summer cash employment. Further, they suggested that there was less involvement by young people in subsistence sockeye salmon fishing and processing.

Prior to this study, uncertainty existed among ADF&G staff regarding the magnitude of changes in subsistence sockeye salmon harvests in the Kvichak watershed (see also Stickman et al. 2003:23). The current household subsistence permit program may inadequately document effort, harvest levels, and harvest timing, especially for some very active, multihousehold, extended families. If so, this permit program may underestimate subsistence salmon harvests, resulting in difficulty in tracking harvest trends.

[1] Since the early 1960s, state subsistence regulations have required that subsistence salmon fishers in the Bristol Bay Management Area, including the Kvichak watershed, obtain a subsistence permit, keep a record of daily catches on the back of the permit, and return the permit and harvest record to ADF&G at the end of the calendar year (5 AAC 01.330 (a)).

[2] Figure 3 is based on data presented and discussed in Fall et al. (Fall et al. 2006:215–219, 245), which should be consulted for background on the methods used to develop these per capita harvest estimates. Note that the subsistence permit database combines data from Iliamna and Newhalen into a single estimate due to the difficulty of separating residents of the 2 communities based on mailing addresses (the 2 communities have the same zip code).

[3] At its Bristol Bay regulatory meeting in December 2003, the Alaska Board of Fisheries elevated the Kvichak sockeye salmon stock from a "stock of yield concern" to a "stock of management concern" (as defined in the "Policy for the Management of Sustainable Salmon Fisheries" [5 AAC 39.222]) due to its recent chronic inability to meet escapement goals (Westing et al. 2005:6).

Table 2.–Subsistence harvests of sockeye salmon, number of permits issued, and average harvest per permit by all permittees and local residents, Kvichak District, Bristol Bay Area, 1983–2006.

	All subsistence permits			Bristol Bay residents only			Other Alaska residents [a]		
	Estimated harvests	Permits issued	Harvest per permit	Estimated harvests	Permits issued	Harvest per permit	Estimated harvests	Permits issued	Harvest per permit
1983	88,372	175	505	87,914	173	508	458	2	229
1984	101,456	169	600	100,432	166	605	1,024	3	341
1985	83,776	255	329	77,804	181	430	5,972	74	81
1986	58,777	182	323	57,988	174	333	789	8	99
1987	72,000	161	447	71,679	160	448	321	1	321
1988	77,100	168	459	75,532	163	463	1,568	5	314
1989	71,400	169	423	70,034	164	427	1,366	5	273
1990	76,600	182	421	75,202	165	456	1,398	17	82
1991	66,786	171	391	65,676	146	450	1,110	25	44
1992	72,148	202	357	69,589	169	412	2,559	33	78
1993	74,123	234	317	71,343	199	359	2,780	35	79
1994	64,343	209	308	61,059	168	363	3,284	41	80
1995	54,679	201	272	51,238	157	326	3,441	44	78
1996	54,872	211	260	52,565	169	311	2,307	42	55
1997	59,508	192	310	56,407	155	364	3,101	37	84
1998	53,656	205	262	50,021	163	307	3,635	42	87
1999	57,723	216	267	54,889	159	345	2,834	57	50
2000	36,990	212	175	34,270	170	202	2,720	42	65
2001	32,808	207	159	30,907	176	176	1,901	31	61
2002	33,001	180	183	31,423	155	203	1,578	25	63
2003	38,495	175	220	36,904	157	235	1,591	18	88
2004	53,225	206	258	51,594	186	277	1,631	20	82
2005	48,263	194	249	46,185	171	270	2,078	23	90
2006	49,850	179	279	47,389	151	314	2,461	28	88
24-year average	61,665	194	318	59,502	167	357	2,163	27	79
Average, 1987–1996	68,405	191	359	66,392	166	400	2,013	25	81
Average, 1997–2006	46,352	197	236	43,999	164	268	2,353	32	73
Average, 1997–2001	48,137	206	233	45,299	165	275	2,838	42	68
Average, 2002–2006	44,567	187	239	42,699	164	260	1,868	23	82

a. Nonlocal residents were ineligible to receive permits from 1983 to 1984 and 1986 to 1989.

Source ADF&G Division of Subsistence Alaska Subsistence Fisheries Database.

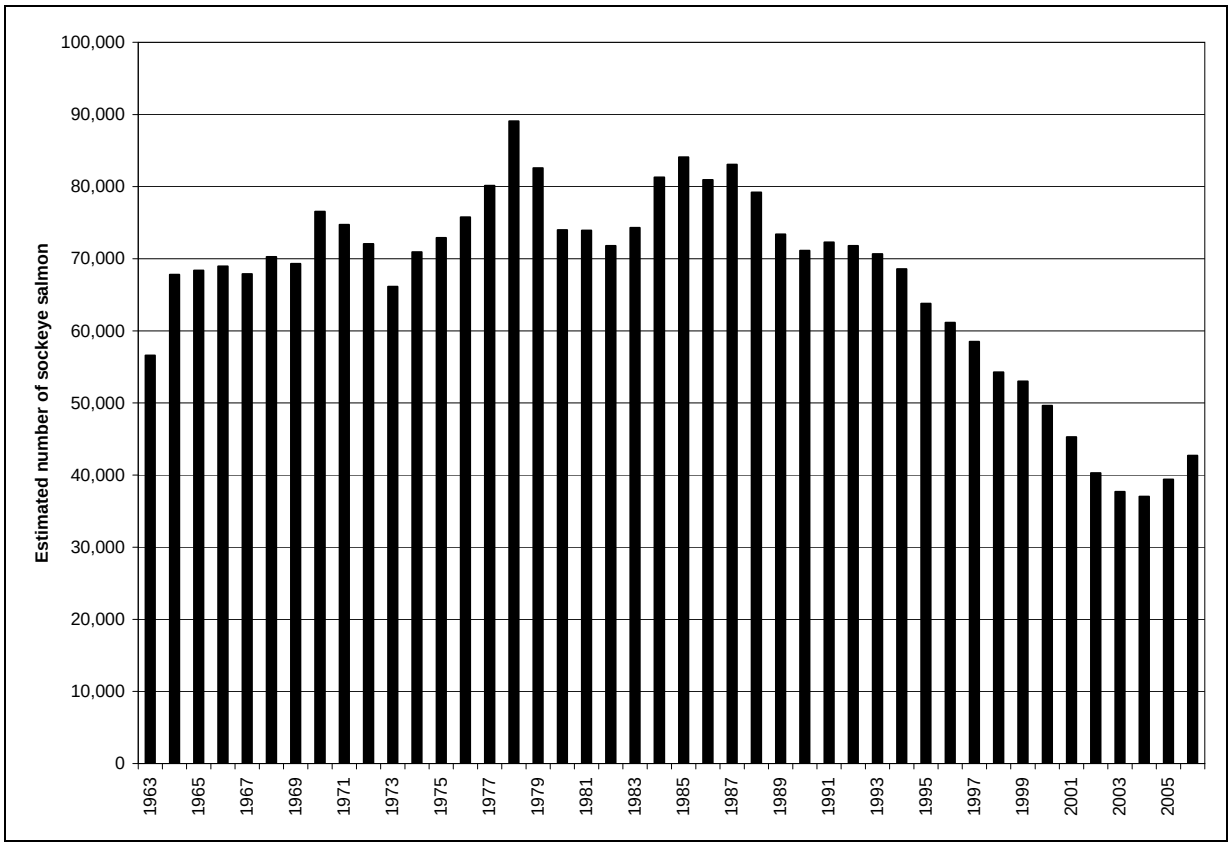

Figure 2.–Kvichak District: 5-year running average of estimated subsistence sockeye salmon harvests (Kvichak drainage communities only), 1963–2006.

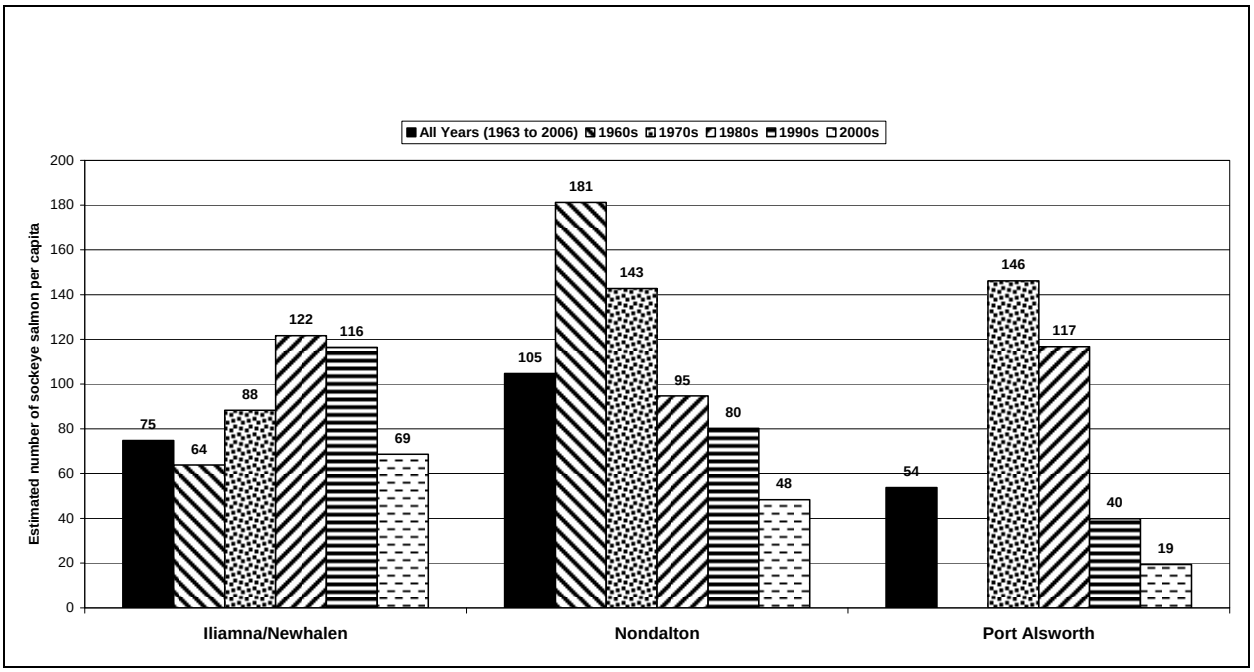

Figure 3.–Estimated subsistence harvests of sockeye salmon per capita, Iliamna/Newhalen, Nondalton, and Port Alsworth, by decade, 1963–2006.

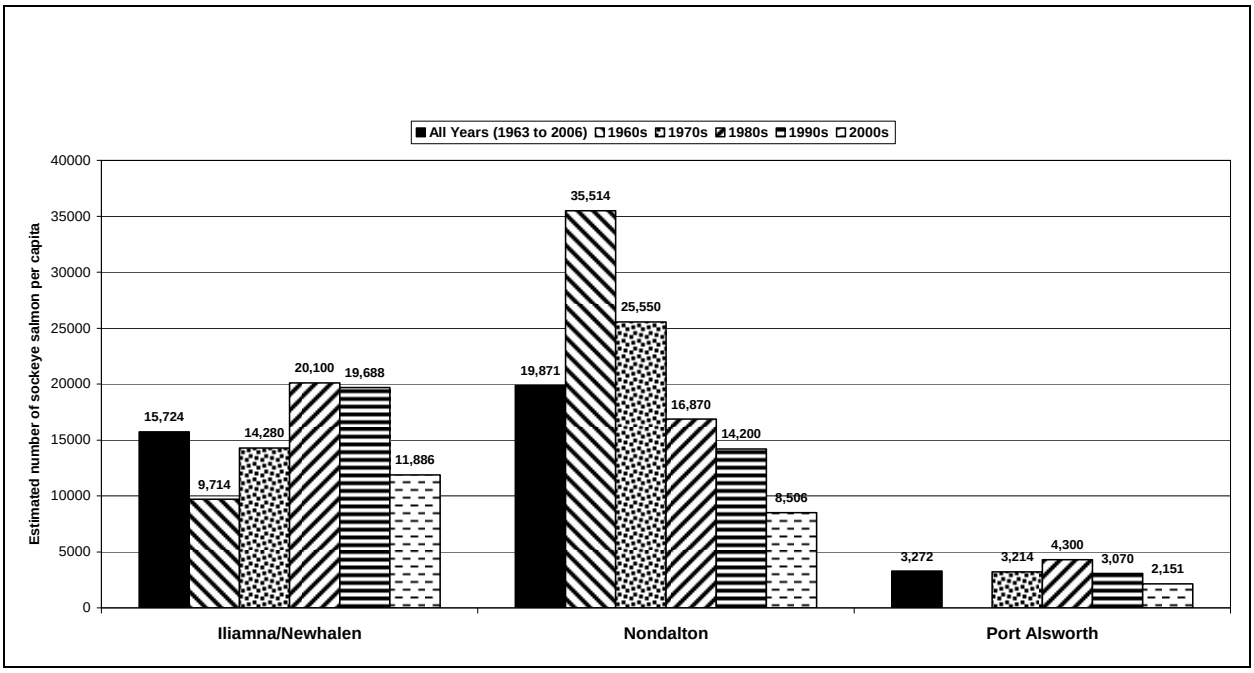

Figure 4.–Estimated subsistence harvests of sockeye salmon, Iliamna/Newhalen, Nondalton, and Port Alsworth, by decade, 1963–2006.

With this background of changing harvest levels and uncertain conditions that appear to be shaping trends in the subsistence sockeye salmon fishery, this project addressed the following 3 key research questions:

1. How do families make decisions about subsistence fishing in light of ever-changing sociocultural, economic, and environmental circumstances?
2. What sociocultural, economic, and environmental factors shape annual variations in subsistence harvests of Kvichak sockeye salmon?
3. Which of these factors shape long term trends in the fishery?

This project addressed these questions through a combination of social sciences research methods, organized in stages in order to build upon findings as the study progressed, including observing subsistence fishers, conducting systematic household surveys and family case studies, and interviewing key respondents. The results of this project will help fisheries managers by identifying those factors that affect subsistence harvest levels and participation rates, and by providing more accurate and precise harvest data.

BACKGROUNDS OF STUDY COMMUNITIES

The 4 study communities are within Southwest Alaska's Lake and Peninsula Borough. Newhalen and Nondalton are incorporated as second class cities while Iliamna and Port Alsworth are unincorporated communities. These 4 communities are part of the upper reaches of the Kvichak watershed. On their migration to the headwaters of this system, salmon pass Iliamna and Newhalen at the mouth of the Newhalen River, and Nondalton and Port Alsworth further upriver. The results of this project will be presented in the order in which returning salmon reach the study communities.

Iliamna is located on the northwestern shore of Iliamna Lake. It is connected by a 4.5 mi paved road to the community of Newhalen and the Newhalen River. Iliamna developed around a store in the early 20th century and drew its population from surrounding villages. With a state-run airport, float plane facilities, several sportfishing and hunting lodges, a primary care clinic, and other services, Iliamna serves as a

subregional center for other communities in the Iliamna Lake–Lake Clark area (Morris 1986:38; ADCCED 2009). The population of Iliamna, as estimated by the Alaska Department of Labor and Workforce Development, was 87 in 2007 and 95 in 2008 (Table 1). Household surveys conducted by the Division of Subsistence resulted in an estimated year-round population of Iliamna of 73 in 2004, 67% of which was Alaska Native (Table 3).

Table 3.–Demographic characteristics of study communities, 2004.

	Iliamna	Newhalen	Nondalton	Port Alsworth
Number of households	22	31	43	30
Estimated population	73	125	164	109
Mean household size	3	4	4	4
Average length of residency in community, household heads (years)	30	35	35	15
Percentage of households with at least 1 Alaska Native head of household	69%	100%	97%	23%
Percentage of population, Alaska Native	67%	96%	90%	18%

Source Fall et al. 2006: 22.

Newhalen is located at the mouth of the Newhalen River on Iliamna Lake. The 1890 federal census recorded a Yup'ik community called *Noghelingamiut* near this location. Newhalen and Iliamna share a school and postal facilities (Morris 1986:41; ADCCED 2009). The estimated population of Newhalen was 185 in 2007 and 162 in 2008 (Table 1). For 2004, Division of Subsistence surveys documented a year-round population of 125, with 96% Alaska Native (Table 3).

Nondalton is located on the western shore of Sixmile Lake. The present population, most of whom are of Dena'ina Athabascan heritage, traces its ancestry to Kijik (on Lake Clark), Lime Village on the Stony River to the north, and other small settlements in the Lake Clark area (Morris 1986:42; ADCCED 2009). Nondalton's population was estimated in 2007 at 194 and in 2008 at 202 (Table 1). For 2004, Division of Subsistence household surveys estimated Nondalton's year-round population at 164, (90% of which was Alaska Native) (Table 3). At the time of the project, there was no store in Nondalton.

The community of Port Alsworth, at Tanalian Point on Lake Clark, was established in the 1940s when the Alsworth family homesteaded at the site. Presently, Port Alsworth hosts the field office for the Lake Clark National Park and Preserve (Morris 1986:46; Fall et al. 2006:129; ADCCED 2009). The estimated population of Port Alsworth was 115 in 2007 and 125 in 2008 (Table 1). For 2004, the year-round population was estimated as 109 based on Division of Subsistence surveys, with 18% of the population Alaska Native (Table 3).

Table 4 summarizes selected findings about employment characteristics of the study communities in 2004 from systematic household surveys conducted by the Division of Subsistence (Fall et al. 2006). The majority of adults in 4 communities held a job for at least a portion of 2004, including 73% in Iliamna, 69% in Newhalen, 69% in Nondalton, and 84% in Port Alsworth. Most of the cash employment in Nondalton and Newhalen was seasonal. In Nondalton, employed adults worked an average of 6.5 months and 20% held year-round jobs. In Newhalen, the average was 7.6 months of employment with 28% working year-round. Reflecting its role as a subregional center, 79% of employed adults in Iliamna worked year-round, with an average length of employment of 10.5 months. In Port Alsworth, employed adults worked an average of 9.8 months and 67% worked year-round, reflecting the availability of employment with the NPS and local lodges and guiding services. Per capita income ranged from a high of $15,069 in Iliamna to $14,670 in Port Alsworth, $13,148 in Newhalen, and $7,737 in Nondalton. For

1999, the federal census estimated the per capita cash income for Alaska at $22,660 (U. S. Census Bureau 2001).

Table 4.–Employment characteristics of study communities, 2004.

	Iliamna	Newhalen	Nondalton	Port Alsworth
Percentage of adults who were employed	73%	69%	69%	84%
Mean number of months employed, employed adults	11	8	7	10
Percentage of employed adults who were employed year-round	79%	28%	20%	67%
Percentage of households with at least one employed adult	92%	92%	92%	91%
Per capita income (earned and other)	$15,069	$13,148	$7,737	$14,670

Source Fall et al. 2006:24, 26.

Table 5 reports selected findings about characteristics of resource harvest and use in the study communities in 2004, the most recent year for which comprehensive data are available. All households in the study communities used wild resources in 2004 and virtually every household was involved in harvesting wild foods. Also, the majority of households shared resources with other households and received gifts of fish, wildlife, and wild plants. Study community households used a wide range of wild foods, ranging from a household average of 11.0 different kinds in Port Alsworth to 11.4 kinds in Iliamna, 13.7 in Nondalton, and 14.8 in Newhalen. In 2004, harvests were substantial. As estimated in pounds usable weight, harvests ranged from 133 lb per person in Port Alsworth, 358 lb per person in Nondalton, 469 lb per person in Iliamna, and 692 lb per person in Newhalen.

In 2004, salmon contributed the largest portion of subsistence harvests of wild resources in the 4 study communities, ranging from 62% of total pounds harvested in Nondalton (Figure 5), to 69% in Port Alsworth (Figure 6), 72% in Newhalen (Figure 7), and 79% in Iliamna (Figure 8). As shown in Figure 9, salmon made up 50% or more of the total harvest of wild foods in every year for which comprehensive harvest data are available, except Iliamna in 1973 (a year of very poor sockeye salmon returns to the Kvichak watershed).

Table 5.–Characteristics of resource harvest and use, study communities, 2004.

	Iliamna	Newhalen	Nondalton	Port Alsworth
Mean number of resources used, per household	11	15	14	11
Mean number of resources attempted to harvest, per household	10	13	12	9
Mean number of resources harvested, per household	8	12	11	7
Mean number of resources received, per household	5	6	5	5
Mean number of resources given away, per household	3	8	6	3
Mean household harvest, pounds usable weight	1,553	2,794	1,365	483
Per capita harvest, pounds usable weight	469	692	358	133
Percentage of households using any resource	100%	100%	100%	100%
Percentage of households attempting to harvest any resource	100%	100%	97%	100%
Percentage of households harvesting any resource	100%	100%	97%	100%
Percentage of households receiving any resource	77%	96%	97%	91%
Percentage of households giving away any resource	54%	80%	92%	73%

Source Fall et al. 2006:28.

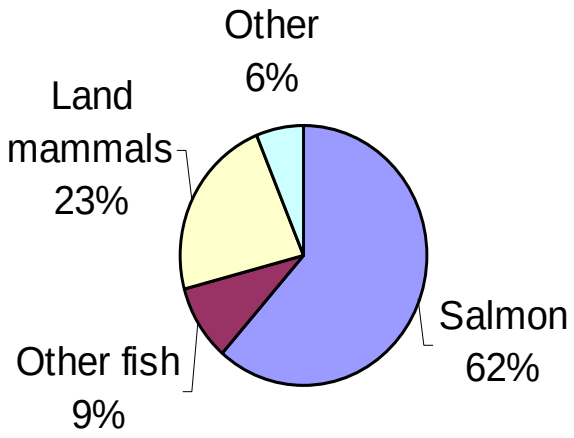

Figure 5.–Composition of resource harvest by category, Nondalton, 2004.

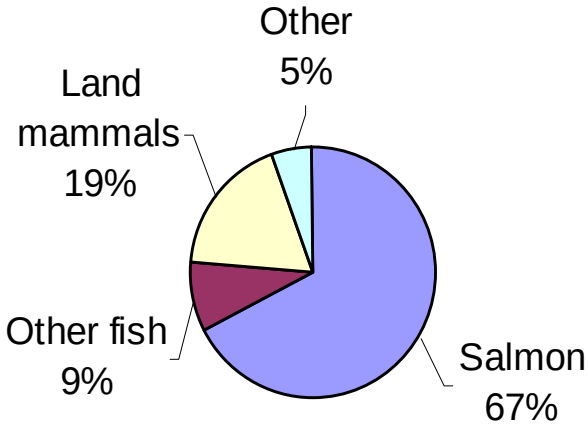

Figure 6.–Composition of resource harvest by category, Port Alsworth, 2004.

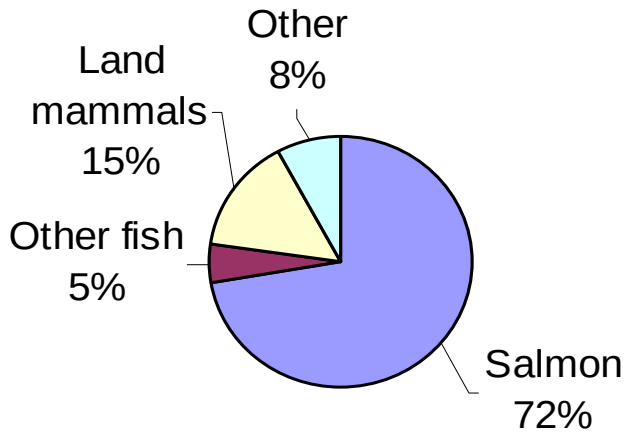

Figure 7.–Composition of resource harvest by category, Newhalen, 2004.

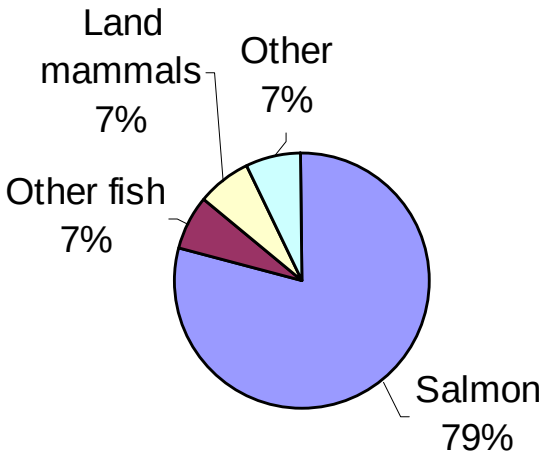

Figure 8.–Composition of resource harvest by category, Iliamna, 2004.

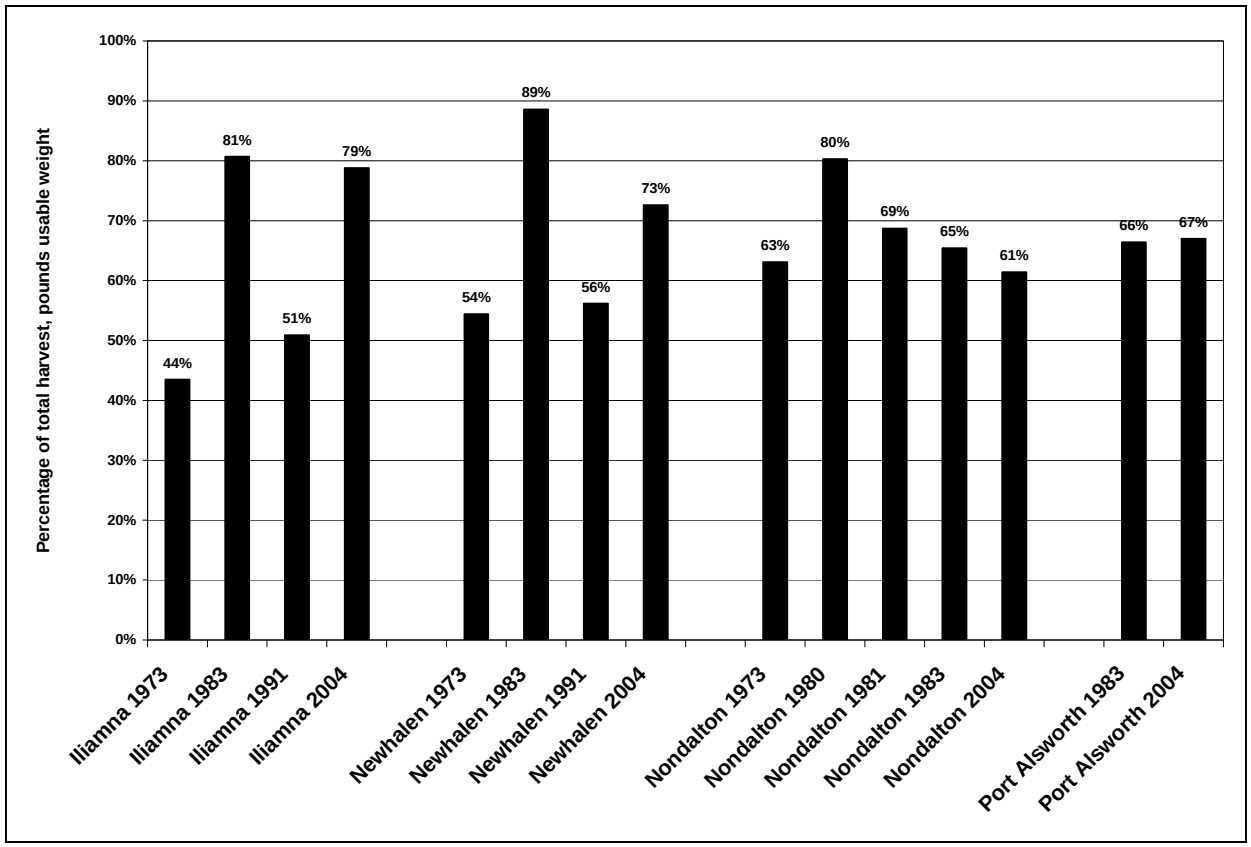

Figure 9.–Salmon as a percentage of total wild resource harvest.

STUDY OBJECTIVES

Responding to the project's 3 research questions entailed meeting the following 6 research objectives, 3 of which focus on data collection and 3 on data analysis.

1. Through participant observation and follow up key respondent interviewing, prepare an ethnographic description of the subsistence sockeye salmon fisheries of the communities of Iliamna, Newhalen, Nondalton, and Port Alsworth in 2007; especially the social organization of harvesting, processing, and distributing the harvest; the location of harvests, including the location of fish camps (active and inactive); gear types used (gillnet, seine,[4] rod and reel); and processing methods. As discussed in the Methods section, limited fieldwork pertaining to the 2008 fishing season provides additional perspective for the ethnographic description.
2. Through participant observation, key respondent interviewing, evaluation of permit data, and conducting systematic household surveys, estimate the subsistence harvest of sockeye salmon by location, date, and social group (household, extended family, community) for Iliamna, Newhalen,

[4] In this report, a "seine" means a "beach seine," which is "a floating net designed to surround fish which is set from and hauled to the beach" (5 AAC 39.105(a)(6)). In contrast, a gillnet is "a net primarily designed to catch fish by entanglement in the mesh" (5 AAC 39.105(a)(1)). In this report, "seining' refers to a fishing technique that surrounds fish for harvest rather than entangling them in the net. Gillnets can be used to seine if the mesh size is small enough to prevent entangling the fish in the net.

Nondalton, and Port Alsworth in 2007. As noted in the Methods section, a second round of household surveys took place to document harvests in 2008.

3. Through a combination of data gathering methods, such as logbooks, journals, photographs, and audio recordings, document the social context (e.g., division of labor, consumption, and sharing) of subsistence fishing effort for 4 case study families over the course of 1 year for each family, in order to demonstrate community patterns of subsistence uses and adaptation to changing environmental and socioeconomic conditions.
4. Based on the data collected for Objective 3, describe the decision-making processes of the 4 case study families during their annual subsistence harvests of sockeye salmon and other nonsalmon fish. Include adjustments to the processes in response to resource abundance, the species selection processes, and the decision-making processes of selecting those family members who participate.
5. Based on the findings for Objectives 1–4, identify the social, cultural, economic, and environmental factors that shaped subsistence sockeye salmon harvesting activities in Iliamna, Newhalen, Nondalton, and Port Alsworth in 2007.
6. Based upon key respondent interviews and the conclusions reached under Objective 5, describe changing subsistence fishing strategies and patterns (trends in the fishery), including harvest levels, harvest locations, social organization of production, and processing methods, in the study communities over the last 20–25 years.

RESEARCH METHODS

Table 6 provides a chronology of project activities. Table 7 lists the project personnel. Project coordination was facilitated by weekly, biweekly, or monthly teleconferences between project personnel (teleconferences took place weekly or biweekly during summer 2007 fieldwork). When available, staff from OSM participated in the teleconferences.

Through partnerships and research methods, the project was intended to be collaborative. The word "collaborative" in applied anthropology refers to a variety of approaches to social science research methodology. Stull and Schensul (1987:1) refer to collaboration as an "interdisciplinary partnership," speaking specifically of a research team approach between social scientists and those professionals or institutions with the experience and ability to affect policy within a community or at a local level. Lassiter (2005:84) defines "collaborative ethnography" as "the collaboration of researchers and subjects in the production of ethnographic texts." In this context, those who anthropologists traditionally called "informants" are now considered "consultants," and they play a significant role shaping the generation of research data and influencing the final text. Much of Alaska's anthropological gray literature and agency reports are the products of collaborative efforts. Examples include research partnerships between agencies with shared interests, collaborations between professionals of differing disciplines, and, at times, research partnerships that integrate local knowledge and perspectives into reports by giving community consultants an editorial responsibility over their contributions and, occasionally, coauthorship.

This project was a collaborative effort on multiple levels. The research team was composed of principal investigators and co-investigators from 3 agencies invested in the resource management and addressing subsistence needs of the region's residents. Two members of the research team (Karen Stickman and Michelle Ravenmoon) were National Park Service employees as well as community members with familial and cultural ties to villages where this research was conducted. Their participation in this project addressed one project goal: to bring a local perspective and voice into the final report. Therefore, we have identified sections of the report that are based primarily on their observations and experiences. The case study family methodology also addressed the goal of highlighting local voices, but represents a different form of collaboration, one between researcher and community consultants. This methodology was

proposed in order to adhere to the BBNA Partners Program mandate of ensuring significant involvement by regional residents in any research that BBNA conducts or supports.

Table 6.–Project chronology.

Date	Event/activity
April 1, 2007	Project begins
April 16, 2007	Community meeting, Nondalton
April 17, 2007	Community meetings, Newhalen and Iliamna
May 31, 2007	Community meeting, Port Alsworth
June–July 2007	Fieldwork in Iliamna, Newhalen, Nondalton, and Port Alsworth
August 17, 2007	First post fieldwork workshop
September 2007	Initial visits to family case study households, Nondalton and Port Alsworth
October 2007	Key respondent interviews, Nondalton, Newhalen, Iliamna
October 2007	Observations of redfish fishing, Newhalen
October 2007	Initial visits to family case study household, Newhalen
November 2007	Initial visits to family case study households, Iliamna
January–February 2008	First round of salmon harvest surveys in the 4 study communities
February 2008	Key respondent interviews, Iliamna and Newhalen
February 1, 2008	Community meeting, Nondalton
January 2008-March 2009	Visits to family case study households
May 1, 2008	Submission of draft of first annual report
May–June, 2008	Analysis of salmon survey results
June–July 2008	Follow-up ethnographic fieldwork at fish camps
July 2008	Key respondent interviews in Port Alsworth
July–November 2008	Data analysis
December 1, 2008	Submission of performance report
January 28–29, 2009	Second post fieldwork workshop
January–May 2009	Preparation of draft final report
March 9–10, 2009	Community meetings to review preliminary study findings in Nondalton and Port Alsworth
March 2009	Second round of salmon harvest surveys in Nondalton and Port Alsworth
April 2009	Community meeting to review preliminary study findings in Newhalen
April 2009	Second round of salmon harvest surveys in Iliamna and Newhalen
May 2009	Analysis of salmon survey results
May 1, 2009	Submission of draft annual report
May–June 2009	Internal review and revisions to draft final report
July 1, 2009	Submission of draft final report for OSM review
September 2009	Revision of final report based on OSM comments
November 1, 2009	Final comments received from OSM on revised draft final report
December 31, 2009	Submission of final report
March 1, 2010	End of project (as stated in cooperative agreement)

Table 7.–Project personnel.

Name	Affiliation
Carty, Courteney	Bristol Bay Native Association
Fall, James A.	Alaska Department of Fish and Game, Division of Subsistence
Florey, Victoria	Bristol Bay Native Association (2007–2008 only)
Hay, Jessica	National Park Service, Lake Clark National Park and Preserve
Holen, Davin	Alaska Department of Fish and Game, Division of Subsistence
Krieg, Ted	Alaska Department of Fish and Game, Division of Subsistence
La Vine, Robbin	Bristol Bay Native Association
Ravenmoon, Michelle	National Park Service, Lake Clark National Park and Preserve
Stariwat, Jory	Bristol Bay Native Association (as summer intern in 2008) and Alaska Department of Fish and Game, Division of Subsistence (2008–2009 only)
Stickman, Karen	National Park Service, Lake Clark National Park and Preserve
Yazzie, Cecelia	Alaska Department of Fish and Game, Division of Subsistence (2007–2008 only)

LITERATURE REVIEW

The literature review helped frame questions for key respondents and topics for ethnographic fieldwork. The literature search focused on 2 topics: the ethnography of fish camps, especially in northern North America, and ethnographic methods that incorporate individuals and families directly into data collection. Project personnel searched library databases, and anthropology, sociology, and fisheries journals.

ETHNOGRAPHIC FIELDWORK

Ethnographic fieldwork followed the general outline below.

1. Identify all subsistence fishing families in each community;
2. Select 5–10 families to work with during subsistence fishing;
3. Observe and participate in subsistence harvesting and processing;
4. Interview fishers to record their observations of the sockeye salmon runs and of their fishing activities;
5. Ask about and observe roles in fishing and processing by age, sex, kinship, and other factors;
6. Ask about, observe, and participate in methods used to process the harvest;
7. Ask about and observe distribution of the harvest within fishing and processing groups;
8. Ask about and observe distribution of harvests to households and families outside the harvesting and processing groups;
9. Map the location of all fish camps;
10. Inventory facilities at each fish camp; and
11. Obtain the history of each fish camp.

During the first study year, ethnographic fieldwork in the 4 study communities occurred in June and July 2007, and a second time in Newhalen and Iliamna in October 2007. Field personnel included Davin Holen (ADF&G), Theodore Krieg (ADF&G), Robbin La Vine (BBNA), Karen Stickman (NPS), Michelle Ravenmoon (NPS), ADF&G intern Cecelia Yazzie, NPS intern Jessica Hay, and BBNA intern Victoria Florey. Data were recorded primarily in field notes, audio recordings, and photographs. Global

positioning system (GPS) coordinates were recorded for fish camps and net locations, and an inventory of fish camps used by community residents in the last 5 years was performed.

The purpose of fieldwork for summer 2008, the second study year, was to fill data gaps from the prior year's fieldwork. The 2008 fieldwork was also necessary for understanding annual variations in fishing efforts and processing. The project staff for the second year was the same, except BBNA intern Jory Stariwat[5] took over for Victoria Florey.

Iliamna and Newhalen Ethnographic Fieldwork in 2007

Ethnographic fieldwork that focused on summer subsistence sockeye salmon fishing at Iliamna and Newhalen occurred June 11–July 26, 2007. Krieg and Yazzie were the field personnel; Yazzie participated through June 21 and Krieg for the entire period. Holen traveled to Iliamna and Newhalen during the week of June 25 to assist Krieg with fieldwork.

Iliamna and Newhalen are located on the northern shore of Iliamna Lake, and are connected by a 4.5 mi paved road. Iliamna borders Roadhouse Bay and Northeast Bay. Newhalen is adjacent to the eastern shore of the Newhalen River, near the river's outlet into Iliamna Lake. In Iliamna in 2007, a smokehouse and the associated fish processing equipment were located near the shore in Roadhouse Bay, and near the shore on the western side of Northeast Bay. In 2007, the Newhalen salmon processing areas, which included fish cutting tables, drying racks, "fish bins" (see "Case Studies," below), and 10 smokehouses, were concentrated along that portion of the Newhalen River below the village. In almost all cases, the smokehouses were used by extended families who worked together.

Instead of holding a more formal community meeting to introduce this project, the Newhalen Tribal Council suggested a barbeque. They donated some of the supplies and the use of the community building. Flyers advertising the event were displayed at public locations. The barbeque took place on the evening of June 15, 2007. Brochures about the project were distributed, and Krieg gave a short presentation. About 30–40 people attended the event, with more than one-half of them children. Some Iliamna residents attended as well.

Researchers observed the first subsistence sockeye salmon net in the Newhalen River on June 11, 2007. The next day, Krieg contacted the owner of the net, who agreed to allow project personnel to accompany him as he checked his net. This arrangement continued through the summer**.** Krieg also accompanied 5 additional subsistence fishers during their trips to check nets. When subsistence fishers delivered salmon to a processing location, Krieg was able to observe, as well as participate in, processing activities.

On trips each day from Iliamna to Newhalen, Krieg visited Northeast Bay, a major fishing location for a number of Iliamna households, in order to establish if nets were in the water. The nets Krieg observed used a running line, which allowed them to be retrieved, and the fish removed, without a boat. In the morning, if Krieg observed that the nets were deployed he checked them again on his return trip, or he contacted the owners to obtain details about the day's fishing. One Iliamna household did most of its fishing and some processing at the Newhalen River and then they transported the fish to their Iliamna smokehouse. In this case, and a few others, it was possible to observe fishing interaction and cooperation between Newhalen and Iliamna households.

Some fishers who used Iliamna area beaches held day jobs, so they checked their nets and processed the fish at the beach in the evening. Researchers found that this was a good time to plan a return trip from Newhalen to Iliamna by way of the beach to make observations. If little activity was taking place at Newhalen, Krieg returned to Iliamna earlier in the day in order to observe fishing activities.

[5] Stariwat was an intern for BBNA housed at ADF&G in Anchorage during summer 2008. He is now employed by ADF&G as a subsistence resource specialist.

From October 10 to 16, 2007, Krieg participated in fall fishing for spawning and spawned-out sockeye salmon ("redfish")[6] at Newhalen and the processing of spawning and spawned-out sockeye salmon in Newhalen and Iliamna.

Iliamna and Newhalen Ethnographic Fieldwork 2008

Krieg and Stariwat conducted follow up ethnographic fieldwork in Iliamna and Newhalen in summer 2008. Krieg arrived in Iliamna on June 28 and stayed until July 12. Krieg's scheduled work days ended July 5, although he remained in Newhalen and continued to make observations and participate in salmon fishing activities, at the invitation of community residents, while on personal leave until July 12. Stariwat participated from June 29 through July 3.

Because Iliamna and Newhalen are connected by road, travel between the 2 communities is relatively easy. Krieg and Stariwat were housed in Newhalen, where most of the subsistence sockeye salmon fishing activity occurred. When little fishing activity was occurring in Newhalen, Krieg and Stariwat drove to Iliamna to speak with fishers and to check if nets had been set in the high effort area of Northeast Bay or in any other fishing locations in the Iliamna area.

As in 2007, Krieg documented salmon processing methods through photographs, video recordings, and written descriptions. He also documented the reported reasons for variations in the styles of cutting fish for drying and smoking. Researchers also observed the interactions between adults and children in subsistence activities.

In 2008, additional attention was given to the impact of wage employment on subsistence salmon fishing in relation to the amount of leave employees were able to take, the location of jobs, energy and enthusiasm towards fishing during leave, and in one case, the availability of childcare during leave in 2008.

Being around people who were subsistence fishing in Newhalen and Iliamna provided Krieg with the opportunity to issue permits to those who requested them. He also explained how the information recorded on the permits is used by ADF&G and the Alaska Board of Fisheries (BOF). Further outreach detailing the importance of the permit program occurred when Krieg and Stariwat returned to Newhalen and Iliamna in April 2009 to administer subsistence salmon harvest assessment surveys.

Nondalton Ethnographic Fieldwork 2007

Nondalton hosted 5 project personnel from the 3 agency partners during the 2007 summer subsistence sockeye salmon fishing season. La Vine and Florey of BBNA arrived in Nondalton on June 28, 2007, and remained until August 1, 2007. Holen of ADF&G arrived July 8 and remained until July 20. Stickman and Hay of NPS arrived July 9 and remained until July 20.

On June 28, Holen and Krieg flew from Iliamna to Nondalton for the day. On the way, they stopped in Port Alsworth to pick up Ravenmoon. These project personnel joined La Vine, Florey, and the Nondalton community at a community barbeque where the food was donated by BBNA and the project personnel's own funds. The barbeque was held in the late afternoon and project personnel were able to interview residents about their preparations for subsistence fishing. Project personnel also distributed brochures about the project, and Holen and La Vine gave a short presentation. About 30 people attended.

On July 9, Holen, La Vine, Stickman, Hay, and Florey met at the Nondalton community building to coordinate the fieldwork. Establishing reliable boat and all-terrain vehicle (ATV, 4-wheeler) rentals required 2 days. Until then, the project personnel walked to the fish camps that were near the community. Stickman used her own boat and Holen rented a boat and once these were operational it was possible to

[6] At Iliamna and Newhalen, spawning and spawned-out sockeye salmon are called "redfish," "fall fish," or "fall salmon." At Nondalton, this resource is generally referred to as "fall fish" or by using the Dena'ina name *nudelvay*. In Port Alsworth, all 4 terms may refer to spawning and spawned-out sockeye salmon.

visit fish camps near the mouth of the Newhalen River. During the fieldwork, project personnel assisted residents by retrieving nets, splitting fish, cutting fish into strips, placing fish into jars in preparation for canning, and in any additional tasks. Project personnel wrote extensive field notes, which provided a great deal of data that addressed many of the questions in the key respondent interview protocol (see Appendix A). Although project personnel concentrated their efforts on specific camps, on July 18, Holen, Stickman, Hay, and Florey visited every occupied camp at the outlet of Sixmile Lake (the area is labeled "Fish Village" on some maps) and on the Newhalen River. Project personnel asked questions at each camp, used a GPS to plot their locations, and completed an inventory of facilities at each camp.

After Holen left Nondalton in late July, Florey interviewed 4 households in Nondalton and 4 households in Port Alsworth, with the goal of discovering information about subsistence permits and the use of seine nets. The interview protocol prepared by Holen, and a brief summary of the responses, appear in Appendix B. Detailed responses at the household level may be found in Florey's field notes[7].

Holen returned to Nondalton on October 11, 2007, with the intent to join a key household in fishing for spawning sockeye salmon at Kijik on Lake Clark. However, due to an illness in this family, Holen was unable to go, and no other fishing household was available. Holen therefore conducted 5 key respondent interviews.

Nondalton Ethnographic Fieldwork 2008

For Nondalton, only limited fieldwork was planned for 2008 as researchers concentrated their efforts to meet research goals elsewhere. Jessica Hay (NPS) arrived in Nondalton on July 15 and left on July 20. Her intention was to focus on the level of children's participation in subsistence salmon fishing and processing. However, due to rainy weather and the continuing presence of brown bears *Ursus arctos* near the camps, there was very limited opportunity to participate in or observe fishing and processing. Karen Stickman (NPS) again joined in her family's subsistence fishing activities in Nondalton in 2008 and provided her observations about similarities and contrasts between 2007 and 2008.

Port Alsworth Ethnographic Fieldwork 2007

Michelle Ravenmoon (NPS), a resident of Port Alsworth, was the project lead for the fieldwork in that community. Ravenmoon worked with several families in the community over the summer to document their harvests of salmon through ethnographic notes and photographs. Ravenmoon also hosted La Vine and Florey during their July 27, 2007, visit to Port Alsworth. During this visit, the project personnel traveled to other locations on Lake Clark to visit 4 families.

Port Alsworth Ethnographic Fieldwork 2008

Ravenmoon was again the project lead for the fieldwork in Port Alsworth in 2008. Ravenmoon continued to work with several families in the community during the 2008 fishing season to document their harvests of salmon through ethnographic field notes and photographs.

After researchers reviewed the goals and objectives in the project plan after the first study year, they determined that key respondent interviews for Port Alsworth were a data gap and that completing these was the best use of available travel funds for ADF&G. Holen and Stariwat traveled to Port Alsworth to conduct key respondent interviews with knowledgeable subsistence salmon fishers on July 23–26, 2008. Holen and Stariwat used a boat owned by NPS and piloted by one of the key respondents to travel to homes on Lake Clark. The interviews were arranged by a local research assistant. In addition, Ravenmoon, a subsistence fisher herself, assisted in choosing the 5 key respondents. Ravenmoon had conducted 1 key respondent interview with a family with whom she has worked extensively and Holen and Stariwat conducted the additional 4 interviews during this trip.

[7] Florey, V. *Unpublished*. 2007 field notes. Bristol Bay Native Association, Dillingham, Alaska.

While traveling, Holen and Stariwat observed 5 gillnets anchored off the beach in the water, but they observed few active fishers and found that most nets set during the week are picked in the evening after normal work hours. They also walked the shores of Port Alsworth and attempted to observe fishing activities, but only 1 group of fishers was seen, and they were completing the field processing of their harvest. After finishing the key respondent interviews, Holen and Stariwat helped Ravenmoon set her gillnet off the beach on the morning of Saturday, July 26.

KEY RESPONDENT INTERVIEWING

The key respondent interviews in the study communities occurred mainly in the fall and winter of 2007–2008, but a few interviews took place opportunistically at fish camps during subsistence fishing (Table 8). Nineteen key respondent interviews took place in the first project year in Iliamna, Newhalen, and Nondalton. In the second project year, the focus of key respondent interviews was Port Alsworth and 5 were completed. There were a total of 24 key respondent interviews conducted for the project (Table 8).

Key respondents, chosen by researchers for their breadth of experience in subsistence fishing, ranged from elders who had been fishing for 50 years or more to younger people who were just beginning to fish. In addition, key respondents represented both households who fished at fish camps and those who fished in the communities. Interviews were conducted using an open approach: residents were asked general questions and led the interviews. A key respondent interview protocol (Appendix A) was used and general questions in this protocol usually led to respondents addressing the more specific questions that needed to be answered.

The results of key informant interviews and participant observation are summarized in the case studies of fishing locations and fishing families. Additionally, items from key informant interviews are introduced in the Discussion section.

WORKSHOPS

On August 17, 2007, all staff listed in Table 7, with 2 exceptions,[8] participated in a 1 day workshop to review the summer's fieldwork and plan the next phases of the project. Each staff member prepared a presentation that illustrated subsistence fishing and processing activities in the 4 study communities. Staff members also identified topics and research questions that required further investigation that they had uncovered during key respondent interviews, household surveys, and their work with case study households.

Project personnel, along with Pippa Kenner of OSM, met in Anchorage January 29–30, 2009. Table 9 lists workshop participants. The workshop agenda appears in Appendix C. The goals of the workshop included reviewing fieldwork activities in 2008, listening to an update on the case family research by Robbin La Vine, and developing a schedule for completion of the annual report and draft final report. Each researcher reported his and her activities in a Microsoft PowerPoint[9] presentation. Key products of the workshop were a list of contents and assignments for the annual report, and a schedule for remaining project activities.

[8] The exceptions were intern Yazzie, who had left the state to begin graduate school, and Stariwat, who did not participate in the project until the second study year.

[9] Product names are given because they are established standards for the State of Alaska; they do not constitute an endorsement.

Table 8.–Key respondent interviews.

Community	Respondent	Location	Researcher	Date	Duration	Summary
Nondalton	A	Nondalton	Holen	October 12, 2007	:30	History of family camp from 1952 to the present; how fishing for salmon, including methods and processing, had changed over time.
Nondalton	B	Nondalton	Holen	October 12, 2007	1:30	Topics spanned many years, including the first motor used in the village; traveling by foot to get groceries; traditional processing methods and storage for fish; and fall fishing in the past.
Nondalton	C	Nondalton	Holen	October 12, 2007	1:30	A more contemporary look at fishing in Nondalton, including modern fish camps and their land status; modern methods of fishing; attitudes related to salmon permits; distribution and timing of salmon and distribution of freshwater fishes; and how beavers affect salmon streams.
Nondalton	D	Nondalton	Holen	October 12, 2007	:30	The history of fishing in Sixmile Lake since 1928. A shorter interview, set mostly in the past; fishing for dogs; the old village; and the fish camp.
Nondalton	E	Nondalton	Holen	October 12, 2007	1:00	The contemporary fishery, including the distribution of Nondalton residents, by family, at fish camps; locations for fishing; using a seine vs. a set gillnet; weather factors when fishing; and methods for processing fish.
Nondalton	F	Nondalton	La Vine	December 12, 2007	1:30	The subsistence way of life and the means of acquiring the skills for preserving fish. The 2007 fishing season was also discussed in some detail, including predictions of future subsistence fishing efforts; a youth's experience and introduction into the subsistence way of life by her parents.
Nondalton	G	Anchorage	La Vine	February 14, 2008	:30	Her late start in learning to process fish; what she currently knew; and what she hoped to learn in the future.
Nondalton	H	Fish Camp-Nondalton	Stickman	July 17, 2007	1:00	Discussion of involvement in subsistence fishing since 1952, including changes in subsistence fishing; methods of fishing and processing fish; and transmittal of this knowledge to the younger generation.
Newhalen	I	Newhalen	Krieg	October 13–15, 2007	1:50	History of Newhalen, including former locations of Newhalen; the area adjacent to the smokehouses along the river; overall history of the area up to and including Nondalton.
Iliamna	J	Newhalen	Krieg	February 6, 2008	:30	This respondent had lived in Iliamna for 20 years and was very involved in the summer subsistence salmon fishery. She related some of the changes she had observed in the area during that time; the interview closely followed the interview protocol.
Newhalen	K	Iliamna	Krieg	February 7, 2008	:45	History of the Newhalen area; history of her smokehouse location and house associated with it; interview closely followed the interview protocol.

-continued-

Table 8. Page 2 of 2.

Community	Respondent	Location	Researcher	Date	Duration	Summary
Newhalen	L	Newhalen	Krieg	February 7, 2008	:45	History of her smokehouse location and associated house; family history of subsistence fishing; interview closely followed the interview protocol.
Iliamna	M	Iliamna	Krieg	February 8, 2008	1:00	Elders and active subsistence fishers; a historical perspective of Iliamna, including information about Macallik Creek, which was a place to go for salmon in the fall during times of shortage; salmon returns to other streams and regulations; interview closely followed the interview protocol.
Newhalen	N	Newhalen	Krieg	February 11, 2008	1:00	Extended family fishing information for the family, including the current state of subsistence fishing in Newhalen; traditions concerning fishing.
Port Alsworth	O	Port Alsworth	Holen/Stariwat	July 24, 2008	:45	Fishing as a nuclear family. Their fishing location, gear type, and distribution had remained the same throughout their 25+ years of fishing. The salmon runs have declined in number in the past 20 years, but the fish have remained healthy, although the size varied yearly.
Port Alsworth	P	Port Alsworth	Holen/Stariwat	July 24, 2008	:45	Subsistence fished in the Port Alsworth area since 1995. He gave about two-thirds of his harvest to nonpermanent residents of the area who could not legally subsistence fish. He suggested that the lateness of that year's salmon run was caused by warmer water temperatures.
Port Alsworth	Q	Port Alsworth	Holen/Stariwat	July 24, 2008	:30	Lives in Port Alsworth for half the year. In the 1970s, he harvested about 200 salmon per year for his family. He was currently less dependent on salmon. He intentionally minimized his harvest by using a short net and strategizing its placement.
Port Alsworth	R	Port Alsworth	Holen/Stariwat	July 24, 2008	1:00	Lived in Port Alsworth his entire life. He has fished every year since he started with his grandmother around 1970. He intentionally tried to harvest few salmon, usually 5–7 per day. He fished during the peak of the salmon run.
Port Alsworth	S	Port Alsworth	Ravenmoon	April 30, 2008	2:00	Lived in Port Alsworth since 1991 and has fished every summer for salmon. When he first moved here, he depended almost entirely on the salmon and wildlife harvests. Since he had established a home and income, his dependence was less, yet still a considerable amount compared to other Port Alsworth families.

Table 9.–Data review workshop, January 29–30, 2009, participants and affiliation.

Name	Agency
Carty, Courtenay	Bristol Bay Native Association
Fall, James	Alaska Department of Fish and Game
Hay, Jessica	National Park Service
Holen, Davin	Alaska Department of Fish and Game
Kenner, Pippa	U.S. Fish and Wildlife Service
Krieg, Ted	Alaska Department of Fish and Game
La Vine, Robbin	Bristol Bay Native Association
Ravenmoon, Michelle	National Park Service
Simeone, Bill	Alaska Department of Fish and Game
Stariwat, Jory	Alaska Department of Fish and Game
Stickman, Karen	National Park Service

COMMUNITY REVIEW MEETINGS 2009

The community review meetings are discussed in the order in which they occurred. Summaries of the discussions that took place during these meetings appear in the Results section below. Community review meetings in Port Alsworth and Nondalton occurred in conjunction with a researcher's trip to conduct household surveys about 2008 subsistence sockeye salmon harvests as well as to obtain signed photograph release forms for the final report. The meeting in Port Alsworth occurred on March 9 and Nondalton on March 10, 2009. Table 10 summarizes participation at the community meetings. For Nondalton and Port Alsworth, the community review meetings were arranged 2 weeks in advance, with the goal of reviewing the information collected during the 2 years of the project. Holen prepared Microsoft PowerPoint presentations tailored to each community. He was assisted in the presentations by Stariwat. The Nondalton review consisted of 42 slides and the Port Alsworth review consisted of 34 slides. Ravenmoon (NPS) gave an additional presentation to relate the findings specific to Port Alsworth.

Table 10–Community review meetings, March–April 2009, dates and number in attendance.

		Number in attendance	
Community	Date	Community residents	Total
Port Alsworth	March 9,2009	4	7[a]
Nondalton	March 10,2009	10	12[b]
Newhalen	April 27,2009	8	10[c]
Iliamna	d.		

a. Davin Holen, Jory Stariwat, (ADF&G) and Michelle Ravenmoon (NPS) attended the meetings in Port Alsworth.

b. Davin Holen and Jory Stariwat (ADF&G) attended the meeting in Nondalton.

c. Ted Krieg and Jory Stariwat (ADF&G) attended the meeting in Newhalen.

d. Due to competing events, a meeting could not be scheduled in Iliamna.

The community review meetings in Iliamna and Newhalen were scheduled to occur the week following the meetings in Nondalton and Port Alsworth so Krieg and Holen could attend all 4 presentations. However, the Newhalen high school basketball team advanced to the state finals in Anchorage and many community members traveled to Anchorage to watch the games. Krieg rescheduled the presentation to occur April 27 in Newhalen and he was unable to work out a time with Iliamna for a meeting. Krieg

adapted the presentation from Nondalton for the Newhalen meeting. The ADF&G presentations had several parts, including:

1. Review of the goals and objectives of the project, including the research questions;
2. A brief history of research about the sockeye salmon stocks and management of the fishery;
3. Project methods;
4. Discussion about how the project benefits the community;
5. Some preliminary findings, based on mapping of fish camps and sockeye salmon harvest locations, participant observation at fish camps and fishing sites, key respondent interviews, and the household harvest surveys;
6. A discussion of the subsistence salmon permit system informed by harvest survey findings;
7. A discussion of some preliminary conclusions synthesized from the information; and
8. A question and answer period.

HOUSEHOLD SURVEYS OF 2007 SUBSISTENCE SALMON HARVESTS

While conducting ethnographic fieldwork during summer 2007, project personnel noted the approximate number and the species of salmon harvested in subsistence fisheries, and the social composition of the harvesting and processing groups. These observations helped project personnel generate the household lists and design the survey instrument (Appendix D) for the project's systematic household surveys. The survey included standard survey questions regarding demography and salmon harvests so as to produce data that are comparable with other study years and can be included in the division's subsistence salmon database.

In January 2008, ADF&G staff compiled data from returned ADF&G subsistence salmon permits for each study community, in preparation for the household surveys. Krieg and Holen then traveled to the study communities to administer the systematic household survey, as well as to review and supplement the data collected during participant observation and the harvest data reported on returned permits. Data collected during the survey included:

1. Demographic data, including age, sex, relation to household head, and ethnicity;
2. The household's participation in 2007 subsistence salmon fisheries, including whether the household used, fished for, received, or gave away salmon;
3. Salmon harvests by species and gear type;
4. The respondent's assessment of the 2007 subsistence salmon season; and
5. The respondent's assessment of issues and concerns about the subsistence salmon fishery.

Local research assistants (LRA) were hired from and trained in the study communities to help with survey administration. Project personnel visited each household and distributed a 4 page overview that described the project and the role of the data generated from the household survey.

The majority of surveys were completed in February 2008. ADF&G staff completed 6 additional surveys in Nondalton and 1 additional survey for Port Alsworth in May 2008.

The sampling goal was to administer the survey to at least 1 representative in each year-round household in the 4 study communities. Table 11 presents the sample achievement for the survey for 2007. In total, 115 surveys (83% of households) were completed and there were 21 no contacts and 3 refusals. The refusal rate was 2.5%. By study community, sample achievement ranged from 97% in Newhalen, to 80% in Iliamna, 80% in Port Alsworth, and 72% in Nondalton.

Table 11.–Sample achievement, salmon harvest surveys, 2007.

	Iliamna[a]	Newhalen	Nondalton	Port Alsworth	All study communities
Number of households	30	38	36	35	139
Number of interviews	24	37	26	28	115
Number of no contacts	5	1	8	7	21
Number of refusals	1	0	2	0	3
Sample achievement [b]	80%	97%	72%	80%	83%
Refusal rate [c]	4%	0%	7%	0%	3%

a. Iliamna includes 1 household living at Chekok.

b. Sample achievement = number of interviews divided by number of resident households.

c. Refusal rate = number of refusals divided by the sum of the number of interviews and number of refusals.

HOUSEHOLD SURVEYS FOR 2008 SUBSISTENCE SALMON HARVESTS

In winter 2009, ADF&G staff updated the study year on the survey instrument. The same types of information were collected in 2008 as in 2007. In February 2009, ADF&G staff compiled data from returned ADF&G 2008 subsistence salmon permits for each project community. Holen and Stariwat traveled to Nondalton and Port Alsworth March 9–13, 2009, to administer the 2008 salmon surveys, as well as to train an LRA in each community to complete the interviews without assistance. Krieg and Stariwat traveled to Newhalen and Iliamna on April 27 to begin the surveys and train the LRAs.

The sampling goal was the same as 2007: to administer the survey to at least 1 representative in each year-round household in the 4 project communities. In Port Alsworth, the LRA, Faith Robertson, completed 27 surveys out of 30 households (90%) (Table 12). In Nondalton, the LRA, Sheri Balluta, working with Stariwat, completed 22 surveys in 2 days and then an additional 9 surveys on her own. Holen completed another survey with a household representative in Anchorage, for a total of 32 surveys out of 39 households (82%). Chastity Anelon was the LRA in Iliamna, and she worked with Stariwat. Diane John was the LRA in Newhalen and she worked with Krieg. Both LRAs had also conducted the surveys in 2007. In Newhalen, 34 of 37 households were interviewed (92%) and in Iliamna, 26 of 29 households were surveyed (90%). In total, 119 of the 135 year-round households in the 4 study communities (88%) were interviewed about salmon harvests in 2008. Seven households (5%) could not be contacted and 9 households (7%) declined to participate. The refusal rate for the 2008 survey was 7%.

Table 12.–Sample achievement, salmon harvest surveys 2008.

	Iliamna	Newhalen	Nondalton	Port Alsworth	All study communities
Number of households	29	37	39	30	135
Number of interviews	26	34	32	27	119
Number of no contacts	3	1	0	3	7
Number of refusals	0	2	7	0	9
Sample achievement [a]	90%	92%	82%	90%	88%
Refusal rate [b]	0%	6%	18%	0%	7%

a. Sample achievement = number of interviews divided by number of resident households.

b. Refusal rate = number of refusals divided by the sum of the number of interviews and number of refusals.

ANALYSIS OF HOUSEHOLD SURVEY AND PERMIT DATA

Subsistence salmon harvests were estimated for each study community based on both the reported harvests from returned permits and the harvests reported during postseason interviews. Harvest information noted during ethnographic fieldwork, as well as data from returned permits, was available to assist respondents during postseason interviews. Harvest estimates were expanded to nonreturned permits and nonsurveyed households. The formula for standard expansion of community harvests is

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

where

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

(mean harvest per returned survey)

H_i = the total estimated harvest (numbers of fish) for each community i,

$\boldsymbol{h}_i$ = the total harvest reported on returned permits and during household surveys,

n_i = the number of returned permits and completed household surveys, and

S_i = the number of permits issued (includes households that initially did not obtain permits, but, as discovered during household interviews, had harvested salmon in the subsistence fishery. The data from these "late" permits were added to the permit list).

To compare estimates of subsistence salmon harvests based on returned permits with those based on postseason surveys, harvests as reported on permits returned to ADF&G before the household surveys began were included in the database and used to produce a community estimate. Interviewed households reviewed any harvest data they had provided before the survey and provided additional harvest numbers, most frequently for harvests of spawning sockeye salmon that took place after the permit had been returned. Harvest information provided during the surveys for households that did not return permits was added to the Division of Subsistence permit database and used to develop an estimate of subsistence harvests for the annual Bristol Bay management report that is produced by the ADF&G Division of Commercial Fisheries.

CASE STUDY FAMILIES

Discussion among project personnel of possible selections for case study families began during the summer 2007 fieldwork season. At that time, the researchers observed numerous families in each community engaging in subsistence salmon fishing. In many cases, multiple generations and extended family members were participating in the fishing and the processing. At the postseason project personnel workshop in August 2007, further discussion of possible selections of case families occurred. While a number of families would have well represented their community's subsistence harvest activities, project personnel were interested in selecting those who would consistently participate, and who would most likely contribute their own observations and data. After consultation with other project personnel, La Vine selected 4 potential case study families. She notified the village councils in Iliamna, Newhalen, and Nondalton (there is no tribal government in Port Alsworth) and asked for their comment and approval. Then La Vine contacted the families to obtain their consent to participate. Also during this time, La Vine worked with other project personnel to produce an introduction to the family case study component of the project for distribution to each participating family, consent documents, and a subsistence harvest activity log (see appendices E–G).

Family Training and Initiation into the Project

The families in Port Alsworth, Nondalton, and Newhalen quickly gave their consent to participate. Initiation of the project in Iliamna did not proceed as rapidly. The first family selected in Iliamna was difficult to contact and, once contacted, declined to participate. The second recommended family also proved difficult to contact. By mid October 2007, however, this family returned from their remote fish camp in order to complete the processing of their fall sockeye salmon harvest, and they gave consent. The family in Iliamna recorded subsistence fishing activities from November 2007–October 2008, one month later than the other 3 families.

La Vine traveled to each community and distributed a project folder containing an introductory letter, consent form, harvest activity logs, and a project contact sheet (see Appendices E–H). The families also received a notepad and pen, detailed area maps, a digital camera with rechargeable batteries, and a digital voice recorder. During the initial meetings, La Vine and the case study families discussed expectations for future subsistence harvest activities, as well as the families' past harvesting activities.

Further information about periodic visits to each family and methods of data collection is provided in the Results section, below.

Final Interviews with Case Study Families

La Vine met with the Nondalton family during the last week of May 2009 to review sections of the draft final report. She spent 2 evenings with the family, the first to go over the report and the second to identify family photos most illustrative of their activities and way of life. The family endorsed the contents of the report and made some minor corrections. They also narrowed down their extensive photo collection to 96 images for possible inclusion in the report.

La Vine arranged a final visit with 1 member of the Newhalen family during her May 2009 return to the village. She and the family member reviewed sections of the final report and reviewed and identified photos to be included in the finished product. All materials were approved, and minor corrections were made.

La Vine spent an afternoon with the Iliamna family during her last visit to the community in May 2009. One member reviewed sections of the draft report, and both reviewed their extensive photos, commented on the past year, and made a final selection of images for inclusion in the report.

Because the Port Alsworth family was traveling, La Vine was unable to meet in person with them during her last trip to the region for report and data review in May 2009. She remained in contact with the family and arranged for report review and approval to occur via e-mail.

Summary of Case Study Families' Project Activities

In summary, by the end of the study period in November 2008, the Iliamna case study family had produced 367 photographs of subsistence activities and occasions of sharing, 12 harvest activity logs, 2 journal entries, and multipage copies of their personal harvest logs for the summers of 2001–2007. The Newhalen family had produced 91 photographs. The Nondalton case study family had produced 909 photographs of subsistence harvesting, processing, and occasions of sharing, as well as 52 pages of notes and journal entries, 5 subsistence harvest activity logs, and 13 short interviews with other village subsistence fishers. The Port Alsworth family began a weather journal after the birth of their child in February 2008, and produced 15 photographs from various outings and subsistence activities which had begun in late spring 2008. Three of the families used U.S. Geological Survey (USGS) maps to help record the locations and dates of their subsistence activities. All families participated in final interview sessions, which provided researchers with their perspectives on their subsistence activities.

Change of Staff Plan

After April 25, 2008, Robbin La Vine was not a permanent staff member at BBNA. Courtenay Carty became the Subsistence Fisheries Scientist for BBNA within the OSM Partners Program. For this project, however, La Vine remained a coprincipal investigator, and, as an independent contractor for BBNA, maintained all responsibilities assigned to her and BBNA in the project investigation plan. Carty was responsible for the project's administrative needs, such as hiring and administrative oversight of the project intern, making travel and supply arrangements, and issuing checks to compensate case study families for their participation in the project.

ORGANIZATION OF THE RESULTS AND DISCUSSION SECTIONS

In the Results section of the report, project staff organized the findings from participant observation and key respondents into case studies focused on fishing families and fishing locations. Kinship diagrams illustrate harvesting and processing groups, as well as harvest distribution patterns. For other examples of the case study approach and kinship diagrams, see Schichnes and Chythlook (1988:105–116) and Fall et al. (1984:67–81). Analysis of case study data focuses on:

1. Organizational principles (age, sex, kinship, other) of the subsistence sockeye salmon fishery in 2007;
2. Harvesting, processing, and storing methods;
3. Decision making that informs harvest goals and harvest levels;
4. The geographical scope of the subsistence fishery;
5. The interrelationships between subsistence harvests of salmon and other resources;
6. The environmental, economic, social, and cultural factors that shaped subsistence salmon harvests in the study communities in 2007 and 2008; and
7. The environmental, economic, social, and cultural factors that have shaped subsistence salmon harvests in the study communities over the last 20–25 years for key respondents and case study families.

Later in the Results section of the report, the findings of the household harvest surveys are presented, followed by detailed description of family case studies. The Discussion section reviews factors that shaped subsistence salmon fishing in the study communities as well as factors that may influence trends in the Kvichak subsistence salmon fishery.

RESULTS

ETHNOGRAPHIC DESCRIPTION OF THE SUBSISTENCE SOCKEYE SALMON FISHERIES OF THE COMMUNITIES OF NONDALTON, NEWHALEN, ILIAMNA, AND PORT ALSWORTH IN 2007 AND 2008

Literature Review

Project personnel completed 37 literature summaries. The review incorporates literature related to the fisheries in the study area, ethnographic fieldwork methods, and case study methods. The literature reviews were provided to the Office of Subsistence Management on July 15, 2008.

Overview of Subsistence Sockeye Salmon Fishing, 2007

The escapement of sockeye salmon into the Newhalen River in 2007, as estimated by an NPS counting tower, was 667,572 fish, or 24% of the total 2,810,208 fish that ADF&G estimated escaped into the Kvichak River drainage. This was the second highest escapement estimate on the Newhalen River since 2000 (Figure 10). The Kvichak River escapement was within the sustainable escapement goal (SEG) range of 2–6 million sockeye salmon (ADF&G 2007; Young 2007).

The timing of the 2007 sockeye salmon run to the Newhalen River was similar to most years since 2000 (Figure 11). About 50% of the escapement was achieved by July 18, compared to July 21 in 2000, July 19 in 2001, July 21 in 2002, July 16 in 2003, July 21 in 2004, July 21 in 2005, and July 27 in 2006 (Young 2007).

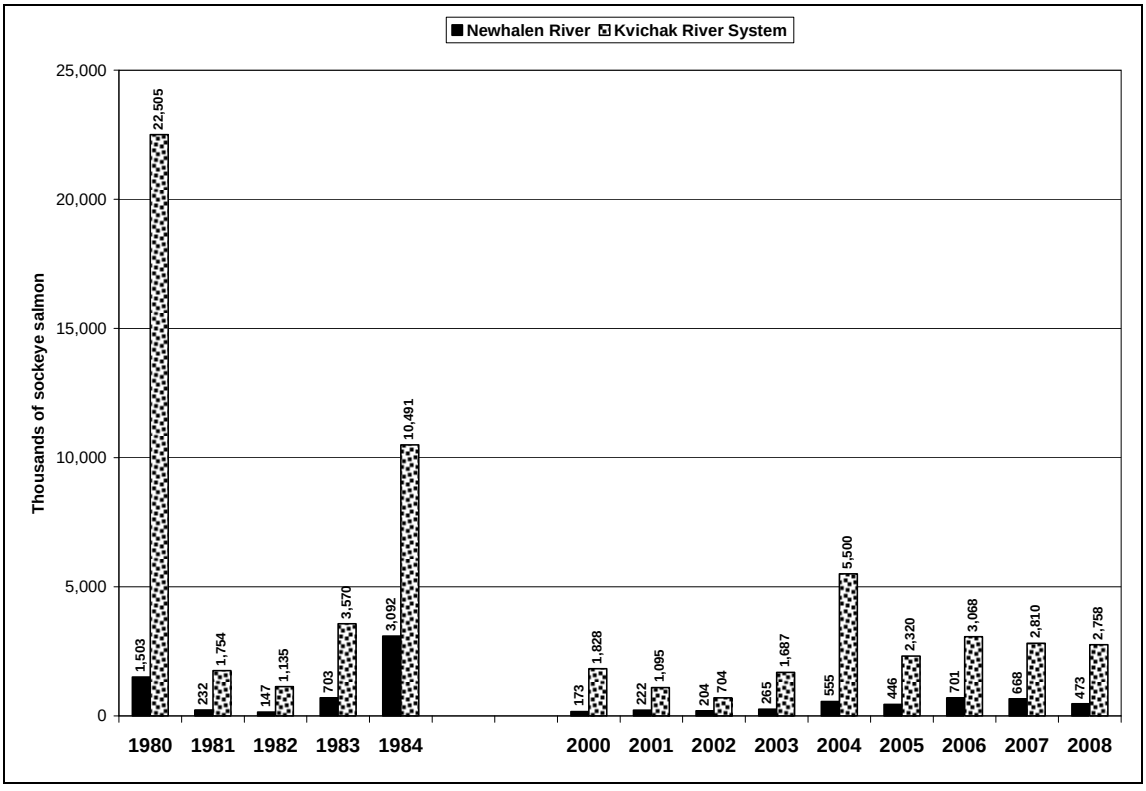

Figure 10.–Estimated escapements of sockeye salmon, Newhalen River and total Kvichak River system, 1980–1984 and 2000–2008.

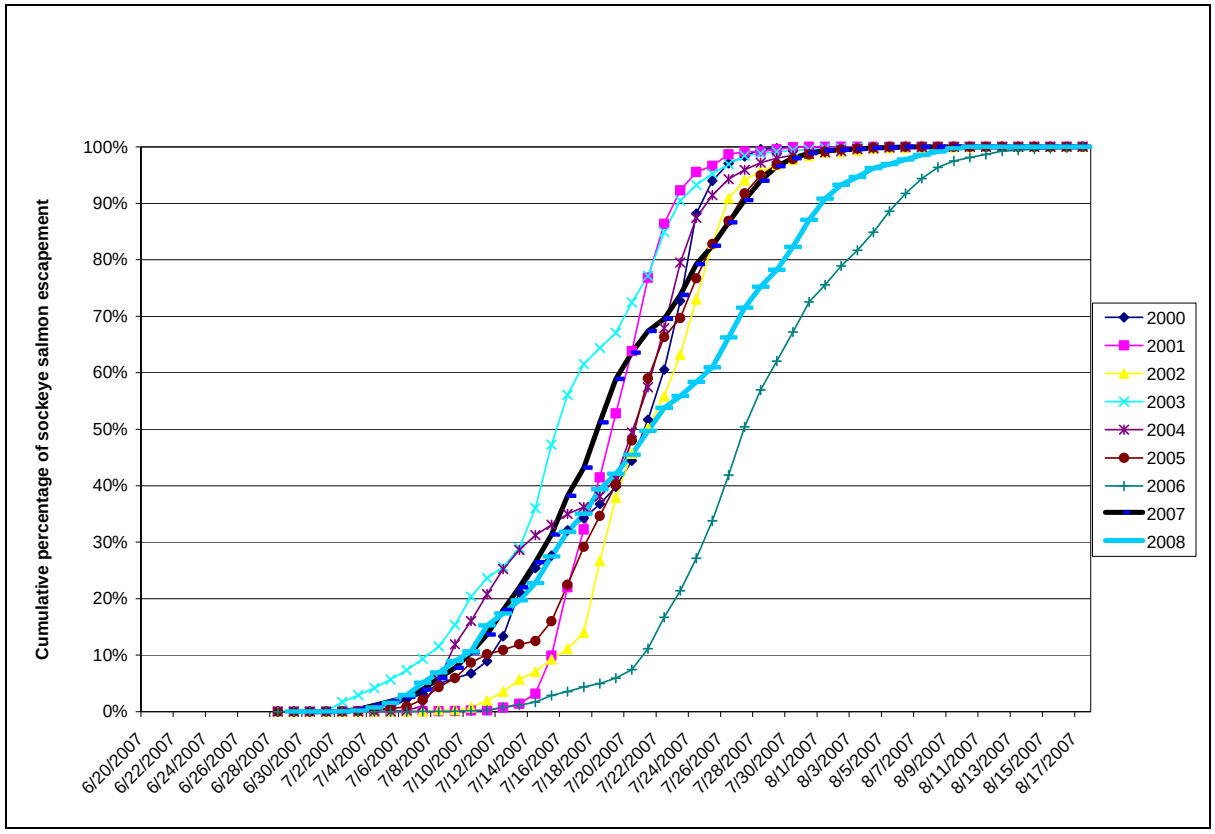

Figure 11.–Newhalen River cumulative percentage of sockeye salmon escapement by date, 2000–2008.

Figures 12, 13, and 14 depict the location of fish camps, smokehouses, and processing facilities used by residents of Iliamna, Newhalen, and Nondalton, respectively. Researchers noted that Port Alsworth residents generally did not travel to fish camps, instead setting gillnets off the beach in front of their houses or across the lake in front of a lodge. Port Alsworth harvest maps developed for this report show these sites. In 2007, project personnel visited fish camps and other processing locations in Iliamna, Newhalen, and Nondalton, marked their locations with a GPS unit, and inventoried the facilities at each site (Tables 13–15).

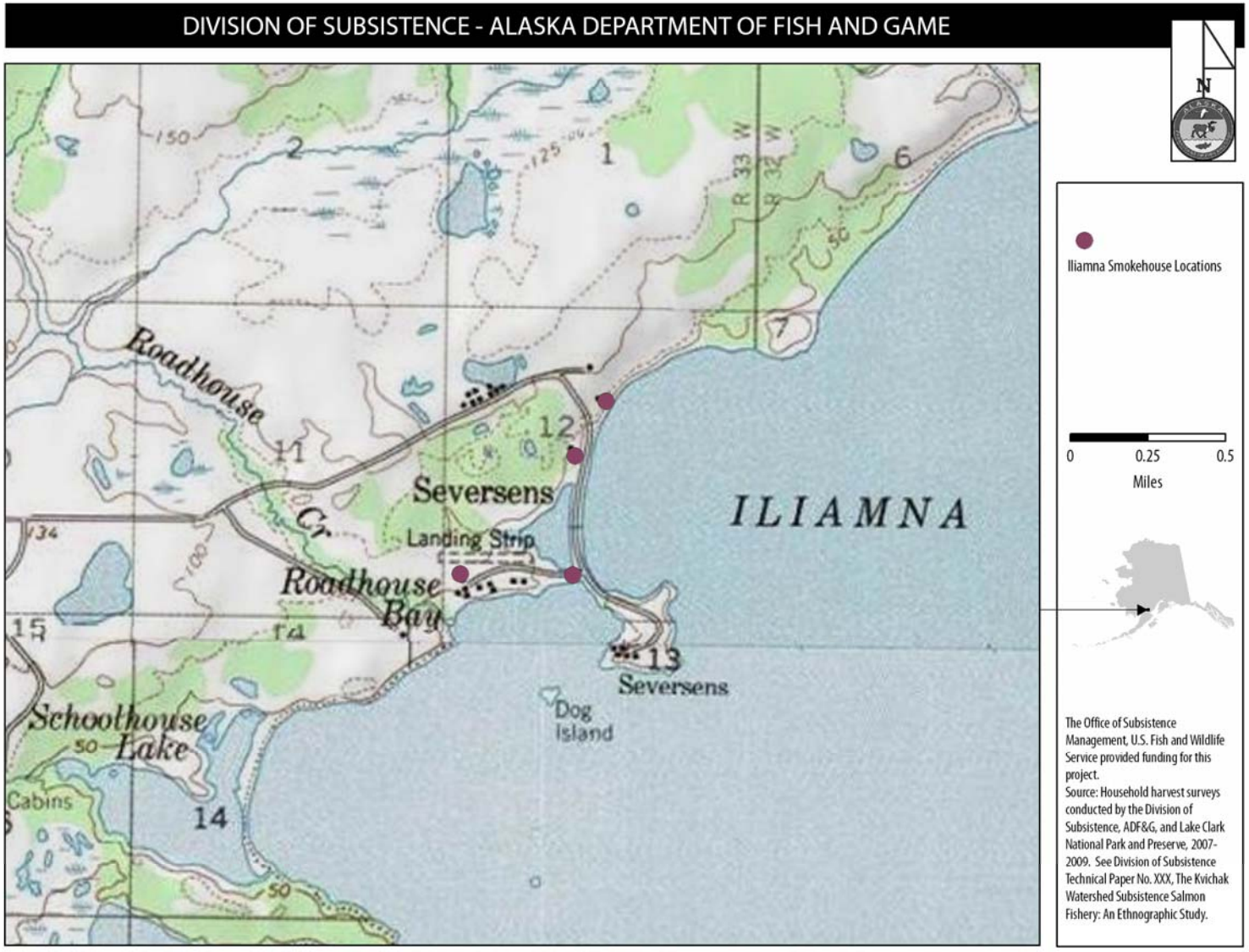

Figure 12.–Fish camps used by residents of Iliamna, 2007.

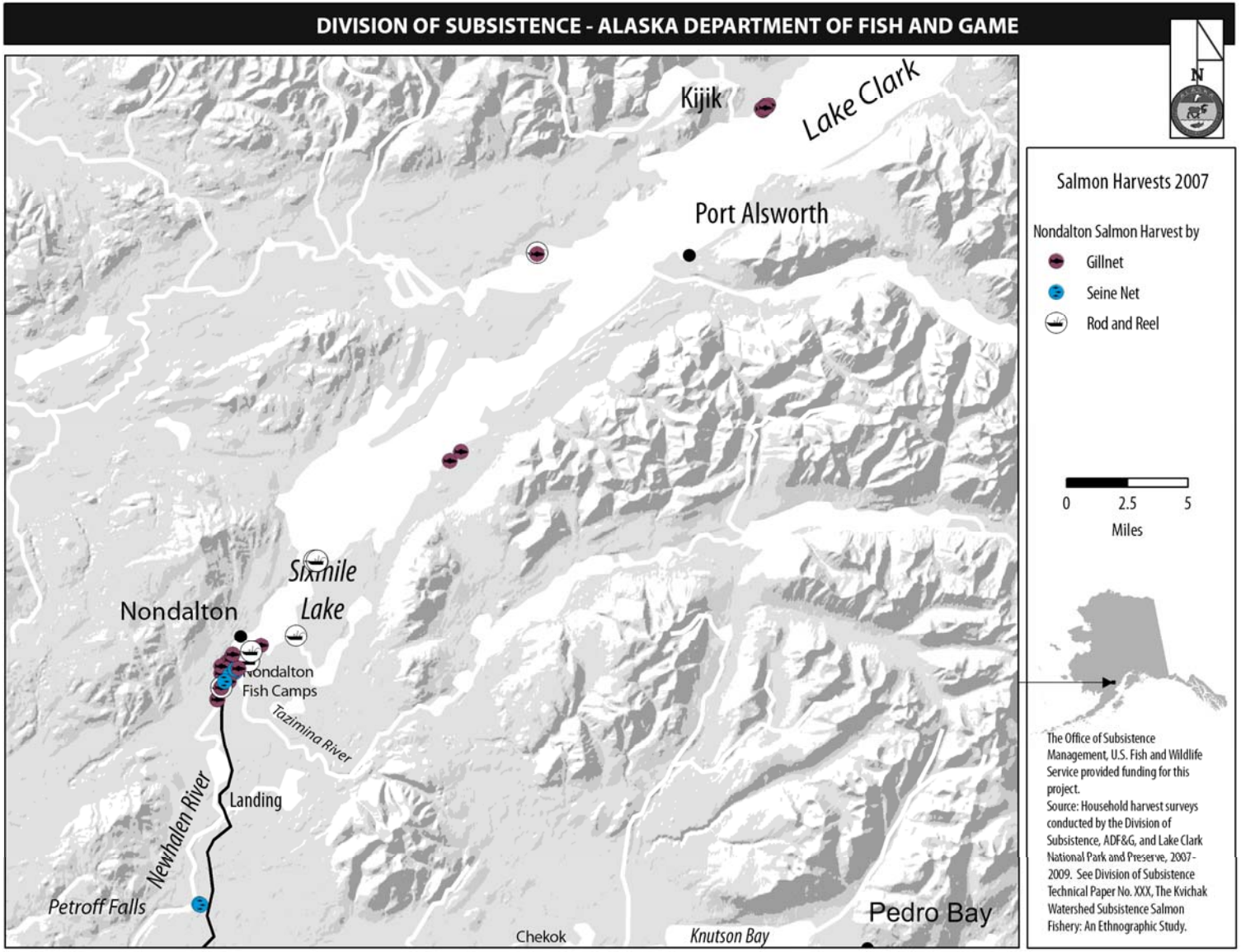

Figure 13.–Fish camps used by residents of Newhalen, 2007.

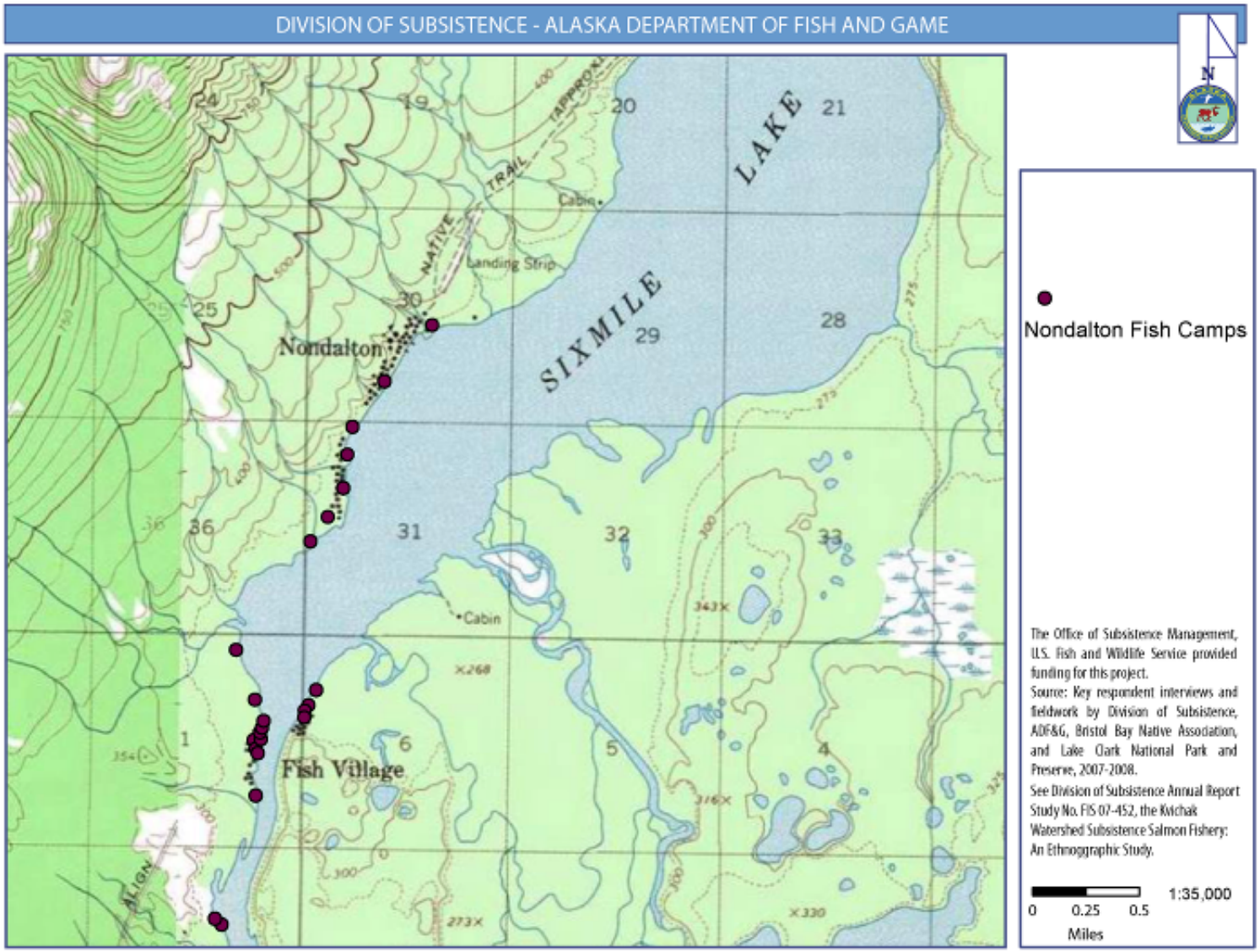

Figure 14.–Fish camps used by residents of Nondalton, 2007.

Table 13.–Iliamna fish camps on Iliamna Lake.

Camp	GPS waypoint number	Active in 2007 Y/N	Number of permanent smokehouses	Number of racks	Number of cutting tables
1	IS-1	Y	1	2	2
2	IS-2	Y	1	1	3
3	IS-3	Y	1	0	2
4	IS-4	Y	1	1	0

Table 14.–Newhalen fish camps at the Newhalen River mouth.

Camp	Active in 2007 Y/N	Number of permanent smokehouses	Number of racks	Number of cutting tables
1	Y	1	1	1
2	Y	1	3	2
3	Y	1	1	2
4	Y	1	1	1
5	Y	1	2	1
6	Y	1	2	1
7	Y	1	1	1
8	Y	1	1	0
9	Y	1	1	2
10	Y	1	2	2
11	Y	1	0	0
12	Y	1	0	0
13	Y	1	0	0

Table 15.–Nondalton fish camps on Sixmile Lake and the Newhalen River.

Camp	Active in 2007 Y/N	Number of permanent cabins	Number of tents	Number of permanent smokehouses	Number of permanent storage buildings	Number of racks	Number of bone racks	Number of cutting tables	Number of fish bins	Number of steam baths
1	Y	1	0	1	0	2	0	1	0	0
2	Y	1	0	1	0	3	0	1	1	0
3	Y	1	0	1	0	2	1	2	1	0
4	Y	4	1	1	0	3	0	2	2	1
5	Y	0	0	0	0	2	0	1	1	0
6	Y	0	0	0	0	0	0	1	1	0
7	Y	0	0	0	0	3	0	1	1	0
8	N	0	0	1	0	3	0	2	1	0
9	N	0	0	1	0	2	0	2	1	0
10	N	1	0	1	0	2	0	1	0	1
11	Y	1	0	1	0	2	1	0	1	0
12	Y	1	2	1	1	3	0	1	1	0
13	N	2	0	1	0	1	1	0	0	0
14	Y	2	0	1	1	3	0	2	1	0
15	Y	2	2	1	1	1	1	1	2	1
16	Y	3	1	1	2	3	0	2	1	1
17	Y	1	0	1	0	2	0	1	1	1
18	N	1	0	1	0	2	0	0	1	0
19	Y	1	0	1	0	2	1	1	2	0
20	Y	2	0	2	1	2	0	1	1	1

-continued-

Table 15. Page 2 of 2.

Camp	Active in 2007 Y/N	Number of permanent cabins	Number of tents	Number of permanent smokehouses	Number of permanent storage buildings	Number of racks	Number of bone racks	Number of cutting tables	Number of fish bins	Number of steam baths
21	Y	2	0	1	0	2	0	1	1	0
22	Y	2	0	1	0	4	0	3	1	0
23	N	1	0	1	1	2	0	0	0	0

Researchers paid special attention to Nondalton fish camps because they were located some distance from the community, and because some residents moved their households to these camps when actively fishing. For example, Figure 15 shows 23 fish camps on Sixmile Lake and the upper Newhalen River that are associated with families from Nondalton; 17 of these camps were active in 2007. During the mapping activity, researchers learned that there were 2 camps on Lake Clark closer to Port Alsworth that were used by families with ties to Nondalton. These are not depicted in Figure 15. Nondalton families established their camps on lands they used traditionally. Other families in the community recognized these families' rights to use these locations.

Most fish camps used by the families contacted for this project were occupied by more than 1 nuclear family. Researchers found that family members currently living in other communities traveled to these fish camps on an annual basis. One camp, for example, hosted 5 different nuclear families.

By cataloging permanent structures in fish camps, project personnel can generate estimates of the amount of effort, time, and money that is needed to construct and maintain fish camps. The inventory of permanent structures in each camp included permanent smokehouses, cabins and tents, bath houses, fish cutting tables, fish drying racks, and storage facilities (Figure 16). The presence of a bath house or steam bath at a camp suggests that fishers are more likely to stay for extended periods of time, rather than make frequent trips back to the village and its running water (Figure 17). Before the widespread use of snowmachines, dog teams were used, and the dogs fed the meat-laden salmon backbones. Some camps still had "bone racks" used for this purpose (Figure 18 and Plate 1). These results will be further explored in the Discussion section.

Plate 1.–Nondalton "bone rack" with a subsistence harvest.

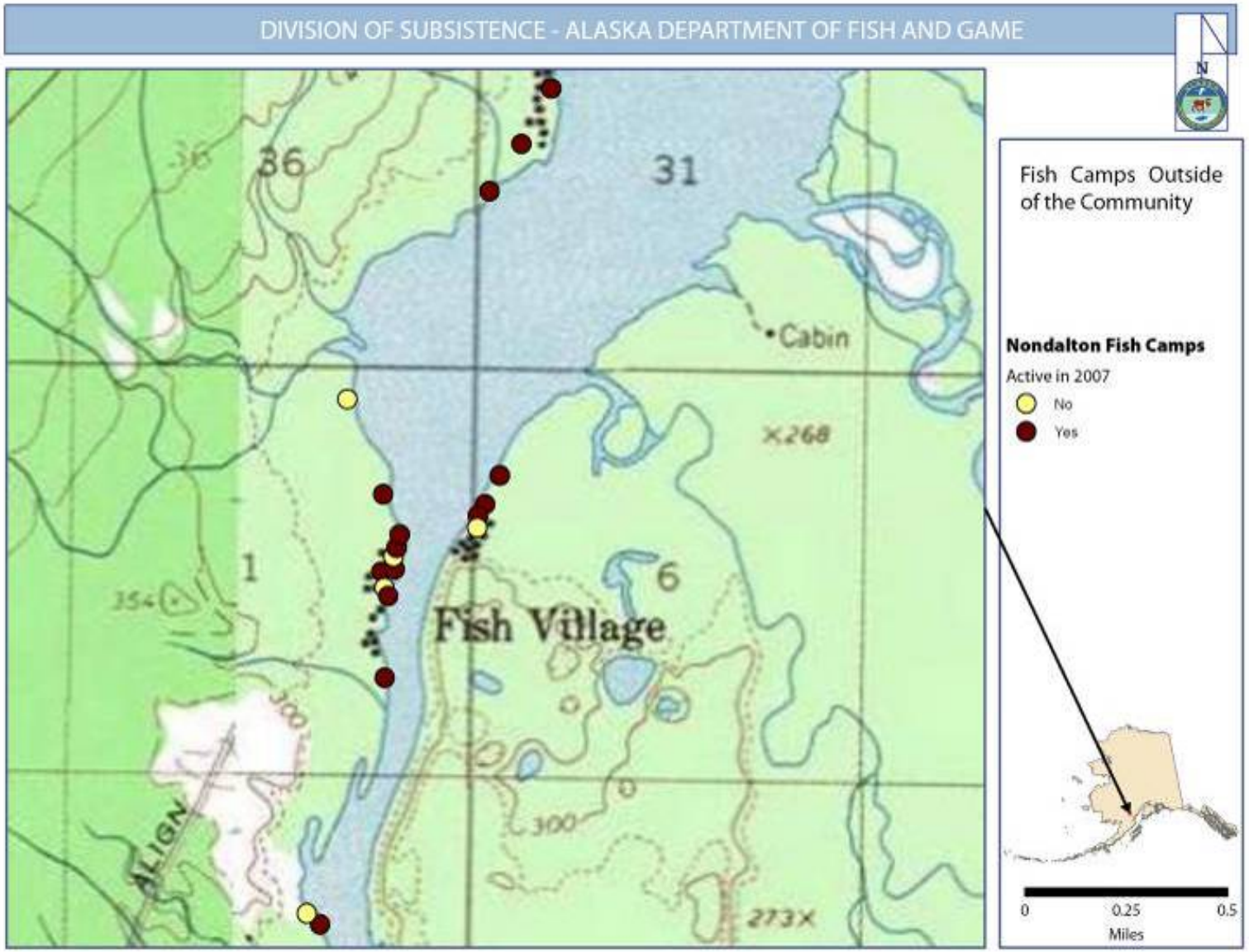

Figure 15.–Nondalton fish camps, active and inactive in 2007.

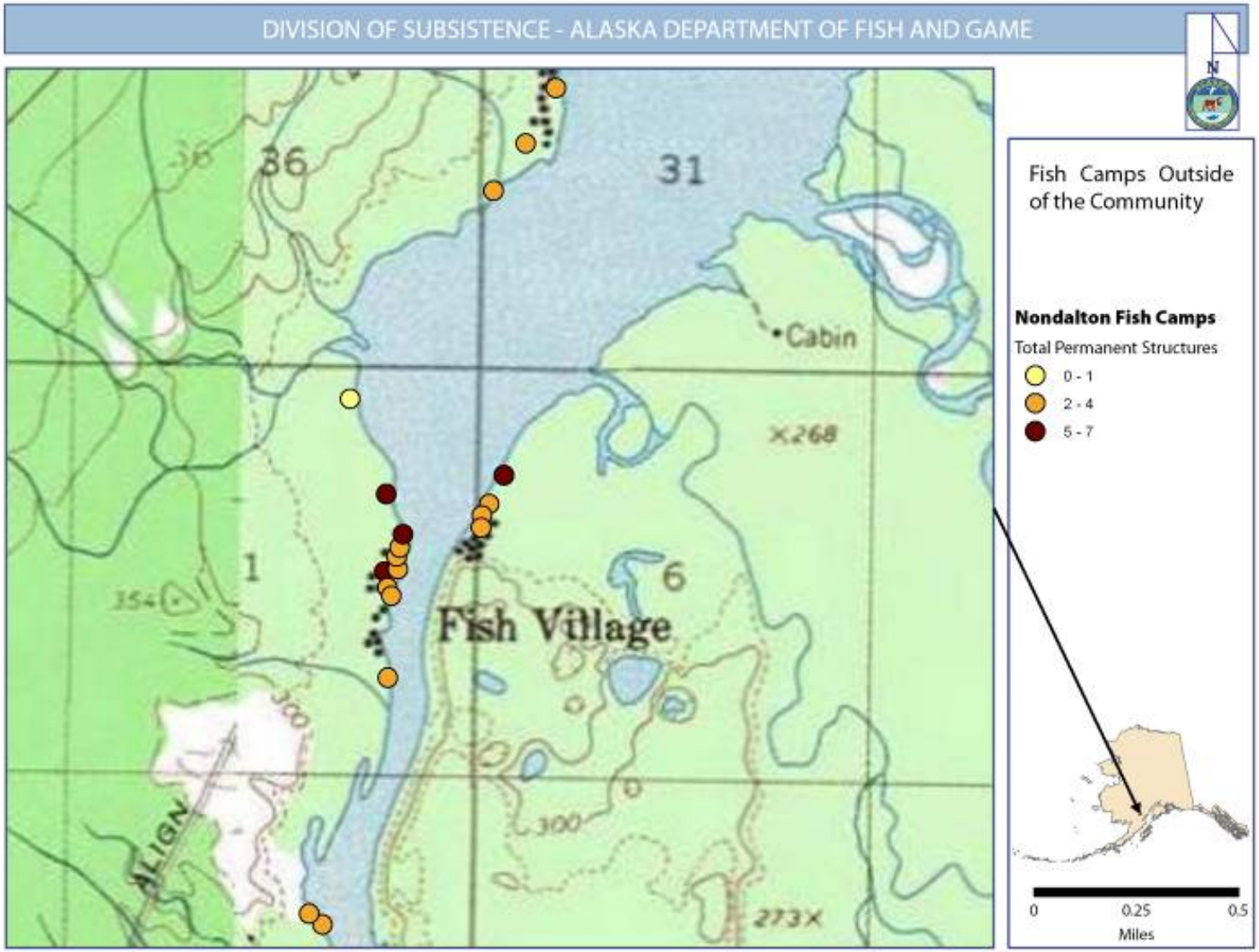

Figure 16.–Number of total permanent structures at Nondalton fish camps, 2007.

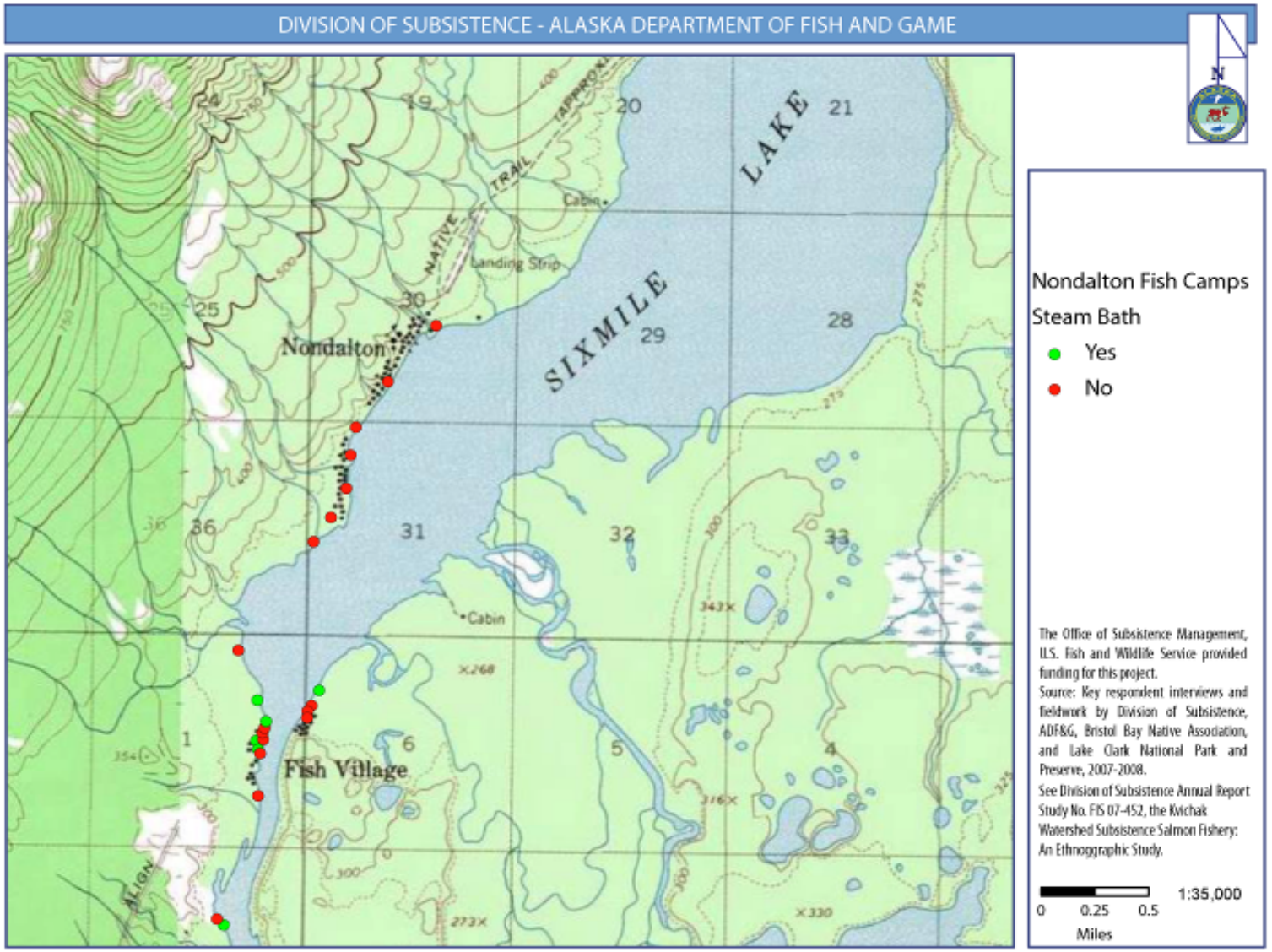

Figure 17.–Inventory of steam baths at Nondalton fish camps, 2007.

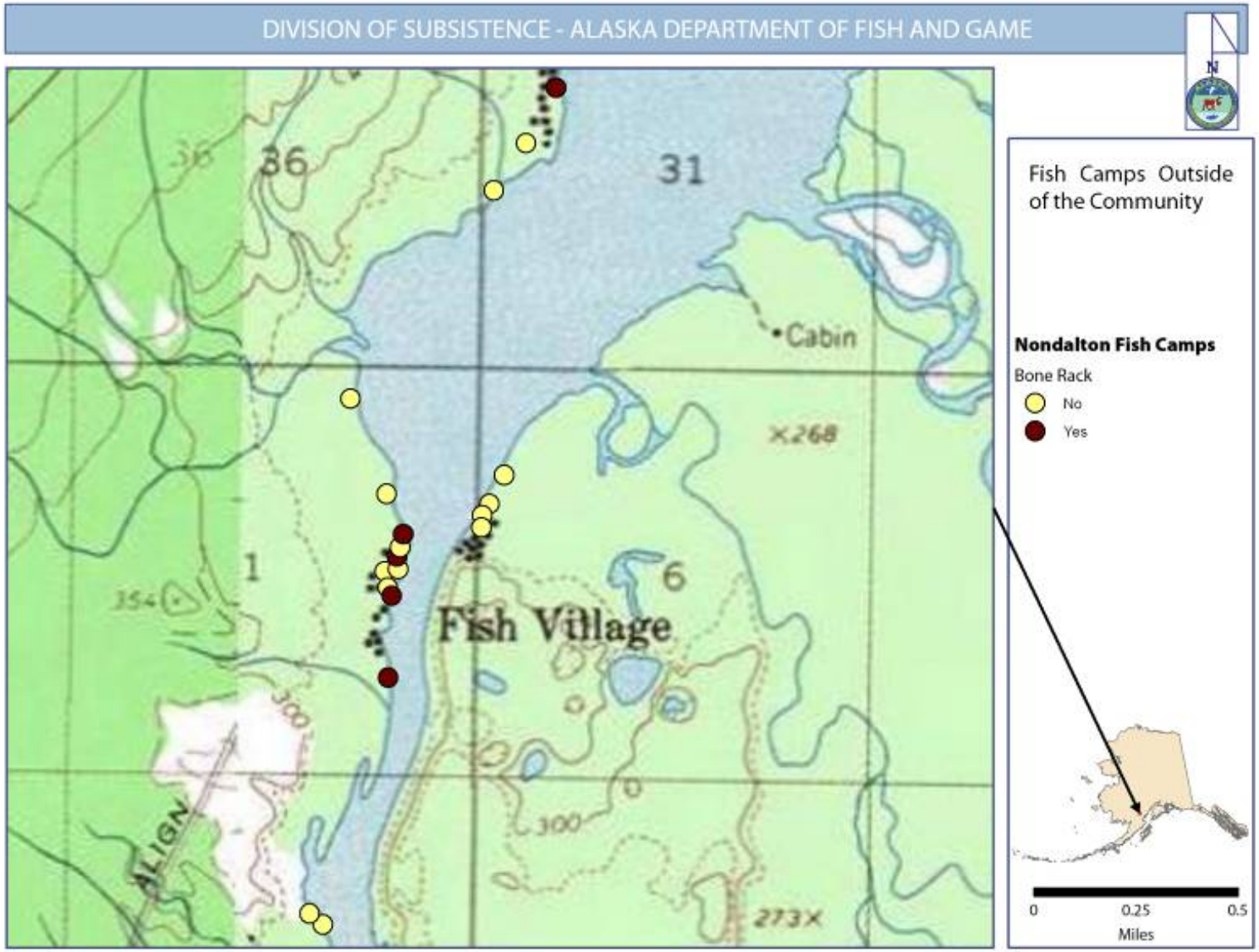

Figure 18.–Inventory of bone racks at Nondalton fish camps, 2007.

Overview of Subsistence Sockeye Salmon Fishing in 2008

The escapement of sockeye salmon into the Newhalen River in 2008, as estimated by the NPS counting tower, was 472,962 fish, or 17% of the total 2,757,912 fish ADF&G estimated to have escaped into the Kvichak River drainage. Although 29% lower than the estimated escapement in 2007, the 2008 escapement estimate was the third highest for the Newhalen River since 2000 (Figure 10). The Kvichak River escapement estimate was within the SEG range of 2–10 million sockeye salmon (ADF&G 2008; Dan Young, Fisheries Biologist, Lake Clark National Park and Preserve, Port Alsworth, personal communication, January 26, 2009).

The timing of the 2008 sockeye salmon run to the Newhalen River was later than in 2007 (Figure 11). In 2008, about 50% of the escapement was achieved by July 21, compared to July 21 in 2000, July 19 in 2001, July 21 in 2002, July 16 in 2003, July 21 in 2004, July 21 in 2005, July 27 in 2006, and July 18 in 2007 (Dan Young, Fisheries Biologist, Lake Clark National Park and Preserve, Port Alsworth, personal communication, January 26, 2009). Daily estimates of passage in 2008 tended to be lower than those in 2007, especially in the early portion of the run, although significant numbers of sockeye salmon continued to pass the counting tower well into August 2008, in contrast to 2007 when the run had, for the most part, ended by August 1 (Figure 11).

As discussed in more detail below, the weather in summer 2008 was considerably colder and wetter than in previous years, which, respondents said, hindered fish drying efforts prior to further preservation of the fish by smoking. As observed by researchers, the typical first steps in fish processing were splitting the salmon and placing them on drying racks in the sunlight and breeze (Plate 2). After the salmon were split they were usually placed in a brine of water, rock salt, and (sometimes) brown sugar. Then, the salmon were hung on outdoor fish racks so that excess slime and water dripped off. The fish dried on the outside before they were placed in the smokehouse. The salmon were usually hung skin-side out and, after the skins were dry to the touch, they were turned flesh-side out and the meat was given additional time to dry. Hanging salmon on the outside racks usually occurred early in the day so that the fish were dry enough to be brought into the smokehouse by the evening. It was not common to leave the fish on the racks overnight. Sunlight, wind, and dry weather allowed for adequate drying before the fish were brought into the smokehouse. The 2007 season allowed for adequate drying. In 2008 respondents said that it rained nearly every day during the fish camp season and fish from the outside racks were often placed in the smokehouse while still "sticky"—without being adequately dried, which increased the risk of the fish becoming "sour," or spoiled. Also, respondents said that if salmon were placed in the smokehouse while still damp, the heat in the smokehouse had to be increased, which resulted in a harder, drier, and less desirable product.

Some outdoor drying racks observed by researchers had a greater capacity than the smokehouses, thus facilitating larger harvests, since fish could be stored on the drying racks, then moved inside once space became available. With the more inclement weather in 2008, respondents said that fish had to be cut and placed immediately into the smokehouses. Because of this more limited space, fishers said that they either harvested smaller amounts—only what would fit into the smokehouse—or they cut the salmon, and then canned or froze it without smoking. These adaptations in 2008 may account for the differences in processing methods and harvest amounts between the 2 project years, especially for those fishers who usually harvested large numbers of salmon at a time and who relied on drying racks to manage the overflow.

Plate 2.–Subsistence sockeye salmon drying on racks, Nondalton fish camp, 2008.

Iliamna and Newhalen: Case Studies of Subsistence Fishing and Processing

Case studies provide ethnographic information about subsistence fishing and processing in each community. Included in these case examples for Iliamna and Newhalen, as well as the other study communities that follow below, are descriptions of facilities at fish camps or processing locations, the social organization of harvesting and processing, harvest estimates, harvest methods, and the disposition of the harvest. No two cases are similar and each case study was chosen to demonstrate different aspects of fishing and processing as they relate to the research questions. Iliamna and Newhalen are presented together in this section since families from both communities occasionally work together and share fishing locations and processing facilities.

Case Study A: Newhalen

This case example describes in detail the social organization of subsistence fishing and processing at Newhalen based on extended family relationships in 2007. The traditional ecological knowledge that informs processing is evident, as are the traditional roles based on age, sex, and skill level.

This case study family consisted of an extended family whose processing activities center around a smokehouse owned by a female elder and her 7 children. (This case includes facilities at camps 4, 8, and 11 in Table 14.) The smokehouse was close to a small house near the Newhalen River where the family

once lived. A few years ago, a daughter-in-law built a second smaller smokehouse in this area so that she could process her own fish. Figure 19 depicts the kinship relations of this case study family.

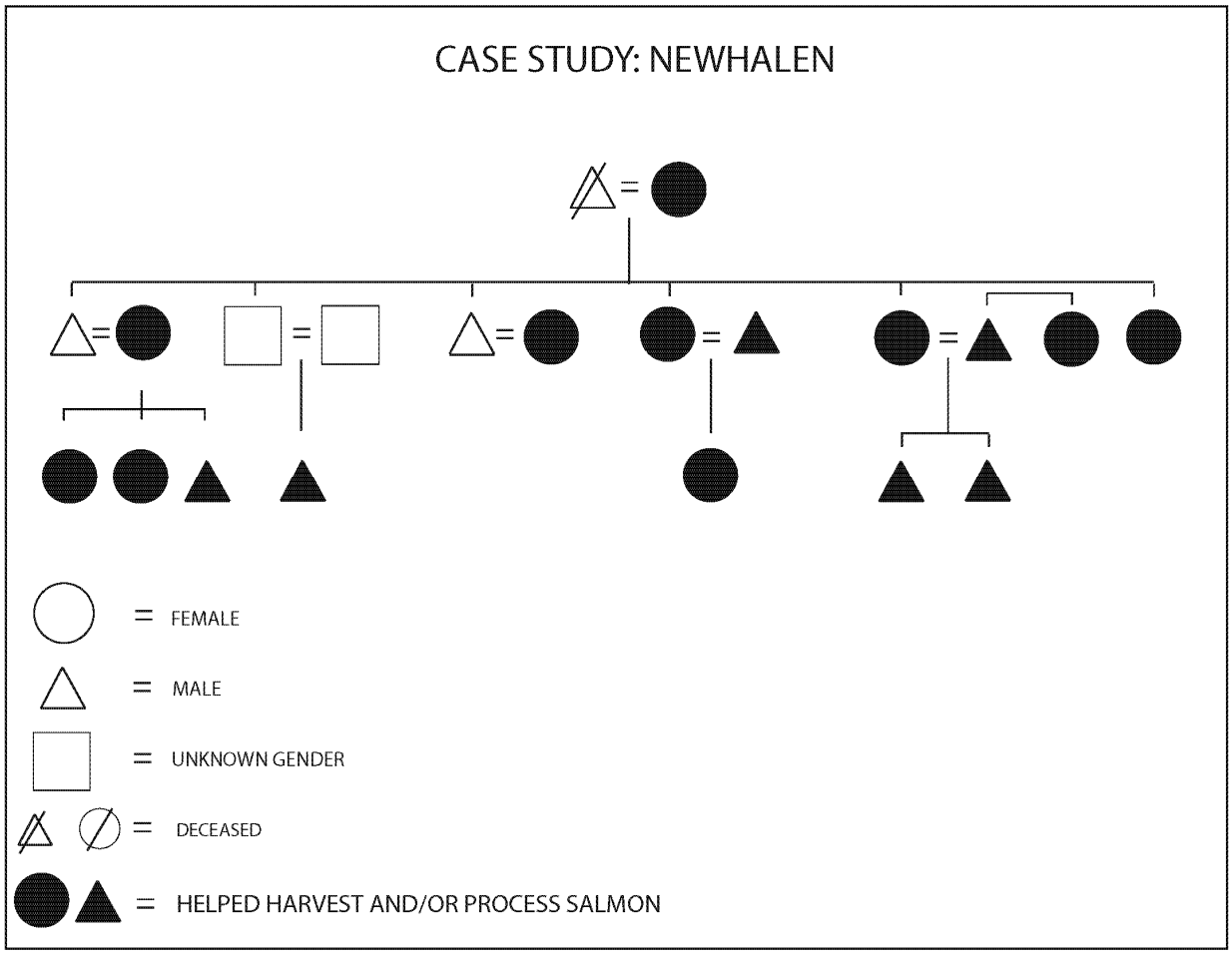

Figure 19.–Kinship relations in Case Study A: Newhalen.

In 2007, this daughter-in-law, her nephew, her 2 teenage daughters, and, on occasion, her 8 year old son, were the first to use this fish processing area that season. They processed 162 sockeye salmon during the last week in June, took a 1 week break, and then, from July 9 to 13, processed an additional 160. Her husband's first cousin caught the fish for her and might have received some gasoline in return. The daughter-in-law preferred to place individual strips of salmon in her canning jars, so the way she processed her fillets was labor intensive, with the most labor going into tying 2 strips together with string so that no fish strip touched the pole over which it was hung. After the strips were tied together they were soaked in a saltwater brine for about 5 minutes and hung to dry until the meat was no longer sticky to the touch, about 1 day. The strips were then moved into the smokehouse and smoked and dried for another 2 days. At that point they were ready for canning.

This daughter-in-law also smoked and dried some of the strips for a longer period of time so that they could be consumed without later having to be canned. These strips were placed in plastic bags and then frozen. When interviewed in Newhalen in February 2008, this daughter-in-law said that she was planning to preserve more fish in summer 2008 because she had not prepared enough in 2007.

On July 1, 2007, the daughter-in-law's husband's cousin delivered about 60 sockeye salmon to the owner. The owner, her daughter and granddaughter, and another daughter-in-law processed the fish, and Krieg participated in this activity. About 25 were filleted with strips hanging attached to the fillets. The remaining fish were not cut into strips but kept as fillets because the owner said processing was taking too long and it was getting late in the day.

The owner made all of the decisions. The other daughter-in-law, originally from the Nushagak River area where she learned to cut fish, asked the owner many questions about the local filleting process. The granddaughter headed and gutted salmon after the owner's daughter showed her the correct procedure. The granddaughter also asked, and was allowed, to fillet some fish. All the women used *uluaqs*.[10] The daughter's husband came to cut some wood for the smokehouse and start the smokehouse fire. When the granddaughter wanted to leave the cutting table before the processing was complete, the owner, her grandmother, told her she could not leave because she had asked to help, and therefore had to keep working until the processing was finished.

Another daughter and her husband were initially at the camp, but left in late June to do some commercial fishing. This daughter was second-in-command, behind the owner, in organizing the fishing and processing activities. This daughter owned her own smokehouse at her residence, where she brought her family's fish for smoking after the initial drying. This daughter's husband was the lead skiff operator. When he returned from commercial fishing, he harvested 218 sockeye salmon from about June 30–July 3, 2007 and these fish were processed in this camp. After July 3, the owner spent much less time processing fish, so her daughter directed the operations.

This family's standard fishing procedure began with the son-in-law driving the skiff, while the daughter, her sister-in-law, and the son-in-law's sister sat side-by-side in the middle seat of the skiff and quickly and efficiently picked the fish out of the net by draping it over the skiff from the starboard to port gunwales, keeping each end in the water. Ideally, they said, the net would be anchored at each end so that after the fish were picked the net could return to the water and continue fishing, but sometimes they picked the fish while one or both ends of the net were not anchored.

The lake bed at the outlet of the Newhalen River where this family fishes consists of a delta of submerged sand bars (Plate 3). The water is relatively shallow, approximately 5–15 ft deep, which is conducive for anchoring a setnet. These family members used their gillnet in 3 ways: as a setnet anchored at both ends, as a combination setnet–seine anchored at one end, and as a seine. When they used it as a setnet, they sometimes anchored one end to the shoreline above the water line, and at other times, they anchored both ends to the bottom of the lake. If both ends were anchored in the lake, the family attached buoys to each end of the cork line, not for additional flotation, but for improved visibility.

[10] Traditional knife with an arc-shaped blade set in a wooden handle.

Plate 3.–Mouth of the Newhalen River.

If the location was appropriate and the fish relatively abundant, the family used their gillnet as a drift gillnet–seine. This method started with the family drifting downriver in the skiff and the net attached by a line to the skiff. Fish swam into the gillnet and were caught in the web while the skiff drifted or was maneuvered with the outboard motor so that the net was fully extended in the water. A quicker and more efficient method was to pull the net with the skiff in an attempt to enclose a school of fish. Keeping one end anchored, the family used the skiff to pull the other end around the school of fish. The fish, agitated by the outboard motor and the movement of the net, swam into the net and were caught. This method was used when more fish were needed in order to obtain the optimum number required for processing before returning to shore. The 2 sons-in-law said that neither of the methods was working as well as in the past because the fish seemed better able to see the net, making them harder to catch. After harvesting salmon, this family usually redeployed the net to a good fishing location, where it stayed until the next time fish were needed. The location was selected based on observations of fish, the direction of the wind, and the weather forecast. The net was normally checked twice per day: once in the morning and again in the afternoon or evening.

After returning to shore, the family unloaded the salmon into the fish bin next to the cutting table. The fish were headed and the viscera removed by those family members with the least experience or who did not fillet quickly. The person who was standing nearest to the fish bin extracted the fish from the bin and distributed them onto the table. That person ensured that the other family members who had the task of heading and gutting the fish had enough fish, so that the work did not stop. In some cases, if those who

were heading and gutting the fish could not quickly supply the filleters with fish, a filleter headed and gutted a few, to keep the process moving efficiently.

Those nearby could be called at any time to perform a task necessary to keep the fish processing under way. If an adult was not available, children, who were usually playing, fishing with rod and reel, or trying to catch small "scavenger" fish by hand, were called. Fish heads, viscera, and backbones were placed in buckets or totes, unless the heads or backbones were to be saved. This family usually saved the backbones, tied 2 together and hung them on a rack to dry. The person with this task also had a place at the cutting table, in addition to the headers/gutters and filleters. If not enough room was available at the table, however, this task was delayed until the more important processing was complete. The younger people said that tying the bones together was their least enjoyable job. However, the family maintained that this processing activity was an important activity for beginners: they participate in the process, they have an opportunity to learn other processing techniques, and they must assume some responsibility.

As the fish were filleted they were placed in the water near the river bank, usually within a small impoundment built from stones found nearby. The impoundment was shaped like a half circle, with the open end facing the river bank. This kept the fish from being washed away by the current. At other fish camps, families placed the filleted fish in totes or fish bins, but this family always placed filleted fish in the river. According to respondents, the use of fish bins became prevalent when boat traffic, mainly sport anglers increased and the boat wakes spread the fish. Like other fish camps, this family's fish bin was a wooden frame whose sides were covered with chicken wire.

When there were fewer fish for filleting, the family prepared a brine by filling a 33 gal garbage container approximately halfway with river water, salt, and brown sugar. This solution was vigorously stirred until it floated a potato. The fish fillets were given a final rinse and then placed in clean totes and carried to the brine solution, which was stationed near the fish drying rack. The fish were brined for 15 minutes and then either placed in another tote prior to being hung on the rack or occasionally hung directly on the drying rack. At this location, the fish were usually first placed skin-side out. Then, at some point, frequently after hanging overnight, the fillets were turned so that the meat was exposed and the skin in contact with the rack. Fish fillets that had completed drying were then moved to the smokehouse.

Smoked Salmon Strips

By Funa Hornberger

Filleted salmon cut into strips.

If using 5-gallon buckets, fill ¼ full with fresh, clean water. Stir in 1 barely-handful rock salt. Stir until salt is dissolved. Place filleted salmon strips into salted water and let sit for 2–3 hours. Hang outside to dry overnight skin-side out. The following morning, flip fillets over so meat-side is out. Let hang and dry until late into the evening. Bring salmon into smokehouse and smoke the salmon for about a week. Then let hang to dry for another 2 weeks or let dry to your preference.

If using large trash can container, fill a five gallon bucket with fresh, clean water and pour into the container. Add a heaping cupped handful of rock salt to the water. Let sit for a while so salt dissolves. Then stir water until all salt has been dissolved. Follow instructions as above.

Some people add equal amounts of brown sugar to salt. If that is you preference then you may do so.

Enjoy!

Cleanup started as the last fish was filleted. First, the pieces of carpet or the burlap bags that were used to hold the fish on the cutting table were soaked in the river, sometimes with rocks placed on them so they would not float away. Buckets of water were splashed on the table and grass from the nearby river bank terrace was used to scrub the blood and slime. Everything was thoroughly rinsed. Depending on the time of day, the heads and viscera were covered and then disposed of when the skiff next checked the net, or if it was evening when the processing is finished, they were taken across the river and dumped at the waterline. If everything was timed correctly, and there were enough helpers, all of the tasks ended at about the same time: the fillets were brined and hung, the area and equipment cleaned, and the heads and viscera disposed of.

Krieg observed that the bones were hung from the top of the A-frame drying rack, the hardest place to reach. To reach the top of the drying rack, the person hanging the fish had to stand on the lower levels of the rack and another person had to hand him or her the bones. Once the bones were hung at the top, they were not moved until the end of the season when they were stored in a small cache. Salted fish was also stored in this cache.

In summary, the people who helped at this location were the owner, her 3 daughters, and a son-in-law and his sister. The daughter and son-in-law's 2 sons (one a teenager, the other in his early 20s) helped after they returned from commercial fishing in Bristol Bay. The owner's daughter-in-law and her granddaughter also helped. This granddaughter also was observed helping by babysitting the children of the second daughter who could then focus her full attention on processing fish. A younger girl (relationship unknown) helped hang fish on the drying rack because she was light in weight and could easily climb higher on the fish rack without fear of its breaking. The cousin also helped to head and gut the salmon for a while. The researcher found it interesting that, as other people stopped at the cutting table to visit and perhaps help for a while, they were asked if they wanted a fresh fish. In one instance, the owner's sister-in-law came by and received a fresh fish and some heads. She had not asked for the fish but was very happy to receive them.

Because there is a second smokehouse at this location, and 2 groups using the same equipment, and because the daughter and son-in-law left to help their sons with commercial fishing, once the sockeye salmon arrived in substantial numbers, the processing was split into 4 time periods. First, the daughter-in-law first to arrive at the camp harvested and processed fish from June 26 to 30, 2007. Then the owner harvested and processed fish from June 30 to July 3, followed by the owner's daughter and husband who began July 4. Their processing activities overlapped the daughter-in-law's from July 9 to July 13. The daughter and son-in-law halted their processing about July 21, just before they and other family members started berry picking on July 22.

Case Study B: Newhalen and Iliamna

This case provides another example of how extended families work together to harvest and process salmon at Newhalen, and also shows how these activities link families in Newhalen and Iliamna. Researchers worked with these families in 2007 and 2008.

This case study included 5 households who fished for sockeye salmon together on the Newhalen River (Figure 20). The central household in the group owned a salmon processing site on the river shore about 100 ft from their home. The site included a smokehouse and a skiff. The 5 households shared this processing area as well as gillnets while working together during the salmon fishing season. Four of the 5 households lived in Newhalen and were related through kinship, while the fifth was an unrelated household from neighboring Iliamna. The Iliamna household had lived in the area for only a few years but was considered a friend by the central household and thus invited to participate in their subsistence salmon fishery in 2007 and 2008.

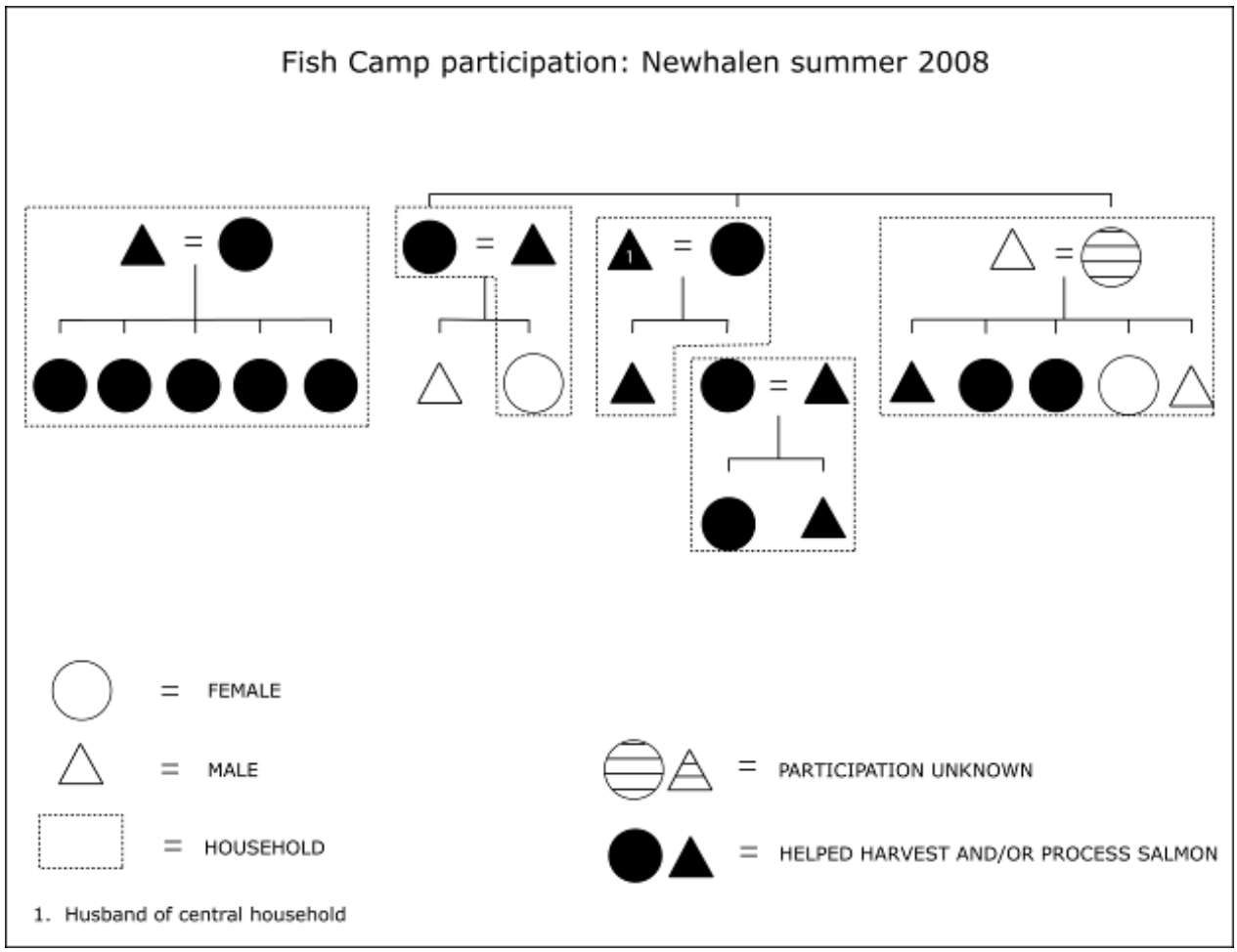

Figure 20.–Kinship relations in Case Study B: Newhalen and Iliamna.

This multihousehold group set multiple gillnets, primarily at the direction of the husband of the central household. They usually set the nets early in the sockeye salmon run, although in 2007 the husband exclaimed that "I'm not putting my net out until the fish come because gas is too darn expensive." In 2008, he said that the price of gasoline prevented him from fishing in a preferred location farther down the beach, in Lake Iliamna west of the outlet of the Newhalen River. Instead, he set the gillnets closer to his home and the shared fish processing site. The group had up to 3 gillnets set simultaneously at different locations. Despite their plans in 2008, however, to postpone fishing until the main run arrived, the group began setting nets earlier than most Newhalen families. In 2007, their first net was set on June 17 but they did not harvest substantial numbers of sockeye salmon until the morning of June 28, when they had 45 in their nets.

The total group harvest, as reported on permits, of fresh sockeye salmon in 2007 was 1,050 fish, which the husband of the central household said was not enough to last through the year since those fish were used by December 2007. The husband's son-in-law also said that his household did not harvest enough fresh sockeye salmon in 2007. The son-in-law's share was 160 fish, but he would have liked 240. Wage employment limited both men's fishing time in 2007. The husband of the central household worked in alternating weeks, and his son-in-law worked 12 hours per day during part of the fishing season. The 3 other households reported that they were satisfied with their shares in 2007. One household commercial fished in Naknek during the subsistence salmon fishing season, so they were able to provide only limited help during summer 2007. Because they were members of this group, they were given a share of the 2007 subsistence harvest.

At the beginning of the 2008 sockeye salmon season, the husband was eager to increase the group's harvest from the previous year's harvest, and he planned to harvest 2,000 fresh sockeye salmon. Although the final reported harvest totaled 1,026 fresh sockeye salmon when surveyed in late April 2009, all households reported harvesting and receiving enough salmon for their households in 2008, despite a harvest similar to the previous year.

As in 2007, the husband of the central household worked for wages during part of the 2008 sockeye salmon fishing season, which halted fishing activity for the group as a whole. His wife and the other households took a break while he was working, but his wife said she was "a little lost, not working on fish." The husband of the Iliamna household also worked for wages during both fishing seasons, but when his work schedule prevented him from fishing, the whole group did not stop fishing. The fishing activity mainly revolved around the central household members who owned the skiff and the smokehouse.

In this group, the men generally picked the nets and the women and children processed the fish, although the men sometimes assisted in the processing as well. Because of the shared responsibilities and the collective harvests, family members said reporting "household shares" of the harvest on subsistence permit returns and during household surveys was challenging. The majority of the harvest, 800 in 2007 and 613 in 2008, was recorded as harvested by the central household. The household that commercial fished in the summer only reported being given fish by the other families in the multihousehold group, while 2 of the other households reported a harvest in 2007 or 2008. The Iliamna household reported harvests in both 2007 and 2008. The total reported on the permits was calculated so as to not double-count fish, but this forced the households to enumerate their shares and decide whether or not their share should be recorded as "given" to them or "harvested" by them.

In 2007, some fish from 2 of the nets were lost to bears and were not counted as part of the harvest. After bear activity, setnet sites were moved to other areas of the lake or farther out from the shoreline, where it was thought that bears were less likely to disturb the nets.

Adults and children participated in fishing and processing activities in 2007 and 2008. In 2007, the husband of the central household said that when one of the younger girls was afraid to head and gut the salmon, he smeared fish entrails on her hands to rid her of her fear of "getting messy with fish." He said that is the way to teach children. Younger children played near the processing area, usually by trying to catch small fish they called *kapotaks*[11] and sticklebacks that were schooling in the processing areas and feeding on discarded salmon. The children sometimes tied pieces of salmon flesh or roe to a line, or, in some cases, just held the food in their hands, and the fish took the bait and could be lifted into a bucket. Children also helped with some processing tasks, including removing the heads and cutting open the fish so that the entrails could be removed in preparation for filleting.

In 2008, the 8-year-old granddaughter of the central household wanted to help cut fish. She was given a sockeye salmon to work on and sufficient time to practice. However, respondents said that she was still too young and physically unable to do it correctly, and eventually became frustrated and careless with the fish. When it was obvious that she was unable to make the proper cuts and it appeared that the fish might be wasted, her grandfather told her she had to stop because it was not good to waste fish. By being present at the processing site, she was growing up with the opportunity and desire to learn to process salmon with her family.

Case Study C: Iliamna

The case example illustrates an extended family's subsistence salmon fishing activities that take place in the community of Iliamna.

[11] These fish were probably primarily various species of sculpins. *Kapatak* in the Central Yup'ik dialect of Bristol Bay refers to sculpins or "bullheads" (Jacobson 1984:188).

This case study family consisted of a woman who had lived in Iliamna for 14 years, and who fished with her daughter-in-law and 3-year-old granddaughter who lived in a nearby community. In 2007, this case study family was using a female friend's smokehouse and subsistence setnet site located at Northeast Bay, on a beach popular with subsistence fishers because it was adjacent to the main paved road that goes through Iliamna. (Camp 2 in Table 13).

This camp had 1 smokehouse, 1 drying rack, and 3 small to medium cutting tables. The cutting tables were located on the beach next to the net. The smokehouse was easily accessible from the cutting tables, so the fish did not have to be carried a long distance. The owner of the smokehouse was absent from the community that summer, but the fisher reported that she usually fished with the owner and 2 other women. One of the other women was employed by Northern Dynasty Mines, Inc. (see "The Proposed Development of the Pebble Project," in the Discussion section, below) in 2007 and thus had limited vacation and fishing time.

On June 28, 2007, the fisher checked the net owned by one of the more active subsistence fishers in Iliamna because the net owner was out of town. There were 2 sockeye salmon in the net, which the fisher said was a good indication that the run had started and it was time for her to install the running lines for her own net. She recorded her first harvest of 2 sockeye salmon on July 2, 2007, and 7 more on July 3. Then from July 5 to 9, she harvested 43 sockeye salmon; from July 11 to 16, she harvested 64 sockeye salmon; on July 19 she harvested 2 sockeye salmon; and July 22–23, she recorded a harvest of 14 sockeye salmon.

In this fisher's assessment, she did not harvest enough salmon in order to smoke the amount that her family needed. She said she needed 200 sockeye salmon, but her recorded harvest was only 132. In the past, she said, fish started to return in mid June, but now fish are returning later and in fewer numbers. Additionally, her boat was not available in 2007, so her fishing was limited to the beach site by the smokehouse. In 2008, she and her son fished with other Newhalen residents to meet their harvest goals.

Case Study D: Iliamna (fishing and processing at Newhalen)

This case, typical of subsistence fishing based at Newhalen, illustrates the many preparatory tasks that must be completed before processing of salmon begins. It also shows the importance of having family members or others available to assist with these preparations.

The smokehouse at this camp, located on the Newhalen River at Newhalen, belonged to a woman who now lived in Iliamna, and who was assisted by her son, grandsons, daughter-in-law, and another female Iliamna resident. The smokehouse was built around 1945. In the study years, this group borrowed another family's skiff to check their setnet. Two other Iliamna families delivered sockeye salmon to this woman, who recorded these fish on her subsistence permit. She processed about 150 sockeye salmon in 2007 and about 175 in 2008.

In early July 2007, Krieg was visiting a nearby smokehouse when this woman arrived and asked for help in her preparations for processing fish. She had spoken to another female Iliamna resident who told her that the next load of fish retrieved by her grandson would be delivered to her, perhaps that day. Krieg accompanied her to the smokehouse. The woman had an old bathtub that she was using for a fish bin that she wanted closer to the river. In accordance with her instructions, Krieg hauled the bathtub down to the edge of the river, placed it partially into the water, and piled rocks around it to keep it in place. They also repaired the screens over the air flow openings at the top of the smokehouse to prevent magpies from entering and cleaned up trash from the beach where her skiff was stored. Krieg then used a hand saw to cut some birch logs that had been collected for smoking and placed them in the smokehouse for her. They also rolled a wire cable reel to the river and tipped it on end to use as a cutting table. They nailed a piece of plywood, found on the beach and perhaps left from the previous year, to the reel. Then the fisher found a piece of plywood with carpet attached, so they also nailed that to the reel, along with a brace to make the table a little stronger. Again, these activities were done under the fisher's instructions. Although the

table was replaced by a new one within about a week, the fisher wanted to be ready that day because of the possibility of receiving fish. On short notice and without others immediately available to help her, she used the materials and labor at hand.

Case Study E: Newhalen

This case provides detail on the selection of fishing and processing sites, as well as some of the history of processing sites used by Newhalen families. It also describes traditional roles and innovations in processing methods.

In 2007, this middle-aged Newhalen woman fished for and processed salmon with her daughter and son-in-law, who lived in Palmer and traveled annually to Newhalen specifically to help with subsistence salmon fishing. The woman shared the smokehouse and processing facilities with her sister and brother and their families, who also lived in Newhalen. This woman's husband had wage employment with the Pebble Limited Partnership who gave him designated days off during which he helped with checking the family's set gillnet. Mostly, however, the wife and her son-in-law picked the salmon from the net.

Each morning from July 6 to July 11, 2008, Krieg met the woman at her smokehouse and helped her check her net in her skiff. They started fishing in the lake near the outlet of the Newhalen River. She pointed out that last year's sand bar that was in the lake on the western side of the outlet was gone. They first set the net there and then set it in the "lagoon." Once, they set their net near the outlet of the Newhalen River into Iliamna Lake when another fisher's net was not set in that location. The area known as "the lagoon" is west of the outlet of the river, where the river widens and the current is very slow. The setnet location in the lagoon was east of the southernmost of 2 noticeable rock outcrops, in an area of deep water where it was difficult for bears to raid the net. The fisher moved into the lagoon from the outlet of the river so she would not harvest "too many" fish. The lagoon appeared to have a more even availability of sockeye salmon, unlike the outlet of the river, where a large pulse of fish could result in an undesirably large harvest. About 30–50 fish appeared to be the amount that this family could process at one time. They also set the net on the eastern side of the outlet of the river, near the rocky reef that extends into the lake from the outlet of the river. On the day of the researcher's visit, the fish were hitting the net in "good bunches" of 5–9 as the net was picked from one end to the other by skiff.

The lagoon location was a traditional one for this family: the fisher's mother had fished here when the fisher was young. The fisher said that her family moved from its home on the west side of the river to Newhalen around 1967 because bears were becoming more numerous. Before then, she said, they never had had problems with bears. From 1967 to about 1972, this woman, her younger sister, and her mother returned to the smokehouse once per year in order to process fish. However, she said, her father was concerned that they were still processing fish near the bears when he was away commercial fishing. Therefore, the family dismantled the smokehouse and rebuilt it at its current location on the eastern side of the Newhalen River. She pointed out 2 or 3 other grassy areas along the terrace edge on the west side of the river where other families' homes were once located. She said that they had all moved to the east side before her family left in 1967.

The respondent said that she started helping with fish when she was fairly young, about 7 or 8 years old, by heading, gutting, and hanging the salmon and by feeding the dogs. She did not "seriously" cut fish until she was in her early 20s, when her mother could "trust" her. She referred to the learning process of processing fish as "working your way up the corporate ladder." She said that she always helped her mother with fish except for a "rebellious year," when she was a teenager. She also said that she was still learning to process fish, that it was "a lifelong learning thing."

In June 2007, the respondent's sister's son and her brother's son removed the old bone rack (Plate 4) and associated drying racks and delivered the poles for a new rack. Then Krieg helped another man, who was not related to the family, begin installing the poles for a single tier drying rack, but they stopped before attaching the crosspieces because they did not want to do this without the owner present, so she could

show them how she wanted it built. Researchers observe that these events could exemplify an aspect of salmon processing that shows women's expertise in salmon processing, especially how to construct racks that are more efficiently and easily accessed. Because women were observed to do much of the salmon processing in most families, they would express definite preferences in the construction of their processing facilities. Researchers observed that men were most often enlisted for repetitive work, or heavy lifting, both of which did not require special salmon processing skills.

The old bone rack was originally constructed, along with the smokehouse, in 1972. The bone rack was removed because, after the respondent's father's death in 2006, they no longer had dogs to feed. Also she said, they were cutting any additional meat off the bones so that it could be canned (the fillets cannot be too thick if they are to dry and smoke properly). When they had dogs, the respondent said, the fillets were hung on the bone rack only if the other racks were full. The backbones were tied together with twine and hung starting at the top of the bone rack and working down to the lower poles. Because the bones for the dogs had more meat, the multitiered bone rack allowed the bones to be hung higher so they could get more wind and dry faster.

Plate 4.–Newhalen "bone rack" with a subsistence harvest.

This woman explained that she developed a procedure for "stripping" the salmon that was faster than her mother's. Her mother had cut slits along the outside (skin side) of the fish, which took a long time. The

woman cut on the meat side, cutting through the meat and then through the skin, and used the table to put pressure on the *uluaq* to make a good clean cut. Also, her mother made the final cut, which produced the strips hanging down from the fillet, after the fillets had been placed on the rack. The woman said that this was very tedious and time consuming so she made that cut on the cutting table. She also said that an elder once told her to break the discarded backbones of processed fish if they were to be left where animals could eat them. She said she has since followed this instruction but that she did not know the origin of the tradition and that not everyone did this. She took the bones and other fish parts across the river and dumped them at the edge of the water for the seagulls to eat.

Case Study F: Newhalen

This case study differs from other family-focused case studies by describing one man's involvement as a primary supplier of salmon for multiple subsistence fishing families. This case illustrates the interconnectedness of fishing groups in Newhalen and Iliamna and shows that these groups are not strictly bounded entities. It also illustrates how some subsistence harvests are accounted for on household subsistence permits.

This single middle-aged man (marked with an asterisk in the center of Figure 21) lived in his mother's household in Newhalen. As illustrated in Case Study A, each distinct Newhalen fishing group tended to center around a smokehouse. This man was primarily associated with his mother's household and his extended family, all of whom processed salmon together or had access to the cutting tables, drying racks, and other equipment as needed. He harvested salmon for this group, but he also fished ("picked" the net) for several other families that were focused around other smokehouses, including at least 2 families living in Iliamna. This man set his own subsistence gillnets and others gave him their gillnets to set as well. In 2007, he was observed to be checking up to 3 gillnets at a time, either by himself or with the help of the nets' owners. His job in the fishery was to pick nets and deliver the fish to a fish box.

In 2007, in addition to supplying about 400 sockeye salmon to his mother's processing group, this man delivered over 370 sockeye salmon to at least 5 other groups, only 3 of which were kin (Figure 21). In most cases, these groups lacked an individual who was able to set and pick a net, often due to employment outside the village or because they did not own a net or a skiff. Similarly, in 2008, this man again provided about 400 sockeye salmon to his mother's group, and over 345 sockeye salmon to 5 other processing groups. He also headed and gutted fish as needed at other cutting tables, but his main function was to tend the nets.

Each person or group who received fish from this man (fish that were harvested either in his nets or nets he was setting and checking for others) claimed the amount as their harvest on their subsistence salmon permits and during subsistence salmon harvest surveys. This man did not keep track of the number of fish he picked from the others' nets and considered it the responsibility of those receiving fish to record the harvest as their own.

This man expected no reciprocity from the family members who processed salmon at his mother's cutting table and smokehouse, most likely because these were fish that were part of his food supply. In other cases, in exchange for his delivery of salmon people gave him gasoline or money to pay for gasoline, or salmon that had already been processed. There may have been cases of delayed reciprocity, such as gifts of meat from caribou *Rangifer tarandus* or moose *Alces americanus*, but these were not observed while the researchers were present. In other cases, it appeared that this man's delivery of fish was altruistic, especially if a family lacked a fishing net or a boat operator. On the other hand, the researchers observed instances when this man declined to deliver fish to someone he considered "just acting lazy" or who had their own family members capable of helping.

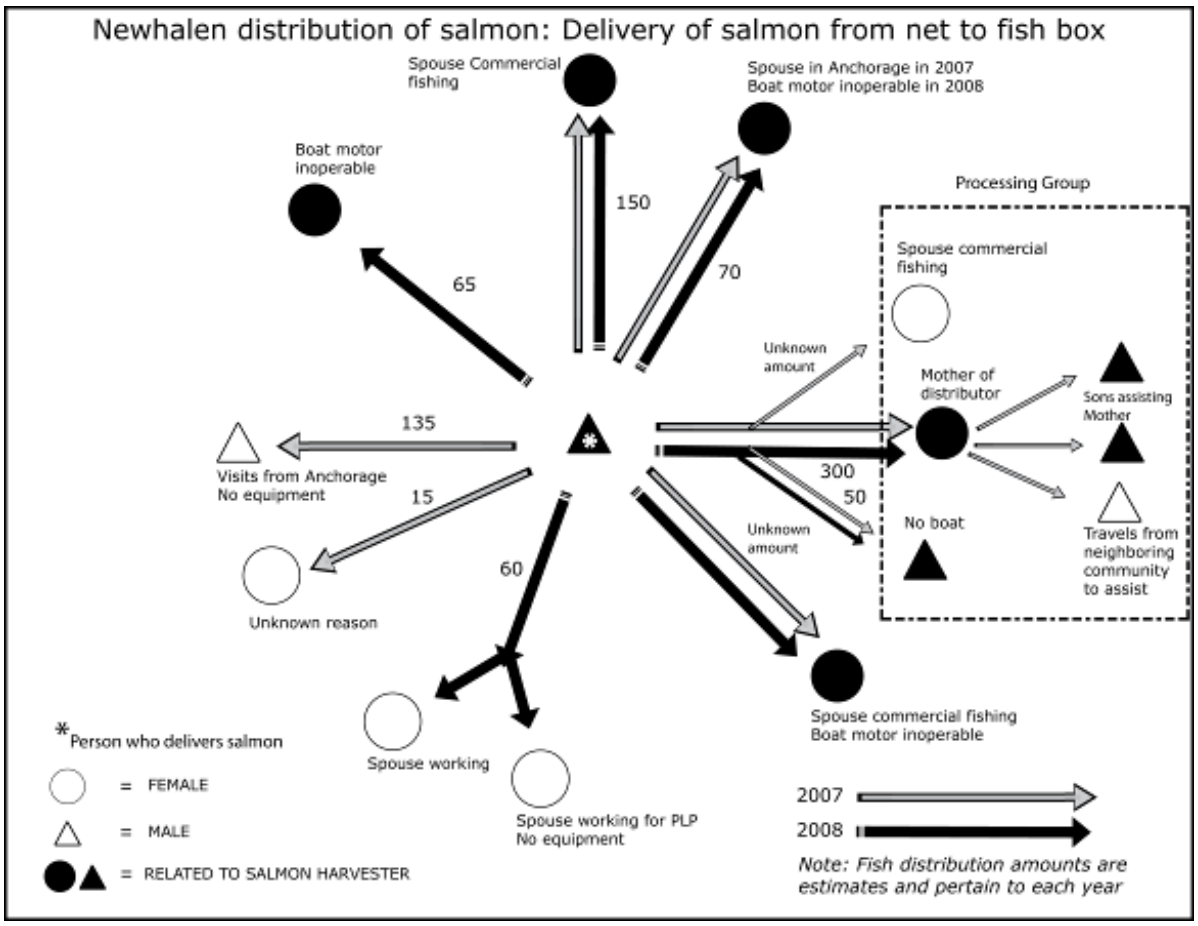

Figure 21.–Division of labor, participant characteristics, and kinship relations in Case Study F: Newhalen.

In 2007, this man was the first to go subsistence fishing in the Newhalen area. In 2008, he was also one of the first fishers. Despite reporting low or nonexistent harvests in the earliest part of these 2 fishing seasons, this man continued to set a net or nets, and he usually checked them twice per day, once per morning and evening. He also tested areas that had not been fished before and tried to find a location where he could harvest salmon without disturbances by bears or seals.[12]

Researchers learned that gillnets set near the mouth of the Newhalen River were often disturbed by seals. Respondents said that seals often eat most of the body of fish caught in nets, but leave the heads. This man said that on one morning in 2007 he found a juvenile seal in his net, which he had set near the outlet of the river. He and a person in another boat untangled the seal and released it while the mother seal waited nearby.

Also, nets set in certain areas along the lake shoreline, where there was vegetation cover close to the shoreline, were reported to be prone to bear disturbance. Respondents said that the bears tear the nets in order to get the whole fish, and then residents have to pay for costly net repairs or replacement. One technique used by respondents to prevent bear disturbances was to avoid the use of a buoy attached to the end of their net, because it attracts bears. Another bear avoidance technique used by this man was setting the net in the deeper waters of the lake or river, and not attaching it to the beach.

[12] Probably a distinct population of year-round resident harbor seal *Phoca vitulina* that inhabits Iliamna Lake, one of two harbor seal populations worldwide to live entirely in fresh waters (Smith et al. 1996:272). The other, *Phoca vitulina mellonae*, is found in Lacs de Loups Marine, or Lower Seal Lakes, on the Ungava Peninsula in northern Quebec.

Because of this man's intimate knowledge of fishing locations, other less experienced fishers chose setnet sites based on his prior use of the locations. By experimenting with various fishing sites on the Newhalen River and by attempting to harvest the first sockeye salmon of the season, this man provided valuable information to fishers in the Newhalen area, such as when and where the sockeye salmon were running. Other fishers planned their activities based on the patterns of his early catches and were able to focus their own efforts at stronger portions of the sockeye salmon run. His search for ideal fishing locations also informed other fishers of changing river conditions, especially those related to sandbars.

In summary, this man's role as a fisher not only provided salmon to multiple families—some of whom could not harvest salmon on their own—but also provided key information to other fishers in the area about run timing, river conditions, and bear and seal activity.

Case Study G: Subsistence Fishing for Spawning Sockeye Salmon by Newhalen Residents in Fall 2007

Prior Newhalen case studies described fishing for fresh sockeye salmon in the summer. This case pertains to harvesting and processing redfish (spawning and spawned-out sockeye salmon, see Footnote 6) in the fall. Again, the activity involves extended families and multiple households.

On October 10–12, 2007, Krieg joined several families from Newhalen in subsistence fishing for redfish. On the morning of the first day, he assisted 1 male household head with preparing a seine net. This man wanted to use a small meshed trawl net made of thick strands that he had previously used as a brailer.[13] Some Newhalen residents reported that they preferred to use this type of net for targeting redfish because the elongated hooked jaws and sharp teeth of the breeding male sockeye salmon did not get caught in the web and the fish were therefore easier to remove. The rest of the day was spent preparing this seine as well as the skiff for the next day's trip.

Fall weather appears to be a key factor in the timing of a redfish harvesting trip to Iliamna Lake. An east wind on the lake was considered dangerous for travel, and although an east wind was blowing the next morning, 2 skiffs left for Knutson Bay. Two brothers-in-law were the skiff drivers. The crew in one boat included the driver (who owned the skiff), his son, his nephew and his nephew's girlfriend, and the girlfriend's uncle. The crew in the other boat included the driver and his wife, their son, and Krieg. Both crews encountered strong winds and large waves, and they considered returning to the village. As they entered Knutson Bay, however, the wave height decreased and they enjoyed a smoother ride to the beach.

At the landing site, near the mouth of a stream which split into 2 forks a short distance from the beach, many sockeye salmon in their spawning colors were found (Plate 5). After building a fire to warm up, and having tea and lunch, the first seine took place in the lake near the mouth of the stream. Two men, each holding opposite ends of the seine and keeping it stretched, walked it toward the mouth of the stream (Plate 6). As they approached the beach they walked closer to each other in order to create a pocket in the net which would enclose the fish that were milling around. The main concern of those controlling the seine was to keep the lead line on the bottom of the lake and the cork line above water, so that the fish could not escape under or over it. Once the net was close enough to the beach, everyone helped to harvest the fish and place them in large plastic boxes, which they called "totes." They said that the fish were abundant in 2007. The men occasionally held the net at the mouth of the stream while another person walked downstream in each fork to herd the fish into the net.

[13] A brailer is a bag-shaped net on board a drift gillnet vessel used to lift fish from the hold of the vessel into a tender vessel, processing vessel, or processing facility (5 AAC 06.358(d)(D)(4)).

Plate 5.–Redfish (spawning or spawned-out sockeye salmon) at Knutson Bay, Iliamna Lake.

Plate 6.–Subsistence seining in the fall at Knutson Bay, Iliamna Lake.

Although the large-humped males were preferred, both the males and the females were kept. The only fish that were released from the seine were the fish that had white or yellowish-white areas on their bodies because the fishers said they looked like they were starting to decay. All of the fish that were thought to comprise a "full load," an estimated 400 fish, were caught and loaded in the skiffs in less than 1 hour.

The crews then safely returned to Newhalen, arriving at dusk. They unloaded the fish into 1 bin and 1 large tote that were located near a smokehouse on the edge of the river. They covered the fish with cut carpet pieces to protect them from gulls, and then pulled the skiffs out of the water. No processing took place until the next morning.

The next morning, 7 women began cutting fish, including the wife of one of the skiff drivers (her brother owned the other skiff), one of her sisters, a sister-in-law, 2 of the skiff driver's sisters, and the mother and aunt of the girlfriend's uncle in the first skiff.

The women quickly and efficiently processed the fish using the same methods that were observed during the summer season. Most of the split fish was sliced on the diagonal in order to expose more meat for drying; it was not cut lengthwise into strips in preparation for canning. A few fish were left in the round, with their heads and viscera. These fish were notched—sliced close to the caudal peduncle from the dorsal and ventral sides, up to but not through the backbone—so that 2 fish could be tied together with string and hung over a rack. As the fish processing was ending, around noon, 2 other skiffs were observed leaving for Knutson Bay. Later that evening, many of the same women also helped with processing the harvests from these 2 skiffs.

The redfish were divided among the processors as well as delivered to several additional households. At least 13 households shared this harvest. All the fish were hung in open areas, to dry (Plate 7). Lunches that day featured fried or baked redfish.

In Iliamna a few days after this, Krieg also observed the processing of redfish that had been harvested with a gillnet near the Kijik area of Lake Clark. The fishers were planning to make another harvesting trip to the Kijik area, and planned to process these fish the next day. These 2 trips resulted in a combined harvest estimate of 500 fish.

While in the communities, Krieg also observed hunting for freshwater seals and waterfowl, and rod and reel fishing for other species, all of which occurred in association with redfish fishing. While conducting a key respondent interview, Krieg was also treated to a snack of that summer's dried fish served with the fat from a brown bear, and with tea.

General Observations about Subsistence Fishing in Newhalen and Iliamna in 2007 and 2008

For the first few days of fieldwork in 2008, only small numbers of sockeye salmon were being harvested by subsistence fishers at Newhalen and Iliamna. In both study years, researchers observed that fishers used these periods of slow fishing to prepare for the primary salmon run by moving cutting tables, building fish bins (Plate 8), and attending to other maintenance chores at the fishing and processing sites.

Plate 7.–Subsistence “redfish,” cut and hanging to dry.

Plate 8.–Stariwat assisting with construction of a fish bin.

During the researchers' visits to Iliamna and Newhalen in 2008 (June 28–July 12), all of the observed salmon fishing was done with set gillnets and no seining was observed. One group of Newhalen fishers reported drift gillnetting as their method of harvest in 2008 when they were surveyed in early 2009.

Krieg and Stariwat participated in fishing activities in varying weather conditions in 2007 and 2008, and they were told of weather-related conditions that affected fishing in 2008, such as water temperature, water current, debris, wind, and rain. The researchers observed techniques used by some fishers when processing salmon in the rain and how fishers reacted to other changes in the weather. The disappearance of the sandbars at the outlet of the Newhalen River into Iliamna Lake was said to have changed the water depth in the area for salmon fishing in 2008.

The field researchers observed and listened to accounts of fishing competition with bears and seals, and they learned about the ways people react to disturbances by bears and seals and how potential conflicts and competition are avoided.

In 2007 and 2008, many young children were present during fish harvesting and processing, even when not directly assisting in fishing activities. In addition to interacting with adults, children posed questions to adults about fish and fishing. To a lesser degree, older youths in their teens helped to harvest and process fish. Plate 9 shows a Newhalen family processing their subsistence harvest of sockeye salmon in 2008.

Plate 9.–Newhalen family processing subsistence-harvested sockeye salmon, 2008.

Nondalton: Case Studies of Subsistence Fishing and Processing

Case Study H: Nondalton

This case example provides an overview of subsistence salmon fishing and processing at Nondalton in 2007, with details about fish camp facilities, fishing and processing methods, and social roles. It highlights the many tasks involved in preparing for subsistence fishing and the skills needed for successfully harvesting and processing the harvest. The care and pride this extended family invested in their annual production of their winter's food supply are evident in this account.

This family fish camp was located on Sixmile Lake, about one-fourth of a mile from the family's home in Nondalton. Because their home was close, there was no need for family members to stay overnight at the camp. The husband and wife built the camp in the late 1970s, soon after they were married.

The camp consists of 1 small, unfinished log home, 1 structure that was meant to be used as a steam bath but was used for storage, 1 dock, 1 tall decorative cache (not used for storage), 1 bone rack, 1 drying rack, 1 net rack (for drying the net), 2 fish cutting tables, and baskets for harvested fish. The taller cutting table was primarily used to prepare salmon strips, while the shorter one was primarily used for heading, gutting, and filleting. When there were many fish to process, however, the taller table served as a heading–gutting–filleting station as well. Many of the structures were new, built by the father in April 2007, in part to replace the old racks and poles and in part to provide a neat and attractive background for a number of issue-related films that were to be made in Nondalton that summer.

The household's mother/wife is approximately 50 years old. She was able to help operate the nets, but this was usually the men's task. She also helped to remove fish ("pick" fish) from the net, which, in this family, was also primarily the men's activity. She was primarily responsible for removing the heads, viscera, and fins from the salmon. In 2007, she split the fish and prepared strips, but usually, she said, her husband and daughter performed these tasks. She said she first started to split fish in 2005. After the fish were hung on the drying rack, she then decided how to process them.

Because the father/husband (approximate age of 50) was recovering from surgery, his involvement in subsistence salmon fishing and processing was more limited in 2007 than in other years. His primary tasks in 2007 were to oversee the subsistence fishing and processing activities and to run errands. Usually he set the nets, picked the nets, and split the majority of the fish. The family related that he was known for his filleting skills. In 2007, he included fresh fireweed blossoms with some fillets before sealing the plastic bags with a vacuum food sealer ("vacuum packing"), for an aesthetic reminder of summer on the winter day that the package would be opened. In 2007, he also helped to prepare the smokehouse and oversaw much of the boys' work.

The couple's younger daughter, in her late teens, had just returned from spending the spring in Tyonek, a Cook Inlet village where 2 of her mother's sisters live. Like Nondalton, Tyonek is a Dena'ina Athabascan community. While in Tyonek, this daughter learned how to prepare salmon strips "Tyonek style" (a method usually used on Chinook salmon *O. tshawytscha* in Tyonek, see below), and because of this, she was billed as the family's "salmon stripping specialist." In 2007, she also helped to retrieve the nets and occasionally helped to pick the fish from the nets. She was one of the family's primary fish cutters: heading, gutting, and removing the fins from the fish and doing the majority of the splitting, filleting, strip cutting, and hanging. She said that although she had to leave from time to time for employment purposes, Nondalton was her home and where she intended to stay.

One of the family's sons, in his mid 20s, along with a friend (see below), set and picked the nets. He also helped prepare the smokehouse, which included gathering wood, hanging strings for the fish, and lighting the fire. He hung fish strips and performed many errands.

The son's friend, also in his mid 20s, had often helped at this family's fish camp in the past by setting and picking the nets. According to the mother, this friend and her son "were raised like brothers." The friend's

family had their own fish camp, run by his grandmother, at the mouth of Sixmile Lake, and he also helped there. He spent the first day with this case study family setting and picking the nets and sharing in meals. He also fished with rod and reel (unsuccessfully) for "trout" while at the camp. "Trout," according to respondents in the study communities, meant both trout *Oncorhynchus* spp. and char *Salvelinus* spp. such as rainbow trout *O. mykiss*, lake trout *S. namaycush*, Dolly Varden *S. malma*, and Arctic char *S. alpinus*.

In addition, this case study family hired an acquaintance, a man in his mid 50s who lived in the Nondalton area, to assist the mother with preparations that accompany the reopening of a fish camp, including the removal of debris, until her husband and son were able to return to the camp from Anchorage.

The father said that this family used to use a seine net, which, he said, was a more selective process and better for the fish. However, the use of a seine net had just been reestablished as a legal method in 2007, and the family still owned only gillnets. One end of each set gillnet was anchored to their boat dock on Sixmile Lake, and the nets were stretched by using the family's skiff. In 2007, the first set of the season occurred late in the evening, and the net was pulled early the next morning. This first set was performed by the mother and a researcher just prior to the rest of the family's return from Anchorage. After the first set, nets were then set in the morning and pulled a few hours later, in the late morning or early afternoon.

The mother had fished as a commercial setnetter and her method for picking the nets mirrored this experience. The boat was positioned at the end of a net, which was anchored in the lake bed, then the fish were removed and the empty net piled into the boat. As the fish were removed, the family used the net to pull the boat closer to shore. Some nets were picked by standing on the shore, pulling the net toward the shore, and removing the fish as the net entered shallow water. The gravel beach was raked before the nets were retrieved so that sticks or other shoreline detritus did not tangle the lines. As the fish were removed from the nets, they were placed into chicken wire baskets or an old bathtub set deep enough in the lake water so that the salmon remained fresh.

The family harvested 312 sockeye salmon during summer 2007. They said they aimed for a summer total of approximately 300 each year, and often fished in the fall as well. Family members said that summer 2007 was similar to other years in terms of setting and reaching their harvest target, the approximate number of sets (4) needed to reach their target, and the methods employed to harvest and process fish. This season differed from others in the level of the shoreline (low), the switching of some roles to accommodate the injury of the male head of household, and some extra processing in preparation for the elder daughter's wedding.

The mother used long stems of fresh grass on the cutting table when heading, splitting, and filleting fish, but not when cutting strips. She said she usually used birch bark, but was not well prepared that year. The bark or grass were better for the knives, and helped prevent the fish from slipping. This family noted that other families often used strips of carpet for these purposes. If the family had many fish to process, one member sharpened the knives about every half-hour. The fish backbones were tied together and hung on a bone rack, and were later used as dog food.

This may have been the only Nondalton family who prepared their salmon strips "Tyonek style." Rather than cut strips into a whole fish that is then hung by the tail, 2 strips were cut from the fillets but left attached to each other. The strips were soaked in salt brine and immediately hung in the smokehouse. This family felt this method was better because it eliminated a number of steps, the fish did not dry outside where flies could reach them, and the family did not have to spend time cleaning fly eggs off the strips.

In 2007, the family also vacuum packed and froze fillets, and canned (in glass jars) fresh and smoked fish. Many fish were filleted, vacuum packed, and frozen in preparation for the eldest daughter's wedding, held July 2007. The younger daughter often arranged the strips in jars in attractive patterns, sometimes alternating skin-side out with flesh-side out, sometimes showing only the flesh side and sometimes only the skin side of the strips. Some jars were not arranged in patterns because they were to be sent to a son

living out of state who was, according to the family, "not picky." The family also sends canned strips to the elder daughter, who lives elsewhere in the state. While some of the 2007 harvest was thus shared with extended family members, this family relies on the fish they harvest in summer to see them through the winter, and therefore they consume most of the harvest themselves.

Researchers did not closely observe this family's subsistence salmon fishing and processing in 2008. However, informal discussions with family members, as well as the postseason household survey, showed that their activities in 2008 were much like those of 2007, although their harvest increased to about 400 sockeye salmon.

Case Study I: Nondalton

This case example illustrates fish-camp-based subsistence salmon fishing by Nondalton families. The importance of extended family relationships in the successful harvesting and processing of subsistence salmon is clear from this case, as is the critical role of senior women in planning and directing subsistence salmon fishing. Although every family has its own special procedures and traditions, this case is typical of other Nondalton fish camps. This case also highlights the reintroduction of seining as a legal method for subsistence salmon fishing.

This fish camp was located at the head of the Newhalen River, near the outlet of Sixmile Lake. The camp included 4 cabins, each accommodating a nuclear family, as well as 1 steam bath, 2 outhouses, 1 smokehouse, 1 dock, 2 cutting tables, 2 fish boxes, and several fish racks for drying fish. The camp, in this location since the 1940s, was owned by a female elder. The camp once belonged to her mother-in-law (the mother of the owner's deceased husband) and her family.

In 2007, this case study fish camp was used by a number of family members and their friends (Figure 22). The owner's son and his son, both of whom lived in Anchorage, stayed at the camp during fishing and processing. One of the elder's daughters and her 2 children, and the owner's brother, who also lived in Anchorage, also stayed at the camp during fishing and processing. Two of the elder's other daughters, 1 daughter's husband, and 4 granddaughters commuted between Nondalton and the camp during fishing and processing. Long standing family friends from Eagle River, Alaska, as well as a number of other grandchildren and friends also harvested and processed fish at the camp. In the past, they said, every family member who was involved in subsistence fishing or processing stayed at the camp, but now more people stay in the village and commute to the camp.

The owner's sister, whose husband was deceased, owned a second camp next to this one (Figure 22). Both camps worked together to harvest and process salmon. In 2007, the second camp owner's daughter also stayed at the camp during subsistence salmon fishing. The second camp owner's granddaughter and her 2 daughters (the owner's great-granddaughters) commuted daily between Nondalton and the camp, and participated in subsistence fishing activities.

In 2007, this extended family used 1 seine net to harvest sockeye salmon. The family has used a seine net at this camp since the 1950s, when the original owner of the camp and her daughter made a seine from cotton seine net twine.

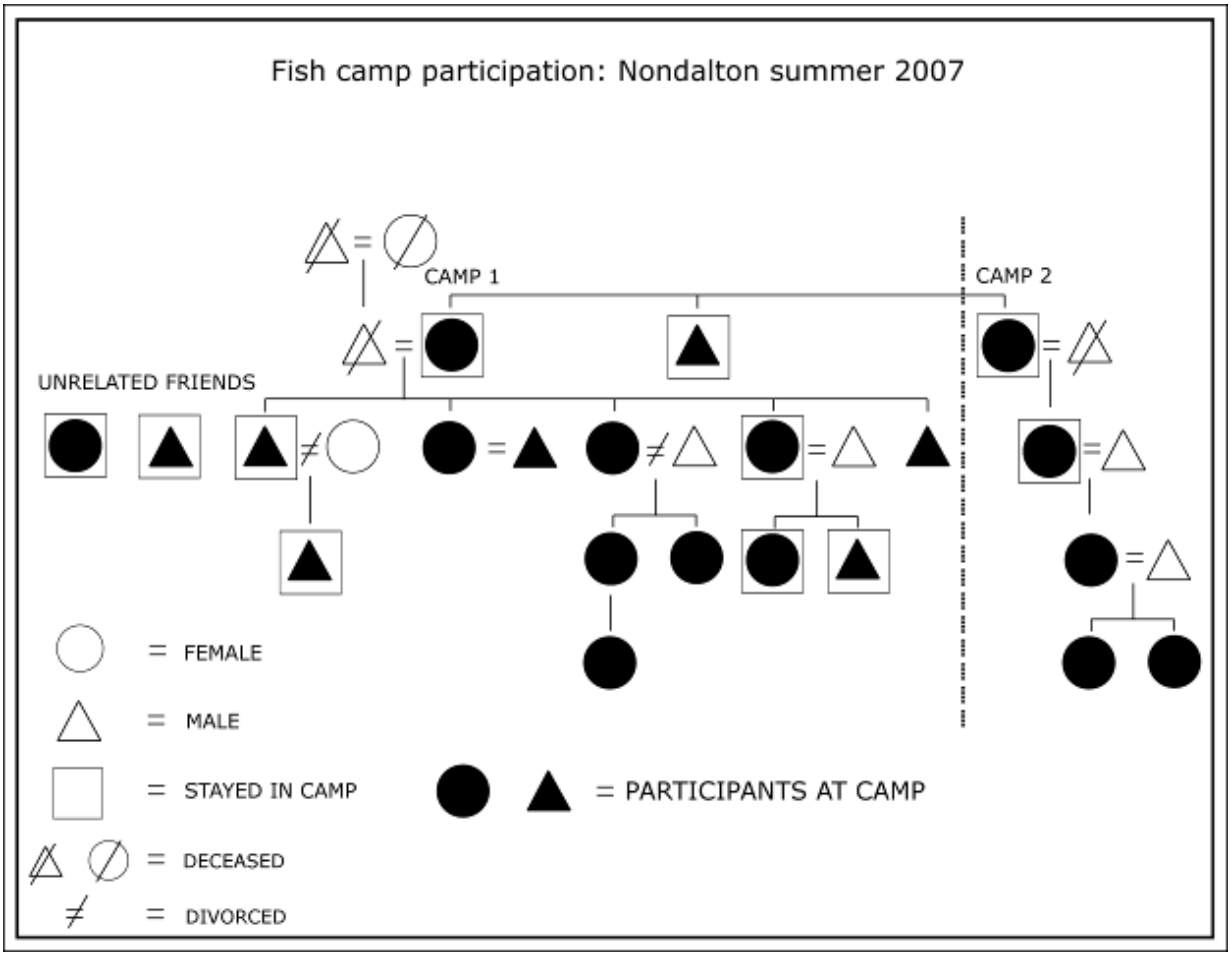

Figure 22.–Kinship relations in Case Study I: Nondalton.

At this camp, men and women remove the heads and viscera of the salmon. Next, the fish were left in the fish box (*k'usq'a*) for at least 1 night (Plate 10). This, they said, helped to soften the meat so when the fish were smoked or dried they did not shrink or harden, as they did if split when fresh. The women usually split the fish and then placed them in a brine consisting of water, rock salt, and brown sugar mixed in a 50 gal plastic container. To assess the appropriate salt content, a medium sized potato was placed in the mixture. As described in Case Study A, the potion was stirred until the potato floated, and this was when the brine was ready for the fish. After the fish were brined, they were hung on outdoor fish racks until they were dry to the touch. The fish were then hung in the smokehouse. This family said that their fish smoking process could last 3 weeks to 1 month or more, depending on the weather. The family also prepared dried fish, canned (in glass jars) strips of fresh fish, salted fish, and froze fish (Plate 11). The estimated 2007 harvest for all families at the 2 camps was 1,500 sockeye salmon.

Plate 10.–Sockeye salmon in a *k'usq'a*.

Plate 11.–Processing subsistence fish for canning.

The extended family at this camp frequently shared its harvests with community members. This family owned the only seine net in the community so their customary practices were to harvest fish for other families and to loan the seine net to other families. In 2007, four families at other camps borrowed the seine net and the case study family also provided sockeye salmon to 5 other family groups.

According to members of this case study family, a number of factors contributed to a "good" subsistence salmon fishing season in 2007, including abundant sockeye salmon and good weather, which meant that not much time was needed for the fish to dry. In addition, they said, harvesting and processing began in the first week of July, so there were not many *k'ełch'eshi* (blow-flies) to lay eggs on the fish, and there were enough people to help with the process of "putting up" fish, such as getting wood for and tending the fire in the smokehouse, operating the seine net, and processing the fish.

The composition of the work groups at these 2 adjacent camps in 2008 was similar to that of 2007, with a few exceptions. In Camp 1, a second son of the owner's son stayed at the camp and participated in fishing and processing. One of the owner's daughters and her husband fished commercially in 2008 and did not participate in subsistence fishing at the camp, but this household did receive dried fish ("dry fish") from other family members. Also, the partner of one of the owner's granddaughters joined the granddaughter and her daughter in commuting from Nondalton to assist at the camp. In Camp 2, a second granddaughter of the owner joined other family members at the camp to assist with processing the salmon.

Case Study J: Nondalton

This case example provides additional detail about processing methods as used by a female elder, and also includes her observations of changes to the local environment. Although this elder does not operate a net herself, the fish harvested in her net by her sons are considered her harvest, and recorded as such on permits and surveys. This was not unusual in the Kvichak subsistence sockeye salmon fisheries observed by researchers.

This camp (number 2 in Table 15), located on the shore of Sixmile Lake, was a 10 minute walk from the village. This camp was run by a female elder whose husband was deceased, and who, for the most part,

fished and processed salmon alone during summer 2007. Because it was close to the village, project personnel were able to frequently visit this camp, and they were able to interview the owner as a key respondent. Some of this woman's children had their own camps nearby. Once per day, one of her sons removed fish from a set gillnet and placed them in her fish bin.

The fish camp was small, with 1 permanent cabin, 1 smokehouse, 1 cutting table, 1 fish bin, and 1 bone rack. As most Nondalton residents used to do in order to prepare food for dogs, the owner tied salmon backbones together and hung them on the bone rack, in addition to the fish that she split. As shown in Plate 12, the owner also kept fish heads under water by hanging them on a line attached to the cutting table, one step in preparing a fermented fish dish commonly called "stink heads."

Plate 12.–Fish heads being saved to make "stink heads."

The owner and her husband began using this camp in 1952, after she moved to Nondalton from Lime Village to marry. She has fished here every year since then. The owner reported that she had observed many changes near the camp and in the lake over the last 55 years. One example she gave was that there was more brush and stands of white birch around the camp. There were no trees near the camp 50 years ago, she said. She also noted a change in the abundance of fish as well and that the lake used to be filled with salmon fry in the summer. To make her point, after processing some fish she washed her salmon-covered hands in the lake. Little pieces of salmon floated away. She said that in the past when she did this, the salmon fry swarmed around the bits of salmon like a cloud. Now, she said, there are no fry and nothing comes to eat the bits of salmon she washes from her hands. She wondered if this meant a poor return of salmon in the future.

On the other hand, she said, there are now many lake trout and northern pike *Esox lucius*. She said that more whitefishes (of various species) were being caught in salmon nets, and there used to be Arctic grayling *Thymallus arcticus* in the lake as well, which her family used to harvest with rod and reel because these fish were too small for the nets and passed through them.

When project personnel arrived at the camp, the owner was working alone, cutting fish at a table stationed in the water, her fish bin nearby. She was placing the salmon heads in a bucket and the salmon viscera were going into the lake. Two of her grandchildren, who were staying with her during the time she was at the fish camp, were playing nearby. Although they were playing in the water, they were also observing her work. She said 2 of her sons fish, but her granddaughters had not learned to cut fish. The researchers offered to help, but she declined, saying that she could handle the work herself and that she works all summer processing salmon because she enjoys the tasks. She also said she did not mind that no one helped her because it was a pleasure for her to share her harvest with her family. Throughout the summer, project personnel visited the camp to observe fishing and processing activities.

The owner split most of her fish, cut slashes in the fish so the meat dried faster, and then placed them on racks under the trees near the smokehouse. The fish dried for several days until they were ready to go in the smokehouse. At the time of the initial visit she had been in the camp for only a few days, so only 4 of the 20 racks in the smokehouse were being used, although more fish were drying outside under the trees. She planned to fill the smokehouse with strips cut from split salmon, can (in glass jars) the strips, and finish by the end of July or early August 2007.

The owner also prepared some split salmon for freezing. She kept the backbones on these fish so that they would stay straight and flat. She dried these fish for about 2 days so they would retain much of their moisture, and then froze them. She planned to give most of her entire salmon harvest to family members who do not fish.

The owner kept a log of her fishing activity on a calendar, but did not transfer the data to a subsistence fishing permit in 2007 or 2008. Her harvest was recorded during the salmon harvest survey in both 2007 and 2008. According to the survey, she harvested 332 sockeye salmon in summer 2007 and a similar number of fish in 2008. She related that this was the amount she needed for her household and to give to family. When interviewed in 2007 she felt it was a "fairly good" season and her harvest was typical of recent years.

The Effects of the Reauthorization of the Use of Seine Nets as a Subsistence Fishing Method for Salmon

In December 2006, the BOF modified regulations governing subsistence salmon fishing so to allow the use of beach seines up to 25 fathoms in length in Iliamna Lake, Sixmile Lake, and Lake Clark (5 AAC 01.320 (b)(7)). In January 2007, the Federal Subsistence Board added beach seines as legal gear under federal subsistence regulations for Lake Clark. Prior to these actions, state subsistence regulations allowed only set gillnets in these waters and federal regulations did not allow beach seines.[14]

Summer 2007 was the first season that the use of seine nets was legal for subsistence salmon fishing in portions of the Kvichak District. In the view of Nondalton residents, this change resulted in more people fishing and working together. This action also validated oral traditions and knowledge about the use of seine nets that had been shared in the past (Stickman et al. 2003).

Comments about the use of seine nets offered by Nondalton community members included the following:

- "It is much easier to fish now that seines can be used in the daytime."

[14] The modified state regulations allow the harvest of salmon "by gillnet and beach seine in Iliamna Lake, Six Mile Lake, and Lake Clark (5 AAC 01.320.(b)(7)) and "by spear in Lake Clark, excluding its tributaries" (5 AAC 01.320(b)(6)). Therefore, subsistence fishers may use gillnets as setnets or drift nets, or to seine.

- "It is much easier to seine when the water is low: there's more beach to pull in the fish."
- "Daytime seining allows for more people to participate, including children."
- "Seining is fun."
- "With the seine as an allowable gear it is not necessary to travel as far to get fish."
- "More people borrowed the seine" [Case Study I's seine].
- "It seemed like more people were out and wanting to get fish. Perhaps it was because of the seining. It's a good way to get people working together."
- "The community should make a seine available for people to use" [Nondalton elder].

Many Nondalton residents reported, during fieldwork and in interviews, that the use of seine nets (including gillnets used as seine nets) is an important subsistence salmon fishing method in the Kvichak watershed, for many reasons. According to key respondents, Kvichak watershed communities have used seine nets to harvest salmon for over 50 years (see also Stickman et al. 2003), often using them at night during the regulatory prohibition, although they did say that until the 2007 season, fewer people used them. One of the reasons Nondalton residents gave for their preference was that that since sockeye salmon return to the lake in pulses, a gillnet set overnight may harvest just a few fish, or it may harvest too many fish for the processing capacity of a camp. In addition, residents reported that the salmon they retrieved from a gillnet were often scarred or bruised. In contrast, they said, the use of a seine net allowed fishers to keep only the number of salmon they could process, and allowed them to harvest only undamaged fish, since fishers could select which fish to keep and which to release. For example, they said, female salmon that look ready to spawn, small fish, or large males (viewed as good breeders) were often released.

One Nondalton family (Case I) reported that they had used the same seine net for 23 years. This family owned the only seine net in the community during the project study period. In the past, researchers were told, the village owned another seine net which had been used as a cooperative net. Seine nets require maintenance, however, and respondents said that since no one took responsibility for the community seine it fell into disrepair. The seine net owned by the family was well maintained (Plate 13). This family said that they shared the salmon they harvested with the seine with other families and that they loaned the seine net to anyone who asked, including families using camps at the outlet of Sixmile Lake and on Lake Clark. In 2007, in Nondalton for example, researchers recorded 11 instances where the seine net was used, with some sites used more than once. In 2008, in contrast, there were 18 recorded instances where the seine net was used (Figure 23). This was consistent with harvests reported on permits and during household surveys since there was an estimated harvest of 3,450 sockeye salmon with the seine in 2007 in Nondalton and 4,267 sockeye salmon in 2008 (Table 16 and Table 17). As of 2008, there was still only 1 seine net in Nondalton.

Researchers observed that seining was a collaborative effort that needed the work of many people in order to be successful. In contrast, Nondalton residents said, set gillnetting required only 1 or 2 people. In the 2 seining activities observed by project personnel, from 6 to 10 people from 2 or more nuclear families were involved in the operation of the seine (Plate 14). Two or more people on shore held one end of the seine net while 1–2 people in a boat made sure the seine net was smoothly deployed as the boat driver moved offshore. In 2007, as in the past, researchers observed that Nondalton residents counted sockeye salmon in "bundles," with 40 fish to a bundle. As the seine net was deployed, families called out to the boat driver the number of bundles they wanted to process at their camp.

Plate 13.–Drying the seine.

The number of salmon present determined the number of people needed to hold the seine net and how far from shore the boat was driven (Plate 15). In one case, because of the abundance of salmon, only a few feet of net were deployed before it was returned to shore and given to the shore based fishers to hold.

Those operating the net made sure the lead line stayed on the bottom of the lake and the cork line stayed above water, so that a complete capture of the fish could occur. The teams at both ends then retrieved the net and brought the fish close to shore, where others could retrieve them. The boat was also pulled close to shore, outside the net. As fishers at each end slowly tightened the net after the fish were removed, or as the fish pushed outwards in their attempt to escape, extra net was folded over the side of the boat and (ideally) held in place by the oar locks (Plate 16). In observed cases, the boat driver counted the fish as they were removed from the seine net and loaded into the bins. When the desired amount was reached, any fish still in the seine net were released when the boat pulled away from the shore. If a salmon looked as if it was not going to live, it was placed into the boat.

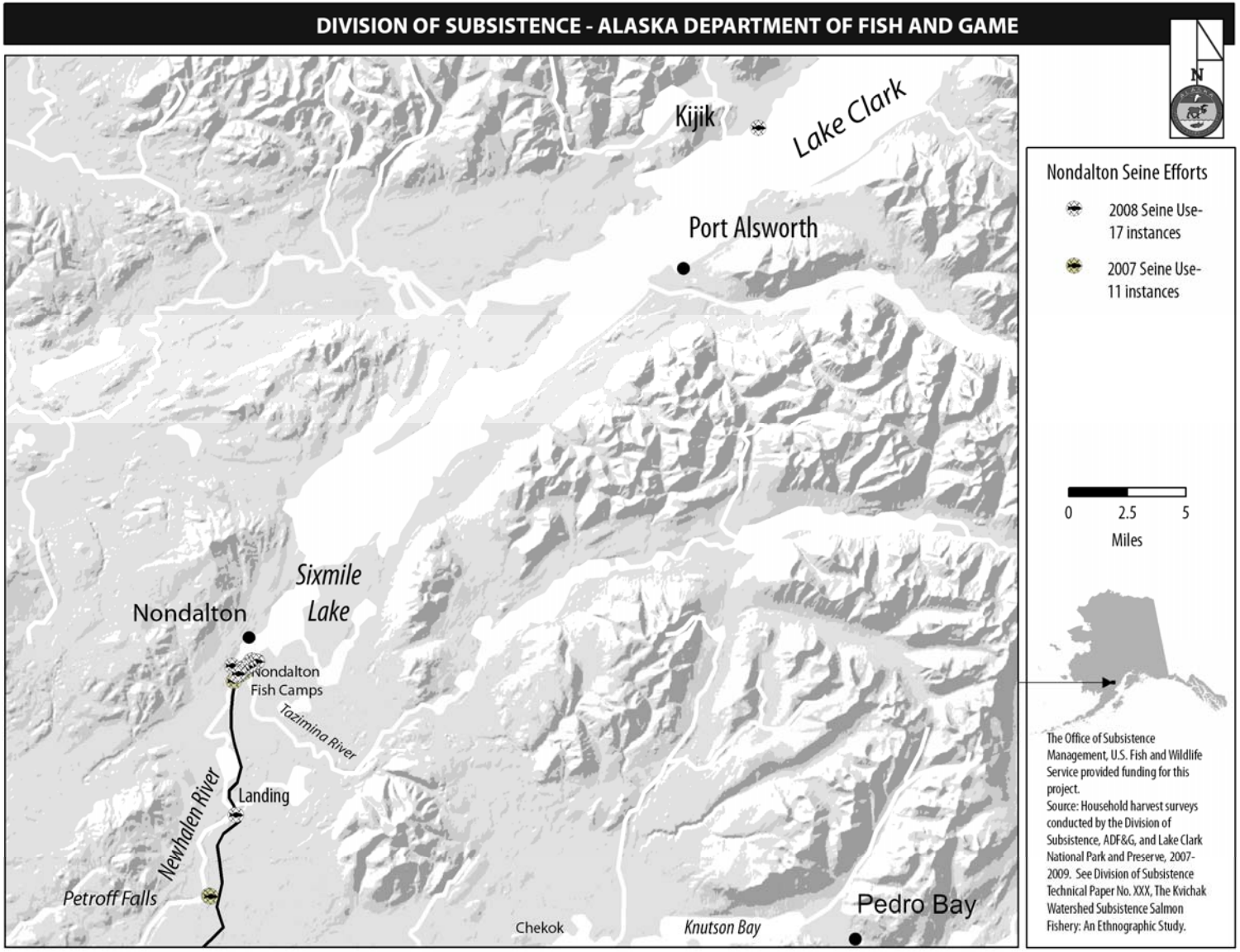

Figure 23.–Location of Nondalton subsistence seine effort, 2007 and 2008.

Table 16.–Estimated salmon harvest by gear type, project communities, 2007.

Resource	Estimated salmon harvest			
	Gillnet	Seine	Rod and reel	Total
Iliamna				
Chum salmon	0	0	0	0
Coho salmon	0	0	0	0
Chinook salmon	51	0	0	51
Pink salmon	0	0	0	0
Sockeye salmon	3,945	0	25	3,970
Spawning salmon	2,116	0	0	2,116
Unknown salmon	0	0	0	0
Total, Iliamna	6,113	0	25	6,138
Newhalen				
Chum salmon	0	0	0	0
Coho salmon	21	0	10	31
Chinook salmon	5	0	0	5
Pink salmon	1	0	0	1
Sockeye salmon	5,375	0	36	5,411
Spawning salmon	1,198	391	25	1,614
Unknown salmon	0	0	0	0
Total, Newhalen	6,599	391	71	7,062
Nondalton				
Chum salmon	0	0	0	0
Coho salmon	0	0	14	14
Chinook salmon	18	0	0	18
Pink salmon	0	0	0	0
Sockeye salmon	5,123	3,450	186	8,759
Spawning salmon	821	0	0	821
Unknown salmon	0	0	0	0
Total, Nondalton	5,962	3,450	200	9,612
Port Alsworth				
Chum salmon	0	0	0	0
Coho salmon	0	0	0	0
Chinook salmon	0	0	6	6
Pink salmon	0	0	0	0
Sockeye salmon	2,331	0	50	2,381
Spawning salmon	119	0	0	119
Unknown salmon	0	0	0	0
Total, Port Alsworth	2,450	0	56	2,506

Table 17.–Estimated salmon harvest by gear type, project communities, 2008.

Resource	Estimated salmon harvest			
	Gillnet	Seine	Rod and reel	Total
Iliamna				
Chum salmon	22	0	0	22
Coho salmon	0	0	0	0
Chinook salmon	140	0	0	140
Pink salmon	0	0	0	0
Sockeye salmon	4,840	0	148	4,989
Spawning salmon	932	792	0	1,724
Unknown salmon	0	0	0	0
Total, Iliamna	5,935	792	148	6,875
Newhalen				
Chum salmon	28	0	0	28
Coho salmon	33	0	47	79
Chinook salmon	4	0	0	4
Pink salmon	12	0	0	12
Sockeye salmon	5,333	218	82	5,633
Spawning salmon	1,066	702	5	1,773
Unknown salmon	0	0	0	0
Total, Newhalen	6,477	919	134	7,530
Nondalton				
Chum salmon	0	0	0	0
Coho salmon	0	0	10	10
Chinook salmon	13	0	0	13
Pink salmon	0	0	0	0
Sockeye salmon	4,971	4,267	169	9,407
Spawning salmon	811	0	0	811
Unknown salmon	0	0	0	0
Total, Nondalton	5,795	4,267	179	10,241
Port Alsworth				
Chum salmon	1	0	10	11
Coho salmon	0	0	14	14
Chinook salmon	0	0	27	27
Pink salmon	0	0	7	7
Sockeye salmon	1,859	0	50	1,909
Spawning salmon	120	0	0	120
Unknown salmon	0	0	0	0
Total, Port Alsworth	1,980	0	108	2,088

Plate 14.–Subsistence seining group, Nondalton.

Plate 15.–Boat deploying a subsistence seine net, Nondalton.

Plate 16.–Picking subsistence fish from beach seine, Sixmile Lake, 2008.

Thus, the use of beach seines resulted in more accurate recordkeeping, that only those fish that could be processed were harvested and no more, and could be seen as an efficient fishing technology that minimized waste. In addition, residents' use of beach seines also demonstrated contemporary TEK, since for effective harvest, residents had to know the locations best suited to the use of a seine net, locations where landing a boat was easy, where the water was shallow enough for people to stand in the water to remove salmon from the net, and where the fish schooled. Some residents reported that they often traveled downstream on the Newhalen River to "Landing," which was a good place to use a seine net, they said. Residents said they also preferred this site because the residents of neighboring Iliamna and Newhalen, who are able to reach this site by road, could share the use of the seine net, which reaffirmed cultural and familial ties with residents of these communities.

Researchers' General Observations about Subsistence Fishing in Nondalton in 2007

In 2007, many Nondalton families spent a considerable amount of time working together at fish camps, as shown in the case examples, above. Based on visits to the camps during the fishing season, as well as the household harvest survey data, it appears that Nondalton residents achieved their salmon harvest goals, at least in terms of fish needed for their own households' consumption and for sharing with others.

An individual's health and employment status influenced his or her participation in subsistence fishing and processing. Several camps were not used in 2007 due to the poor health of their owners. Also, Nondalton was home to a well-respected fire crew and although firefighting provided these residents with a considerable amount of cash income, an active fire season could mean the men were absent from the community for most of the summer, which reduced the labor available for fishing, which in turn, may have resulted in lower harvest estimates.

The availability of additional subsistence resources also appears to have affected salmon harvest goals. Nondalton residents reported that since their moose and caribou harvests have declined they were relying more on salmon. Some residents said they were starting to freeze whole fresh fillets or partially-dried fillets in order to consume them in the winter, as a main meal, in addition to making dried or smoked fish for snacks. In addition, because of the high cost of freight and the increased salmon prices, some residents who fished commercially in Bristol Bay said that they no longer brought some of the harvest home to Nondalton. Instead, they said, they subsistence fished when they returned to the community, with some mentioning that they preferred the taste of salmon harvested in Sixmile Lake to that of salmon harvested in Bristol Bay.

Residents of Nondalton (and the other study communities, as well) faced high fuel costs and periodic fuel shortages. Twice while researchers were in Nondalton, the gasoline station in the city ran out of fuel. Residents said that expensive or scarce fuel resulted in fewer trips to fish camps, and fewer uses of boats necessary to pick fish from nets and transport fish, equipment, and supplies to the camps. In some cases, residents said that they had loaded their ATVs onto their boats, crossed the lake, unloaded the ATVs and then driven down the Iliamna road to get fuel and supplies.

Another factor that shaped subsistence fishing in Nondalton and other study communities was the conviction expressed by many residents that subsistence fishing was essential to, and an elemental part of, their culture, an activity that revived the spirit after a long winter. People anticipated this summer tradition, not only for nutritional fulfillment but also for reconnecting with family and friends, reconnecting with the land and water, and practicing traditional values, such as respect, sharing, humor, gratitude, education, and pride.

Researchers' General Observations About Subsistence Fishing in Nondalton in 2008

Karen Stickman, a coinvestigator who grew up in Nondalton, provided the following general observations about subsistence fishing in Nondalton in 2008, based on her participation in the fishery at her family's fish camp and informal interviews with family members and other subsistence fishery participants.

1. Seining: During informal interviews with subsistence fishers, respondents indicated that fewer individuals seined in 2008 than in 2007, primarily due to cold and rainy weather. Nearly the same amount of seining effort occurred in 2008 as in 2007, they said, but fewer people traveled to the camps to help and watch. Also, they said that they harvested fewer fish during each seining effort because of the wet weather, although this smaller harvest was more manageable and the processing took less time. They said that a smaller harvest of salmon could be processed under the cover of a tarpaulin (Plate 17), and there was less risk of fish spoiling or drying improperly if rain continued. Nevertheless, as in 2007, seining brought people together through harvesting salmon, delivering the fish to different camps, borrowing the net, and involving children. The children were excited and willing to participate by gathering fish from the water. Respondents also said that being able to seine near the camps saved fuel.

Plate 17.–Drying fish under a tarpaulin.

2. The effects of weather and other environmental factors on salmon processing were evident to Stickman and to those she informally interviewed at fish camp in 2008. Observations and comments included:

    - When the weather was rainy and damp, respondents had to ensure there was enough fire and heat in the smokehouse. One respondent said "You have to baby sit your fish more."
    - Both Stickman and the respondents observed that fish took longer to dry, so fishers were extending their stays in fish camp.
    - Respondents said that if the water level was high near the rapids downstream of Landing, it slowed fish passage because fish had difficulties getting through the rapids. Stickman did not see a problem with this in 2008.
    - Brown bears: Both respondents and Stickman observed increased numbers of brown bears in 2008, and as a consequence, fewer people were staying overnight at fish camps. Comments from respondents included: "Bears never used to come around this much before; times are changing and it seems like the bears are changing, too." "Heads of households used to bless the camp, too, by sprinkling holy water and burning incense on the stove; now it seems like that's not done any more. Maybe that's why bears come around, too." "Maybe Fish and Game is trying to protect [bears] so there's more of them."

- Because of the increased presence of bears, fishers appeared to be much more watchful of their surroundings. Individuals at the camps took time to notify others by VHF radio if there was a bear nearby. Some people also brought dogs to their camp as a way to alert them if there was a bear nearby.
- Stickman observed that a family who had a camp on Lake Clark had built a roof over their outdoor fish rack in order to protect it from rain. This family had also built a screen around the rack. Other respondents said that this family was the first to do this, that it appeared to work well, and that it helped to get the fish dry enough to take into the smokehouse.

3. Summer employment patterns did not appear to affect subsistence fishing, according to Stickman's observations. If a family member was working outside the community, fishing still occurred, albeit at a later date, when the family member returned. This pattern was similar to that observed by researchers in other project communities and discussed above.
4. Stickman visited 3 camps and discussed the finding that family members from outside the community visit the camps in order to "put up" fish. In Camp 1, she learned that 3 additional families had visited: 2 from Anchorage and 1 from Seattle. In Camp 2, she was told that 2 additional families had visited: 1 from Anchorage and 1 from Seattle. In Camp 3, 1 family from Anchorage had visited. Respondents at this camp also said that they canned some fish for a relative in Iliamna who was commercial fishing.
5. Other observations made by Stickman in summer 2008:

Plate 18.–An elder (left, with yellow apron) directs the processing of salmon.

- In the majority of camps, a female elder continued to direct subsistence fishing activities by advising fishers when to get fish, how much to harvest, and, in some cases, where to fish (Plate 18). Even if the elder did not come to fish camp, her role, as reported by the subsistence fishers, in providing fish preservation advice continued in its importance
- Stickman asked 1 elder woman (in her 80s) what fish camp meant to her. The elder's response was "It's what we do every summer. It wouldn't be right if we don't do this."
- During summer 2008, Stickman observed less seining activity, gillnets set for longer periods of time, and fewer people outdoors, due, they said, to a very rainy summer.
- Even with the high amount of rain, residents of fish camps informally interviewed reported that they did harvest "enough" salmon. Respondents said that 2008 was a much less "active" season due to the rain, with less seining and fewer people outdoors, but that people did get "enough" fish.
- Seining: Those informally interviewed reported that this method brought people together and that they worked together more, as well as shared more fish.

6. Stickman also provided these personal observations, from the perspective of a lifelong resident of Nondalton, about the cultural meanings and spirituality she associates with subsistence salmon fishing and processing:

> It's hard to put into words the feeling, the connection that ignites the spirit when it comes time for fish camp. It is an ingrained, unconscious sense that is felt when spring turns into summer. Fish camp is a communion with every aspect of putting up fish. It's a relationship that has been created from birth, sensing when summer comes, it's time to go back to fish camp. It's the smell, the slime. It's nature, connecting us back to the water, uniting us with each other. It's knowing you have fish for winter, not only for your family but to share at potlucks and with other families. It's a spiritual igniter that restores us with excitement after a long winter. It's a part of life that is not questioned—do we do fish or do we not?—it's done every summer. It's the contented labor of splitting fish, of stoking the smokehouse fire, and of taking care and pride in doing it the right way. This deep-rooted way of life cannot be measured, cannot be priced, but nor should it be overlooked in a study even though it's beyond the visual and the spoken. It's the observer's intuition and open-mindedness, to be able to look beyond project objectives, that can possibly capture this meaning.
>
> It's different with someone who starts to put up fish after they are grown up. It is a new experience. It is not part of their makeup. Putting up salmon for winter food, dry fish, canning, freezing is something they may do if they have time or if it's something they enjoy, possibly for recreation. Also the connection, the familiarity, lifelong relationship with the camp, nature, fish and food source is not there from birth and over generations.

Port Alsworth: Case Studies of Subsistence Fishing and Processing

Case Study K: Port Alsworth

This first case example for Port Alsworth illustrates some contrasts with subsistence fishing patterns at Nondalton and Newhalen in that there were a smaller number of individuals involved and generally lower harvest goals. Similar to the other communities, however, was the collaborative nature of the activity and the knowledge and skills necessary for successfully harvesting and "putting up" salmon.

This family consists of 2 couples who fished from the older couple's home. Their setnet site was directly below their house, which was near Hardenburg Bay on the southern shore of Lake Clark. The older male head of household said that he had been fishing here since 1992. Their facilities included 1 small smokehouse, 1 small fish rack, 1 cutting table, 1 fish box, and their home. Their fishing equipment included an 18 ft boat with a 60 hp motor, 2 ATVs, and 2 set gillnets. They did not use a seine net, nor had they in the past.

The male head of the household was approximately 50 years old and his female partner was in her early 30s. The head of the household's son and girlfriend, both in their 20s, also participated in the harvest of sockeye salmon. The family said that they set their net by July 24 every year, which was usually when the run reached Port Alsworth. The father and son set the net. The son picked it, usually alone, but the older female occasionally helped. Everyone participated in transferring the salmon from the boat into the fish box, which was made from a wooden frame wrapped with chicken wire. The fish box, which this family called a *k'usq'a* (the Dena'ina language name) was partially submerged in the water in order to keep the salmon cool and away from the blow-flies. The son's girlfriend helped by carrying the fish to the cutting table, which was located above the mean high water mark. The couple and the son split the fish, and if the fish were to be gutted, everyone helped to remove the viscera from the salmon and then cut the fish into fillets. Everyone also participated in the process of canning (in glass jars) the fish. The smokehouse fire was tended by the older couple, except that while the woman was at work from 8 AM to 5 PM, the male head of the household tended the fire.

This family had 2 gillnets, 1 short and 1 long. If the salmon run was slow, the family deployed the longer net, and if the season was good they deployed the shorter gillnet. They set the net in the morning and anchored one end by tying it to the shore. They fished the net overnight and picked it the following morning. They used their boat to reach the net and pick the salmon and they kept the net in the water for the day. If the family wanted to take a break from fish processing, they did not pull the net from the water. Instead, the family used plastic cable ties ("zip ties") to tie the netting and lead line to the cork line. It appeared as if the net were still fishing, but the netting was not out. The fishing lasted about 3–4 days if the salmon were running well, and up to 1 week if it was a slow season.

The fish were immediately processed: this family did not keep the fish in the *k'usq'a* overnight. Their cutting table was constructed so that there was a tall end and a short end. The older female cut on the shorter end, the older male on the taller end, and his son in the middle. The fish scraps were placed in a bucket which was emptied into the lake. Once the fish were split, they were carried to the house so that processing could be finished. The family filleted sockeye salmon by cutting along the ventral side to the gills, behind the gills, then down the back, avoiding the dorsal and adipose fins. The process was repeated on the other side of the fish, resulting in 2 fillets. The head remained on the backbone and the fish were not gutted during this process (Plate 19).

Plate 19.–Port Alsworth family processing their subsistence harvest.

At the beginning of the season they canned the salmon, starting with fillets that had the skin removed. The fillets were prepared for the jars by cutting them into strips according to measured marks on a board,

which made the salmon strips the exact size of the pint jars. Jars were filled by the older woman, with the assistance of the son's girlfriend. They canned only fresh, unsmoked salmon and they added jalapeño peppers for extra flavor in some of their jars. They usually had 2 large pressure cookers going at one time, which were watched by the older woman. This family said that they preserved about 12 cases of sockeye salmon (12 pint jars per case) for themselves and 12 cases for the son and his girlfriend. The father had another son living in Valdez, and he said they send him a couple of cases of canned salmon every year. They had also received smoked salmon from the older woman's grandmother, who lived in Nondalton.

After the canning was finished they focused on the preparation of dried and smoked fish. They said that summer 2007 was the second time they had prepared smoked sockeye salmon. They cut the fish in tail-on fillets, without cutting strips. After soaking the fish in a salt brine, they hung the salmon on the fish rack in their garage/workshop and turned on a high powered fan, which helped the excess brine and fish slime to drip off the salmon. They then transferred the salmon to their smokehouse, where it remained for 1 week.

This family also froze some salmon. They cut the fillets, left the skin on, vacuum packed them, and froze them.

The family harvested about 300 sockeye salmon in summer 2007, which they said was their usual target harvest level. They felt that the 2007 season was a "pretty good" one, and that they harvested all the fish they needed.

Case Study L: Port Alsworth

This case study is typical of those Port Alsworth families who were interviewed for this project and who had relatively low harvest goals. Lacking the extended family networks of Nondalton and Newhalen, and thus the labor force, these families were observed to employ strategies that minimized harvests, and frequent sharing of harvests was observed as well.

The husband in this 2 member household had been fishing in the Port Alsworth area since 1976. Their house was on Lake Clark, outside the main the community, close to Tanalian Creek (Plate 20). It was accessible by boat or by road to the community. The couple moved permanently to Port Alsworth in 1993, after the husband retired. Prior to retirement, the husband had setnet commercially for salmon in Bristol Bay, had occasionally retained a portion of his harvest for home use, but had not participated in the directed subsistence fishery until after his retirement. Because the husband was an aircraft pilot, most of the households' food was flown in from Anchorage.

In 2007 and 2008, this household used a short gillnet in order to harvest about 5–15 sockeye salmon per day. They set the net several feet above the lake bottom to allow some fish to escape by swimming under it. These techniques not only provided them with a harvest they could easily process on a daily basis, they also appeared to reduce the incidental harvest of resident fish species.

This couple provided about two-thirds of their subsistence harvest of sockeye salmon to those summer residents of Port Alsworth who requested fish. Under recently enforced NPS regulations, only year-round residents of Lake Clark National Park and Preserve could participate in subsistence fishing within the waters of the park. In the husband's opinion, this rule ignored the familial and historical ties of past residents of the area. Therefore, the couple cleaned, filleted, and packaged salmon, and then placed them in 2 outdoor chest freezers where other people removed them for their own use.

The couple kept around 40 fish per year for their own use. A few fish were canned but most were smoked in spring. Smoked sockeye salmon were served to guests as well as consumed several times per week by the couple.

Plate 20.–Homes in Port Alsworth, as seen from Lake Clark.

The husband related that he liked to smoke sockeye salmon after they had been frozen for part of the winter. He said that he smokes a few salmon at a time using recipes he learned from friends and that he also experimented with recipes. He had a commercially purchased smoker that had electronic controls.

The husband fished the early smaller run because, he said, after July 25, too many salmon could be caught in a day. He pulled his net after July 25 so as not to exceed 25 fish per day, the maximum the household could process daily, even if harvesting fish for others. Without an extended family network, he did not have the workforce needed to process larger numbers of salmon on a daily basis.

This respondent said he had not observed variations in sockeye salmon run strength into Lake Clark, even in years when biologists reported minimal escapements. Other Port Alsworth key respondents made similar comments. The husband said that most Port Alsworth residents fished early to get the "fresher" salmon in the smaller early run and pulled their nets before the larger portion of the run arrived. Therefore, he said, they did not directly observe the strength of the run after they completed their fishing.

Case Study M: Port Alsworth

This case illustrates the subsistence fishing patterns of a lifelong resident of Port Alsworth who used several strategies to minimize his harvests. It shows the effect of the availability of other foods on harvest levels in the community and the continuation of a fishing tradition despite economic change.

This fisher, who had been raised in Port Alsworth, was in his 40s. He was married and had 3 children, all of whom lived only part of the year at the home. Both he and his wife were employed in Port Alsworth. His first memory of fishing was of helping his grandmother, around 1970, when he was only 5 years old. He could not remember a year when he did not help with the annual salmon fishing and processing.

The family lived on the shores of Lake Clark and shared a smokehouse on the beach with several other families (Plate 21). They had been fishing at the site since 1986. The husband was usually the only household member who harvested or processed salmon. The children helped pick the fish from the net but did not assist with the processing. Since most of the salmon went immediately into the smokehouse after being filleted, there was no need for a large labor force to process the fish, he said. The fisher related that he had taught his children to fish but since they were almost grown it was up to them to participate. He said that he would continue to fish as long as he lived in Port Alsworth. He related that fishing for salmon was "just what you do in the summer," and that it was what he had always done.

Plate 21.–Smokehouse and setnet used by Case Study M family, Port Alsworth.

He said that when he was a child helping his grandmother, his small extended family caught about 400 sockeye salmon each summer. All the fish were dried, placed in the smokehouse, and then canned. Today, he said, his family harvests from 40 to 70 sockeye salmon annually. He said they kept approximately 30 fish, gave some away, and traded some with other families for other subsistence foods. He said that having ready access to groceries meant they purchased most of their food, and that because he was a pilot, he could bring in groceries whenever he wanted. Although the family ate salmon once or twice per week during the fishing season, he said he no longer had a "taste for it' and that when the fishing season was over, they usually consumed only a "couple of" fish per month. He joked that he ate too much fish while growing up.

Currently, he said, the family processed most of their salmon by filleting and then freezing them after they have been wrapped, and they canned a few fish after smoking them in the shared smokehouse. The household fished with the wife's family before they moved from Port Alsworth and continued to send some of their canned fish to the relocated family each year.

The family used passive means to minimize their harvest. They used a small gillnet with holes that had purposefully not been repaired. They harvested 5–7 sockeye salmon per day. Similar to the family in Case Study L, this family set the net several feet off the bottom in order to allow the escapement of fish under the net. And like other Port Alsworth residents related, they fished early and then pulled the net when the larger part of the run arrived.

The family said they always used a set gillnet in that capacity, but that once, when few fish were available in Lake Clark, they used a gillnet to seine sockeye salmon at Alexie Creek on the Newhalen River. The husband reported that, except for the year they seined at Alexie Creek, as long as he could remember there had always been enough salmon. However, he said, salmon were more abundant in the 1970s. As a pilot, he could observe salmon runs from the air, and believed that over the past 15 years the runs were "average" and remained steady.

By talking with others and through his own observations, this fisher believed that residents of Port Alsworth were achieving their harvest goals. Populations of caribou and moose had declined near Port Alsworth, in his opinion, and meat from caribou and moose was no longer provided to community residents by sport hunters and guides. Therefore, he said, Port Alsworth residents were eating more salmon, and harvests could increase if big game remained scarce.

Case Study N. Port Alsworth

The following case describes one of the more active subsistence fishing households in Port Alsworth, one with long term involvement in subsistence fishing in the Kvichak watershed. The case illustrates the role of work relationships in the sharing of equipment and harvests. The case also provides details on how harvest goals are established and factors that influence the achievement of those goals.

The household consisted of a married couple in their early 30s and their teenaged nephew. The couple worked full time for Lake Clark National Park and Preserve. The wife was in charge of the family's subsistence salmon harvesting operation and did much of the work by herself. If the nephew was in Port Alsworth during the harvest, he helped set the gillnet. The wife operated the boat, picked the net, pulled the net, and cleaned and processed the salmon. She said she has been involved in salmon fishing and processing all of her life and had split fish on her own since she was 13 years old. The husband occasionally helped to set or pick the net.

The entire family harvested wood for the smokehouse just before the arrival of the sockeye salmon run at Port Alsworth. They traveled by boat to harvest birch, alder, and poplar ("cottonwood"). The husband operated a chain saw while the nephew and wife hauled the wood to the boat. The wood was transported by boat to the smokehouse area where the nephew chopped and stacked the wood.

On a few occasions in 2007 a female friend (work acquaintance) helped the wife pick the net (Plate 22). The friend participated with the hope of learning how to process and preserve her own salmon. The friend received one-fourth of the harvest, which was recorded on the friend's permit. In this way, a long term subsistence fisher helped to teach another resident how to fish in the absence of an extended family network. Based upon interviews and observations of fishing and processing, it appears that work relations often substitute for family networks in Port Alsworth.

In 2008, the wife's older sister and her 2 young children visited from Anchorage to learn how to process salmon. They stayed for 2 weeks and helped with canning, making salmon lox, and smoking salmon in the smokehouse. During the wife's work hours, her sister, and the owner of the property on which the smokehouse was located, tended the smokehouse fire.

Plate 22.–Picking subsistence salmon from a set gillnet, Port Alsworth.

The wife's family also subsistence fished for salmon on Iliamna Lake in Intricate Bay, near the community of Pope Vannoy. She fished there, and helped her father with his salmon harvest there, around the first week in July. In 2008, her brother helped with the majority of their salmon fishing in Intricate Bay. In 2008, all of her salmon strips (from 40 fish harvested in Intricate Bay) were processed in Pope Vannoy.

The salmon harvested from Lake Clark were processed in Port Alsworth. The gillnet was set in Lake Clark in front of the house of a friend (another work acquaintance). This friend owned lake front property on the northern shore of Lake Clark, facing Port Alsworth. The smokehouse, built in 2006 by the case study husband, was above the high water mark on the beach. The case study household's agreement with the landowner was that the owner of the property could use the smokehouse, too.

The salmon processing site had a 4 ft by 2 ft cutting table, a small (8 ft by 4 ft) smokehouse, and a 10 ft drying rack. The friend owned an 18 ft skiff with a 50 hp motor that they used to set and pick the net (Plate 23).

Plate 23.–Fishing boats in Port Alsworth.

The 10 fathom gillnet was set and anchored off shore. The wife had "hung" (made) the net herself and had purposefully made it short in order to harvest a manageable number of salmon. The net was usually set overnight during the peak of the run. The capacity of the net was around 50 sockeye salmon. The net was picked from the boat, unless the net was going to be pulled afterward, in which case the anchor was left attached to a buoy and the net disconnected from the anchor. The net was then pulled to shore where it was picked. The boat was not stored on the beach where processing took place because of large rocks and waves.

The family shared their net with 3 or 4 other families in Port Alsworth and the smokehouse was shared with at least 4 families. All families were work acquaintances of the case study family. Usually, if other families wanted salmon, they set and picked the net themselves, and recorded the salmon on their own permits. The case study family recorded the salmon on their permit if they picked the salmon for a family that did not have a permit.

The family sent canned salmon to the wife's 2 sisters and mother in Anchorage and the husband's mother in Georgia. In total, they shared about 4 cases of canned sockeye salmon. They said that they sent smoked salmon strips as gifts to friends and relatives throughout Alaska as well as out of state. They said that about one-third of their smoked salmon had been shared outside the household.

The family of 3 said that they calculated a salmon harvest goal before the season and that their harvest varied from about 100–250 sockeye salmon per year. The factors this family gave that affected the calculation of the harvest goal included the amount of salmon used in the previous winter ("how much is left over"), whether wild meat was abundant (they said it had not been abundant in recent years), and the

amount of leave from work allowed so they could participate in fishing. They said that there were many other factors affecting their attainment of the harvest goal, such as weather, salmon run timing, and family members learning to help and helping with salmon harvesting and processing. In 2008, the family wanted to harvest more sockeye salmon than it did, but the peak of the run was late in Intricate Bay and 1 week later than usual in Port Alsworth. In addition, they said, the weather was not conducive to drying the salmon and the wife had full time work. She was also training her sister to process fish, which slowed the speed of the processing. The family's goal for 2009 was 200 sockeye salmon.

In 2007, the first study year, this family said that they harvested an amount of sockeye salmon that was closer to the high end of their harvest goal range. Ninety of these salmon were smoked in the smokehouse in Port Alsworth, and the remainder were either canned, frozen, or salted.

In 2008, the second study year, the family said that 45 sockeye salmon were dried and smoked. These fish were harvested at Intricate Bay on Iliamna Lake and transported to Port Alsworth. One-half of the 45 smoked salmon were salted and the other one-half salted with brown sugar, added for additional flavor. About 12 sockeye salmon were salted for pickling in the winter months, 8 salmon were made into lox and frozen, 8 salmon were filleted and frozen, and the remaining fish (about 30) were canned. Of the 30 salmon that were canned, about one-half were partially smoked and then canned. The family said that they had the smokehouse in Port Alsworth going continuously for about a week for this entire process. The weather at the end of July and beginning of August was cool and wet (Plate 24); as a result, the wife decided not to thoroughly dry the salmon and instead canned half-smoked salmon.

Plate 24.–Cutting subsistence-caught fish in inclement weather.

Case Study O: 2008 Harvest of Fall Sockeye Salmon in Port Alsworth

As in the other communities, some families in Port Alsworth harvested spawning or spawned-out sockeye salmon.

Sockeye salmon were harvested as late as October 2008 in Port Alsworth. One family was interviewed about its fall sockeye salmon harvest. The family consisted of an older couple and 2 young grandchildren. They harvested sockeye salmon near the Tanalian River using a 10 fathom gillnet in early October. They set the net using their 18 ft boat with a 50 hp motor. They made a single set, which lasted 30–45 minutes. They did not want to get too many salmon, they said, because fall redfish have long teeth that tangle easily in the net. To pull the net they used their ATV (a 4-wheeler, in this case), not the boat. They harvested about 20 sockeye salmon. They said the meat of the salmon was nice and firm, and about one-half of them had spawned.

The wife immediately gutted and split the salmon. She left the tail on so that the fish could later be hung to dry. She then froze them in an indoor freezer. Once the outdoor temperatures were below freezing, in December, she removed the salmon from the indoor freezer, thawed them in water, washed them once more, and then hung them outdoors on a pole behind her house to freeze-dry. She said the birds then started to peck at the fish so her husband placed mosquito netting over one-half of the fish and a tarpaulin over the other half. The family said that this type of freeze-dried salmon was called *nudelvay* in the local Dena'ina language. *Nudelvay* is one of this family's favorite treats, which they eat dipped in oil, traditionally bear or seal oil.

The couple said that they shared fall salmon with family and friends in Anchorage and Dillingham. They also talked about past problems with bears. Last year, they said, they harvested fall salmon and hung it to dry. In December, however, a brown bear got into it, and the family expressed surprise at how late the bear was out. In October 2008, they said, the head of the household killed a brown bear in their yard. The bear was getting into things and returning every night.

Researchers' General Observations about Subsistence Salmon Fishing in Port Alsworth in 2007

The 2007 sockeye salmon run reached Port Alsworth around July 22. Residents deployed 5 nets along the shoreline from south of the Tanalian River north to the Hardenburg Bay channel. Project personnel interviewed over 20 families in summer 2007, and all said they participated in the subsistence salmon fishery. The majority of families harvested 50–100 sockeye salmon each while a few families reported harvesting over 400 each. Generally, Port Alsworth residents filleted, then froze or canned (in glass jars) the salmon. In 2007, several unrelated families shared a net, and in one case, 1 household shared a net with 4 other families. The majority of nets were used only on the weekends. Seine nets were not used in Port Alsworth in 2007.

Eight families in Port Alsworth owned their own smokehouses, and they often shared their smokehouses with other families. One smokehouse, for example, was shared among 11 families. The method of preparing fish for the smokehouse varied. Some processors cut salmon into strips, while others cut fillets then dried them by placing the fillets on oven racks placed outdoors (Plate 25). Another family often froze salmon immediately after harvest. In October, when this family was not busy with other summer activities, they thawed and smoked the fish.

Plate 25.–Fish drying in Port Alsworth.

Factors that influenced subsistence salmon harvest quantities and fishing effort at Port Alsworth in 2007 included the following:

1. The amount of salmon that was left over from the previous year's harvest;
2. Whether the person had enough vacation leave to subsistence fish and process the harvest;
3. The number of family and friends available to help with fishing and processing; and
4. The abundance of game, especially in recent years. Many residents reported that the availability of caribou and moose had declined.

One Port Alsworth family reported harvesting and processing an average of 50 additional salmon per year and that they have started to hunt black bears *Ursus americanus* due to the scarcity of moose and caribou.

Researchers' General Observations about Subsistence Salmon Fishing in Port Alsworth in 2008

When Holen and Stariwat visited Port Alsworth in July 2008, they observed 5 nets in use. According to harvest permit records, these nets generally harvested fewer than 15 fish per day and in some cases, the harvest was only 5–8 fish per day. The goal, according to Port Alsworth residents interviewed for this project, was to harvest enough fish so that a family could have a meal of salmon once or twice per week until the next years' salmon season. Of respondents interviewed, the highest reported annual harvest was

300 sockeye salmon and the lowest was around 30. Nevertheless, during the 4 key respondent interviews conducted in Port Alsworth in 2008, several general themes emerged. In all cases, respondents said they harvested substantially more salmon in the past. Much of the recent decrease was a result of the availability of store-bought foods that arrived by aircraft. There were 2 runways in Port Alsworth, and some families had members who were aircraft pilots who frequently traveled to Anchorage. They often returned with groceries for their own families as well as for others who did not own aircraft.

Although many Port Alsworth households participated in the fishery, most households tried to harvest only a small number of fish per day (as low as 5). To do this, residents used shorter nets, some as short as 5 ft, or they did not repair holes in nets. There were also many who fished only on the weekends, and only for 1 or 2 weekends per year in order to harvest enough salmon to provide a meal once or twice per week until the next years' salmon season. Most weekend fishers said that the adults, who usually processed the fish, did not want to be overburdened with fish processing at the end of their work day. Respondents said that the sharing of salmon was common as well. One resident, who worked for the National Park Service, noted that fishers shared nets and fish with coworkers and with church members. These groups appeared to parallel the extended kinship networks that are common in predominately Alaska Native communities (e.g., Fall et al. 1984; Schichnes and Chythlook 1988).

In 2008, Ravenmoon (NPS) worked with other Port Alsworth families to harvest both fresh and spawning or spawned-out sockeye salmon, and she provided the following observations of the 2008 subsistence salmon fishing season.

Ravenmoon noted that the summer 2008 temperatures in Port Alsworth were cooler than in past years. Also in 2008, she noted that sockeye salmon appeared to trickle in slowly. Port Alsworth residents did not report harvesting sockeye salmon in their nets until after July 25 and the run did not peak until just prior to July 30. Many of the people who were drying salmon commented to Ravenmoon that the wet weather complicated the drying and smoking process. It became a more tedious job, they said, to keep the heat and to gauge how much to apply to the drying salmon when the weather was wet. However, many families in Port Alsworth generally reported that they canned and froze the salmon without smoking them, so these families were not as affected by the weather.

In 2008, Ravenmoon observed an average of 5 nets set in Port Alsworth along the northeastern shores outside of Hardenberg Bay. Many net owners shared their nets with several families. The nets were predominately set on the weekends because many residents had wage employment during the week. Seining was not practiced in Port Alsworth in 2008.

Residents also reported that brown bears were a nuisance in the fall and that several bears had been killed in residents' yards. The bears had been observed scavenging the shorelines for dead salmon in late September, October, and November.

Weather Patterns in 2007 and 2008

Researchers had the opportunity to observe weather in the project communities as well as its effects on project area subsistence salmon fishing and processing. The weather during the 2 field seasons was dramatically different . The 2007 field season was often warm and sunny and water levels were low. The 2008 season, by contrast, was extremely rainy, and water levels were higher than in 2007.

Table 18 reports temperature and precipitation data for Iliamna and Port Alsworth for those dates that the 2007 and 2008 field seasons had in common (July 15–22). Table 19 shows the range of temperatures and precipitation for the entire 2007 (July 9–22) and 2008 (July 15–22) field seasons.

Table 18.–Temperature and precipitation data, Iliamna and Port Alsworth, July 15–22, 2007 and July 15–22, 2008.

	Maximum temperature	Average temperature	Low temperature	Precipitation, inches
July 15–22, 2007				
Iliamna	69°F	56°F	50°F	0.31
Port Alsworth	71°F	57°F	46°F	ND
July 15–22, 2008				
Iliamna	64°F	50°F	42°F	1.68
Port Alsworth	68°F	53°F	42°F	ND
Differences, 2008–2007				
Iliamna	−5°F	−6°F	−8°F	+1.37
Port Alsworth	−3°F	−4°F	−4°F	ND

Source Weather Underground, Inc. 2009 (http://www.wunderground.com). Accessed February 3, 2009.

Table 19.–Temperature and precipitation data, Iliamna and Port Alsworth, July 9–22, 2007 and July 15–22, 2008.

	Maximum temperature	Average temperature	Low temperature	Precipitation, inches
July 9–22, 2007				
Iliamna	69°F	55°F	44°F	0.74
Port Alsworth	71°F	57°F	46°F	ND
July 15–22, 2008				
Iliamna	64°F	50°F	42°F	1.68
Port Alsworth	68°F	53°F	42°F	ND
Differences, 2008–2007				
Iliamna	−5°F	−5°F	−2°F	+0.94
Port Alsworth	−3°F	−4°F	−4°F	ND

Source Weather Underground, Inc. 2009 (http://www.wunderground.com). Accessed February 3, 2009.

Unfortunately, there were no data for Nondalton, but for Iliamna and Port Alsworth the available data show clear declines in temperature, and, in the case of Iliamna, a definite increase in precipitation.

The temperature in Iliamna was about 6°F cooler in 2008 than in 2007, and there was an additional 1.37″ of rain. In 2008, the high temperature was 5°F cooler and the low temperature was 8°F cooler than in 2007. In Port Alsworth, the temperature was about 4°F cooler and there was no difference in rainfall. The high was 3°F cooler in 2008 and the low was 4°F cooler.

Summary of Community Review Meetings 2009

Newhalen Community Review Meeting

The community review meeting at Newhalen took place at the Newhalen Teen Center on April 27, 2009. It started at 6 PM and ended about 7:30 PM. Seven Newhalen community members and 1 person from Naknek attended, along with Stariwat and Krieg (Table 10). Krieg and Stariwat used a PowerPoint presentation to review study objectives, methods, and preliminary results. A productive and informative discussion took place. The participants endorsed the preliminary study findings about sharing patterns,

youth involvement in fishing, the social organizations of fishing groups, and the financial costs of subsistence fishing, and provided additional background information.

One participant at the Newhalen meeting was concerned that the study was ending during an economic downturn. He said that community residents planned to harvest more salmon in response to the poor cash economy. Another individual reported the subsistence harvests as recorded on returned permits often failed to include harvests of late run sockeye salmon and therefore estimated harvests were too low. Krieg instructed meeting attendees to return their permits only after all harvests were complete.

Another participant discussed subsistence beach seining as an alternative to setnetting for those who commercial fish in Bristol Bay and return to Newhalen after the main sockeye salmon run has passed. He and other attendees agreed that residents who stay through the summer can set a gillnet and harvest as many fish as needed. However, people returning to Newhalen from commercial fishing often arrive when there is not enough time to set a gillnet and achieve harvest goals. As a result, the returning commercial fishers have to search for salmon at different sites and often turned to the seine net to attempt to meet their harvest goals before the season ends.

When presented with results that showed salmon harvests by species, audience members shared stories of catching species less common than sockeye salmon. One person was surprised when he harvested a coho salmon *O. kisutch* on the Newhalen River at Landing in 2008. Another person said he saw coho salmon jumping in large numbers near each bank of the Kvichak River near Levelock when the tide was out. It was his first time seeing coho salmon, so he used a dip net to harvest about a dozen. One person said he knew where the coho salmon spawned, but did not share the location. Another person said she caught a pink salmon *O. gorbuscha* in Lake Iliamna, but did not know what it was at the time, other than some species of salmon. Several people said that they had caught Chinook salmon near the headwaters of the Newhalen River, but only occasionally.

Iliamna Community Review Meeting

Due to competing events, a meeting could not be scheduled in Iliamna. Krieg briefly reviewed the project background and key preliminary findings with a tribal council staff member on April 28, 2009.

Nondalton Community Review Meeting

The community review meeting in Nondalton was held in the late afternoon of March 10. Flyers had been posted for over a week and ADF&G announced the meeting over VHF radio. Two residents also made numerous calls to community households to drum up interest in the meeting. At least 2 of the main families that were involved in the research attended the meeting.

Attendees showed interest in the information and made comments throughout the presentation. One of the questions posed by presenters was whether the subsistence fishery was as strong as it once was and whether children were still involved. Those in attendance at the meeting reported that they participated in the fishery over the course of the project and that 1 family, with their children, lived at a fish camp during summer. The consensus among attendees was that most Nondalton residents participate in the fishery in some way, although not to the extent they once did in the past.

A discussion took place about the regulatory requirement that subsistence fishers obtain permits and return them with a record of harvests.[15] Of the 15 permits issued in 2008 to Nondalton residents, only 7 were returned. Meeting attendees were asked why more permits were not returned. The general response was that obtaining and returning permits was not important. People in Nondalton have always fished and

[15] State and federal subsistence salmon fishing regulations require fishers to obtain a household subsistence permit before subsistence fishing with gillnets or beach seines. Federal regulations allow qualified rural residents to subsistence fish for salmon in Lake Clark and its tributaries by snagging with a handline or a rod and reel, using a spear or bow and arrow, or by capturing with bare hands, without a permit.

always will, they said. Attendees asked why a permit was required to do something that had always been done by community residents.

The use of the beach seine was also an important topic in the discussion. Although interviews conducted for this project showed that in 2007 beach seines were primarily used in Sixmile Lake, attendees reported that in 2008 many people had also seined at Landing. Attendees said that harvesting the fish at Landing earlier in the run, when the weather was still cool, helped during processing because there were not as many insects. Although the fish camps are located on the lake, several meeting attendees said that Landing had always been an important harvest location, including a location for seining.

Prior to the reauthorization of the seine as a harvest method in 2007, attendees said some residents used a beach seine at night or in the evening. One attendee at the meeting said his family continued to seine at night, when fish were closer together and the seine did not have to be pulled as far from shore.

During the meeting, researchers brought up the subject of the involvement of young children and teens at fish camp. One attendee at the meeting said that some teenagers were not involved in subsistence fishing because they were attending formal camps, such as math camp, Bible camp, or culture camp, during the fishing season (see Shaw's essay, in the Discussion section). Some older youth worked during the summer as well. Therefore, this attendee said, these children did not go to fish camp with their families because they were too busy. The attendee added that younger children participated by watching and asking questions, as well as by helping. In addition, she said, some of the older youth returned to the fish camps after the formal camps or jobs end.

In general, the meeting was well received in Nondalton. Attendees asserted that subsistence fishing was still an important part of life for them. One attendee's comment, that Nondalton residents have always fished for salmon and always will, seemed to sum up the importance of subsistence salmon fishing in their lives.

Port Alsworth Community Review Meeting

The Port Alsworth meeting took place on March 9, 2008. A good discussion followed the presentation. There was general agreement with the project findings. Attendees asked questions about how subsistence permit data were summarized and reported. Other questions arose about the differences between state and federal subsistence fishing regulations. For example, Port Alsworth residents expressed confusion about NPS residency requirements for harvesting subsistence salmon.

ADF&G presented qualitative and quantitative data that suggested Port Alsworth households generally harvested fewer subsistence salmon than Nondalton households. In key respondent interviews, Port Alsworth residents stated that smaller harvests were targeted in part because the harvests of large land mammals and freshwater fishes were also important. In addition, due to the number of aircraft and aircraft pilots in Port Alsworth, store-bought foods were a much larger part of the diet. Port Alsworth residents used several methods to ensure a smaller salmon harvest, such as short nets and nets with purposefully unrepaired holes. There was general agreement regarding these findings expressed at the community meeting.

ESTIMATED SUBSISTENCE SALMON HARVESTS OF THE STUDY COMMUNITIES IN 2007 AND 2008.

Results of the Survey for 2007

Table 20 reports demographic characteristics of the study communities based upon the survey conducted in early 2008. Estimated community populations were 104 in 30 households in Iliamna; 144 in 38 households in Newhalen; 130 in 36 households in Nondalton; and 119 in 35 households in Port Alsworth. The majority of the population in 3 communities was Alaska Native: 61% in Iliamna, 91% in Newhalen, and 85% in Nondalton. In Port Alsworth, 29% of the population was Alaska Native.

Table 20.–Demographic characteristics of households, from division surveys, project communities, 2007.

Characteristics	Iliamna [a]	Newhalen	Nondalton	Port Alsworth
Number of households				
Total	30	38	36	35
Sampled [a]	24	37	26	28
Percentage sampled	80%	97%	72%	80%
Household size				
Mean	4	4	4	3
Minimum	1	1	1	1
Maximum	7	8	10	10
Sample population	83	140	94	95
Estimated community population	104	144	130	119
Age				
Mean	35	30	32	28
Minimum [b]	0	1	1	1
Maximum	86	89	86	77
Median	34	25	28	25
Sex				
Males				
Number	46	80	64	61
Percentage	45%	56%	49%	52%
Females				
Number	58	64	66	58
Percentage	55%	44%	51%	48%
Alaska Native				
Households (either head)				
Number	18	36	35	10
Percentage	58%	95%	96%	29%
Estimated population				
Number	64	132	110	43
Percentage	62%	91%	85%	36%

a. Iliamna includes 1 household living in Chekok.

b. Minimum household age of 0 indicates newborn in 2008.

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

Based on the household survey and as shown in Table 21, almost all of the households in all 4 study communities used salmon in 2007: 88% in Iliamna, 98% in Newhalen, 99% in Nondalton, and 96% in Port Alsworth. Most households also fished for salmon: 83% in Iliamna, 87% in Newhalen, 99% in Nondalton, and 79% in Port Alsworth. In Iliamna, Newhalen, and Nondalton, at least 71% of households received or gave away salmon. In Port Alsworth, 61% received salmon and 32% gave away salmon.

Table 21.–Estimated harvest and uses of salmon, project communities, 2007.

	Percentage of households						Amount harvested	
Resource name	Use	Att	Harv	Recv	Give	Dog food	Total	Mean HH
Iliamna								
Sockeye salmon	88%	83%	71%	58%	67%	8%	3,970	165
Spawning salmon	50%	42%	33%	33%	38%	4%	2,116	88
Coho salmon	0%	0%	0%	0%	0%	0%	0	0
Chum salmon	0%	0%	0%	0%	0%	0%	0	0
Chinook salmon	50%	8%	4%	38%	17%	0%	51	2
Pink salmon	0%	0%	0%	0%	0%	0%	0	0
Unknown salmon	0%	0%	0%	0%	0%	0%	0	0
Total, Iliamna	88%	83%	71%	71%	71%	8%	6,138	255
Newhalen								
Sockeye salmon	98%	84%	62%	62%	57%	0%	5,411	146
Spawning salmon	57%	38%	24%	38%	35%	0%	1,614	44
Coho salmon	8%	8%	5%	5%	5%	0%	31	1
Chum salmon	0%	0%	0%	0%	0%	0%	0	0
Chinook salmon	30%	11%	3%	24%	16%	0%	5	0
Pink salmon	3%	3%	0%	0%	0%	0%	1	0
Unknown salmon	0%	0%	0%	0%	0%	0%	0	0
Total, Newhalen	98%	87%	62%	81%	73%	0%	7,062	191
Nondalton								
Sockeye salmon	100%	100%	96%	92%	96%	8%	8,759	337
Spawning salmon	54%	38%	34%	50%	42%	0%	821	32
Coho salmon	8%	8%	8%	4%	8%	0%	14	1
Chum salmon	0%	0%	0%	0%	0%	0%	0	0
Chinook salmon	27%	19%	4%	23%	19%	0%	18	1
Pink salmon	0%	0%	0%	0%	0%	0%	0	0
Unknown salmon	0%	0%	0%	0%	0%	0%	0	0
Total, Nondalton	100%	100%	96%	92%	96%	8%	9,612	371
Port Alsworth								
Sockeye salmon	96%	79%	79%	43%	32%	0%	2,381	85
Spawning salmon	11%	7%	7%	7%	4%	0%	119	4
Coho salmon	11%	0%	0%	11%	0%	0%	0	0
Chum salmon	0%	0%	0%	0%	0%	0%	0	0
Chinook salmon	25%	4%	4%	21%	0%	0%	6	0
Pink salmon	0%	0%	0%	0%	0%	0%	0	0
Unknown salmon	0%	0%	0%	0%	0%	0%	0	0
Total, Port Alsworth	96%	79%	79%	61%	32%	0%	2,506	89

In 2007, sockeye salmon made up more than 99% of the salmon harvest in each community (Table 22). Most households used gillnets, mostly as setnets but occasionally as drift nets, to harvest salmon: 71% in Iliamna, 62% in Newhalen, 88% in Nondalton, and 75% in Port Alsworth (Table 23). In Nondalton, 42% of households harvested salmon with a seine and 38% with rod and reel. No households used seines in Iliamna or Port Alsworth, and 5% of Newhalen households used seines to harvest spawning sockeye

salmon. Use of rod and reel for salmon harvest was also uncommon in the 3 study communities other than Nondalton: 4% of households in Iliamna, 11% in Newhalen, and 4% in Port Alsworth.

Also according to the household survey, in 3 study communities, gillnets (usually set gillnets but occasionally drift gillnets) accounted for almost all the salmon harvest in 2007: 99.6% in Iliamna, 93.5% in Newhalen, and 97.8% in Port Alsworth (Figure 24). In Nondalton, gillnets accounted for 62% of the harvest and the seine provided 36%.

On average, based on the household survey, households in Iliamna harvested about 255 salmon in 2007, 59 salmon per capita (Table 21 and Table 24). The average household harvest in Newhalen was 191 salmon, 49 salmon per capita. In Nondalton, households averaged a harvest of 371 salmon, 74 salmon per person. In Port Alsworth, the average household harvest was 89 salmon, 21 salmon per capita.

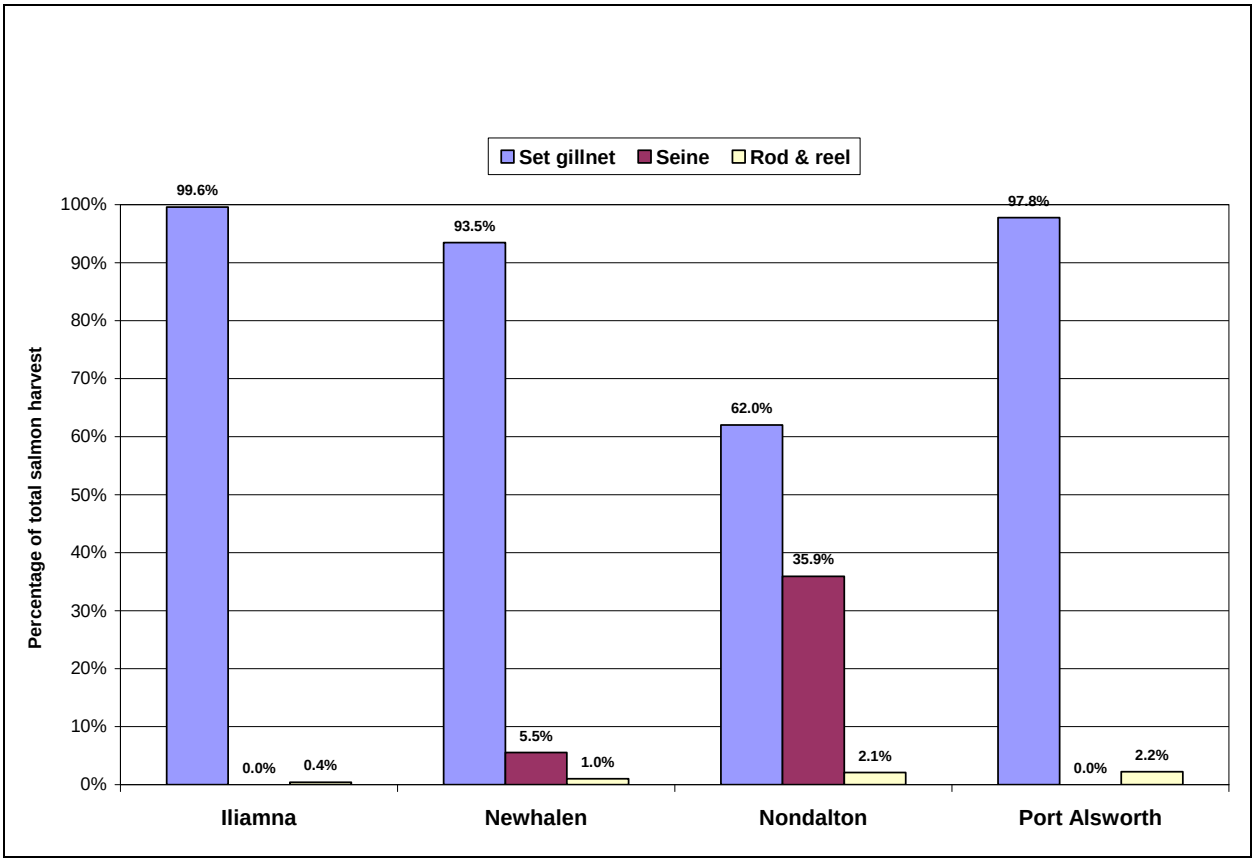

Figure 24.–Percentage of salmon harvest by gear type, study communities, 2007.

Table 22–Harvest of salmon by species, study communities, 2007 and 2008.

	2007				2008			
	Iliamna	Newhalen	Nondalton	Port Alsworth	Iliamna	Newhalen	Nondalton	Port Alsworth
Sockeye salmon	99%	100%	100%	100%	98%	98%	100%	97%
Coho salmon	0%	<1%	<1%	0%	0%	1%	<1%	<1%
Chum salmon	0%	0%	0%	0%	<1%	<1%	0%	<1%
Chinook salmon	<1%	<1%	<1%	<1%	2%	<1%	<1%	1%
Pink salmon	0%	<1%	0%	0%	0%	<1%	0%	<1%

Table 23.–Estimated percentage of households harvesting salmon by gear type, 2007.

	Percentage of households			
Resource	Gillnet	Seine	Rod and reel	Any method
Iliamna				
Chum salmon	0%	0%	0%	0%
Coho salmon	0%	0%	0%	0%
Chinook salmon	8%	0%	0%	8%
Pink salmon	0%	0%	0%	0%
Sockeye salmon	71%	0%	4%	71%
Spawning salmon	33%	0%	0%	33%
Unknown salmon	0%	0%	0%	0%
Total, Iliamna	71%	0%	4%	71%
Newhalen				
Chum salmon	0%	0%	0%	0%
Coho salmon	3%	0%	3%	5%
Chinook salmon	8%	0%	0%	8%
Pink salmon	3%	0%	0%	3%
Sockeye salmon	62%	0%	8%	62%
Spawning salmon	19%	5%	3%	24%
Unknown salmon	0%	0%	0%	0%
Total, Newhalen	62%	5%	11%	62%
Nondalton				
Chum salmon	0%	0%	0%	0%
Coho salmon	0%	0%	8%	8%
Chinook salmon	8%	0%	0%	8%
Pink salmon	0%	0%	0%	0%
Sockeye salmon	69%	42%	35%	96%
Spawning salmon	35%	0%	0%	35%
Unknown salmon	0%	0%	0%	0%
Total, Nondalton	88%	42%	38%	96%

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Table 23. Page 2 of 2.

Resource	Percentage of households			
	Gillnet	Seine	Rod and reel	Any method
Port Alsworth				
Chum salmon	0%	0%	0%	0%
Coho salmon	0%	0%	0%	0%
Chinook salmon	0%	0%	4%	4%
Pink salmon	0%	0%	0%	0%
Sockeye salmon	75%	0%	4%	79%
Spawning salmon	7%	0%	0%	7%
Unknown salmon	0%	0%	0%	0%
Total, Port Alsworth	75%	0%	4%	79%

Table 24.–Salmon harvest per capita, study communities, 2007 and 2008.

	2007			2008		
	Population	Total salmon harvest	Per capita salmon harvest	Population	Total salmon harvest	Per capita salmon harvest
Iliamna	104	6,138	59	108	6,875	64
Newhalen	144	7,062	49	132	7,530	57
Iliamna and Newhalen combined	248	13,199	53	240	14,405	60
Nondalton	130	9,612	74	151	10,241	68
Port Alsworth	119	2,506	21	110	2,088	19
All study communities	496	25,317	51	501	26,734	53

Comparison of Survey and Permit Data for 2007

Iliamna 2007

In 2007, 25 of 30 Iliamna households obtained subsistence salmon permits. Nineteen permits (76%) were returned by mail to ADF&G with harvest data prior to the household harvest surveys in early 2008 (Table 25). The harvest as reported on permits returned by these 19 households was 1,643 sockeye salmon. Based on these returned permits, the 2007 estimated subsistence salmon harvest expanded for all Iliamna residents who held subsistence permits would be 2,162 sockeye salmon.

Harvest data from the remaining 6 Iliamna households that were issued permits were obtained during the household surveys. Through the surveys, researchers identified 2 additional households that harvested sockeye salmon in 2007 for subsistence uses, but that did not obtain permits; 2 other surveyed households had no harvest. Sockeye salmon harvests reported by all 29 contacted households totaled 5,082 fish; if expanded to account for the 1 household for which no data are available, the estimated subsistence sockeye salmon harvest for the community would be 5,257 salmon, compared to 2,162 fish if only data from returned permits were used to develop the estimate (Table 25, Figure 25).

Table 25.–Subsistence sockeye salmon harvest estimates based on returned permits and surveys, 2007.

	Iliamna [a]	Newhalen	Nondalton	Port Alsworth	All study communities
Before surveys					
Number of permits issued	25	20	9	16	70
Number of permits returned	19	14	3	13	49
Return rate	76%	70%	33%	81%	70%
Reported harvest	1,643	3,155	693	1,038	6,529
Estimated harvest, all permit holders	2,162	4,507	2,079	1,278	10,026
After surveys					
Number of permits issued	25	20	9	16	70
Number of permits returned [b]	25	20	9	15	69
Households that fished without a permit [c]	2	3	16	10	31
Households that did not fish [c]	2	14	1	6	23
Total, "permits" [d]	29	37	26	32	124
Total contacts [e]	29	37	26	31	123
Total harvest reported on permits	1,643	3,155	693	1,038	6,529
Additional added to returned permits [c]	124	446	34	190	794
Fish recorded on permits returned during the survey	1,415	2,940	2,305	344	7,004
Harvest by households that did not have permits [c]	1,900	305	4,004	810	7,019
Reported harvest from both permits and surveys	5,082	6,846	7,036	2,382	21,346
Total number of households	30	38	36	35	139
Number of households with data from either permits or surveys	29	37	26	31	123
Survey sample achievement	97%	97%	72%	89%	89%
Total estimated harvest, from both permits and surveys	5,257	7,031	9,742	2,689	24,720

a. Includes Chekok.

b. Includes data, collected during surveys, from nonreturned permits.

c. According to the survey.

d. Households with permits prior to the survey plus data from other surveyed households.

e. Households that returned a permit or responded to a survey.

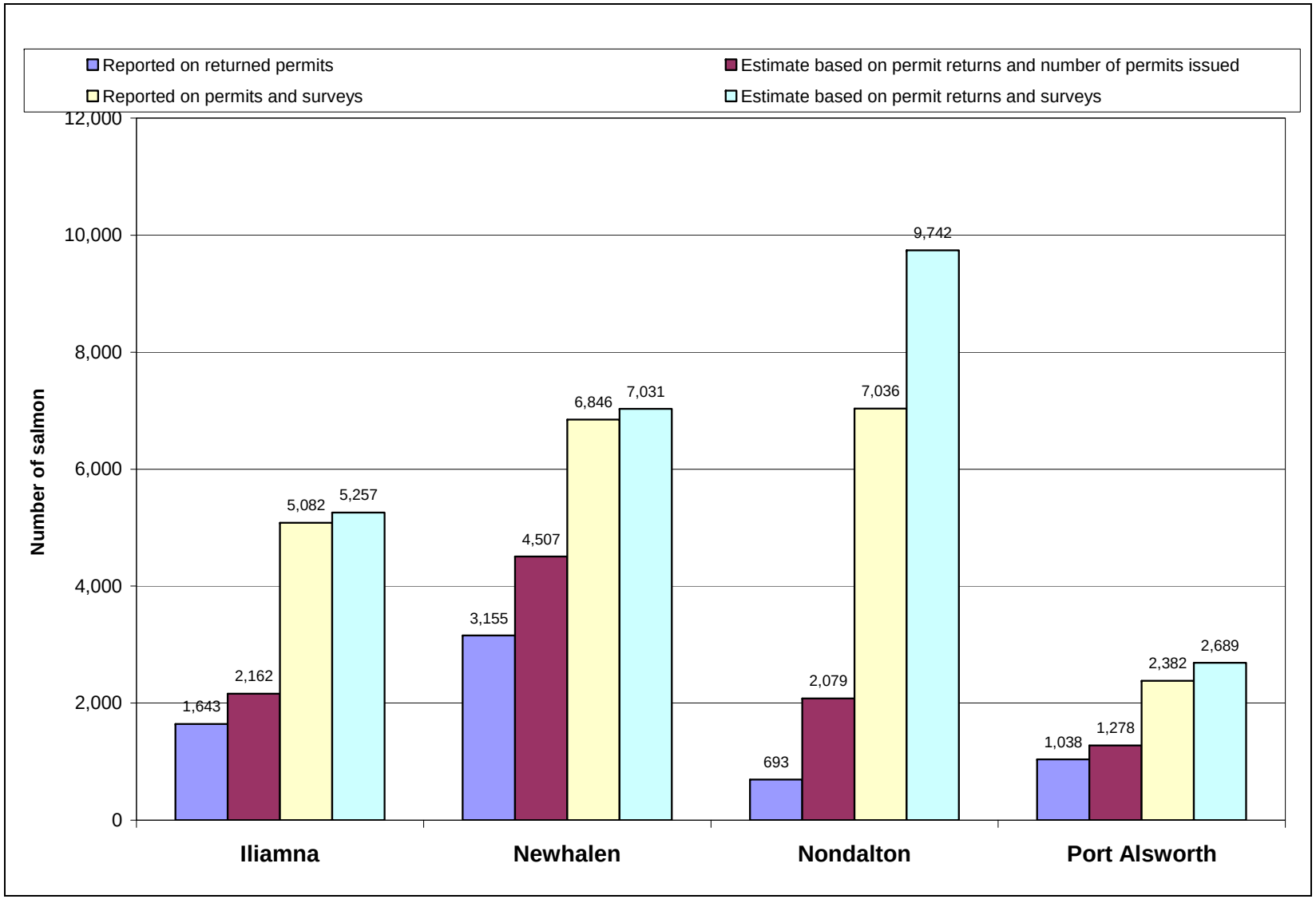

Figure 25.–Comparison of sockeye salmon harvest estimates, 2007.

Newhalen 2007

In Newhalen, 20 of 38 households obtained subsistence salmon fishing permits for 2007, with 14 (70%) returning them to ADF&G with harvest data prior to the household surveys (Table 25). These 14 households reported a harvest of 3,155 sockeye salmon, giving an estimated harvest for Newhalen in 2007 of 4,507 salmon based solely on these permit returns.

The remaining 6 Newhalen permit holders were interviewed as part of this project, and these interviews identified 3 additional subsistence fishing households that did not have a permit. The reported sockeye salmon harvest for all contacted households (permits and surveys) for Newhalen in 2007 was 6,846 fish; accounting for the 1 household for which no data are available results in an estimated harvest of 7,031 fish, compared to an estimate of 4,507 fish if only data from returned permits were used as the basis for an estimate (Table 25, Figure 25).

Port Alsworth 2007

In 2007, 16 of 35 Port Alsworth households obtained subsistence salmon fishing permits from ADF&G and 13 (81%) returned these with harvest data prior to the household surveys (Table 25). The harvest reported by these 13 returned permits totaled 1,038 sockeye salmon, for an estimated harvest of 1,278 salmon based on the presurvey permit records.

Two more permit-holding households were interviewed during the household surveys, and the surveys identified 10 additional households that harvested salmon but were not accounted for in the permit records. The total reported sockeye salmon harvest for all contacted households was 2,382 fish. Accounting for 4 households for which no data are available results in an estimate of 2,689 sockeye salmon, compared to the estimate of 1,278 salmon if only data from returned permits were used (Table 25, Figure 25).

Nondalton 2007

Prior to the household surveys, 9 of 36 Nondalton households obtained permits for subsistence salmon fishing in 2007 and 3 were returned to ADF&G (Table 25). Harvests recorded on the returned permits totaled 693 fish, which results in an estimated harvest of 2,079 sockeye salmon based solely on the presurvey permit records.

Household surveys collected harvest data for the other 6 subsistence permit holders and identified 16 additional Nondalton households who participated in the subsistence fishery but did not obtain permits. The reported harvest for all interviewed households and returned permits was 7,036 sockeye salmon. Accounting for 10 households for which no data are available results in an estimated subsistence harvest of 9,742 sockeye salmon (Table 25, Figure 25).

Results of the Survey for 2008

Table 26 reports demographic characteristics of the study communities based upon the survey conducted in early 2009. Estimated community populations were 108 in 29 households in Iliamna; 132 in 37 households in Newhalen; 151 in 39 households in Nondalton; and 110 in 30 households in Port Alsworth. The majority of the population in 3 communities was Alaska Native: 59% in Iliamna, 95% in Newhalen, and 87% in Nondalton. In Port Alsworth, 30% of the population was Alaska Native.

Based on the household survey and as shown in Table 27, almost all of the households in all 4 study communities used salmon in 2008: 92% in Iliamna, 97% in Newhalen, 91% in Nondalton, and 100% in Port Alsworth. Most households also fished for salmon: 81% in Iliamna, 71% in Newhalen, 81% in Nondalton, and 93% in Port Alsworth. In Iliamna, Newhalen, and Nondalton, most households received or gave away salmon. In Port Alsworth, 44% received salmon and 56% gave away salmon.

Sockeye salmon made up almost all the salmon harvest in each community: 97.6% in Iliamna, 98.4% in Newhalen, 99.8% in Nondalton, and 97.2% in Port Alsworth (Table 27). Most households used gillnets,

usually as setnets but occasionally as driftnets, to harvest salmon: 77% in Iliamna, 65% in Newhalen, 69% in Nondalton, and 82% in Port Alsworth (Table 28). In Nondalton, 34% of households harvested salmon with seines and 28% with rod and reel. No households used seines in Port Alsworth, and 12% of Iliamna households used seines to harvest spawning sockeye salmon, as did 15% of Newhalen households. Use of rod and reel for salmon harvest was less common in the 3 study communities other than Nondalton: 12% of households in Iliamna, 24% in Newhalen, and 19% in Port Alsworth.

Also according to the household survey, in 3 study communities, gillnets (usually setnets but occasionally driftnets) accounted for almost all the salmon harvest in 2008: 86.3% in Iliamna, 86.0% in Newhalen, and 94.8% in Port Alsworth (Figure 26). In Nondalton, gillnets accounted for 57% of the harvest and seines provided 42%. Seines accounted for 12% of the salmon harvest in Iliamna and 12% in Newhalen.

On average, based on the household survey, households in Iliamna harvested about 264 salmon in 2008, 57 salmon per capita (Table 24 and Table 27). The average household harvest in Newhalen was 221 salmon, 53 salmon per capita. In Nondalton, households averaged a harvest of 263 salmon, 56 salmon per person. In Port Alsworth, the average household harvest was 77 salmon, 17 salmon per capita.

Table 26.–Demographic characteristics of households, project communities, 2008.

Characteristics	Iliamna [a]	Newhalen	Nondalton	Port Alsworth
Number of households				
Total	29	37	39	30
Sampled	26	34	32	27
Percentage sampled	90%	92%	82%	90%
Household size				
Mean	4	4	4	4
Minimum	1	1	1	1
Maximum	8	7	12	10
Sample population	97	121	124	99
Estimated community population	108	132	151	110
Age				
Mean	33	31	31	28
Minimum [b]	1	0	1	1
Maximum	89	90	87	78
Median	33	24	27	26
Sex				
Males				
Number	45	71	74	59
Percentage	41%	54%	49%	54%
Females				
Number	64	61	77	51
Percentage	59%	46%	51%	47%
Alaska Native				
Estimated households (either head)				
Number	18	35	38	8
Percentage	62%	94%	97%	26%

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Characteristics	Iliamna [a]	Newhalen	Nondalton	Port Alsworth
Estimated population				
Number	64	125	132	33
Percentage	59%	95%	87%	30%

a. Iliamna includes 1 household living in Chekok.

b. Minimum household age of 0 indicates newborn in 2008.

Source ADF&G Division of Subsistence household surveys, 2009.

Table 27.–Estimated harvest and use of salmon resources, project communities, 2008.

	Percentage of households					Amount harvested	
Resource	Use	Att	Harv	Recv	Give	Total	Mean HH
Iliamna							
Sockeye salmon	92%	81%	80.7%	46%	62%	4,989	192
Spawning salmon	54%	39%	38.5%	23%	35%	1,724	66
Coho salmon	0%	0%	0.0%	0%	0%	0	0
Chum salmon	4%	4%	3.8%	0%	4%	22	1
Chinook salmon	35%	15%	7.7%	19%	12%	140	5
Pink salmon	0%	0%	0.0%	0%	0%	0	0
Unknown salmon	0%	0%	0.0%	0%	0%	0	0
Total, Iliamna	92%	81%	80.7%	54%	69%	6,875	264
Newhalen							
Sockeye salmon	94%	62%	62%	82%	59%	5,633	166
Spawning salmon	62%	32%	32%	35%	35%	1,773	52
Coho salmon	15%	15%	15%	3%	9%	79	2
Chum salmon	18%	18%	18%	3%	3%	28	1
Chinook salmon	21%	9%	9%	12%	12%	4	0
Pink salmon	9%	9%	9%	0%	0%	12	0
Unknown salmon	0%	0%	0%	0%	0%	0	0
Total, Newhalen	97%	71%	71%	82%	74%	7,530	221
Nondalton							
Sockeye salmon	91%	81%	81%	75%	75%	9,407	294
Spawning salmon	41%	25%	25%	31%	34%	811	25
Coho salmon	3%	3%	3%	0%	0%	10	0
Chum salmon	0%	0%	0%	0%	0%	0	0
Chinook salmon	9%	6%	3%	9%	6%	13	0
Pink salmon	0%	0%	0%	0%	0%	0	0
Unknown salmon	0%	0%	0%	0%	0%	0	0
Total, Nondalton	91%	81%	81%	75%	78%	10,241	263

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Table 27. Page 2 of 2.

Resource	Percentage of households					Amount harvested	
	Use	Att	Harv	Recv	Give	Total	Mean HH
Port Alsworth							
Sockeye salmon	96%	85%	81%	33%	56%	1,909	71
Spawning salmon	11%	7%	7%	11%	7%	120	4
Coho salmon	19%	11%	11%	11%	4%	14	1
Chum salmon	11%	7%	7%	4%	7%	11	0
Chinook salmon	33%	7%	7%	26%	19%	27	1
Pink salmon	4%	4%	4%	4%	4%	7	0
Unknown salmon	0%	0%	0%	0%	0%	0	0
Total, Port Alsworth	100%	93%	89%	44%	56%	2,088	77

Table 28.–Estimated percentage of households harvesting salmon by gear type, 2008.

Resource	Percentage of households			
	Gillnet	Seine	Rod and reel	Any method
Iliamna				
Chum salmon	4%	0%	0%	4%
Coho salmon	0%	0%	0%	0%
Chinook salmon	8%	0%	0%	8%
Pink salmon	0%	0%	0%	0%
Sockeye salmon	77%	0%	12%	81%
Spawning salmon	27%	12%	0%	38%
Unknown salmon	0%	0%	0%	0%
Total, Iliamna	77%	12%	12%	81%
Newhalen				
Chum salmon	18%	0%	0%	18%
Coho salmon	3%	0%	12%	15%
Chinook salmon	9%	0%	0%	9%
Pink salmon	9%	0%	0%	9%
Sockeye salmon	56%	3%	15%	63%
Spawning salmon	15%	15%	3%	32%
Unknown salmon	0%	0%	0%	0%
Total, Newhalen	65%	15%	24%	71%
Nondalton				
Chum salmon	0%	0%	0%	0%
Coho salmon	0%	0%	3%	3%
Chinook salmon	3%	0%	0%	3%
Pink salmon	0%	0%	0%	0%
Sockeye salmon	66%	34%	28%	81%
Spawning salmon	25%	0%	0%	25%
Unknown salmon	0%	0%	0%	0%
Total, Nondalton	69%	34%	28%	81%

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Table 28. Page 2 of 2.

Resource	Percentage of households			
	Gillnet	Seine	Rod and reel	Any method
Port Alsworth				
Chum salmon	4%	0%	4%	7%
Coho salmon	0%	0%	11%	11%
Chinook salmon	0%	0%	7%	7%
Pink salmon	0%	0%	4%	4%
Sockeye salmon	78%	0%	11%	81%
Spawning salmon	7%	0%	0%	8%
Unknown salmon	0%	0%	0%	0%
Total, Port Alsworth	82%	0%	19%	89%

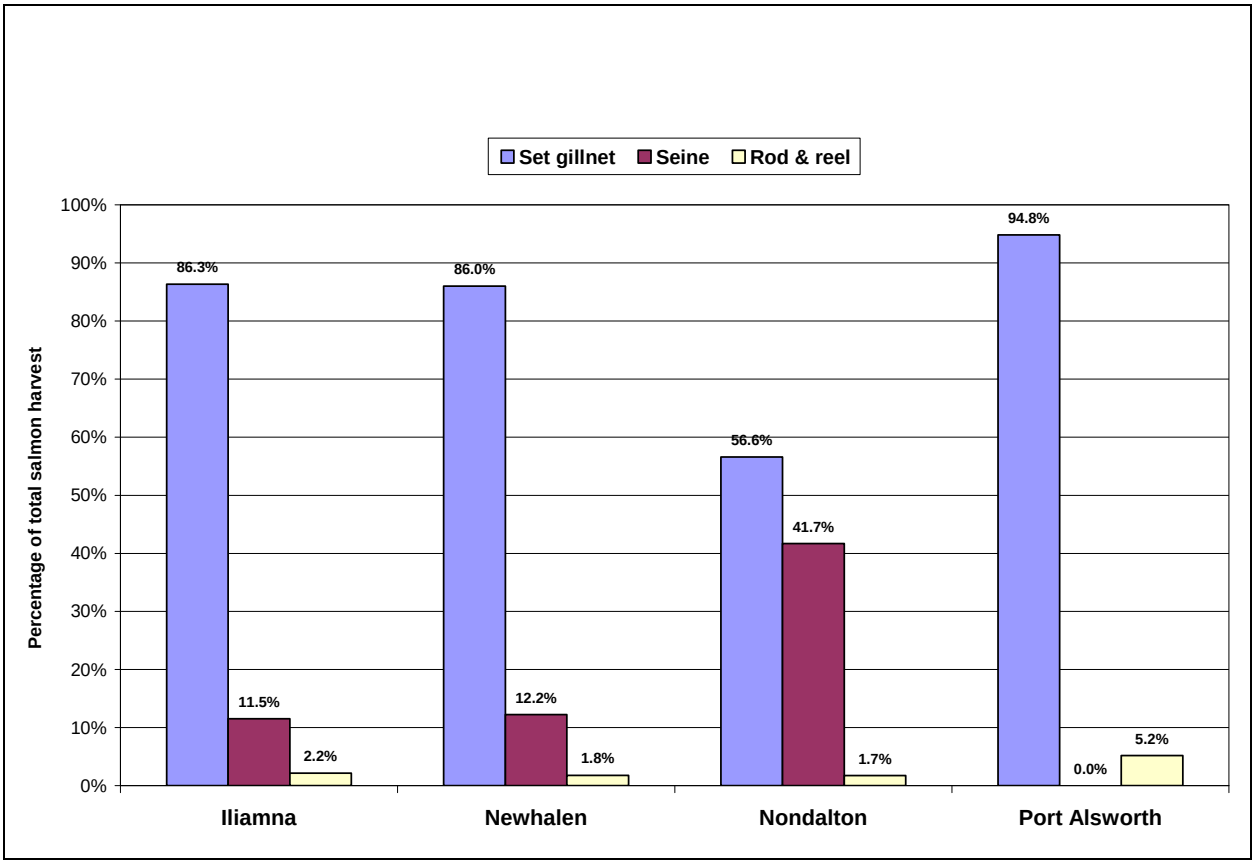

Figure 26.–Percentage of salmon harvest by gear type, study communities, 2008.

Comparison of Survey and Permit Data for 2008

Iliamna 2008

In 2008, 23 of 29 Iliamna households obtained subsistence salmon permits with 20 of these (87%) returning them by mail to ADF&G with harvest data prior to the household harvest surveys in early 2009 (Table 29). The harvest as reported on permits returned by these 20 households was 5,936 sockeye salmon. Based on these returned permits, the 2008 estimated subsistence salmon harvest expanded to all Iliamna residents would be 6,826 sockeye salmon.

Harvest data from the remaining 3 Iliamna households that were issued permits were obtained during the household surveys, which identified 3 additional households that harvested sockeye salmon in 2008 for subsistence uses, but that did not obtain permits; 2 other surveyed households had no harvest. Sockeye salmon harvests reported by all 28 contacted households totaled 6,645 fish; if expanded to account for the 1 household for which no data are available, the estimated subsistence sockeye salmon harvest for the community would be 6,882 salmon, compared to 6,826 fish if only data from returned permits were used to develop the estimate (Table 29, Figure 27).

Table 29.–Subsistence sockeye salmon harvest estimated based on permit returns and surveys, 2008.

	Iliamna [a]	Newhalen	Nondalton	Port Alsworth	All study communities
Before surveys					
Number of permits issued	23	28	15	23	88
Number of permits returned	20	18	7	21	66
Return rate	87%	64%	47%	91%	74%
Reported harvest	5,936	5,090	417	1,625	13,068
Estimated harvest, all permit holders	6,826	7,918	894	1,780	17,418
After surveys					
Number of permits issued	23	28	15	23	89
Number of permits returned [b]	23	27	13	23	86
Households that fished without a permit [c]	3	2	13	6	24
Households that did not fish [c]	2	6	6	1	15
Total, "permits" [d]	28	36	34	30	128
Total contacts [e]	28	35	32	30	125
Total harvest reported on permits	5,936	5,090	417	1,625	13,068
Additional added to returned permits [c]	104	95	613	190	1,002
Fish recorded on permits returned during the survey	55	1,407	2,514	200	4,176
Harvest by households that did not have permits [c]	550	620	4,857	465	6,492
Reported harvest from both permits and surveys	6,645	7,212	8,401	2,480	24,738
Total number of households	29	38	39	30	136
Number of households with data from either permits or surveys	28	35	32	30	125
Survey sample achievement	97%	92%	82%	100%	92%
Total estimated harvest from both permits and surveys	6,882	7,830	10,239	2,480	27,431

a. Includes Chekok.

b. Includes data, collected during surveys, from nonreturned permits.

c. According to the survey.

d. Households with permits prior to the survey plus data from other surveyed households.

e. Households that returned a permit or responded to a survey.

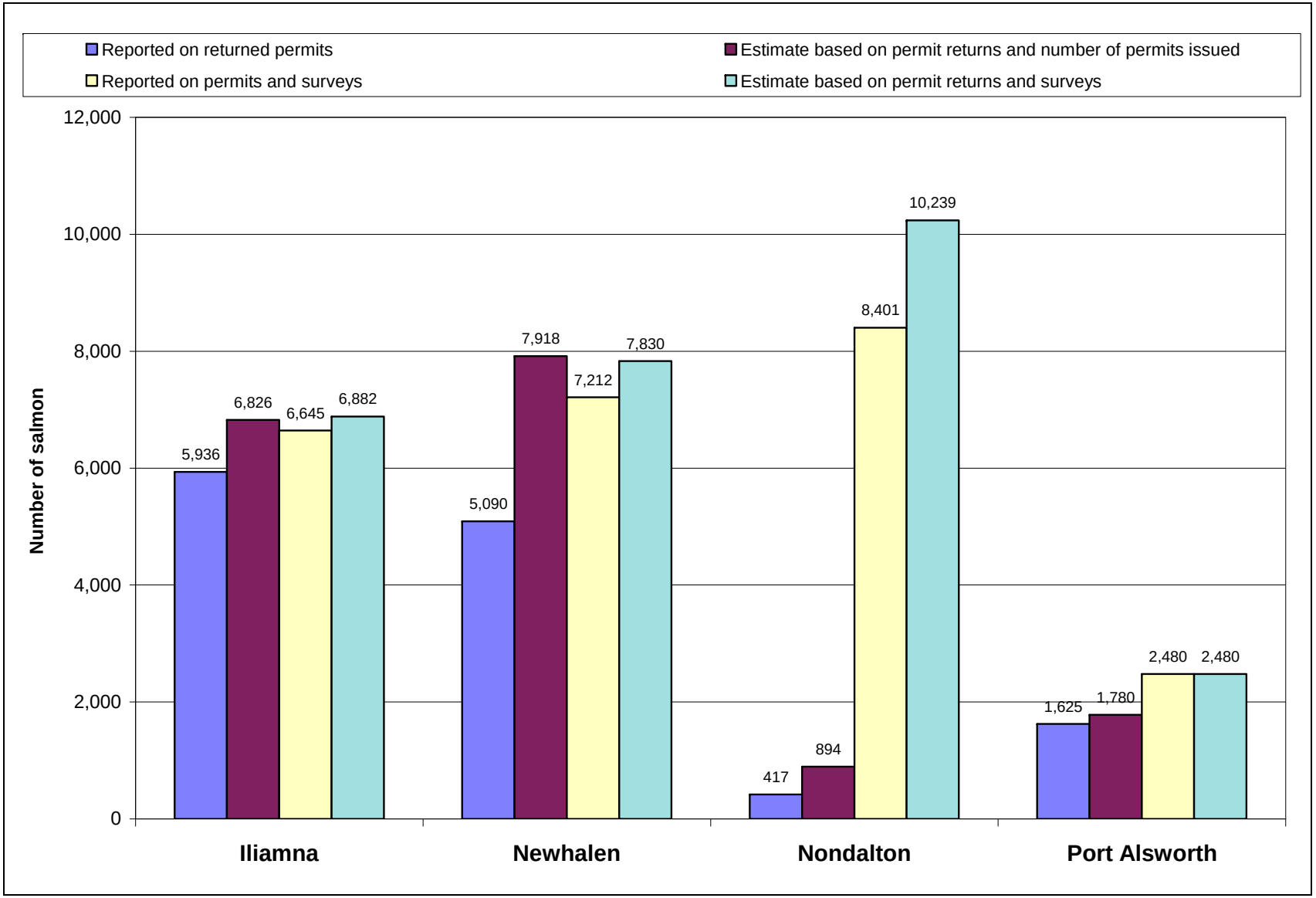

Figure 27.–Comparison of sockeye salmon harvest estimates, 2008.

Newhalen 2008

In Newhalen, 28 of 37 households obtained subsistence salmon fishing permits for 2008, with 18 (64%) returning them to ADF&G with harvest data prior to the household surveys (Table 29). These 18 households reported a harvest of 5,090 sockeye salmon, giving an estimated harvest for Newhalen in 2008 of 7,918 sockeye salmon based solely on these permit returns.

Of the remaining 10 Newhalen permit holders, 9 were interviewed as part of this project, and these interviews identified 2 additional subsistence fishing households that did not have permits. The reported sockeye salmon harvest for all 29 contacted households (permits and surveys) for Newhalen in 2008 was 7,212 fish; accounting for the 3 households for which no data are available results in an estimated harvest of 7,830 fish, compared to an estimate of 7,918 fish if only data from returned permits were used as the basis for an estimate (Table 29, Figure 27).

Port Alsworth 2008

In 2008, 23 of 30 Port Alsworth households obtained subsistence salmon permits and 21 (91%) returned the permits to ADF&G. The reported harvest on these 21 returned permits was 1,625 sockeye salmon (Table 29). The estimated total subsistence sockeye salmon harvest for Port Alsworth based on the number of permits issued and the harvests reported on returned permits is 1,780 fish

In Port Alsworth, the 2 remaining subsistence permit holders were interviewed and 6 other households were surveyed who participated in the subsistence fishery but did not have permits. Combining permit returns and interviews resulted in harvest records for all 30 Port Alsworth households. The subsistence sockeye salmon harvest was 2,480 salmon, compared to an estimated 1,780 sockeye salmon based on presurvey permit records alone (Table 29, Figure 27).

Nondalton 2008

In 2008, 15 of 39 Nondalton households obtained subsistence salmon permits and 7 (47%) returned the permits to ADF&G (Table 29). These 7 returned permits reported a total harvest of 417 sockeye salmon. The estimated total subsistence sockeye salmon harvest for Nondalton, based on the number of permits issued and the harvests reported on returned permits is 894 fish.

In Nondalton, 6 of the remaining permit holders were interviewed during the household surveys, and 13 additional households were identified who participated in the subsistence fishery but did not obtain a permit. The reported sockeye salmon harvest by all Nondalton households who returned subsistence permits or were interviewed was 8,401 fish. Accounting for 7 households for whom no data are available results in an estimated harvest of 10,239 sockeye salmon, compared to 894 sockeye salmon based on presurvey permit records alone (Table 29, Figure 27).

Subsistence Sockeye Salmon Fishing Locations in 2007 and 2008

Figures 28 through 44 show salmon harvest locations recorded during household harvest surveys. Each household was asked to indicate locations where gillnets were set, seining occurred, or rod and reel fishing took place. A harvest amount was recorded for each location. Each community has maps which demonstrate harvest location by salmon species, and by gear type for each study year. In Iliamna, Newhalen, and Nondalton, most of the maps demonstrate that subsistence fishers focused their harvest efforts on areas where sockeye salmon were known to school. In Port Alsworth, fishing was focused near the community. In Iliamna in both 2007 and 2008, gillnet fishing effort targeting bright sockeye salmon was concentrated in 2 primary locations: off the beach in front of the community, and on the Newhalen River (Figure 28, Figure 29). For spawning sockeye salmon, some Port Alsworth fishers and their relatives from Nondalton traveled to Lake Clark and used gillnets to fish. In addition, Iliamna fishers targeting spawning sockeye salmon traveled to Knutson Bay, where 3 instances of the use of a seine were recorded (Figures 30 and 31; Plate 6).

Newhalen respondents fished for bright sockeye salmon in 2007 and 2008 almost exclusively in the Newhalen River or at the river outlet into Iliamna Lake (Figures 32 and 33; Plate 3). As with Iliamna residents, Newhalen residents' seining effort targeting spawning sockeye salmon occurred at the head of Knutson Bay. Newhalen residents also fished for salmon with rod and reel on the middle and upper reaches of the Newhalen River (Figure 34, Figure 35). In 2007 and 2008 Iliamna and Newhalen residents used some of the same fishing locations (Figure 36).

Nondalton residents' subsistence sockeye salmon fishing effort was focused on 2 locations: 1) adjacent to their fish camps at the outlet of Sixmile Lake, for bright sockeye salmon, and 2) at Kijik on Lake Clark, for spawning sockeye salmon. As discussed earlier, the seine net was an important harvest technology for Nondalton respondents in 2007 and 2008. Most seining occurred on the eastern side of Sixmile Lake, where sockeye salmon were known to school (Figure 37 and Figure 38). Nondalton residents used set gillnets at the outlet of Sixmile Lake and along the western shores of the lake. Respondents reported that inclement weather in October 2007 and October 2008 prevented some residents from making their customary trip to Kijik to fish for spawning sockeye salmon. However, maps for both years captured some harvests near Kijik and other nearby sites on Lake Clark (Figure 39 and Figure 40). On Lake Clark, 1 resident reported using a spear to harvest 1 sockeye salmon at Kijik.

As mentioned above, Port Alsworth residents' fishing effort was focused near the community, with nets often set in front of homes (Figures 41–44). Most fishing effort in Port Alsworth was directed at bright sockeye salmon; there were only a few instances in either year of residents targeting spawning sockeye salmon in the fall.

Assessment of Meeting Households' Needs

During the surveys for both 2007 and 2008, respondents were asked if their household obtained "enough salmon for your own household's needs through your own efforts and/or sharing." If needs were not met, respondents were asked "Why did your household not get enough?"

For 2007, the majority of households in all 4 study communities said their subsistence salmon needs were met, ranging from 93% in Port Alsworth to 89% in Nondalton, 76% in Newhalen, and 54% in Iliamna (Table 30). Of those who did not meet their needs in 2007, most (24%) cited time constraints—they were too busy with other activities, such as wage employment, to harvest and process subsistence salmon (Table 31). Others said they did not have the necessary gear (16%) or were away from the community (12%). Only 8% said that a lack of fish prevented them from getting enough salmon.

In 2008, also, most households obtained enough salmon to meet their needs: 97% in Newhalen, 91% in Nondalton, 89% in Port Alsworth, and 85% in Iliamna (Table 30). Also, as in 2007, "time constraints" was the primary reason that survey respondents cited for not obtaining enough salmon. No respondent in 2008 cited a scarcity of salmon as a reason for not achieving harvest goals (Table 31).

Table 30.–"Did you obtain enough salmon for your household's needs through your own efforts and/or sharing?" Combined responses from all study community households.

	2007			2008		
Communities	Yes	No	No response	Yes	No	No response
Iliamna	54%	46%	0%	85%	15%	0%
Newhalen	76%	24%	0%	97%	3%	0%
Nondalton	89%	12%	0%	91%	9%	0%
Port Alsworth	91%	7%	0%	80%	11%	0%

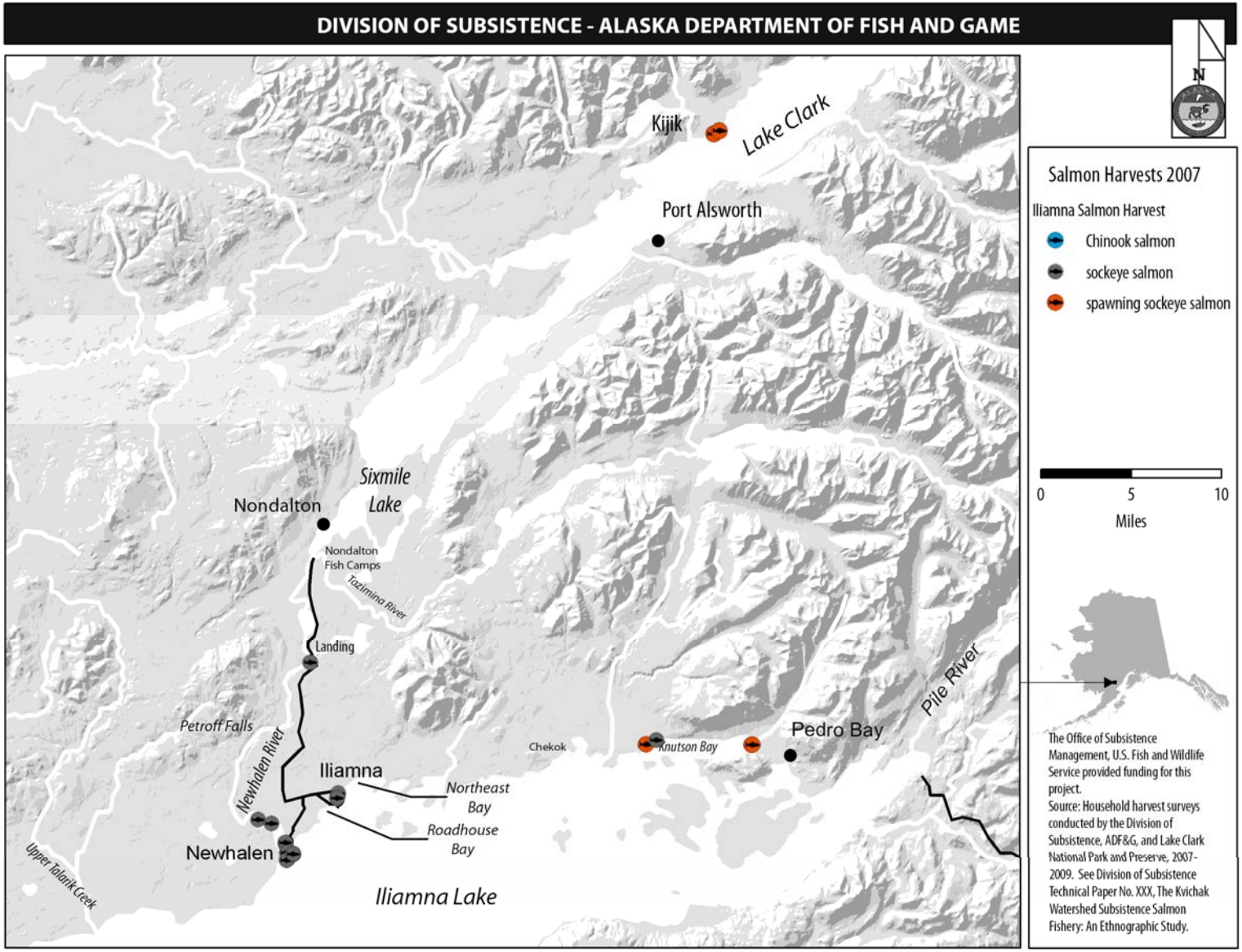

Figure 28.–Salmon harvest locations, Iliamna, 2007.

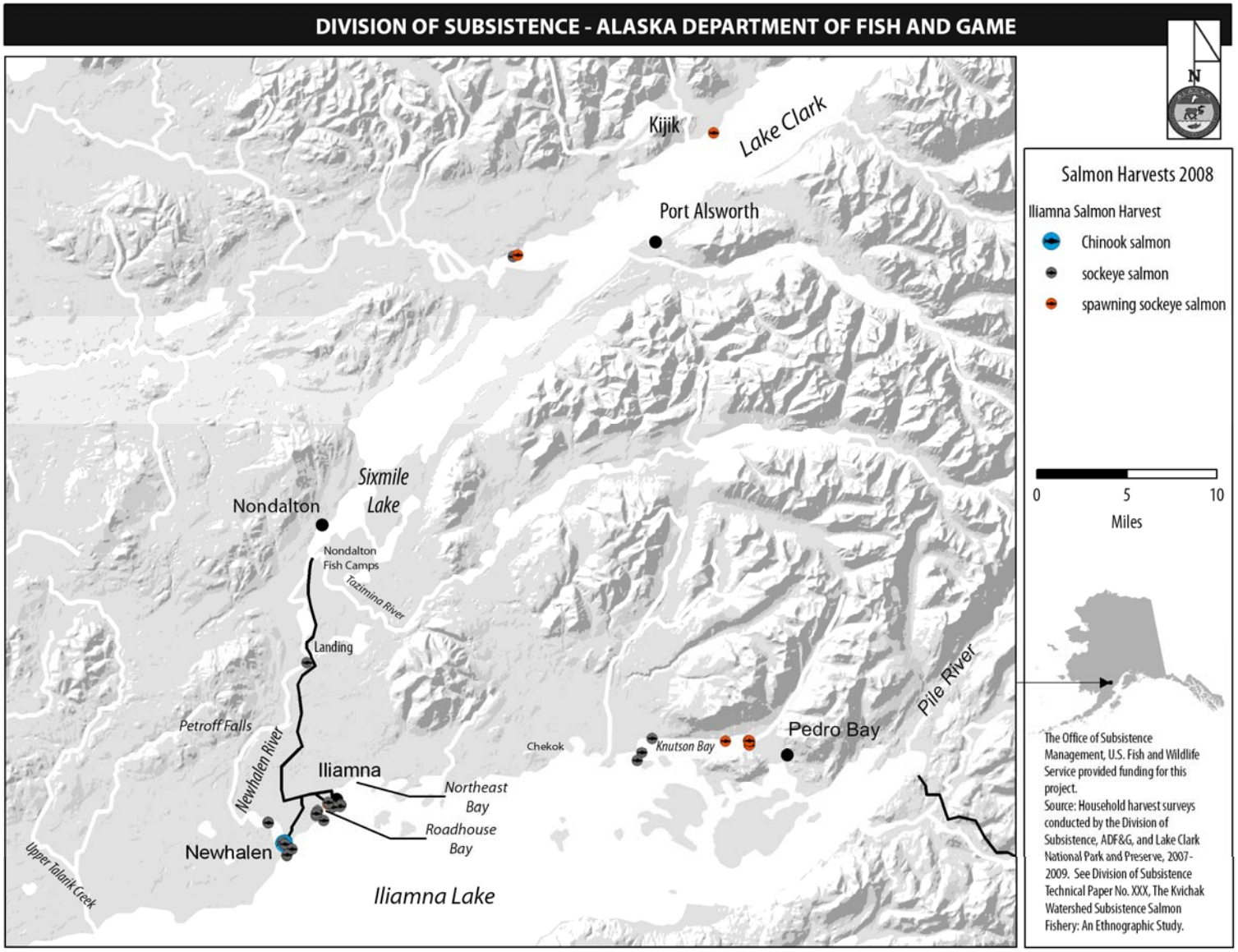

Figure 29.–Salmon harvest locations, Iliamna, 2008.

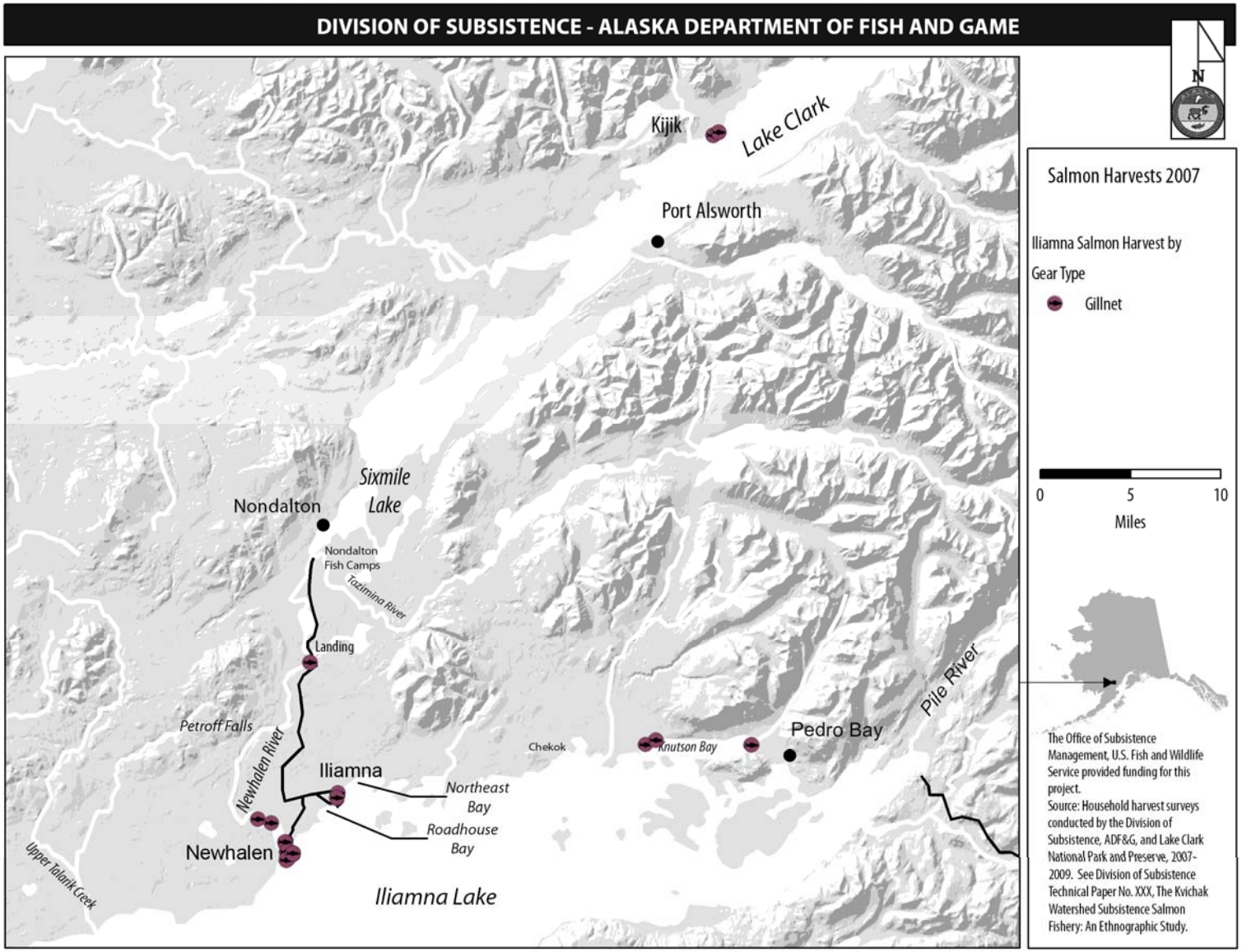

Figure 30.–Iliamna salmon harvests, by gear type, 2007.

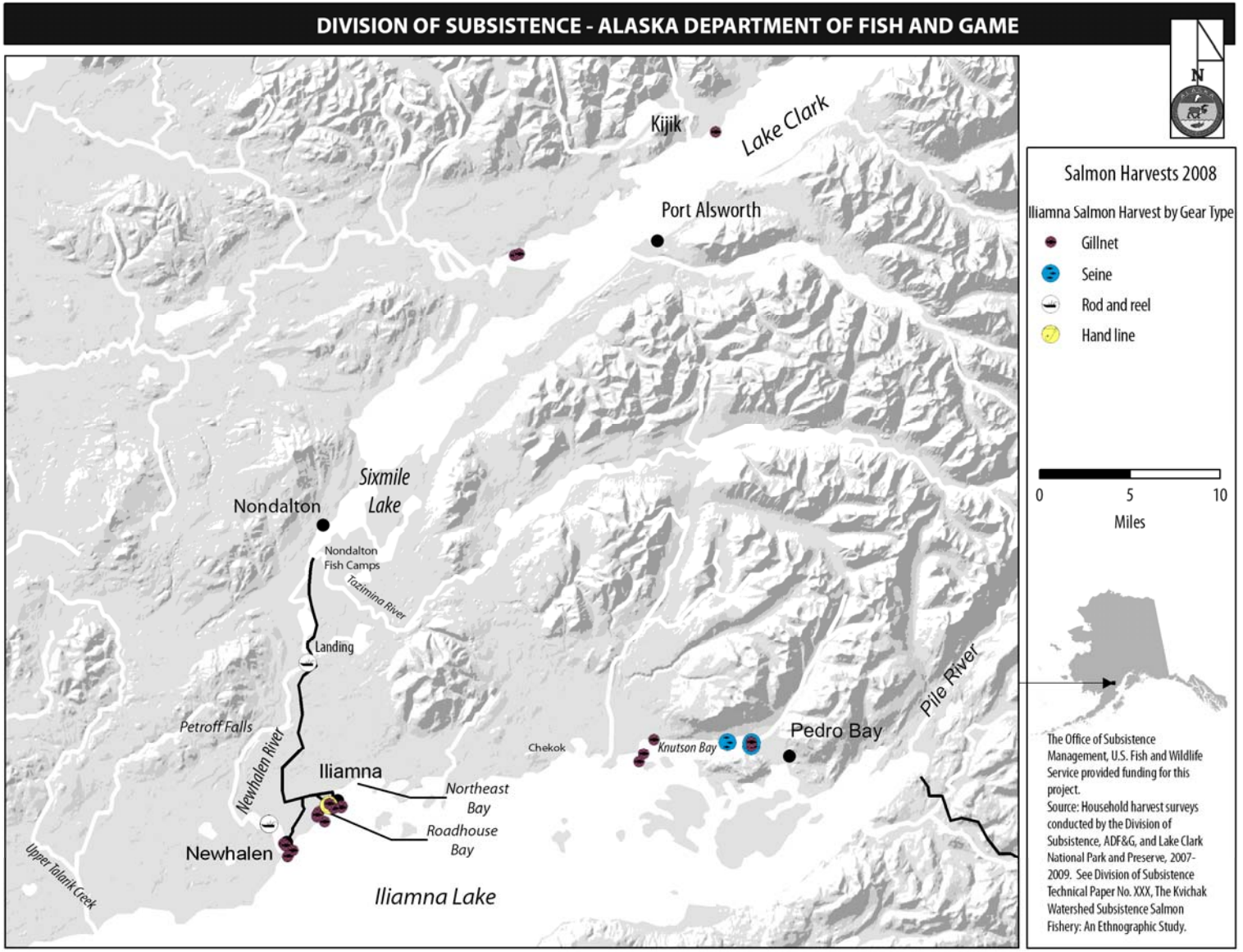

Figure 31.–Iliamna salmon harvests, by gear type, 2008.

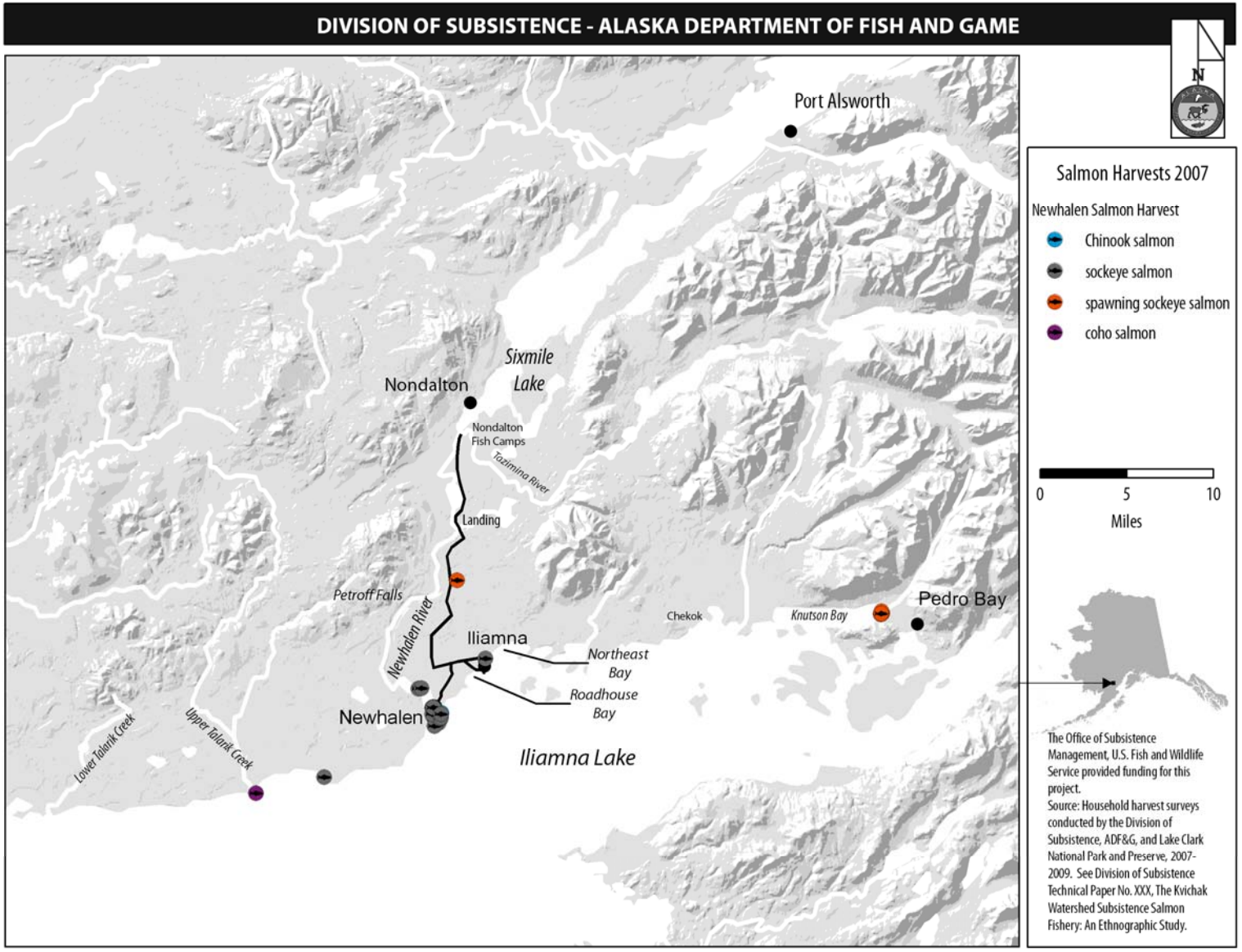

Figure 32.–Salmon harvest locations, Newhalen, 2007.

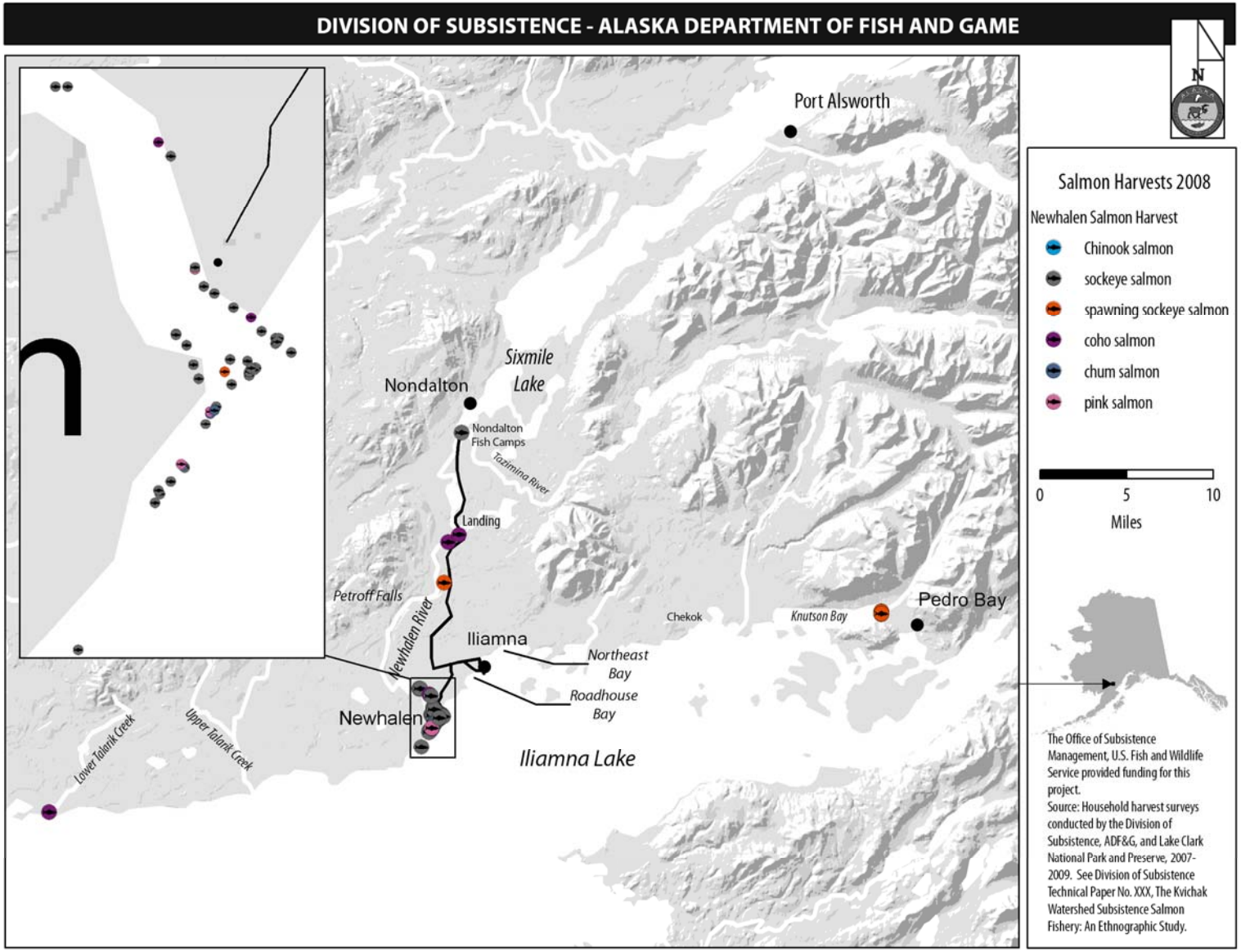

Figure 33.–Salmon harvest locations, Newhalen, 2008.

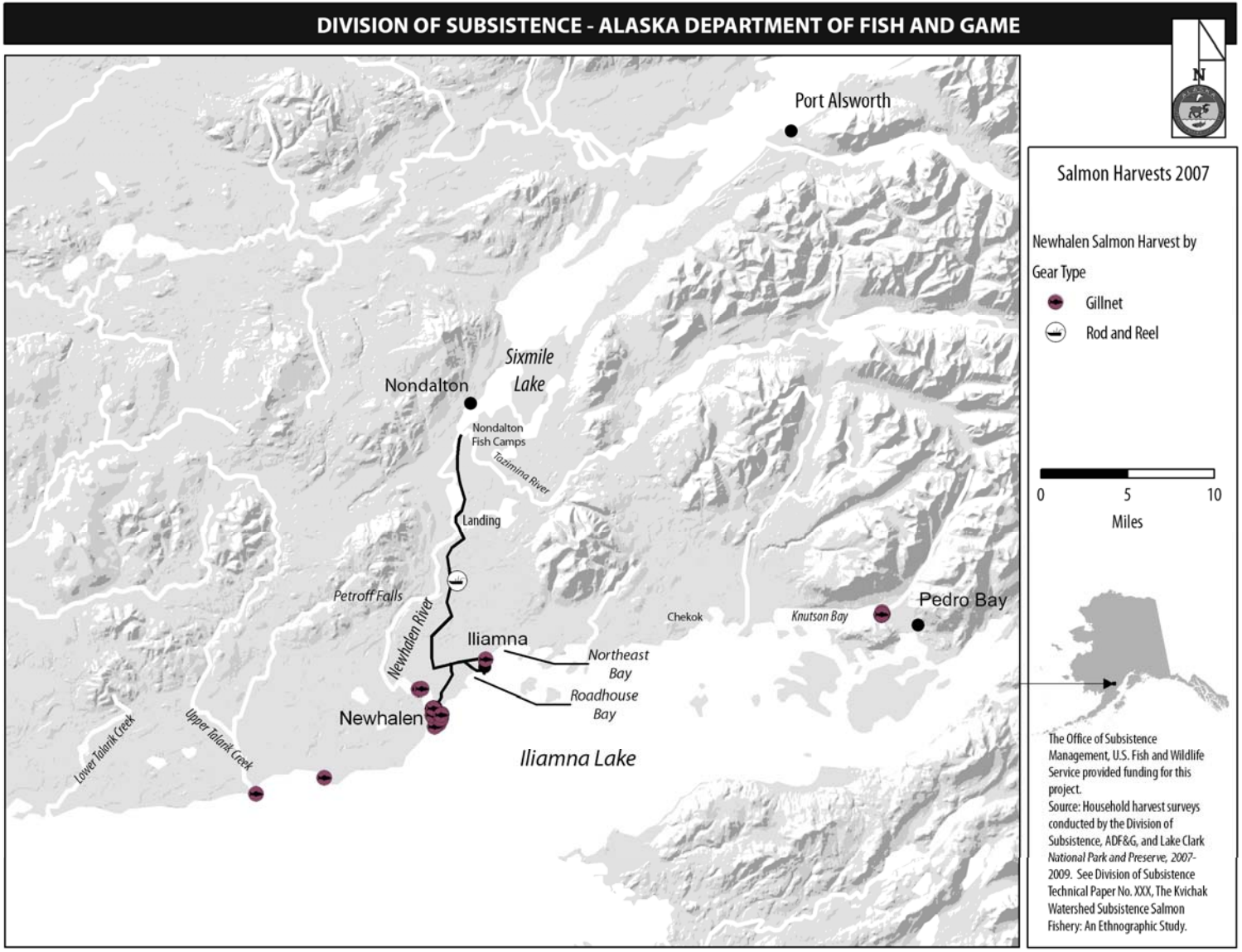

Figure 34.–Newhalen salmon harvests, by gear type, 2007.

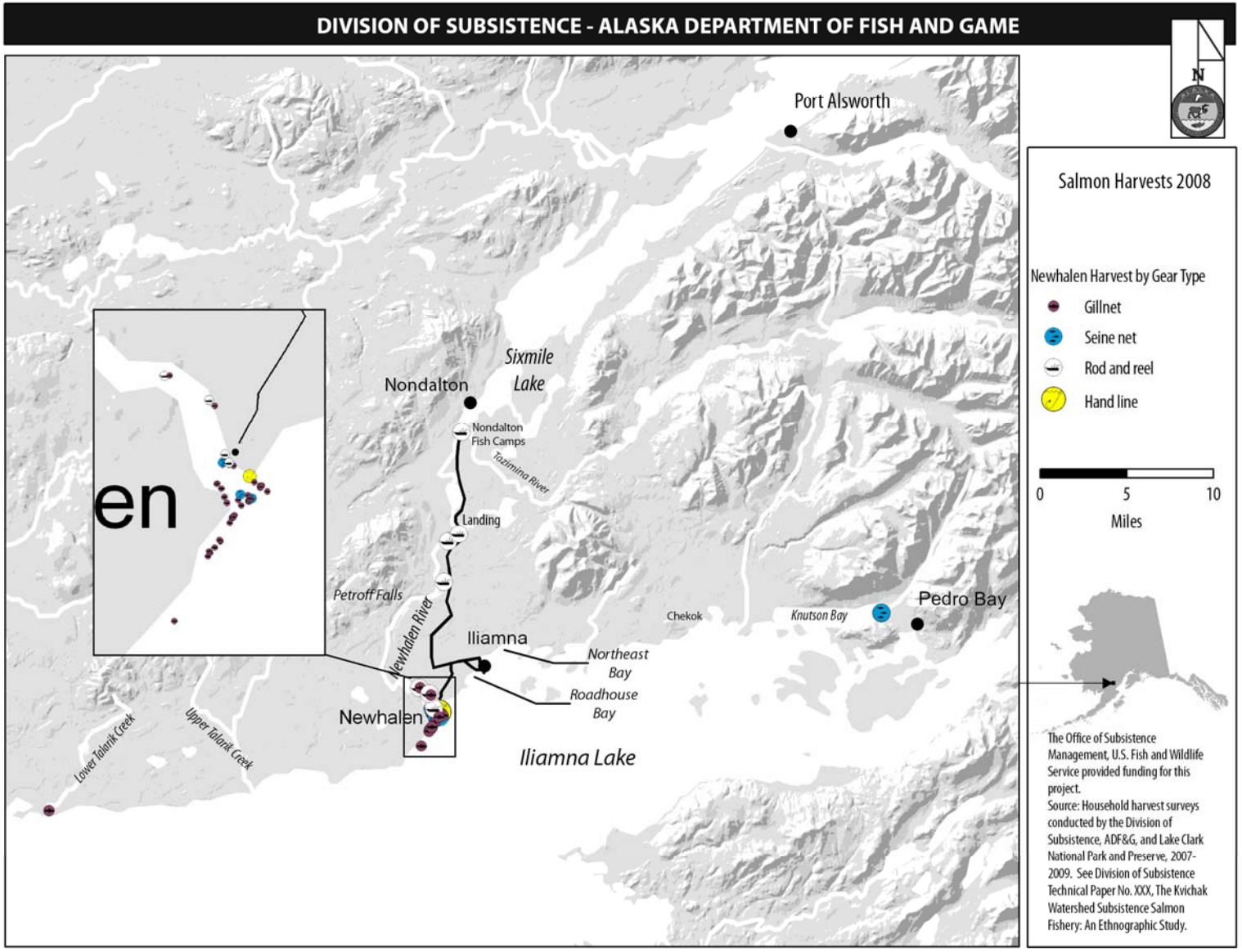

Figure 35.–Newhalen salmon harvests, by gear type, 2008.

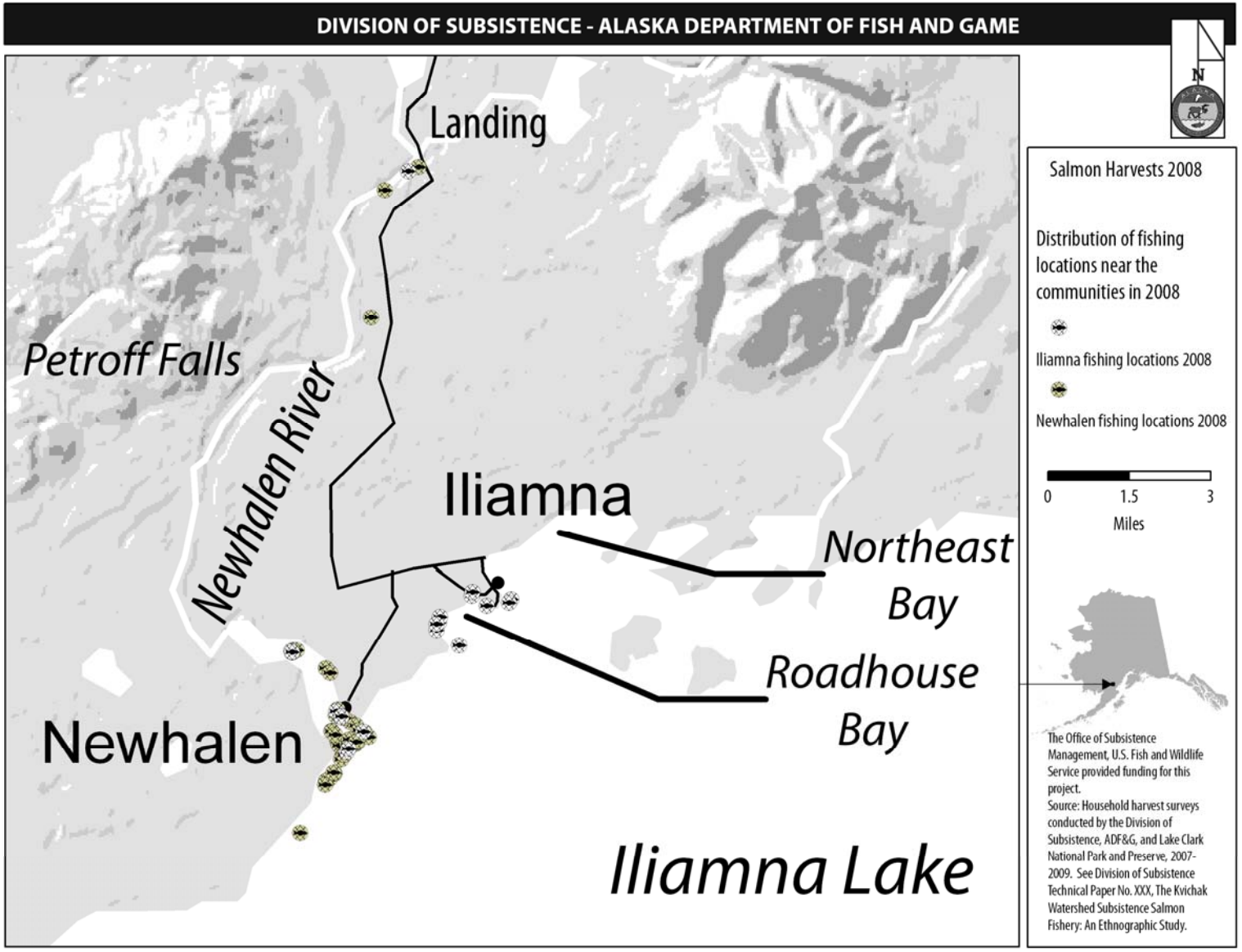

Figure 36.–Salmon harvest locations, Iliamna and Newhalen, 2008.

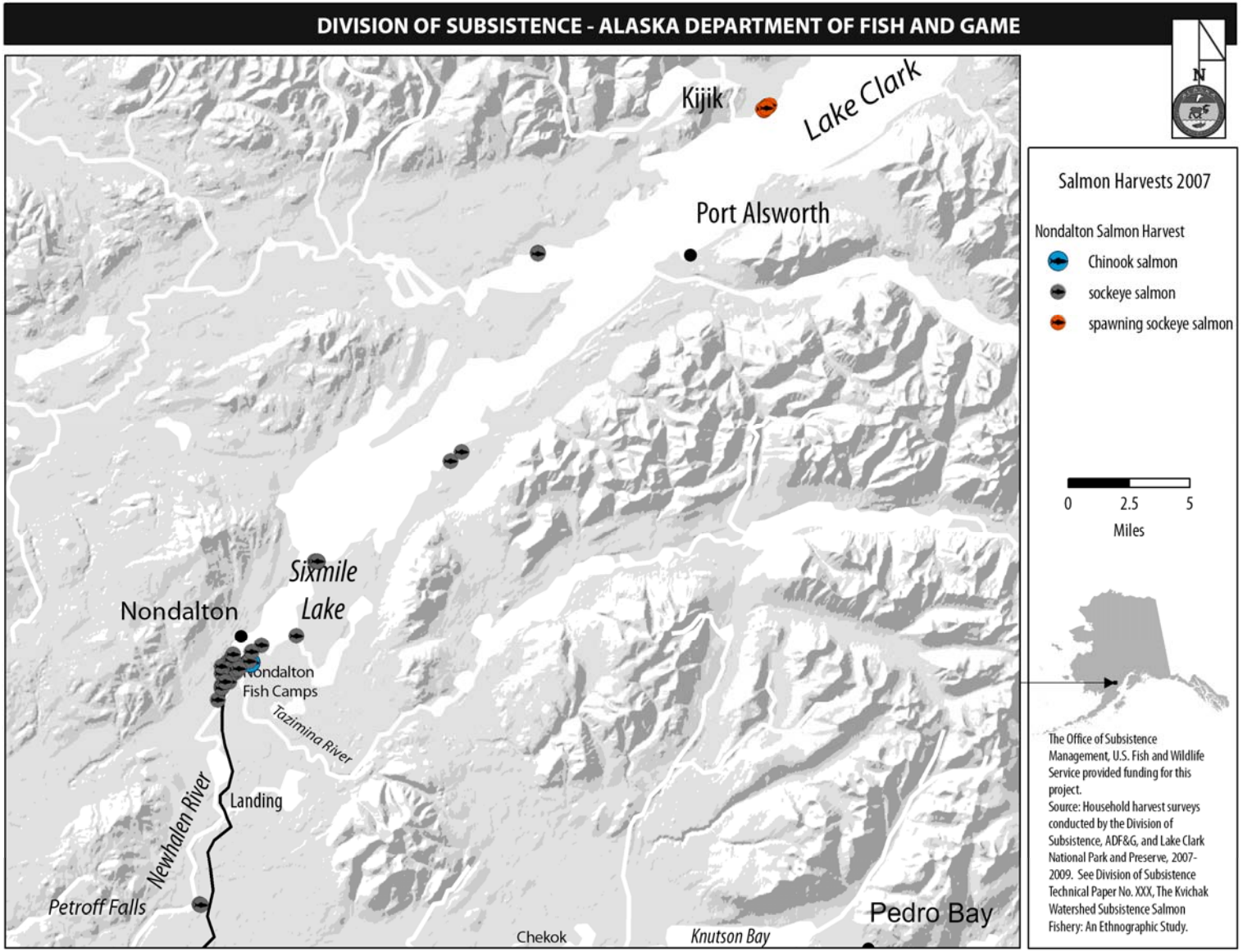

Figure 37.–Salmon harvest locations, Nondalton, 2007.

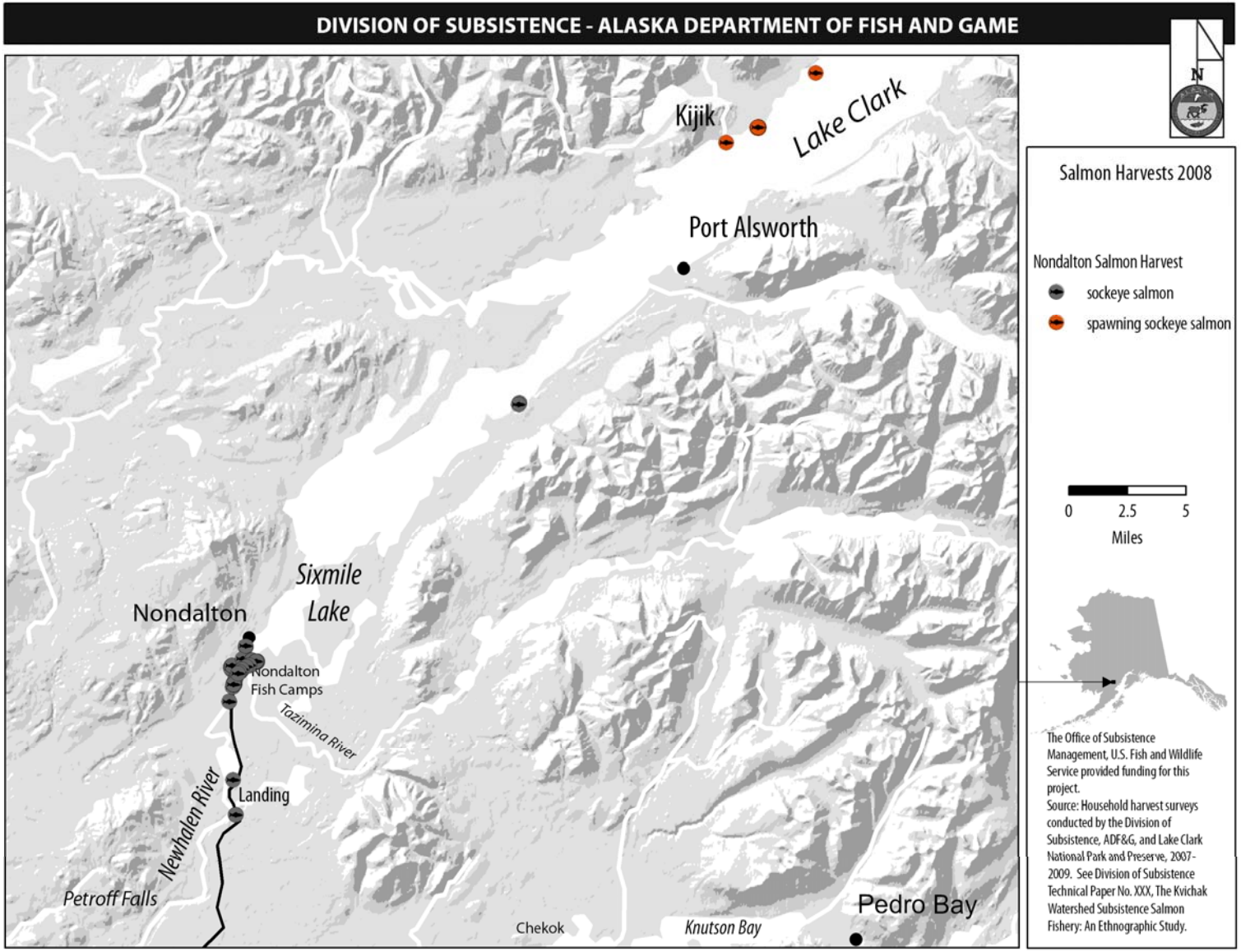

Figure 38.–Salmon harvest locations, Nondalton, 2008.

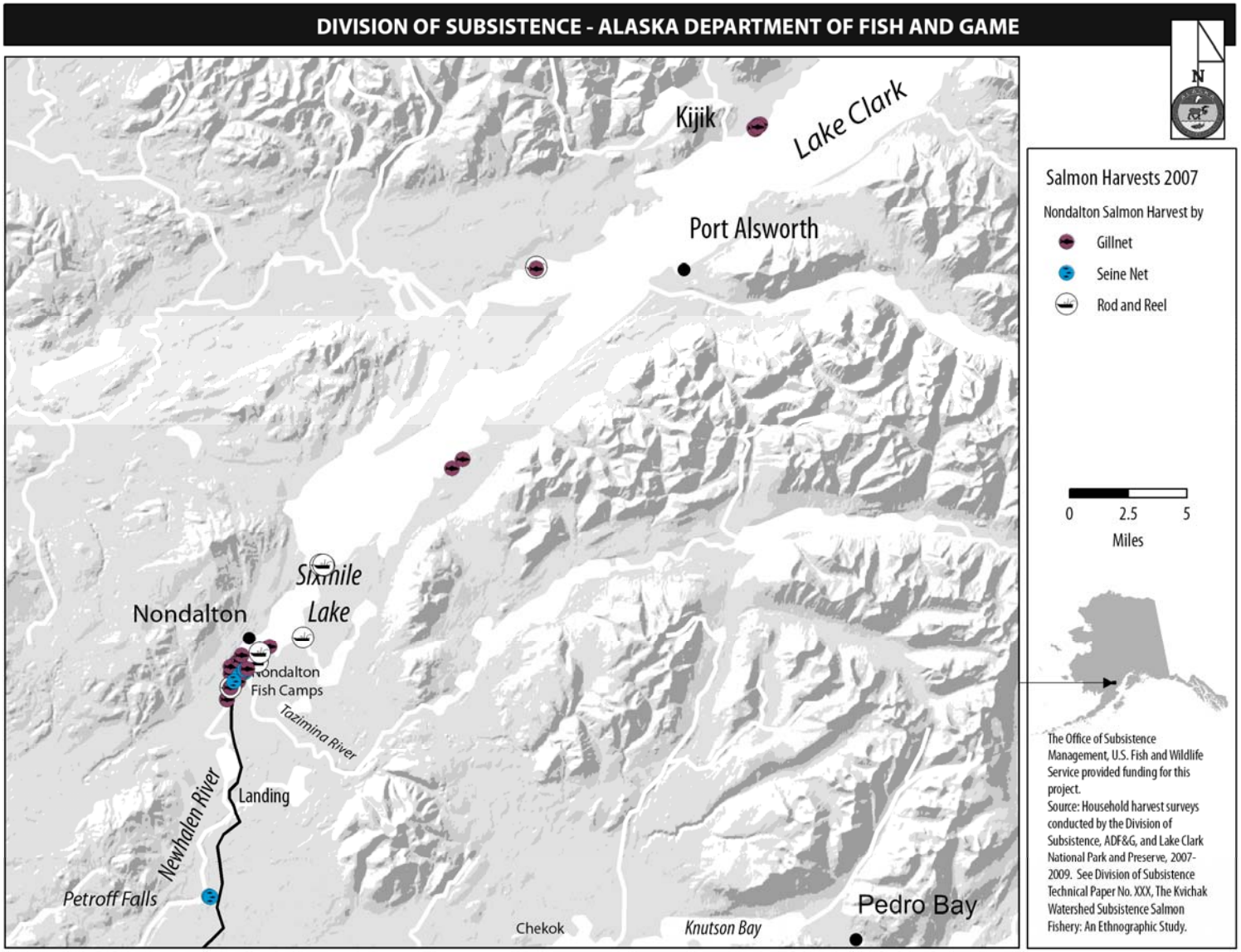

Figure 39.–Nondalton salmon harvests, by gear type, 2007.

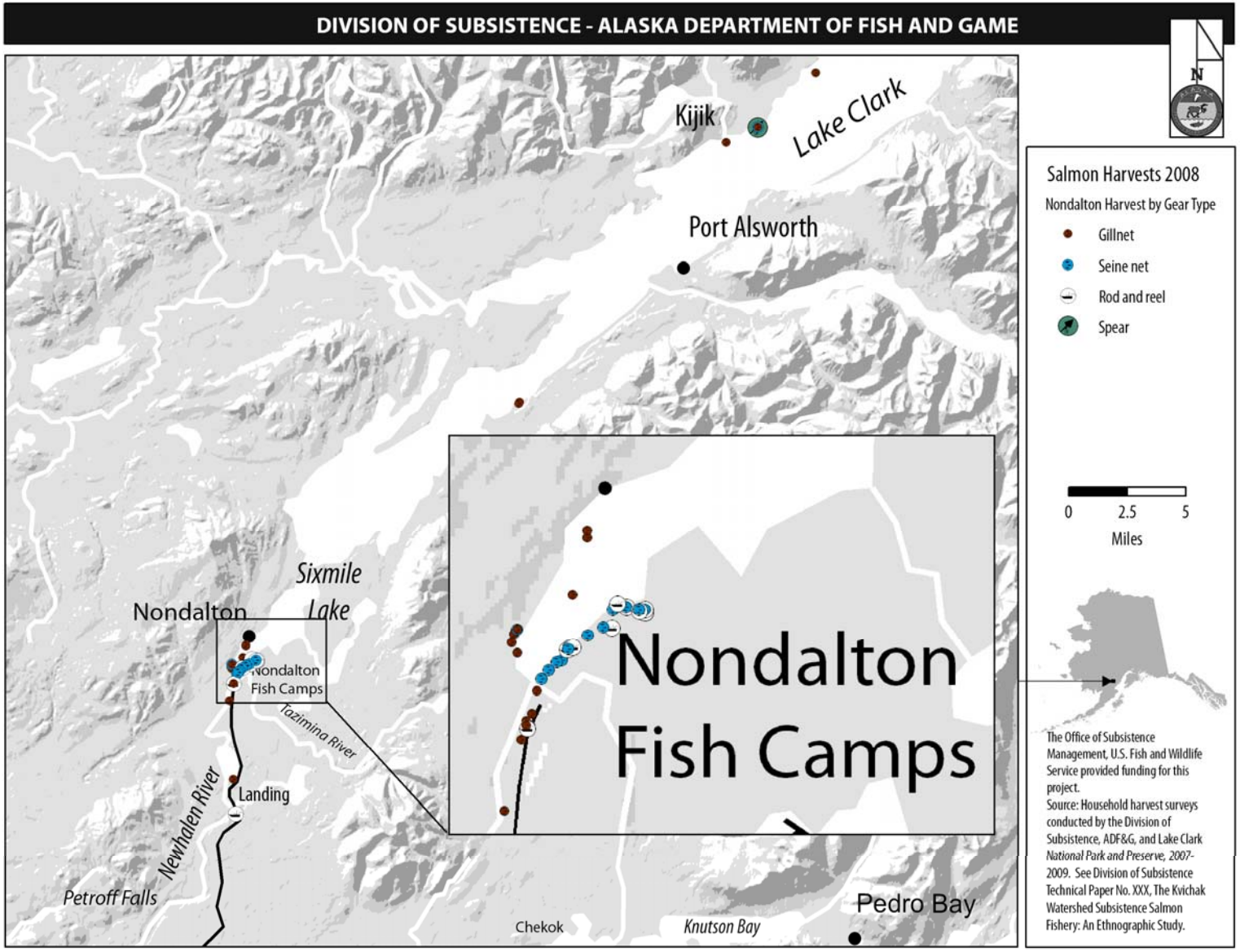

Figure 40.–Nondalton salmon harvests, by gear type, 2008.

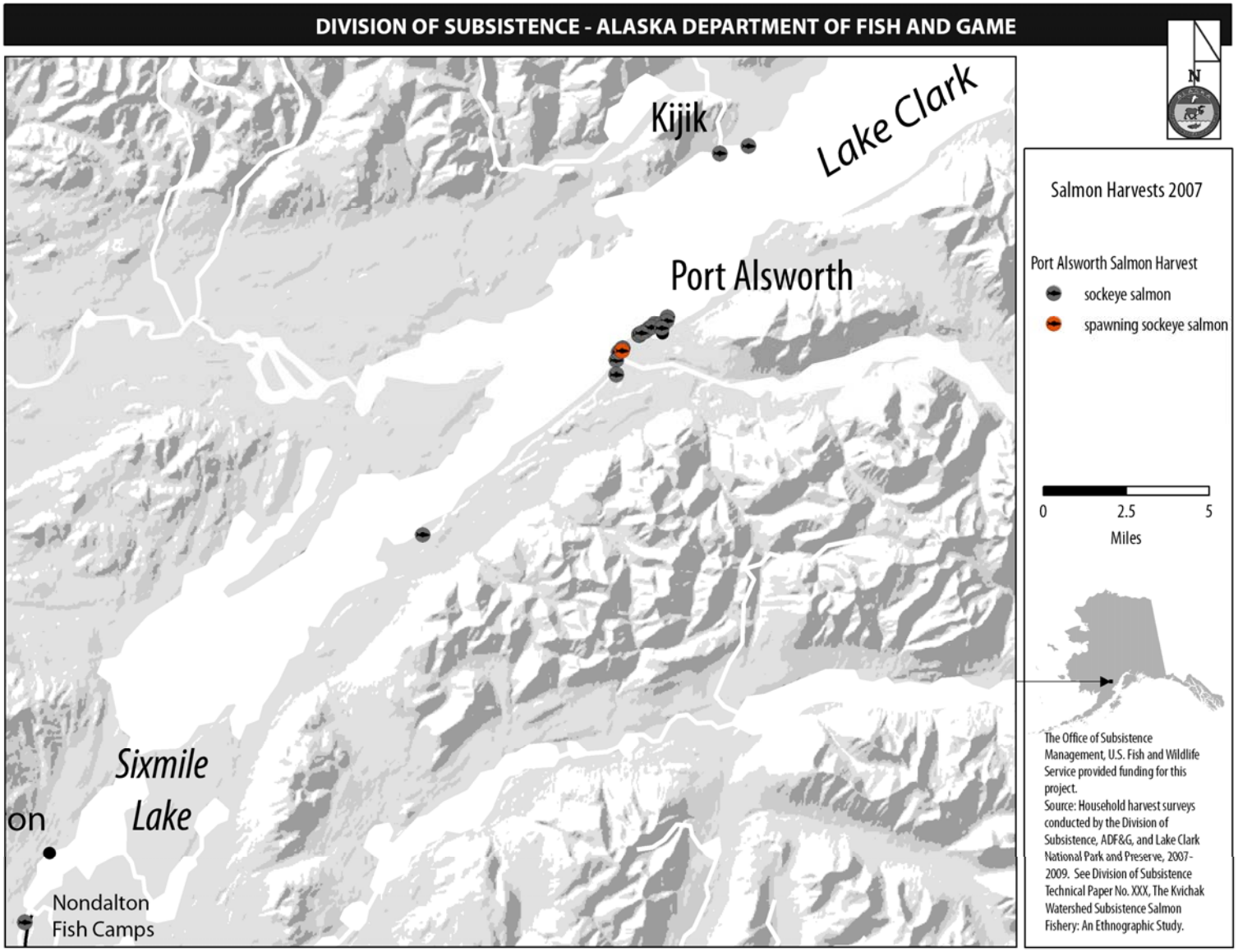

Figure 41.–Salmon harvest locations, Port Alsworth, 2007.

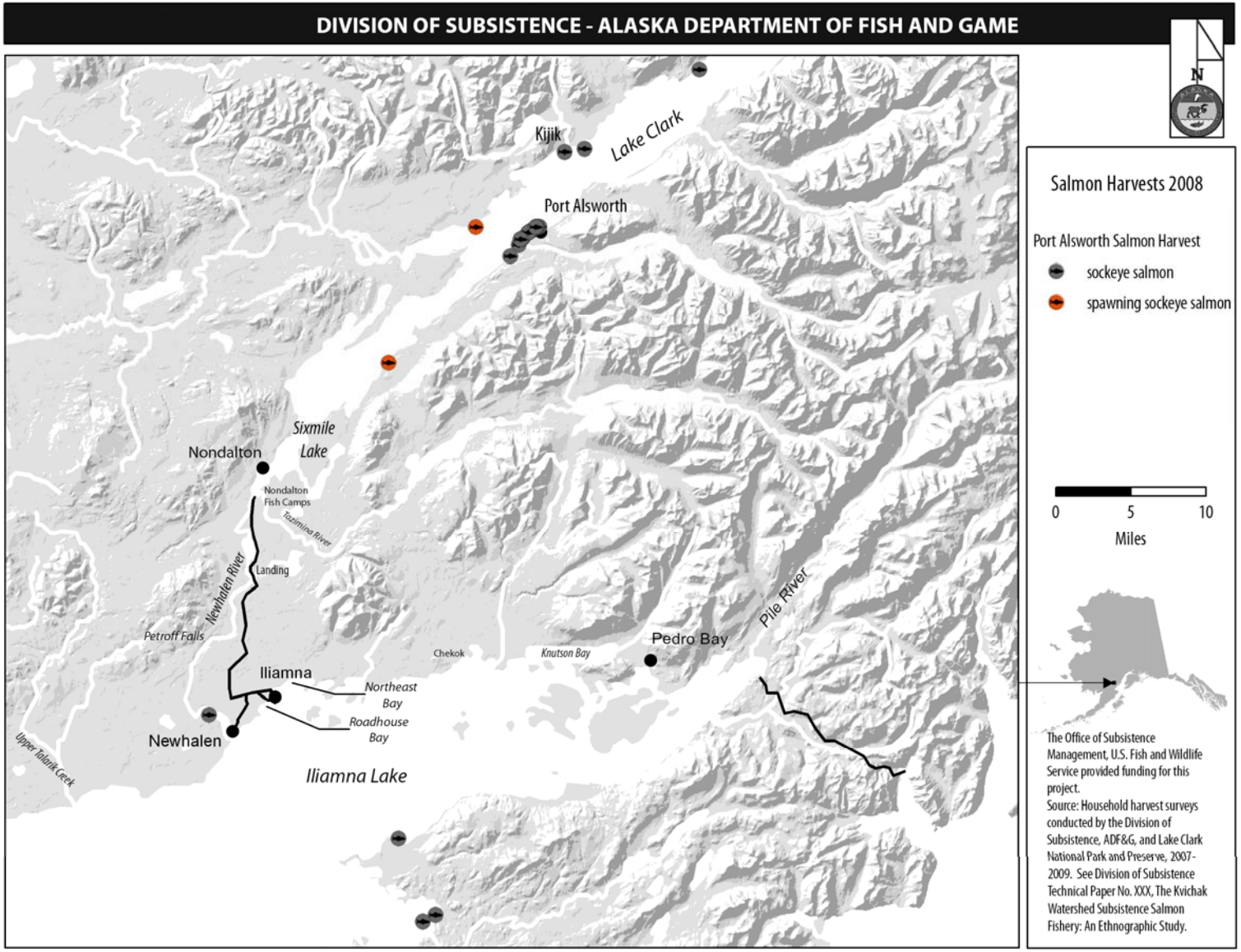

Figure 42.–Salmon harvest locations, Port Alsworth, 2008.

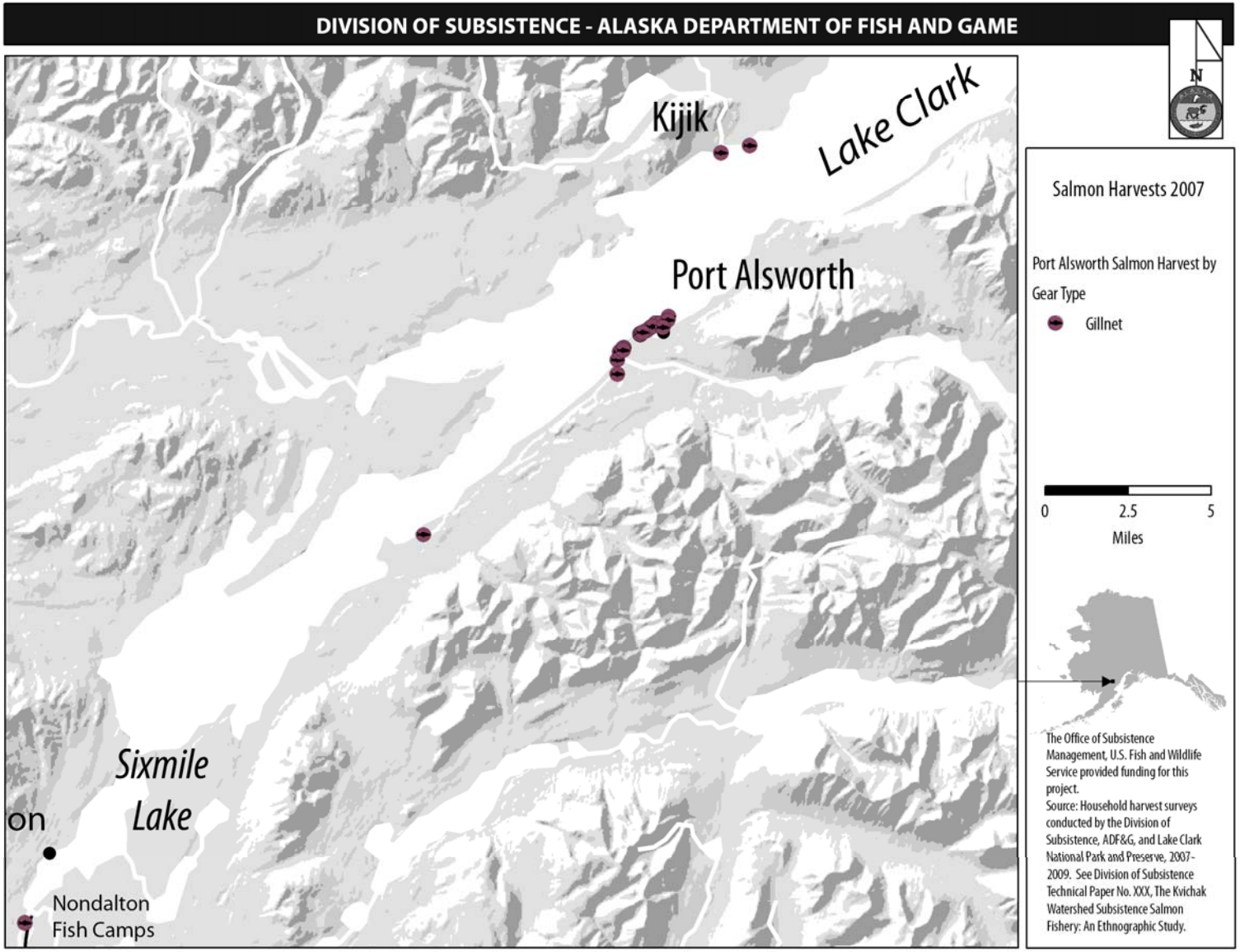

Figure 43.–Port Alsworth salmon harvests, by gear type, 2007.

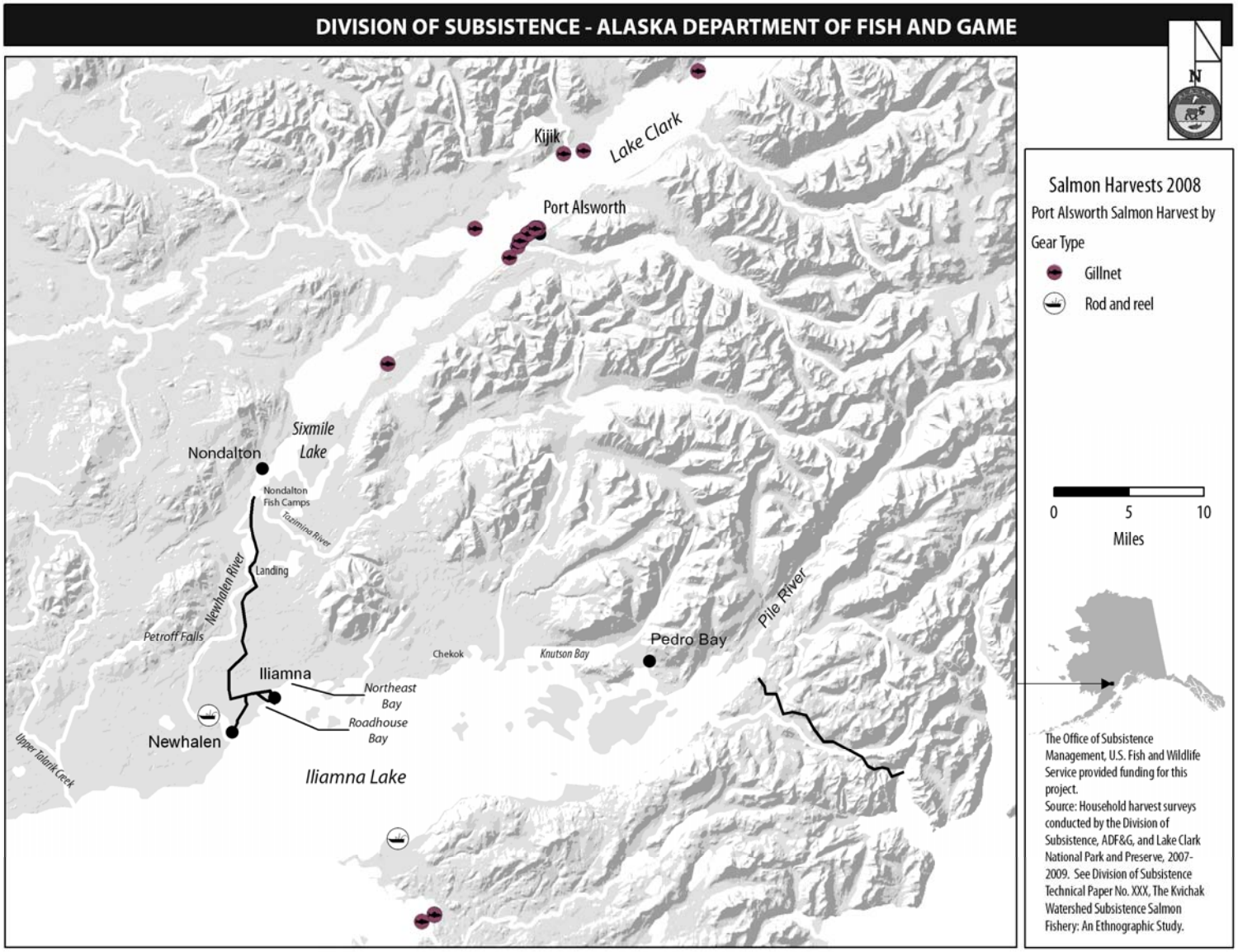

Figure 44.–Port Alsworth salmon harvests, by gear type, 2008.

Table 31.–"Why did your household not get enough salmon to meet its needs?" Combined responses from all study community households.

2007	Percentage
Death in the family	4%
Gave too much away	12%
Lack of gear	16%
Lack of fish	8%
Out of town	12%
Time constraints	24%
Too inexperienced	4%
No response	20%

2008	Percentage
Didn't predict needs accurately	18%
Lack of gear	9%
Relied on others for salmon	9%
Time constraints	46%
No response	18%

Analysis of the Number of People Named on Subsistence Salmon Permits 2008

The importance of a sufficient labor pool and the role of extended families in harvesting and processing subsistence salmon in the study communities can be demonstrated by analyzing the number of individuals named on subsistence permits in 2008 (Table 32). For example, in Newhalen, 129 names are recorded on the 28 subsistence salmon permits issued to Newhalen households in 2008, which is an average of 4.6 names per permit. Because some names appeared on more than 1 permit, this total of 129 names actually represents 118 individuals. Of the 129 names recorded on permits, there were 45 instances (representing 43 individuals) of nonhousehold member names recorded on a permit. This was 35% of all persons named on the Newhalen permits. Of the 28 permits, 6 (21%) recorded the names of only those people who lived in the household. Eleven permits (39%) listed individuals living in 1 other household in addition to the household of the permit holder, 7 permits (28%) listed individuals living in 2 other households, 3 permits (11%) listed individuals living in 3 other households, and 1 list individuals living in 5 other households.

The pattern in Nondalton in 2008 was similar to that in Newhalen (Table 32). On average, 5.4 persons were named on subsistence salmon permits. Of the total 81 persons named, 25 (31%) were not members of the household of the permit holder. Unlike Newhalen, there were no cases in Nondalton in which a person was named on more than 1 permit. Like Newhalen, many permits issued in Nondalton represented multiple households: 8 permits (53%) named only those persons from the permit holder's household, but 4 named people from 2 households, 1 represented 3 households, and 2 represented 4 households.

Iliamna exhibited similar patterns to those of Nondalton. In Iliamna, 108 names were recorded on the 23 subsistence salmon permits issued to Iliamna households in 2008, which is an average of 4.7 persons per permit. No person was named on more than 1 Iliamna permit; therefore this total of 108 names represented 108 individuals. Of the 108 names recorded on permits, there were 37 instances, representing 37 distinct individuals, of nonhousehold member names recorded on a permit. This was 34% of all persons named on the Iliamna permits. Of the 23 permits, 11 (48%) recorded the names of only those people who lived in the household, 6 permits (26%) listed individuals living in 1 other household in addition to the household of the permit holder, 4 permits (17%) included individuals from 2 additional households, and 2 permits (9%) listed individuals living in 3 additional households.

In contrast, only 1 permit issued to residents of Port Alsworth in 2008 had the name of an individual who was not a member of the permit holder's household (1 person out of 92 names recorded on permits; 1%). On average, 4.0 names were recorded on Port Alsworth subsistence salmon permits in 2008. Although cooperation and sharing does occur in Port Alsworth, as shown in several of the case studies, it appears to be more common for nuclear families to harvest salmon by themselves, perhaps with borrowed gear, and more common to process salmon at shared facilities. When 2 or more Port Alsworth nuclear families work together, they evidently each obtain their own permits.

Table 32.–Analysis of the number of persons named on subsistence permits, study communities, 2008.

	Iliamna	Newhalen	Nondalton	Port Alsworth
Number of permits issued	23	28	15	23
Total names on permits [a]	108	129	81	92
Average number of names per permit	4.7	4.6	5.4	4.0
Total number of names on permits who were not members of permitted household [a]	37[d]	45[e]	25	1
Total number of individuals named on permits [b]	108	118	81	89
Total number of individuals named on permit of another household [b]	37	43	25	1
Number of households represented on permits [c]				
1 household	11	6	8	22
2 households	6	11	4	1
3 households	4	7	1	0
4 households	2	3	2	0
5 households	0	0	0	0
6 households	0	1	0	0

a. Number of names = sum of names that appear on individual permits; includes instances where the same person was named on different permits; includes all persons regardless of place of residence.

b. Number of individuals excludes instances where the same person was named on more than 1 permit.

c. Minimum number of households.

d. Six individuals named on Iliamna permits were also named on permits held by residents of communities other than Iliamna (but issued in Iliamna or Newhalen).

e. Four individuals named on Newhalen permits were also named on the permits of Iliamna households.

THE SOCIAL CONTEXT OF SUBSISTENCE FISHING FOR 4 CASE STUDY FAMILIES

Family Documentation from September 2007 through March 2008

In the following section, the social context of subsistence harvest activities over a calendar year is explored through summarizing the results of bimonthly interviews with 4 families. These summaries also illustrate the significance of the sockeye salmon fishery within the context of residents' overall annual subsistence harvest cycle, or seasonal round.

Iliamna Case Family

Social Organization

This Alaska Native family consisted of 2 adults in their mid 50s and early 60s. Lary Hill spent much of his early life in Nondalton. His mother was from Tanalian on Lake Clark. She met and married Lary's father, who was from Iliamna, and they moved to Levelock and then Naknek. Lary's wife, Emma Hill, was also a lifelong regional resident. Her father was Nels Hedlund, a Yup'ik man from Eek, a community on the lower Kuskokwim River. Her mother was Rose Kinney, a Dena'ina woman who was born at Chekok on Iliamna Lake and who, after returning to the area with Nels, remained a resident on the family's homestead. Both Lary and Emma were school teachers who had taught in the region but who were retired from teaching at the time of this project. Emma was employed full time on an intermittent basis by the Pebble Limited Partnership (PLP). Lary occasionally worked for PLP as a "bear guard" and was an active member of the Lake Clark National Park Subsistence Resource Commission.

Their 2 children (a girl and boy) were grown and had moved to the Anchorage area. The couple regularly entertained their 3 grandchildren, all boys ranging in age from 7 to 10, through much of the summer and during winter and spring school vacations (Figure 45). Although the Hills' grandchildren did not live in the community or region and were urban Alaskans, they accompanied their grandparents on many of their year-round outings and spent much of their time engaged in subsistence activities during visits.

The Hill's primarily subsistence fish camp and secondary residence was at Mink Creek, on the northern shore of the eastern end of Iliamna Lake. Their daughter visited them at Mink Creek June 17–August 3, 2008, in order to assist with the salmon harvest. She had been working for the Anchorage School District in Eagle River, Alaska, but decided to quit her job in order to spend the summer with her parents. This was the first time she had cut fish, and she said that she quit her job in part because she wanted to learn and carry on this tradition.

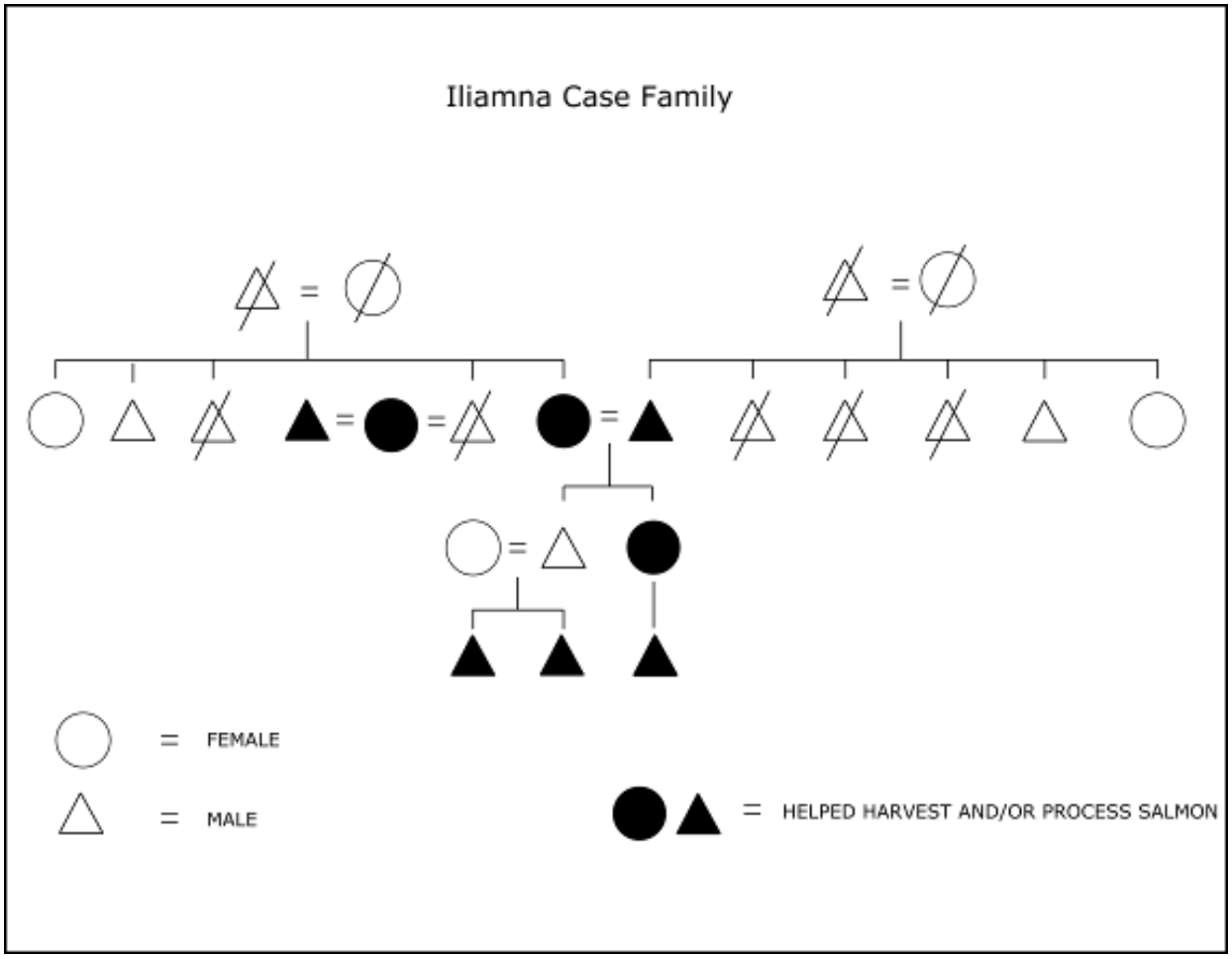

Figure 45.–Kinship relations, Iliamna case family.

Other extended family members involved in annual subsistence harvest activities included Emma's brother and his wife, and Emma's (former) sister-in-law (she was married to Emma's brother, who is now deceased). The sister-in-law, who is non-Native, had remarried and was the only family member to live year-round on her portion of her family's allotment on Fox Bay. Her home did not have a freezer, thus canning and smoking fish was crucial for her household. The sister-in-law also had an extensive garden, and she canned her vegetables and berries as well as her fish.

October–December 2007

Spawning Sockeye Salmon: Emma and Lary harvested and processed fall fish (spawning sockeye salmon, see Footnote 6) early in October during a short window of weather they said was perfect for the activity. During processing the weather was very cold, and temperatures went below freezing for 1–2 weeks. Then the weather warmed and it began to rain, which caused problems for many who freeze-dried fall fish in order to keep them from spoiling or "getting sour". Emma and Lary were able to keep their harvest dry because it was hung inside an open shed which they had further protected by surrounding it with a bear-proof electric fence. Usually, they said, it took about a month for fall fish to dry, but that year, due to the inclement weather, it took closer to 1½ months to dry.

Nonsalmon Fishing: The couple said they like to go ice fishing in the fall, but because the weather in 2007 was unusually mild they did not have the chance. However, Emma related that fall was the prime time to fish for "trout" (trout and char, unknown species) and other nonsalmon species:

> November, in the fall time. When the lake first starts freezing, and the bays, because the trout come in then. And you don't want to fish in September and October because the trout eat the fish eggs, salmon eggs, and the trout taste like them. They take on that rotten fish taste. So in November they're ... oh, you catch them and they bite real quick. They're so much fun to catch. And you fry them and they are so good. So, November is a good month, and [in] December and January there usually aren't many, for some reason. The older people, Mom, used to say that, when it gets cold, trout go out into the deep and they kind of hibernate on the bottom. And then February and March they come back out into the warmer water. So March, maybe end of February and the month of March and April, are really good ice fishing. You catch quite a few. And they taste really good.

Subsistence Foods No Longer Eaten: The Hills occasionally received seal products, primarily in the form of oil or blubber, but did not target seals themselves. Other foods they had consumed in the past but did not in present day included beavers, porcupines, and bears. The foods that were still preferred included almost all fish, moose, caribou (now rarely seen locally, they said), berries, bird eggs, and almost all birds. The Hills said that the changes in the variety of subsistence foods that have occurred since their youth were mainly due to better storage capabilities and increased technological advances that allowed long term preservation of preferred foods.

December 2007–February 2008

Nonsalmon Fishing: On December 28 the couple caught rainbow trout and Arctic grayling at Landing on the Newhalen River. The temperature was about 30°F, it had just snowed, and their grandsons were visiting, all of which they felt were good reasons to go fishing. They caught 12 Arctic grayling and rainbow trout, in combination. A few days later they went to West Bay to fish, but the temperature had dropped significantly and the wind was blowing. They had 2 younger grandsons with them so they did not stay long. They managed to harvest a few fish before they left.

On January 30, 2008, while in Naknek for a funeral, they fished for rainbow smelt *Osmerus mordax* ("smelting"), which they said was a popular activity in that community. Emma said, "It was cold, but that's when you smelt." They caught 158 fish, which were placed in zipper-top plastic bags, about 25 fish to a 1 gal bag, and then frozen. They gave away 5 bags and kept 1 for themselves. They gave them to a number of extended family members, who in turn gave some to others. The family said that smelt were typically gutted and then fried.

Consumption and Distribution of Wild Foods: This family estimated that about 50% of their food was wild-caught food, and fish was a big part of their diet. Throughout the year, Emma prepared fish, salmon or nonsalmon, for dinner at least 3 times per week.

During the summer, after all the strips were cut from the smoked salmon fillets, they were canned or bagged and then frozen. As they were processing, Emma often boiled the tips, the collars, and other uneven leftover pieces for lunch. The family and kids liked the smoked and dried fish for lunches, snacks with tea, and for picnics and hunting expeditions. These were usually what they ran out of first. Canned fresh salmon was used on a weekly basis. The salmon most often used for sharing and as gifts to friends and family was the canned smoked fish. Emma's sister, who lived in the state of Washington and thus did not process salmon, was sent a gift package every year. They also shared with elders in the community no longer able to go out and get their own food.

They felt that others in their community ate about the same percentage of fish and wild-caught food as they did, or perhaps a larger percentage.

February–March 2008

Nonsalmon Fishing: On March 9, the Hills took their 3 grandsons fishing at West Bay (the bay near the Iliamna grocery store). The boys used little rubber eggs and caught 3 Dolly Varden and 1 lake trout. The boys were on their school spring break. They had hoped to harvest more fish, since March was the month for such activities, but the weather was too cold. A few days later, they went out again, however, and over the course of 3 separate outings, 3 more fish were caught. These fish were frozen to eat later, as, they said, a single fish did not make much of a meal. Emma also said that there were plenty of outings when no fish were caught, or when the fish were too small and were released. On March 30, Emma took La Vine to Landing where she borrowed ice fishing gear, learned to "chum a hole,"[16] and caught 6 small fish, including trout (unknown species) and Arctic grayling (Plate 26). Emma made tiny fillets of each fish and sent La Vine home with them, where she pan-fried them for supper.

Emma said that there were northern pike in the small lake adjacent to their home in Iliamna. While they were able to catch northern pike at this location in the summer, they had never been able to catch northern pike through the ice in the winter.

Large Land Mammals: The Hills did not go hunting, but they had been given some caribou by another community member. It was "just enough for a meal," they said.

March–June 2008

Nonsalmon Fishing: Lary went on an overnight fishing trip to Lake Clark on April 10. He went with his nephew, Emma's brother, and a friend from Pope Vannoy. They caught a number of northern pike, lake trout, and burbot *Lota lota*, which were split between the men. That evening, they ate deer meat from Kodiak, given to them by the friend from Pope Vannoy.

Bird egg gathering: On May 29, Lary went "egging" with Emma's brother and harvested about 36 gull eggs (from unknown species). On June 7, a friend from the community gave them more gull eggs, as well as smaller tern eggs (also unknown species).

Consumption and Distribution of Wild Foods: By June 7, the Hills had 3½ pint jars of canned smoked salmon and 18 jars of canned fresh salmon remaining. There were about 4 or 5 packages of smoked dried fish in the freezer. The remainder of the fresh frozen salmon had either been recently consumed or cooked for the dog. All of the fall fish had been eaten or given to family members. Emma's brother had given them beluga whale meat .

June–August 2008

This section details the family's summer at Mink Creek, near Chekok, where Emma's mother was born and raised, and where the family homestead, now over 100 years old, was located (Plate 27). After her

[16] For this family, "to chum a hole" meant to lure fish closer to the hole with a sprinkling of salted salmon eggs.

parent's death, the family property was divided between Emma and her 2 brothers. The family referred to Emma's portion of the allotment as Mink Creek. According to Emma and Lary, the village of Chekok was originally located in a canyon further in the mountains. They explained that Chekok was an "Indian" name for "paint valley," because of the clay, which was used for paint, found in the canyon.[17] In 2008, the family left for Mink Creek on June 9, and they were accompanied by one of their grandsons.

Fish Camp Preparation: According to the Hills:

> Well, you have to have your smokehouse ready, and your wood ready, everything ready, before you even get the first fish. So we'd start getting our wood ... we like to get it in the spring. And last winter was good … we went up with four-wheelers first, and we got our cottonwood up in the creeks and pulled them down on the ice and then stacked them. So we had our wood in March. And then in June ... the fish come end of June, first of July. And we move up at the end of May. So the month of June, if the smokehouse needs repairs of any kind, that's when you do it. If you need new smoke poles, that's when you get them. And then I always put fresh gravel in the smokehouse, clean it out, you know. You don't want a dirty smokehouse: that's where you put your food. So you get everything ready in June for the fish in July.

They said that they usually transported a few loads of supplies to Chekok in early summer, prior to moving there for the season. When they arrive at their fish camp, they spend a lot of their time repairing nets, making sure the smokehouse and poles are clean and ready, and splitting the wood they had gathered in the spring for the smokehouse. Emma also added:

> May tenth is my last day of work and then we're going to start. We have to haul groceries and all kinds of supplies up for the summer and Lary just got us smokehouse wood last week. He went up snow machining. And we use cottonwood, and we like to get it in March or May and give it time to dry out a bit, because if it's too wet it puts, like, creosote on the fish. Birch too, if you use it when it's too green. So we kind of let it dry out so it doesn't put out so much creosote.

Emma said that wood that is too green makes the fish taste too strongly of smoke, and leaves a film as well. She preferred poplar to birch because the flavor was not as strong and it smelled a little sweeter. They also take time to picnic, gather bird eggs, fish for trout and char, and generally enjoy themselves before the big push of work.

Migratory Waterfowl Hunting and Bird Egg Gathering: Lary, Emma, their grandson, and Emma's brother and his wife went duck hunting and egg gathering on June 9, the day they moved to Mink Creek. The brother shot 2 ducks and took them to his home, and the 9 eggs harvested were split between the 2 families. While on the outing they had a picnic supper.

Nonsalmon Fishing: On June 10, the same family members listed above went rod and reel fishing. They harvested 3 rainbow trout and 1 Dolly Varden, which the brother's wife then gave to an elder in the village. They had another picnic and harvested bird eggs, including 5 seagull eggs and 9 gull eggs (all of unknown species). In general, they said, when they first arrive at Mink Creek they use rod and reel to fish, and sometimes use the "trout net" (a small-meshed net that residents usually call a "whitefish net") before the salmon arrive in late June.

Emma and Larry said: "You do not eat trout in the summertime. You eat trout all winter long, so by the time the salmon arrive salmon are like the 'prime rib' of fish." In any case, they said, they did not like the taste of trout after the salmon arrived because the fish often tasted of the spawned-out salmon carcasses on which they were feeding.

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[17] The Dena'ina name is *Chix Kaq'* or "ochre mouth;" that is, the mouth of "red ochre creek" (Kari and Kari 1982:22).

Plate 26.–Subsistence fishing through the ice for nonsalmon fish at Landing.

Plate 27.–Subsistence fish drying at the Hill family's homestead, Mink Creek.

Emma said that the family has to travel to Nondalton in order to harvest whitefish ("with the big hump on their back"). She said that these fish usually could not be found in Iliamna Lake, except near the community of Igiugig.

Fish Camp: Until the death of Emma's mother in 2004, the Hills processed fish at her mother's smokehouse, about 1 mi from Mink Creek. When Emma's mother was unable to contribute significantly to the work of processing fish, she still enjoyed staying at fish camp, and so the family kept the activity at her camp. Emma said that her mother would always keep track of the work, wanting to know how much fish was processed, the number of cans, and the different processing methods. By 2003, her mother was no longer able to come to Chekok due to poor health. In addition, a bear had damaged the homestead. In 2004, Emma and Lary built a new smokehouse on the beach at Mink Creek. Emma's sister-in-law now joins them there to harvest and process most of her fish.

The Hills had set their "trout net" early in the season. They had set their first salmon net on June 30 and their last on July 11 (Plate 28). They set the nets at 2 different sites on Lake Iliamna: 1 at "Tern Island" in Fox Bay and the other in Box Bay at Mink Creek. Staff at the University of Washington Fisheries Research Institute (FRI) site near Chekok told Lary he could use one of their seine nets that summer, and they said that while they appreciated the offer and the harvest method, they did not have enough people on hand to properly seine. Emma said that to best use a seine fishers need to find a school of fish, which they don't do in the summer along the shores of Iliamna Lake as much they do near Nondalton at the outlet of Sixmile Lake into the Newhalen River.

Plate 28.–Picking the salmon net, Iliamna.

Lary, with additional help from the eldest grandson and the husband of Emma's sister-in-law, set and picked the nets. They said that they used to set the nets overnight, but had recently started setting the net in the morning to stop the bears from raiding and tearing their nets while the family slept. If nets were set overnight, Emma's sister-in-law picked the nets in the morning. She arrived early at the site, and if there were fish to process, she began removing the heads and viscera. The 2 women traditionally removed the heads and viscera, and filleted and cut strips of salmon by themselves, although in 2008 Emma's daughter joined them at the cutting table for the first time.

The first fish was canned fresh and not smoked. Emma also used much of the backbone meat left over from cutting strips for canning. Salmon harvested later in the summer were cut into strips, hung and smoked for 2 days in the smokehouse, and then canned (Plate 29). Emma didn't brine her fish; instead, she salted it as she was taught. After salting her fish, she rinsed it before hanging. Fish harvested later in the summer were also salted. To make fresh frozen fish, coordinated trips into Iliamna were required because there was no freezer at Mink Creek.

Plate 29.–Emma Hill checks some subsistence fish hanging in her smokehouse, Iliamna.

The family's concerted efforts picking the net and processing the salmon took about 1 week. Then the salmon dried for about 10 days to 2 weeks. Thus, the entire effort took about 3 weeks to process and preserve all the salmon. In summer 2008, they processed a total of 246 salmon for their immediate family, including 5 fish that were eaten fresh. They processed about 4½ cases of pint jars with canned fresh salmon, and about 4 cases of half-pint jars of smoked salmon. They froze about 10 quart bags of smoked dried fish, and brought some whole fish to Iliamna to freeze. But, they said, they fewer less frozen fish in

2008 than in other years because the weather and the sockeye salmon run did not align for the family to make the trips to town.

Emma and Lary noted that they usually returned to Iliamna by the time the fireweed lost its bloom.

At least one-fourth of what they processed from the sockeye salmon fishery was immediately shared with their 2 children and 3 grandchildren, as well as with friends.

They said that they usually pick 15–20 gal of various species of berries each year. During the summer of 2008 they picked at least 5 gal of various species of salmonberries ("cloudberries"), and then continually picked, ate, and froze all other summer and fall berries, such as various species of blueberries, crowberries ("blackberries"), currants, and cranberries.

August–November 2008

On September 5, Emma's brother gave Emma and Lary the leg of a moose because the Hills did not have a successful hunt. They were able to package about 50 lb of this meat.

During an interview in August 2008, Lary spoke about changing migration patterns and behaviors of the caribou in the region. In one case he said, while he was on bear watch for PLP, he came across an entire herd of caribou that had bedded down in an alder stand, which he felt was unusual. They had been stripping the bark from the alders, and appeared to be trying to avoid the noise from the helicopter activity at the nearby mine development site.

Three spruce grouse *Dendragapus canadensis* (often called "spruce hens") were harvested at Mink Creek when Emma and Lary were there processing fall fish (see below). Emma made a "pot roast" from the spruce grouse and she said they ate this for the 3 days of their stay.

From October 2–5, Emma and Lary stayed at Mink Creek to harvest fall fish. They said that they preferred to harvest fall fish at Knutson Bay by seine, but that year they had used their gillnet, so they could not select the fish as they could have if they had used a seine (Plate 30). An inability to select fish in the right condition for fall processing can cause a preservation problem, they said, because if they harvested fish that had pink flesh, it had not yet used all its fat reserves and was more likely to spoil. They headed and gutted 54 spawning sockeye salmon and brought the fish back to Iliamna to dry.

Also while at Mink Creek to fish for spawning sockeye salmon, they picked 4 gal of various species of cranberries, which were frozen and later made into jams and pies.

Plate 30.–Removing fall fish from a subsistence gillnet used as a seine, Iliamna.

Newhalen Case Family

Social Organization

This Alaska Native family consisted of 2 adults in their 50s and 5 living children. Three of the 5 children were grown and were living with spouses and children of their own. The 2 children who lived at home were a 13 year old girl and a 19 year old boy. Raymond and Joanne Wassillie, lifelong members of the community, were both employed by the Newhalen Tribal Council with positions of leadership, thus they were invested in the administration and needs of the village.

The Wassillie's eldest daughter and her family lived in Igiugig, and their 2 sons lived in Newhalen with their families. All family members participated in many harvest activities as an extended family, including fishing year-round and hunting for moose and caribou. At the time of this project, the youngest Wassillie daughter expressed no interest in processing fish.

Other extended family members that participated in group efforts included Raymond and Joanne's siblings and their spouses and children, and Joanne's mother. When referencing their subsistence activities they often spoke of dividing effort and costs and sharing the resources among 6 or 7 households. However, in examples such as the fall fishing expedition, more households were often involved.

October–December 2007

Raymond, Joanne, and members of their extended family took advantage of a short window of opportunity provided by the weather to travel to Knutson Bay to harvest spawning sockeye salmon. The

weather was rough during the trip and it took 3–4 hours to travel to Knutson Bay. The weather turned nice once they arrived, and it took only 2 hours to return. The family had discussed a return trip later in the year to get more fall fish, because, according to Raymond's mother, salmon remained at this location until January, but the weather never cooperated. This family preferred male fall fish, but they kept some females because the elder women liked the salmon roe. The family also salted salmon roe for use as bait during winter fishing. Another way this family used spawning female salmon was to prepare *knuktuk*, or "upside-down fish." Joanne explained: "We hang the females whole with the guts and the eggs, everything but the head. Just tie a string on the tail and hang them whole like that." Once they were dried, they were boiled and then consumed.

This family used an orange plastic brailer to harvest fish. Ray explained:

> The reason why we do that is in the fall time they have their teeth, their fall teeth out, and they're about this long and you can get fish poison from them, so what I do is use brailers in the fall time because what they do is connect up, catch on the brailer, and they're easier to take off.

They also used the brailer to seine, because, Ray said, a gillnet would harvest more fish than they actually needed and the brailer did not do that (Plate 31). He also cited the speed and ease of taking the fish—it took them 40 minutes to harvest about 500 fish—a significant advantage in fall when weather could change very quickly. During fall fishing, some of the younger boys also caught fish with a rod and reel, but it was "for fun," rather than an effective means of harvesting.

Plate 31.–Using a brailer as a subsistence seine net, Newhalen.

The processing of fall fish was a communal effort between all the family members and the various households that shared the fish (Plate 32). Processing at one table were 7 senior women who generally directed 4 separate extended family groups during the summer processing of bright sockeye salmon. They said that this was the first year all 7 had processed fall fish together as a group. They used *uluaqs* to split the fish.

Plate 32.–Fall fish processing group, Newhalen.

This family did not use standard fish racks to dry fish. Instead, the fall fish were hung on pieces of wood, about 2 in by 2 in, attached to their home under the eaves. They said they dry fall fish this way because of past troubles they have had with bears. They said that bears were more dangerous in the fall than in the spring.

Another community family who also wanted fall fish worked alongside this family to harvest, cut, and hang the fish. They divided the harvest between households only after the process was complete.

They said that they once went to Kijik on Lake Clark to get fall fish and that the salmon there were larger and oilier than the fish they harvested at Knutson Bay.

There was an early freeze in 2007 and the ice was thick enough by November 15 so that the family could go ice fishing at Landing, about 10 ft from shore, where they harvested mostly rainbow trout. (Plate 33) They then fished at the lagoon at the mouth of the Newhalen River on November 16. At that time, they said, the ice covered the entire lagoon area. Soon after this, however, the weather warmed and the ice

melted. Nevertheless, this family said they traveled to Landing frequently in order to fish with a rod and reel from the bank or through the ice on the river. On average, they said, they fished 2–3 times per week in the winter if the weather was right, using salted sockeye salmon eggs as bait. They preferred using eggs from fall fish instead of summer fish because they were looser and did not need to be "worked" as much to separate the eggs from the sac.

Plate 33.–Subsistence fishing through the ice at Landing, November 2007.

Fishing for nonsalmon species, especially through the ice, was very important to this family. Joanne said:

> Last year it was a lot colder so we were able to go out quite a bit. If it's cold out, we'll probably go fishing; if it's nice, we'll probably go at least maybe three times a week. And then the fish we catch, we bring it to my mom or his mom or [2 elders]. And then some times if we got quite a bit we just throw them in the freezer. With bag and water. And then when I fry mine, the little frying pan size, I usually just make a little slit right on the stomach part and pull out the guts and fry it whole. The head and all. And if you fry it crispy you can just eat the bone and all.

About her hopes for the coming months, Joanne said:

> If it freezes, gets really cold and freezes, we spend a lot of time, we'd go across the river, go down to Pete Andrew's [east of the community], try to catch some grayling, go to

> Upper Talarik Creek and they have the bigger rainbows [trout] down there. If that lake is frozen that's what we'd be doing. And now since it's been so warm we've been just driving up to the Landing to go fish ... usually I'll just use the string with a small little hook with a plastic egg on it and Ray will use a rod.

In winter, they split and freeze dried the large rainbow trout they harvested at Lower Talarik Creek, much like the process they used for preserving fall sockeye salmon.

This family reported that meat from large land mammals was in short supply. They said that many people in the community relied on "leftover" meat given to them by sport hunters, but said that the meat was often improperly treated and had spoiled in the field. They expressed concerns about caribou harvest limits because it was common for just a few hunters to harvest and distribute caribou for the entire community. At the time of the interview there was a limit of 2 caribou per hunter, but the price of fuel was rising and they thought it was more cost effective to send only a few hunters rather than 1 per household or family.

This family ate fish about 3 times per week. The fall fish was shared between about 10 households. Joanne reported, "There was his mom, my mom, [3 of his sisters, and an elder]; there's my family, my other son, his other son's family, and there was one more." The couple had hoped to get more fall fish, because the 500 fish shared between 10 households meant that each family had fewer fall fish than they needed.

This extended family had a lot of freezer space due to the amount of resources shared between families. Ray and Joanne kept a large number of frozen salmon fillets. Ray's mother kept most of the smoked fish at her house and whenever Ray and Joanne needed smoked fish they went to the mother's house. Ray and Joanne said they usually ran out of canned fish first.

December 2007–February 2008

Not long after La Vine's visit, the weather turned very cold. Although it made the ice form quickly on Lake Iliamna, which enabled ice fishing to occur, the weather was too cold to stay outside for long periods of time. The family managed to ice fish in early February, but the temperatures were around –35°F. Every time they made a hole, the line would freeze, they said (Plate 34). And the fish weren't biting, because, Joanne and Ray said, it was too cold. During a trip earlier in the month, they harvested about 30 "brook trout"[18] across the river. By the end of February, the weather had improved and on February 24 they joined approximately 30 people and fished through the ice for about 4 hours. The Wassillies harvested about 8 fish.

[18] Most likely a population of lake trout, which residents also call "mountain" trout, with different coloration than the other populations of lake trout in the area.

Plate 34.–Subsistence fishing through the ice for nonsalmon fish at –35°F, February 2008.

In discussing their preferred and normal activity for the months of February and March, Joanne and Ray mentioned the locations of residents' ice fishing efforts. Sucker Lake and Schoolhouse Lake near Newhalen, and Tommy Point across Iliamna Lake were favored locations to target northern pike. The dock in Iliamna was a place people fished for "brook trout" in the winter and they said that rainbow trout were plentiful in Lower Talarik Creek. The Wassillies' said that they often went to Lower Talarik Creek in the spring, when there were more daylight hours.

The couple spoke of their difficulties in participating in the winter moose hunt because they could not travel across the river, which had not frozen, to prime hunting grounds. They discussed submitting regulatory proposals to adjust the timing of their moose hunts or other similar subsistence activities in response to environmental or weather-related impediments. Joanne said, "And so that's one thing he was talking to Theodore [Krieg] about is just to see if they could move our hunting time later because it takes one until January, first week of January, when our river finally froze." The 2 oldest sons and Joanne's brother hunted for caribou late in January, when the temperature was –25°F. The boys traveled towards the Nushagak River, between Levelock and New Stuyahok, before they were able to find any animals. They were able to bring 3 caribou home. Joanne said:

> Well just for him to start off, thirty gallons of gas at six dollars, so you're looking at a hundred and eighty dollars right there. Then they had to gas up in Igiugig and gas up in Levelock in order for them to come back home. So probably three, four hundred dollars

> ... And the three caribou fed my family, my mom's family, his mom's family, his sister, the other sister, a brother, and one more brother.

March–November 2008

After the February visit, La Vine was able to meet one final time with the Newhalen family. There was spotty communication with the family from March to November 2008, but the following data could be gathered.

The biggest change for this family during this period was their participation in the commercial fishery in Bristol Bay. Their son usually used the family commercial fishing permit, but in 2008 he had wage employment away from the region and they had to make an emergency transfer of the permit to their name in order to fish for the season. Unfortunately, they said, they made little to no money. The cost of fuel, coupled with the low price per pound the canneries were willing to pay (60 cents per pound, if they were buying at all, they said), did not make the effort worthwhile.

On their return in August, they harvested and processed about 31 salmon, but they said that the salmon were fairly lean and the meat was already getting "mushy." Fish had been harvested and processed for them over the summer by those family members who had remained in the community, and they were also able to harvest and process fall fish on October 24, which they immediately froze. The family harvested 2 moose during the fall hunt, the meat of which was shared with their parents, uncles, and aunts. However, by the time of the final interview in November, their store of meat was almost exhausted and they were hoping to harvest another moose or caribou during the winter hunt. A concern continually expressed by the Wassillies was the high price of fuel and their ability to purchase bulk fuel for their home, especially closer to the time when their supply was due to run out, in January 2009, which was also the coldest time of year.

Nondalton Case Family

Social Organization

The Nondalton case study family, Clyde Trefon and Valerie Engebretson, were highly motivated individuals who relied on subsistence harvests to sustain their family throughout the year. When selected for this project, the family consisted of 2 adults and 6 children. The adults were in their 30s and 40s and the children ranged in age from 2 to 20 (Figure 46). Clyde was a firefighter during summer 2007 and also worked part time, and then full time for the Village of Nondalton. Valerie worked for the Lake and Peninsula School District.

Clyde was a lifelong Nondalton resident. Although he spent a small amount of time outside the community as a youth for educational purposes, Nondalton was his home, and the only place he wanted to live. The family fish camp was built by Clyde's paternal grandfather and Clyde grew up participating in salmon harvesting activities at this camp. His parents lived in Port Alsworth, where they harvested and processed their own subsistence salmon.

Valerie's family was from Nondalton and Iliamna. She spent 13 years of her early life in Anchor Point, Alaska, and other Alaskan communities, and then she returned to Nondalton as a young adult. She first learned to process salmon in 1995, when she was in her 20s. Clyde's mother taught her.

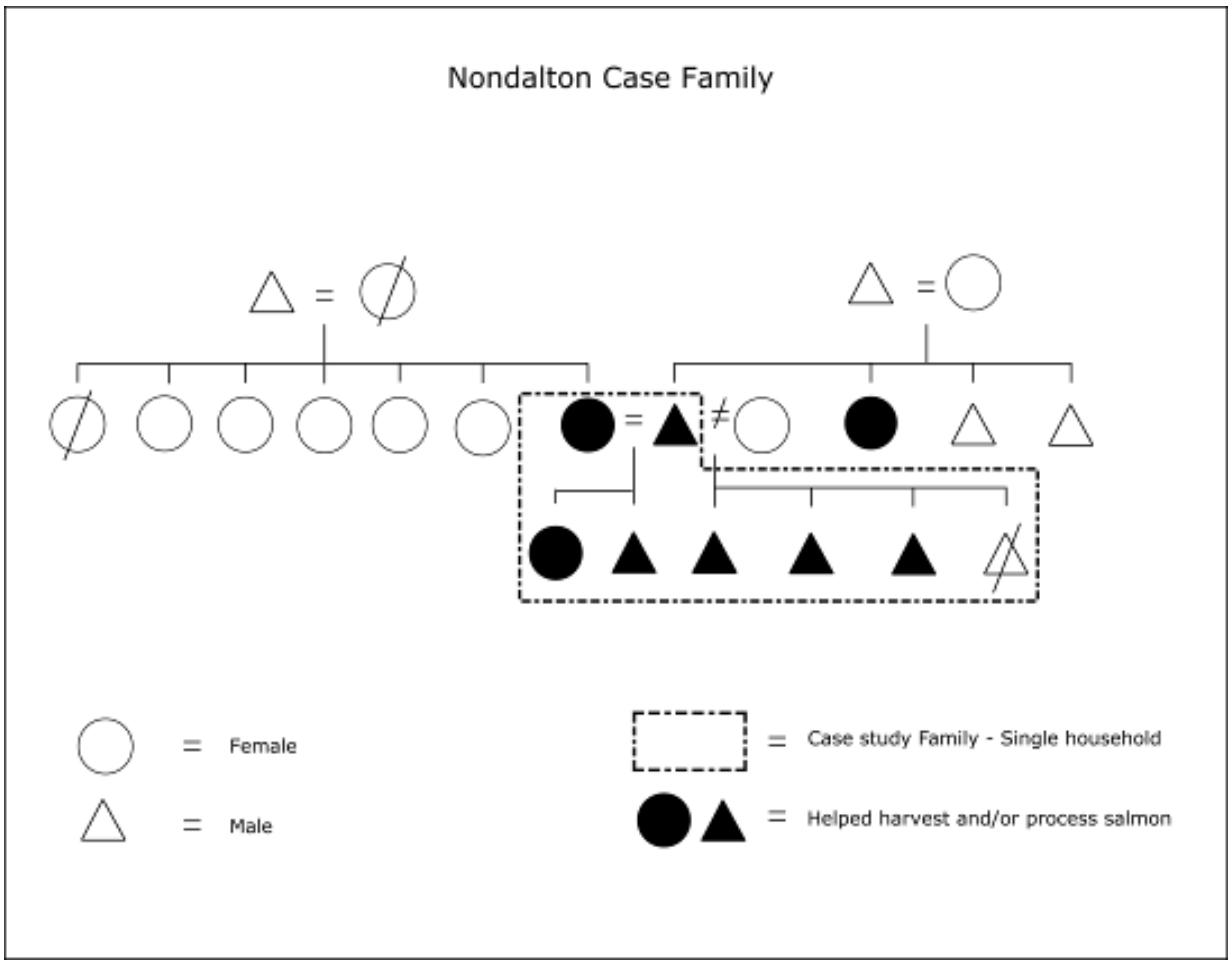

Figure 46.–Kinship relations, Nondalton case study family.

At the beginning of the project, Clyde and Valerie had 6 children living with them: Clyde's 4 from a previous relationship and Clyde and Valerie's 2. Sadly, Clyde's eldest child, who was 20 years old, passed away near the time this project began. The other children were 4 boys ranging in age from 10 to 17 and a 2-year-old girl (Figure 46). The boys were very active and assisted the family with all subsistence harvest activities, including their extensive preparations for summer fish camp. During fishing season they accompanied Clyde downriver to Landing to set and pick the net. They also assisted with many other tasks, such as heading and gutting the salmon, tying and hanging the backbones, hanging the salmon strips, moving them to the smokehouse, maintaining the camp and net, as well as helping their father gather firewood. The family said that the 2-year-old (who turned 3 in 2008) also "helped a lot in her own little way … all summer." In many of the photos taken over the course of the year, she was often in the middle of the action: going on trips with her family, closely watching all the activities of her brothers, and helping her mother process salmon.

Extended family and close friends in the community were occasional participants throughout the year. Clyde's brother and his sister and her husband often accompanied the family on subsistence outings. During summer, they would occasionally "get fish" with Clyde and Valerie, but they usually processed and preserved salmon at their own camps. Clyde's young nephew spent a lot of time at fish camp during summer, and was a year-round playmate of the children. The nephew also often participated in outings to Landing to help harvest salmon, and provided assistance, along with the other children, in the fish camp, such as helping to hang the net on the bone racks and cleaning it of debris.

During summer 2008, a few visitors not related to the family spent a significant amount of time with the family at fish camp. A young woman and her 2-year-old girl came for part of the summer while other family members were away. She expressed interest in learning how to preserve fish, but she mostly contributed by picking the nets and collecting firewood for the smokehouse. Another visitor, a student pursuing a doctoral-level anthropology degree who had been conducting research in Nondalton, also visited the fish camp. She learned how to set and pick the net, process the salmon, and managed to be a big help in the family's harvest efforts that summer.

October–December 2007

This family also liked to make *nudelvay* or "fall fish" (see Footnote 6) in October, when temperatures were below freezing and the insects were gone, but when there was little snow or ice to hinder harvest efforts. All of these conditions were essential, this family said, to assure the preservation of the *nudelvay* through freeze drying.

In October 2007 there was a brief period of good cold weather and a few people from the community were able to process fall fish at Kijik, the traditional fall fishing site for Nondalton residents. However, after this brief cold period, the weather warmed too much for effective processing of *nudelvay* and conditions became unsafe for travel, so the opportunity was missed by the case study family (and by many others in the village). Valerie said that their annual fall fish harvest typically was a family effort shared between multiple households and that they usually processed a total of 300–400 fish. Participants in this fishery included Clyde's parents, who live in Port Alsworth, Clyde's brothers, and his sister. The household would take home about 90 salmon, depending on the number harvested by the whole group. During La Vine's December visit, they said that they were still hoping to find an opportunity to harvest fall fish at Kijik.

In early October, Clyde had the opportunity to interview a man and woman, both community residents, who were on the beach in Nondalton processing the fall fish they had harvested in Kijik for an elder (Plate 35). They were planning to make 5–6 bundles (40 fish per bundle) of freeze-dried salmon, or, they said, they might also freeze it fresh or make salted fish from it.

In some areas of the Kvichak watershed (see the Iliamna and Newhalen case families, above), residents also go rod and reel fishing, either in open water or through the ice, in fall and early winter. During mild weather in early October, Clyde and Valerie went rod and reel fishing for Arctic grayling and other nonsalmon species from their boat along the upper portion of the Newhalen River. They said that this outing was catch-and-release only, and that they used it as an excuse to get out of the house and enjoy each other's company.

Also during this time of year, this family usually hunted for various species of grouse; however, the person traditionally responsible for providing the household with this bird resource was the eldest son, who had passed away in November 2007. They said they had used much of their frozen grouse during his memorial potlatch and they had only a few left in the freezer.

Their winter moose hunt usually occurred in mid December but had not occurred at the time of La Vine's visit. Not long before her visit, family members said they had had word that a herd of caribou had been seen near Lime Village. They said that a "handful" of young men from Nondalton traveled by snowmachine to where the animals had been seen and returned with 8 caribou, which were distributed to all the households in Nondalton.

Plate 35.–Fall redfish ready for processing.

Clyde and Valerie reported that they ate salmon about 3–4 times per week. They boiled, fried, and baked frozen whole salmon, and used dry fish for snacks throughout the day. Valerie was just about ready to bring out her salted fish, after 3–4 months of curing. She planned to soak it overnight, changing the water a number of times in order to reduce the saltiness. By December 2007, Clyde and Valerie had given away six 1 gal bags of dry salmon. The fish went to Clyde's parents, his cousin in Port Heiden, and family and friends throughout the region and Alaska. They said that all their salmon and berry harvests would be used by the next summer.

December 2007–March 2008

Due in part to the death in the family mentioned above, this household reported no subsistence harvest activities for December and January. Typically, they said, these are quiet months, except for moose hunting season. Clyde and Valerie were able to record their sharing as well as the subsistence activities of the village.

During La Vine's first visit in December 2007, she heard many complaints about the unseasonably warm weather, which apparently had prevented the ice from forming and thus prevented the normal harvest activities that were dependent on colder weather. By the time of her March visit, however, the weather was very cold. Clyde and Valerie mentioned that the temperatures were below zero (–10°F to –20°F) during "Slavi" (see below). Although the cold temperatures were late in arriving, they said, it was a good winter, cold and with lots of snow, like they used to have. They said that lots of snow also meant that

there will be a good berry season. They later said that this prediction turned out to be true for the summer of 2008.

Clyde and Valerie said that Nondalton residents' ice fishing starts in earnest about mid to late March, although he did mention that some people were starting to catch Arctic grayling and whitefishes (various species) in Sixmile Lake and on the river, with people apparently catching more Arctic grayling than whitefishes. Clyde said that whitefishes "run" about 1 month behind Arctic grayling. Nondalton residents, he said, prefer to travel to Chulitna Bay on Lake Clark to fish for northern pike. Arctic char and "brook trout" (probably juvenile char, see Footnote 18) were once harvested in the mountain pass leading to Lower Tazimina Lake. Burbot, he said, though usually harvested at night, had been caught during the day, which was uncommon. During La Vine's March visit, Clyde and Valerie reported seeing at least 6 ice fishing holes on Sixmile Lake. Clyde and Valerie themselves had not participated in ice fishing that winter, and explained that they did not ice fish as much as they have had in the past.

They mentioned that a community resident had a commercial permit to sell up to 12,000 lb of whitefish. They said that this man had a "jigger board" and was going to fish with a net through the ice. La Vine did not hear of any whitefish sales.

Clyde spoke about a freshwater seal hunt in Iliamna. If it was to happen, he said, it would be during this time of year. To hunt freshwater seals in Iliamna Lake, hunters follow pressure cracks in the ice in order to find the animals' breathing holes. He once tried but was unsuccessful. Clyde said that it was usually the members of Iliamna Lake communities who went seal hunting.

"Slavi," as Nondalton residents call the Russian Orthodox Christmas, was celebrated during the week of January 9, 2008. "Slaviers," community residents and visitors, sing traditional carols while traveling from house to house. They often stop to share food, tea, and coffee. Some households, like Valerie's, provided a substantial meal and for Slavi 2008. Valerie battered and fried fish, shared dry fish, and made rice and "bannock" (also called "fry" bread). That year, the Slaviers were from Nondalton and Kokhanok. Some Slaviers did not stop at Valerie's to share the meal, others came in and packaged food to go, and others stayed and shared a meal with Valerie and Clyde. Clyde said, "You see a lot of Native food during Slavi time." This level of sharing was not limited to Slavi: during late winter 2008 there were a number of community gatherings, photographed by Valerie and Clyde, that featured subsistence foods. Any occasion, the family said, that brought the community together became an opportunity to share food, most of which was fish and salmon in particular. Documented in their photos were dry fish, fresh salmon served in many ways, salted fish, fry bread, and moose stew.

By the end of March this family still had 12 "whole" salmon in the freezer and about 8 bags of dry fish, which, Valerie observed, was "not much." They had shared the summer's harvest of dry fish and salmon strips with people they met through Clyde's work as a firefighter. The salmon had been sent to family members in Mexico, Arkansas, Idaho, and Pennsylvania, as well as in-state. They were unable to eat Valerie's prized salted fish because someone had stolen the bucket before it had been opened, probably in early January.

Clyde and Valerie reported that residents also started to harvest and stockpile wood for the smokehouse in March, while they were still able to travel on the snow and ice and while the days were getting longer and warmer. But they said they also collected wood in early summer after moving to fish camp, which they said was usually far in advance of the rest of the community.

March–June 2008

During the March 2008 visit, Clyde, Valerie, and a guest remarked on a community meeting hosted by a regional environmental nonprofit group to give a presentation on the effects of copper mining on smelt and on the lifecycle of fish in the Kvichak drainage. They said that one item of interest to Nondalton residents was that they learned that the fish migrating past their side of lake (the northwest) were larger than those on the other side. They also said that the majority of the traditional village sites were on the

northwest side of the lake, which suggested to them that village site selection was based in part on this local knowledge.

Clyde and Valerie took a snowmachine ride on March 29 and photographed ice fishing holes, marked with branches, downstream of "Old Village" (Old Nondalton, located on Sixmile Lake northeast of Nondalton). Clyde's brother, his sister and her husband, and a few other members of the community also went. They ice-fished, and made a small fire over which they roasted skewered flat-dried sockeye salmon and melted snow to make Labrador tea *Ledum palustre*. They also ate cold boiled caribou ribs, salmon spread with crackers, as well as a special treat of frozen blueberries combined with Crisco and sugar, which they called *nivagi*. They were joined by 2 other parties, including one from Newhalen, all targeting northern pike through the ice. although no one had success on this trip. On April 28, a particularly beautiful day, they said, a teacher from the Nondalton school took the students ice fishing and they caught 9 fish. The students went ice fishing again on May 1 (Plate 36).

Plate 36.–Students from the Nondalton school subsistence fishing (and peering) through the ice, May 2008.

This family had received some moose meat from a Nondalton resident in April. Valerie said that they had been given all their meat from large land mammals and that they had not harvested any of their own.

On April 22, Clyde harvested 2 ducks (unknown species) near "Horseshoe Bend" on the Newhalen River. Both birds were given to elders. He and Valerie made another trip downstream of Horseshoe Bend about

1 week later, targeting geese and swans, but when Valerie stood up to take a picture, the flock flew away. (This, of course, resulted in much teasing during the interview.) On May 1, the family shot 12 geese (unknown species), again by Horseshoe Bend. The geese were plucked and processed by the boys, with the daughter close by (Plate 37). Four geese were given to Clyde's parents, and 1 each was given to 4 elders in Nondalton. The rest were eaten by the family. By June, Clyde said, waterfowl and game hunting stopped because "everything is having babies."

Plate 37.–Nondalton case study family members cleaning the subsistence harvest of geese.

The family moved to fish camp on May 25, well over 1 month before the fish were due to return. This was in part at the urging of the children, who looked forward to staying at their summer home. Preparations involved weatherizing the living quarters and general camp maintenance (Plate 38). The now eldest son, 18 by this time, had gone on a wood gathering trip earlier in the spring, so there was plenty of dry wood available on arrival. The boys cut the grass and cleared brush. They also replaced the poles for the smokehouse because the old poles, which dated from the time when Clyde's parents used the camp, had worn out. Other upkeep activities included repairing fish tables and fish boxes.

Plate 38.–Getting fish camp ready for the season, Nondalton case study family.

Valerie entered a very detailed journal account of the steps needed to prepare for the summer fishing season at fish camp. She described harvesting and drying firewood, cutting the tall grass, clearing brush, and ensuring that all fish camp structures and items, such as the dock, fillet table, fish boxes, drying rack, smokehouse, and cabin, were in good condition for the summer (Plate 39). Steps also included ensuring that all equipment and supplies, such as knives, sharpeners, brown sugar, and rock salt, were on hand and at fish camp. The family had covered the fish racks with a blue tarpaulin, to keep the rain off, which turned out to be very important for the wet summer of 2008. This family said that there were many fish camps that did not have covered fish racks.

During La Vine's June 8 visit, Valerie pointed out a setnet across the "Point." She said that she thought someone might be trying to catch whitefishes, because it was very early for salmon.

By June 8, this family had 5 or 6 whole frozen salmon in the freezer and no dry fish. They had given their last bag of dry fish away months earlier because someone "wanted fish."

Plate 39.–Getting the net ready for the season, Nondalton case study family.

June–August 2008

This family's fish camp was one of the largest of the camps located on the north side of the outlet of Sixmile Lake. The main house, a small 2-room structure where meal preparation took place, and where the children slept, and smokehouse were built by Clyde's paternal grandfather, and have been in the family ever since. Not far from the main house was a smaller, more recently built, 1 room structure where Clyde and Valerie slept. Their 2 cutting tables were built into the dock and the fish basket was kept on shore. They also had a net rack, drying racks that had frameworks for covering, and a bone rack built by the 2 oldest boys in 2007.

This family also assisted with the upkeep of the trail between Nondalton and the fish camps at the outlet of Sixmile Lake by filling rough spots with gravel. They used 2 ATV trailers to haul 4 loads of gravel, and also took time to clear brush along the way. They said that they usually did this during breaks from fishing.

The family had 1 gillnet that they used at Landing in order to get fish early. They also used the net to beach seine on Sixmile Lake, in the slough on the southeastern side of the lake. They made a couple of seines from the beach before they reached a "full load." Valerie was primarily responsible for processing the fish, but all the boys knew how to head the salmon and remove the viscera, and they assisted with this task. A spare piece of carpet was used as a cutting surface on the cutting table. Valerie cut and stripped her salmon in the same manner as many Nondalton residents. The fish were split, deboned, and left connected by the tail. The split fish were soaked in brine, hung until tacky, stripped in 2 long Vs on each

side, and then hung in the smokehouse (Plate 40). The boys helped with hanging the strips and tending the smokehouse (Plate 41).

As mentioned above, during summer 2008 there were a number of visitors to Clyde and Valerie's camp. A young Nondalton mother and her 2-year-old stayed with them for part of the summer. This mother's father was away fishing for the summer and she did not want to be alone. She did not show immediate promise in processing the fish so she helped "with the boys" to gather firewood and pick the net. A doctoral student also spent a good deal of time with the family, learning to harvest and process salmon from start to finish while she observed the family. Some of Clyde's male cousins occasionally visited, Valerie's niece and her daughter helped fillet and prepare strips on the day they visited, and Valerie's sister and her daughter visited once from Nondalton.

The family got the first salmon in the smokehouse on July 4. By July 17, the first batch of strips was dry enough to remove, cut, and place into bags. When they returned to Nondalton, they processed dry fish, fresh fish, and salted fish. They preferred thinly cut dry fish strips, which, they said, dried faster and made a really good product. Valerie had hoped to learn how to can fish during summer 2008. They borrowed a pressure cooker for the canning process but found that it was missing some critical parts. They postponed their plans for canning to the 2009 summer season. The boys tied bones together for the bone rack using string teased apart from a gunny sack.

Plate 40.–Valerie works on her drying salmon, summer 2008.

Plate 41.–Clyde and his son in their smokehouse, Nondalton, summer 2008.

The family thought that their 2008 salmon harvest was about the same as 2007. They said that they always started their season with fish caught from Landing, where they harvested about 160 fish in early July. They appeared to be the only family from Nondalton to do so, although sometimes others joined them or expressed interest in joining them. The first nets were set July 2–4. On July 19, the family harvested their final 110 fish when they used their gillnet to seine in Sixmile Lake, in the slough across the lake from their fish camp. The family processed fish from July 4 through 19, and all summer fish processing was completed by July 22. They packed 49 one-gallon bags of dry salmon in strips (the family estimated that they could fit about 2½ salmon processed as strips into 1 one-gallon bag), 22 fresh salmon, and 1½ buckets of salted fish (the extra one-half bucket was because of last year's theft). They said everyone was done picking nets on Sixmile Lake by the time the family removed the last of the dry fish on July 22, although they commented that some Nondalton residents, those with summer fish camps at One Tree Island on Lake Clark, were still setting their nets in late July.

Soon after salmon processing began, the family was able to enjoy fresh salmon roe as well as boiled fresh fish heads (Plate 42 and Plate 43). This family consumed fresh salmon throughout the summer. Of the final 110 fish, Valerie said she preserved only 40. She gave the remainder, headed, gutted, and filleted, to the doctoral student (who redistributed the fish to 2 other Nondalton families), as well as to a non-Native resident from Nondalton and a family friend who lived in the area. By August, 17, bags of dried summer fish had already been shared and they were planning to send some fresh salmon to Valerie's father in Anchorage.

Plate 42.–Fresh fish heads cooking in the pot. Plate 43.–How boiled fresh fish heads are served.

The boys in the family caught various species of whitefishes as well as rainbow trout and Arctic grayling with rod and reel before the arrival of the salmon in late June. They also caught nonsalmon fish throughout summer when these fish came close to shore to eat the remains of the processed sockeye salmon.

The summer of 2008 appeared to be an excellent berry season throughout the region, according to many residents, who said that berries in abundance could be found near Nondalton, at Igiugig near the portage between Sixmile Lake and Lake Clark, and at Chi Point half way between Igiugig and Port Alsworth on the southeast side of Lake Clark. This family picked 8–9 gal of berries (Plate 44). They said that they try to pace their consumption of berries to about once per month, and usually eat them mixed with Crisco and sugar as *nivagi*.

The family received a leg of moose on August 16, which they were planning to share with other members of their extended family, in particular with one of Clyde's brothers who had a few children of his own. Valerie felt that the moose meat would last about 1 month.

August–October 2008

In fall 2008, early poor weather conditions (blowing wind and rain) hindered this family's travel to Kijik. Temperatures then plummeted and an early and heavy snow hit the area. This family said that although some people might have taken the opportunity to process fish early, others were out of luck, including Clyde and Valerie and their extended family, for the second year in a row. Ice had formed on Sixmile Lake earlier in 2008 than it had in 2007.

This family reported that there were more blueberries and crowberries than there were cranberries. Valerie said that she could not take the time to pick cranberries, which ripened later in the season, because she had resumed wage employment on October 1. Valerie noticed that people were not picking many berries in the village, and thought that perhaps most were traveling out of the village for berries.

Clyde and Valerie did not hunt caribou or moose during the fall hunting season, and other residents reported that caribou had been scarce in the region over the past 5 years. During their November interview, the family said that there was word that caribou were spotted around Lower Talarik Creek, near the northern shore of Iliamna Lake. Although this was closer than it had been for several years, for Nondalton residents it was still a long distance to travel, they said. Clyde reported that during one of his last caribou hunts, he had to travel about 100 mi one way before he managed to harvest an animal. He said that at that time gasoline was $5 per gal. In addition to the moose leg they had received earlier in the year, they had received meat from a moose shot near the community just before the end of the moose hunting season, as well as from a moose a family friend had harvested. The meat from these 2 moose had been distributed throughout the community. Clyde said that when someone gets a moose, he or she

usually does not have enough freezer space to keep the entire animal. Sharing, he said, was necessary to prevent waste and spoilage.

Plate 44.–Berry picking near Nondalton, summer 2008.

They reported that Clyde's 18-year-old son caught and skinned a fox. He had skinned it like a moose before Clyde arrived home to demonstrate the proper method of preserving the pelt. But, Clyde said, the most important thing was that his son was learning.

Clyde's parents and Valerie's sister and daughter visited in the fall, and they were all served dry fish. By November, Clyde and Valerie said, they had consumed or shared about one-half of their summer salmon harvest. They said they had eaten at least 4 frozen whole salmon since La Vine had visited in August and had been steadily sharing and eating the dry fish. They shared filleted frozen salmon with Valerie's father in Anchorage. The salted fish had been saved for the deceased son's 1 year memorial potlatch. Clyde elaborated: "[We] give some, [to] her dad … and her aunt wanted some fish, so we'll send her some dry fish, and probably—maybe a whole fish, and some flat fish, but her salt fish, you know, I don't give that to *nobody*." They were particularly careful with their salted fish this year because of the theft of their salted fish the year before.

During their final interview, Clyde and Valerie said that they focused their harvest activities so as to provide primarily for their own household. However, although they claimed that they took care of themselves first, they did take many photographs of meals and activities shared with others, and they

reported that at least one-half of their total summer salmon harvest had been given away. They also included a number of children in addition to their own in camp activities and welcomed any and all from the community to their fish camp, especially those who wished to contribute to and learn about fish camp activities. Many Nondalton children who did not have parents actively processing salmon that summer had expressed interest in the camp, and often joined Clyde and Valerie and their children at fish camp.

Port Alsworth Case Family

Social Organization

At the time of selection, this non-Native family consisted of 2 adults in their 30s, three sons ranging in age between 5 and 8, and a new son born in February 2008. Michelle and Jeremy Davis were long term Port Alsworth residents. Michelle was a second-generation Port Alsworth community member and her grandparents were early homesteaders at Pile Bay on Iliamna Lake. Jeremy was raised in Port Alsworth and was self-employed as an airplane pilot and hunting guide. Although the children were young, they were able to participate in the family's seasonal harvests of wild-caught foods, helping when they were able. During the project year, the 2 oldest boys, twins around 8 years old, matured from hunting for various species of ptarmigan with their father in the fall and spring to hunting the birds on their own by fall 2008.

Michelle spoke about her experiences growing up in Port Alsworth, saying that that although her family relied upon wild-caught foods, moose and caribou in particular, during her childhood, her father provided the food rather than include them in the harvest. She said:

> … it's really only been in the last fifteen years—since I've been married, we do it as a couple and with our children. We're all involved in the whole process. We all go get berries together, we all go get fish together, we all go get meat together. You know, it's just part of the family rituals.

This family took an approach to subsistence that was different than others in this study. First, because Jeremy was a guide he was able to bring home a regular amount of moose and caribou meat for his family to eat throughout the year. Secondly, the family owned their own aircraft and Michelle's parents owned their own flight service. The family thus had the ability to make frequent trips to Anchorage to purchase staples and other groceries. Despite this access to store-bought goods, this family stated their preference for eating the wild caught foods processed by their own labor. Finally, the project year was significant for this family because it brought the birth of their new son. Due to this event, they said, their normal subsistence activities had been somewhat altered , at least for that year.

Winter–March 2008

This family said that ice fishing was a normal winter activity, and while they could easily go on Lake Clark just in front of their house, they often made a special trip by snowmachine to Kontrashibuna Lake, which is located east of Port Alsworth, on the Tanalian River (Plate 45). They said, however, that in 2008 they did this only once, in spring (Plate 46). In years past, they said, they had often camped there in the winter. Michelle said, "We'll usually set up a tent down there and fish, for a good month out of the year." They said that they thought they did not ice fish as much as residents of the other villages in the drainage. In March 2007, they said, a number of families from Port Alsworth went ice fishing and in March 2008 two other families had set up ice fishing shelters, so Michelle's children were occasionally able to join them.

Once or twice per week, they said, the father usually took the boys spruce grouse hunting, and this was one of their favorite after school winter activities. Summer was too busy, he said, with visitors, hunting clients, and other activities, so small game hunting rarely occurred at that time. In spring 2008, these activities were suspended due to the family's short term relocation to an urban center for the birth of their son.

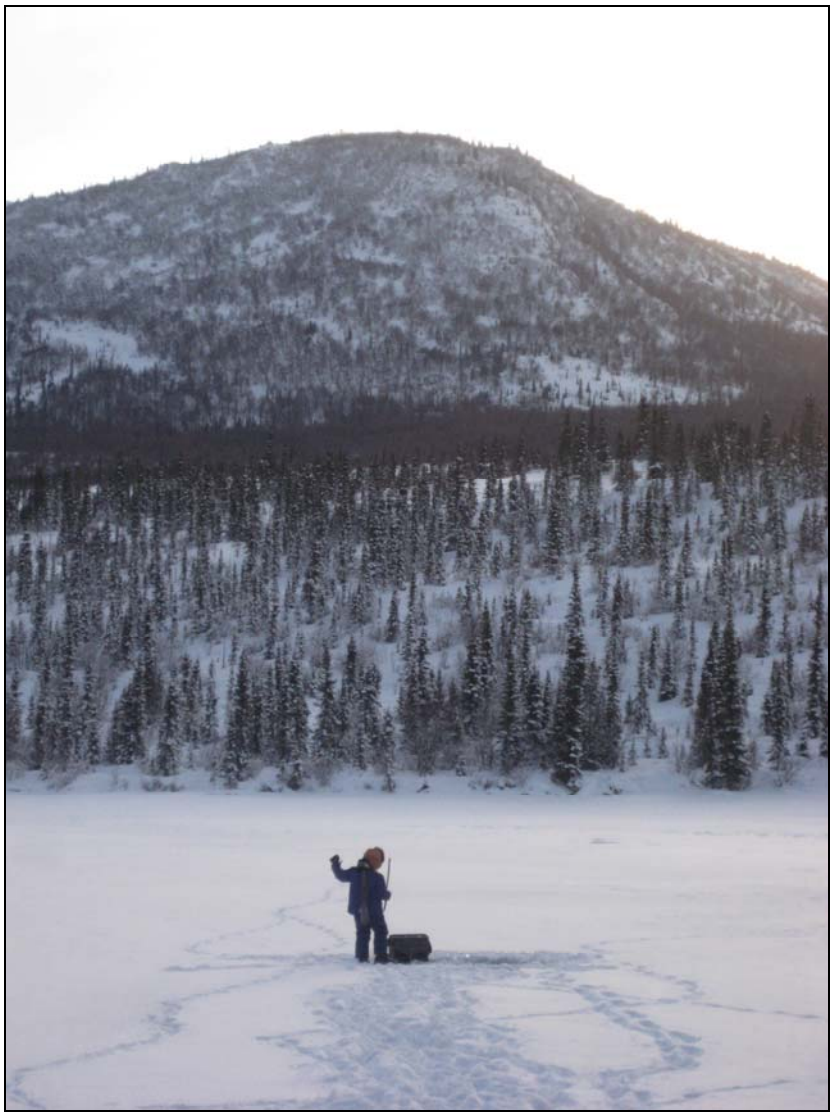

Plate 45.–Subsistence fishing for nonsalmon fish through the ice, Port Alsworth, 2008.

Plate 46.–Port Alsworth case study family taking a snowmachine trip.

The family also operated a trapping camp, which was used by the father and his sons. They made a trip in January 2008 and caught a marten *Martes americana*.

Michelle said that she could recall a time when the caribou herd was so close that:

> …people would go out on snowmachines and just be able to get caribou right here, throw it in the sled and bring it home. And that was wonderful. That hasn't happened the last two years, because of the climate I guess, and the caribou … perhaps they're changing their [migration] patterns or this might be normal to have happen every few years. But none of us remember it.

This family said that they placed the highest value on wild game, then salmon, then ptarmigan, other fishes, and finally berries. They supplemented their wild-caught foods with store-bought foods, especially shipped-in chicken and pork. Their regular consumption of wild game during the 2 study years appeared

to be unique compared to the other case study families, and was perhaps due to Jeremy's work as a guide and the reported scarcity of moose and caribou in the immediate region.

This family canned salmon for their own use as well as for Michelle's parents. By the end of March, Michelle's parents had run out of canned salmon and Michelle was making arrangements to deliver some of her cans. Michelle said that they tried to make the "right" amount of canned salmon, an amount that would get them through winter with just a little extra, because, she said, it was nice to run out of salmon just when one needed to restock the supply. They still had canned and fresh frozen salmon in March 2008, but no smoked or dry fish, because, Michelle said, few people in Port Alsworth prepared fish this way.

In speaking of the family's anticipation of the arrival of April, Michelle told of another favorite spring activity:

> One thing that we do in this next month, it's our favorite, is to watch the salmon spawn right here in front of our house. And this time of year you can go down there and observe the little fry developing. The egg is becoming a fish and if you just pick up a rock, the sun is warming the rocks and creating a nice environment for these eggs and they're just developing into little fish, and it's just our favorite thing to go down there and observe that for the next month. And then as we get into May, they swim away from the beach and we can't observe them anymore.

March–June 2008

Because of his guiding business, Jeremy is usually away from the community for the month of April, and, every other year, for the month of May. In spring 2008, Jeremy had been away for most of April and May. Due to the father's absence and a new baby in the household, this family said they had not been as active in spring harvest activities as they normally would have been. They did manage a couple of family outings to go ice fishing, including an outing with the new baby (Plate 46).

This family still had about 2 cases of quart jars of salmon in early June 2008, which they shared with Michelle's parents' household, and 2 frozen salmon fillets, which was lower than normal. Their moose and caribou stocks were also lower than normal, and Michelle estimated that their supply would last them through another month, but not to August when hunting season would begin again.

June–November 2008

Fish began to trickle into the Davis's nets by July 18, with the bulk of their harvest occurring during the last week of July. Despite their best efforts to process salmon before Jeremy left for work on July 21, Michelle and the boys had to do most of the work after he had gone. In most years, Michelle said, the family processed the fish themselves, with occasional help from other family members. In 2008, however, they had extra help from their church and from community members who would often drop by when the net needed to be picked, which was help Michelle said she felt lucky to have. They processed close to 100 salmon, the majority of which were canned. Michelle's brother is a commercial fisher, so he was able to provide professionally processed, deboned, vacuum packed, and flash frozen fillets. In the past, they said, Michelle's parents processed and canned the salmon for the family, while today, Michelle and Jeremy process and can their own salmon, about one-half of which they share with their parents and other family members.

While other families in this project emphasized the process by which they made smoked salmon, a process that involved hanging, drying, stripping, and other labor intensive steps, the Port Alsworth family did not prepare salmon in this manner and thus they did not require structures such as a smokehouse or drying racks on their property. In fact, "fish camp" for this family appeared to be when they set a net on the shores of Lake Clark just outside their family home. They were able to see the net from their windows.

This family, the boys especially, also regularly used rod and reel to fish for whitefishes in the summer, while harvesting and processing salmon.

They said that they consumed spruce grouse, harvested by the boys, about once per week. Michelle said that her husband used to take the boys hunting in spring but they were now able to go by themselves.

From August through October 2008, Jeremy was able to bring home moose and caribou, but before this time their supply of fresh meat was down to 2 packages of ground meat. In the 2008 season they were able to preserve 1 full caribou as well as 2 moose quarters. They processed 1 moose quarter in Port Alsworth and the other quarter was sent to a commercial processor in Anchorage that makes Polish sausage and similar products. About one-fourth of what they processed was made into stew meat, they made a few small steaks, and the rest was ground. The family said that the boys were big helpers during the grinding process by putting the meat through the meat grinder and then into bags for freezing.

Many of the conversations between La Vine and the family over the course of the year turned to observations about the ebb and flow of the local wildlife, especially the family's accessibility to land mammals. During one visit Michelle commented, "… my brother was just coming home the other day and he said he saw a wolf pack, just up the lake here from us and they seemed to be moving more into the area as the caribou are moving out." She also noted that her husband needed to travel further to find caribou and that he was also noticing changes in the animals themselves:

> ...we don't take many caribou hunters because we want to protect the herd. Last year we had just two or three caribou hunters and the animals they got had very small racks, which is pretty normal for the herd at this point, which is just crazy to me. And I'm not sure but, I can see the herd size decreasing and it's interesting to me that the ones that are left are all very small antlered.

They said that 2008 was an excellent season for various species of blueberries and cranberries. Michelle made about 10 quart jars of jam and froze about 4 cups for muffins and other baked goods.

Michelle observed that although many Port Alsworth residents shared the work of harvesting fish, or their net, it seemed like there wasn't a large amount of sharing of the finished products between households. She noted that fish, however, was a staple at meals shared with family as well as with community residents.

THE DECISION-MAKING PROCESSES INVOLVED IN ANNUAL SUBSISTENCE FISHING ACTIVITIES OF THE 4 CASE STUDY FAMILIES.

Iliamna

Decisions about when to go fishing for fall fish (see Footnote 6) appeared to be based on weather conditions, with cold, clear weather preferred not only to make the freeze-dried product but also to avoid insects, although a trip also had to be timed so as to harvest fish when they were in prime condition. Emma said that fall fish were best harvested "in October, because you don't want any fat left in your fall fish ... because they don't dry as well."

If the weather was poor for ice fishing, Emma said they had to resort to rod and reel during times of open water:

> We've done that, in fact two Christmases, or maybe three now. It didn't freeze. And we had all the kids come in, so we just went up the river [to Landing], drove up the river and then hiked down to the river and we just fished with rod and reel … And I'd get the rainbows [trout] and grayling mostly. Get rainbows and grayling mostly on the river, and then out on the lake you get the Dolly Varden and rainbow. So yeah, we'll be fishing.

Emma and her sister-in-law decided when to start fishing the nets, and were primarily responsible for most of the other decisions related to timing for fish camp, although because Lary picked the net he was often included in the decision-making process as well.

A number of considerations appeared to influence the decision making during this couple's summer salmon harvest preservation process, such as the weather on Iliamna Lake. Emma said, "When it blows up there, you just don't pick the net. You don't set the net, period … because your net just gets full of fish and the fish get ruined. It's sometimes two or three days before you can get out there."

Bears, which this family reported were a long standing problem, caused them to wait for the peak of the run to arrive before setting their nets, in order to get a larger haul. Bears swam to the net, picked the fish from it, and ripped the net in the process. Waiting, the family explained, made the set more worthwhile and they did not want to risk a torn net for 1 or 2 fish. For a while, they said, their bear avoidance technique was to pick the nets in the evening and then kept the unprocessed fish overnight in the brailer, which they kept on the reef at Fox Bay. They eventually purchased an electric fence, which, they said, made a tremendous difference. They could pick their nets in the evening, inside the bear fence, with no problems. Still, they said, the bears tried to pick the net during the day, thus their decision to wait for the peak of the run.

The Hills reported that seals ate a number of fish from the nets during the study year, which also influenced their decisionmaking. Lary said there appeared to be 2 groups of seals raiding the nets and estimated that they had lost 30–40 fish this way. The Hills further explained that the seals caused them difficulties in deciding the length of time for a set and how near or far to set the net. If they soaked the net long enough and far enough from shore to get a good haul, they increased the likelihood of a seal raid. Emma explained: "And what happened was ... Lary was … really afraid that if you put out too much of the net, the seal was gonna get it. Well, so he didn't put out enough of it."

The high price of fuel appeared to influence the Hills' decision to make fewer trips to the villages and other places, although, they said, their subsistence food needs remained the same. The Hills said the cost of subsistence was increasing, along with the cost of other things in the community, but the cost of living did not appear to affect their decision to follow a subsistence way of life.

Lary said that he thought he would process more salmon during summer 2008 because of the scarcity of wild game, but that in the end, they preserved approximately the same amount as they had before.

Newhalen

Safety was mentioned as a consideration in the Wassillie's decisionmaking processes. When fall fishing, for example, the family took 2 boats to the fishing site: one boat was used primarily to carry the people, and the other to transport the harvest along with excess gear. A family member explained: "And besides that, when we work as a family it saves us a lot more on fuel. I mean we're not taking all our boats up there at the same time. We take two and the fuel is a lot cheaper for the whole family; just go ahead and get two boats for one whole family. And it works good."

Because, they said, the fish had more meat, this family decided to target male spawned-out sockeye salmon and to release most of the females. They have decided to keep only enough females to provide roe for use as food and as bait and for the older women's preference for *knuktuk*, described previously.

Weather also appeared to affect this family's decisions about the pursuit of nonsalmon fish in the fall, winter, and spring. Poor weather conditions, typically a late freeze in the fall, meant that they decided to use Landing more frequently to provide fresh fish throughout the winter. Their decisions about fishing methods and means also appeared to be affected by changing seasonal weather patterns. They did more rod and reel fishing in open water, for example, rather than jigging through the ice. If conditions were right, they said, and the lake had frozen, jigging could occur closer to the community or in other prime locations like Pete Andrews Creek and the Upper Talarik and Lower Talarik creeks west of the

community. The Wassillies also appeared to base much of their decision making about late season ice fishing effort on the weather. They could fish, they said, even in the heart of winter, as long as it was clear and not too cold, and they went fishing just as much to get out of the house as to provide fresh fish for the table.

Nondalton

Clyde Trefon and Valerie Engebretson said that they made a conscious decision to immerse themselves in a subsistence way of life and that their focus on a traditional way of life grew as they made a commitment to sobriety and maintaining a healthy household for their children. They said that they felt their decision to remain sober reinforced their abilities to actively pursue wild foods year-round, to involve every member of the family, and to provide each other with a strong foundation and support system for avoiding alcohol.

Weather was an important consideration for this family's decision-making processes for any subsistence harvest activity. For 2 seasons, poor conditions combined with limited and distant harvest locations appeared to frustrate this family's attempts to process fall fish. When asked if a late winter hindered his decision to go ice fishing, Clyde replied: "Not us, we usually do ours in the springtime now. Everybody starts their ice fishing this time of year up here. We don't sit on the lake when it's twenty below trying to stick our head in the fish hole and hope for the best [laughs]."

As noted above, location also played an important part in the decision making process for this family. For fall fish they evidently traveled only to Kijik, and for the summer sockeye salmon harvest they preferred to set their net at Landing. By deciding to use Landing, they said, they could start processing fish earlier than others in Nondalton and they felt they got "a better fish" when they were done. They also said that the "blow flies follow the fish," and that their decision to leave early for Landing allowed them to process fish without contending with too many insects. They also said that this decision meant they were "done with fish" early, which allowed them to spend more time harvesting and processing berries. During the 2008 salmon season, they said, their decision to start early allowed them to avoid the bad weather: during their first week of fish processing the weather conditions were much better than later in the summer when rainy weather prevailed.

Port Alsworth

The Davis family discussed the decisions they made about how to process and preserve fish, and why they did not produce smoked salmon. Michelle explained:

> It's our time to make money. We have May through September; sometimes [Jeremy needs to work] into October, if we really can't make the money [during the summer] to make it through the winter. So we're so busy, and then it's also the time when people come to visit, so between your clientele and then your friends there's hardly a down day.

They said that the process of smoking salmon requires daily care, maintenance, and a significant time investment over many weeks, which was something that this family had decided it could not afford to do.

In June 2008, Michelle said that the rising costs of fuel and food were a factor in her decision to try to preserve more salmon that summer. Their small supply of meat from large land mammals also was a factor that caused her to anticipate eating more salmon as soon as it was available She said that another factor was that she preferred salmon for protein over store-bought meat. By November 2008, Michelle had confirmed that they did preserve slightly more fish and caribou than other years, but that they had decided that they would still need another harvest of moose and caribou to see them through until the next season.

This family estimated that because they got about 75% of their heat from wood, and because wood was a financial offset of the high cost of fuel, they anticipated maintaining that percentage through winter 2008–2009. They decided to make frequent snowmachine trips to gather and stockpile firewood, which

apparently required traveling conditions similar to those families who gathered wood for their summer smokehouses.

The arrival and subsequent departure of a family from the Lower 48 led Michelle to reflect on the hardships of decision-making processes in rural Alaska. She said, "You know, it's [this lifestyle] really normal to me, and when I leave, I come back grateful that I'm still here. I don't *want* that other lifestyle." But perhaps less welcome to this family were the perspectives and decisionmaking from the Lower 48 that traveled north to Alaska. During one discussion about subsistence decisions and resource management, Michelle said:

> The majority of us *really* appreciate what we have. We don't want to go out and cut all the trees down, we don't want clearcutting. But we do want subsistence wood for our fires. Because we want to heat our homes that way. We don't want to kill all the animals. Because we want to go year after year, and get meat for our freezers. It's really important to us. We aren't going to go out and just kill something for the fun of it, and leave it. It's hard to make the rules based on those kinds of expectations. For instance, the wolf population is just out of control right now. But no regulations are put in place, because then organizations from the lower 48 step in and say that the sacred wolves are being killed or whatever and it's just *such* a hard situation, because Alaska is *so* different … from any other place. And they want to regulate us, so that we don't become like they have become. But you have to regulate us according to what *we* have.

DISCUSSION

This section pertains to an analysis of the data collected in this project through participant observation, case studies, key respondent interviews, and household surveys. It addresses factors that shape annual variations in subsistence salmon harvests and participation in subsistence salmon fishing. It focuses on factors that shape long term trends, including changes to harvests and fishing strategies as well as persistence and continuity of patterns. The section ends with an evaluation of the case family method developed for Objective 3 and Objective 4 and which contributed information for exploring objectives 5 and 6.

As discussed in the previous sections, families and extended kin groups in each study community make decisions each summer about their subsistence salmon harvesting and processing goals, decisions based on environmental, economic, and sociocultural circumstances. This report has described the considerable time, energy, money, knowledge, skill, and group effort that subsistence salmon fishing requires.

TRENDS IN SUBSISTENCE SOCKEYE SALMON HARVESTS

As noted previously, available data suggest that harvests of sockeye salmon have been declining in the Kvichak subsistence fishery since the 1960s. The data particularly show a steady and marked decline in harvest at Nondalton, from a mean annual harvest of over 35,000 salmon in the 1960s to a mean annual harvest of 14,000 salmon in the 1990s and a mean of 8,500 salmon per year in the 2000s (Figure 4). As measured in salmon per person, harvests at Nondalton declined from 181 salmon in the 1960s to 80 salmon per person in the 1990s and 48 salmon per person in the 2000s (Figure 3).

Reduced harvests of salmon used to feed dog teams may account, at least in part, for this decline. Ellanna and Balluta (1992:151) reported that in the 1960s "most families [in Nondalton] minimally processed 60 bundles, at 40 fish per bundle" for dog food. This equates to about 2,000 salmon "per family." It is uncertain if "family" in this context means a household or a larger extended family unit, although the latter is more likely. Nondalton had a population of 205 in 1960 and 184 in 1970, for an annual average of about 195 people. Assuming an average household size of 5, the community had about 40 households, which, at 2,000 salmon for dog food per household, gives an annual harvest of 80,000 fish: over twice the average, based on permit records, of 35,000 per year for all subsistence uses. And even if, as may be likely, "family" means an extended family of 3 or 4 households, harvests of salmon for dogs would still

be about 20,000 to 30,000 fish per year. Ellanna and Balluta (1992) do not state when the transition from dog teams to snowmachines occurred in Nondalton, but generally in rural Alaska, snowmachines had largely replaced dog teams by the end of the 1970s (Andersen 1992:23–14). It is therefore not surprising that subsistence salmon harvests were much higher in the 1960s and 1970s than in later decades, after the shift to snowmachines had been completed.

Nevertheless, key respondents interviewed by Stickman et al. (2003:25) reported that subsistence harvests at Nondalton continued to decline even after the use of dog teams decreased. One elder reported that "as recently as 15 years ago [about the mid 1980s], families put up 20 to 25 bundles [800 to 1,000 salmon] per household." Of the 13 respondents interviewed by Stickman et al. (2003:25), seven harvested an annual average of 5 to 8 bundles (200 to 320 salmon) over a 3-year period and 6 respondents averaged between 10 and 16 bundles (400 to 640 salmon). Also, as discussed earlier and shown in Figure 2, permit data show a steady reduction in harvests during the 1990s, a change that cannot be explained by reduced harvests for dogs.

In summary, while all sources show that subsistence harvests of sockeye salmon in the study communities remain relatively substantial, the evidence suggests that harvests have declined steadily since the 1960s. The discussion that follows explores possible reasons for the decline as well as possible reasons for the continuing substantial level of harvest.

ENVIRONMENTAL FACTORS

Salmon Escapement Estimates

Stickman et al. (2003:26) reported that all 18 Nondalton residents interviewed in 2001 "reported fewer fish than in the past and all indicated that they first noticed the change in abundance between five and ten years ago" (the period referred to is, approximately, from 1990 to 1995). They cite declines in sockeye salmon returns in 2000, 2001, and 2002, compared to returns in the early 1980s (Figure 10) and note that "this dramatic reduction in salmon abundance is of great concern to Nondalton residents who worry about the long-term health of sockeye salmon stocks in the Lake Clark/Newhalen River system." Correspondingly, when interviewed for this project, Clyde Trefon of Nondalton said that sockeye salmon returns had declined by about one-third from what he remembered when he was in high school, around 1980.

The sockeye salmon that return to the Newhalen River and Lake Clark drainage and that are harvested for subsistence uses by the study communities are part of the large Kvichak River sockeye salmon stock. Historically, this sockeye salmon stock was, on average, the largest component of the Bristol Bay commercial salmon harvest (Morstad and Baker 2006:1). However, the Kvichak stock has had highly variable runs: from 1950 through 2007, runs ranged from a low of 250,000 fish in 1973 to a high of 42,000,000 fish in 1965 (Poe and Rogers 1984:3; Morstad and Baker 2006:10; Sands et al. 2008:36). Historically, the Kvichak stock has had a 5-year cycle, with a "pre-peak year" (years ending in 9 or 4), a "peak year" (ending in 0 or 5), and 3 consecutive "off-cycle years." Escapement goals have reflected this 5 year cycle, with higher goals for pre-peak and peak years and lower goals for off-cycle years (Morstad and Baker 2006:1; Sands et al. 2008:80).

Commercial harvests of Kvichak River sockeye salmon declined from an average of 5.7 million fish from 1966 to 1995 to 1.4 million fish from 1996 to 2005 (Morstad and Baker 2006:2). The BOF has adopted 3 management plans for the commercial salmon fisheries of eastern Bristol Bay, with the goal of conserving Kvichak sockeye salmon based upon projected returns and inseason assessments. In 2001, the BOF classified Kvichak River sockeye salmon as a stock of "yield concern" under the sustainable salmon policy (5 AAC 39.222). In 2003, the BOF increased the level to a stock of "management concern," which the policy defines as "a concern arising from a chronic inability, despite use of specific management measures, to maintain escapements for a salmon stock within [established escapement goals] or other specified management objectives for the fishery" (5 AAC 39.222). Based on recommendations by

ADF&G, in 2006 the BOF maintained the "stock of management concern" classification for Kvichak River sockeye salmon. As shown in Figure 47, from 1996 through 2006, the minimum escapement goal for Kvichak River sockeye salmon was achieved in only 4 of the 11 years. However, escapement goals were exceeded in 2007 and 2008 (Jones et al. 2009). Further evidence of recent stock recovery is an increase in the estimated return per spawner (Morstad and Baker 2006:5).

When escapements are projected to be below 2 million sockeye salmon, bag limit reductions and area closures occur in the sport fishery, such as occurred in 2000, when a poor return resulted in a closure of the Kvichak drainage sport fishery for sockeye salmon (Morstad and Baker 2006:2). Neither the BOF nor ADF&G, however, have placed restrictions on the Kvichak River drainage subsistence salmon fishery in part because of the remote location, the local residency of most fishery participants, and the relatively low harvest compared to commercial takes. Although the BOF has established a range of 55,000 to 65,000 Kvichak River drainage sockeye salmon as the amount reasonably necessary for subsistence uses (ANS) (5 AAC 01.3369b)(1)), the minimum range of the ANS was not achieved between 2000 and 2007 (Table 2).

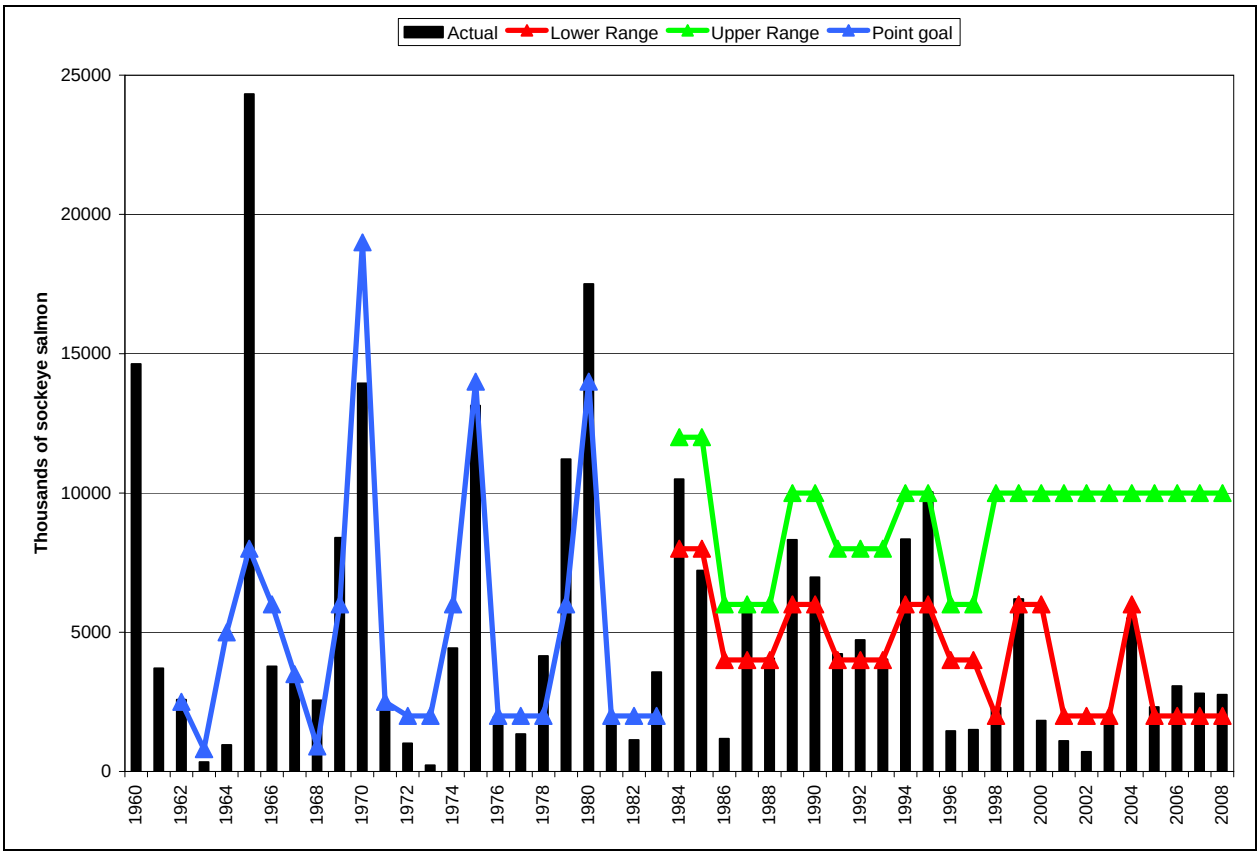

Figure 47.–Sockeye salmon escapement goals and escapement estimates, in thousands of fish, Kvichak River system, 1960–2008.

In terms of the portions of the Kvichak River stock available for subsistence harvests by residents of the 4 study communities, reliable estimates of escapements into the Newhalen River–Lake Clark system are

available for 1980 to 1984 and 2000 to 2008.[19] During those years, escapement estimates were highest in the peak return year of 1980 (1.5 million salmon into the Newhalen River) and the pre-peak year of 1984 (3.1 million salmon into the Newhalen River) (Figure 10). Since 2000, escapement estimates have ranged from 173,000 fish in 2000 to about 700,000 fish in 2006. From 2000 to 2008, the estimate of the Newhalen contribution to the run ranged from 9% (in 2000) to 29% (in 2002) of the total Kvichak sockeye salmon run (Figure 48).

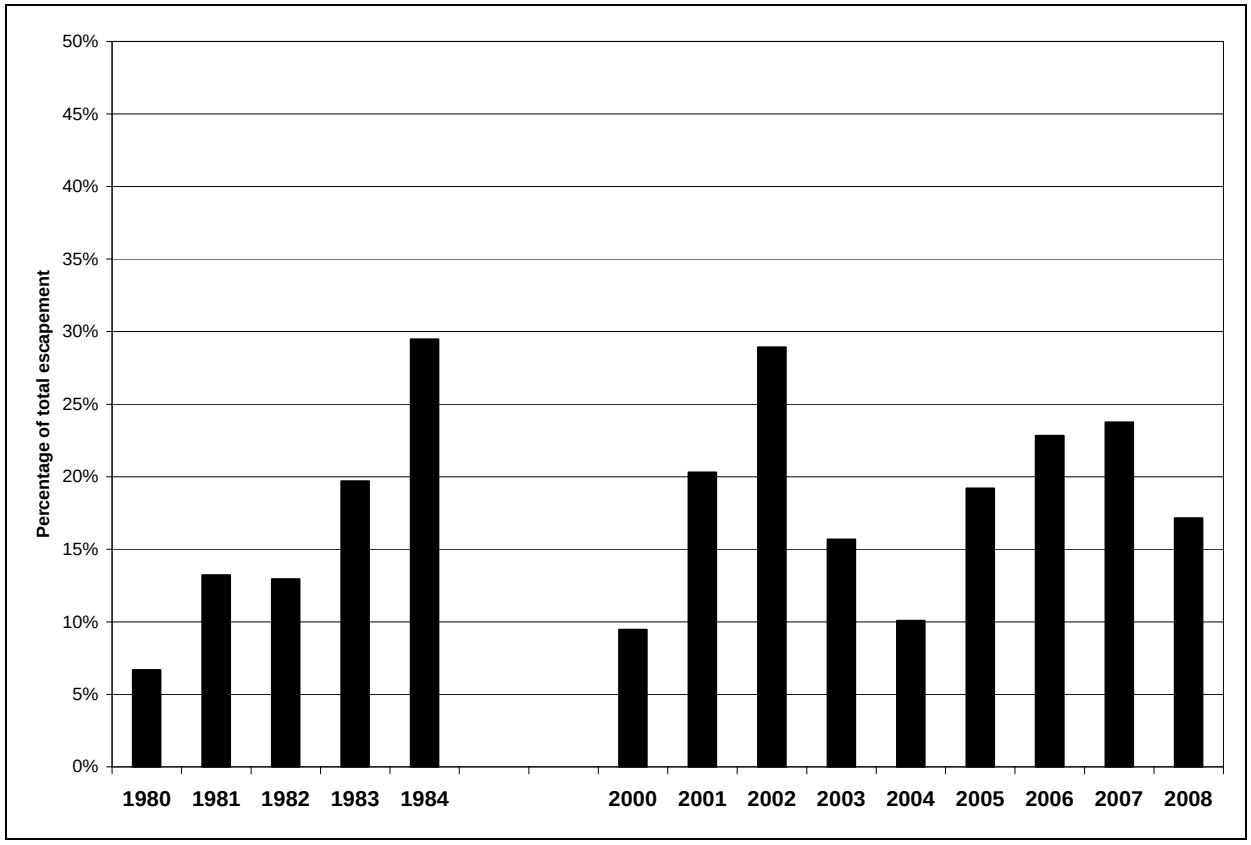

Figure 48.–Escapement of sockeye salmon into the Newhalen River as a percentage of total escapement of Kvichak River sockeye salmon, 1980–1984 and 2000–2008.

In summary, the BOF has recognized the Kvichak River sockeye salmon as a "stock of concern" under the sustainable salmon policy and has taken actions to conserve the stocks through restrictions on the commercial and sport fisheries. In the view of ADF&G (Morstad and Baker 2006:7), these measures appear to have been effective, with improved returns, increased estimated returns per spawner, and achievement of escapement goals since 2003.

A key question remains about the relationship between escapement estimates—one measure of the number of salmon available to subsistence harvesters—and the achievement of harvest goals in the

[19] Estimates from counting tower data of sockeye salmon escapements into the Newhalen River, Sixmile Lake, and the Lake Clark watershed were first developed by the University of Washington Fisheries Research Institute (FRI) in 1980. This program ran through 1984 (Poe and Rogers 1984). Beginning in 2000, the USGS, in cooperation with the NPS, restarted the Newhalen River counting tower project at the same locations and using the same procedures as established by the FRI project (Woody et al. 2003; Carol Ann Woody, U.S. Fish and Wildlife Service, personal communication, June 18, 2009).

subsistence fishery. A review of sockeye salmon escapement estimates into the Kvichak system and subsistence harvests from 1963 through 2004 (Fall et al. 2003:44) found no annual covariation between harvests and escapement estimates, and noted that

> One explanation for why Kvichak sockeye salmon subsistence harvests and escapements do not co-vary every year is the large difference in scale between the Kvichak sockeye run and the subsistence harvests. The subsistence harvest, while extremely significant for local communities and larger than any other in Bristol Bay, is a small portion of the total Kvichak sockeye run even in years of relatively poor returns. Subsistence harvesters have set goals that they attempt to achieve in years of lower abundance by fishing more days. Thus subsistence harvests over time are far less volatile than sockeye salmon escapements into the Kvichak system, which are characterized by a five-year cycle with wide fluctuations from year to year.

As shown in Figure 49, estimates of Kvichak River sockeye salmon subsistence harvests averaged 1.3% of the escapement estimate from 1963 to 2007. In all but 3 of those years, subsistence harvests were less than 6% of the escapement. The highest percentages were 17.2% in 1973 and 16.7% in 1963, both "off-cycle" years with very low escapements.

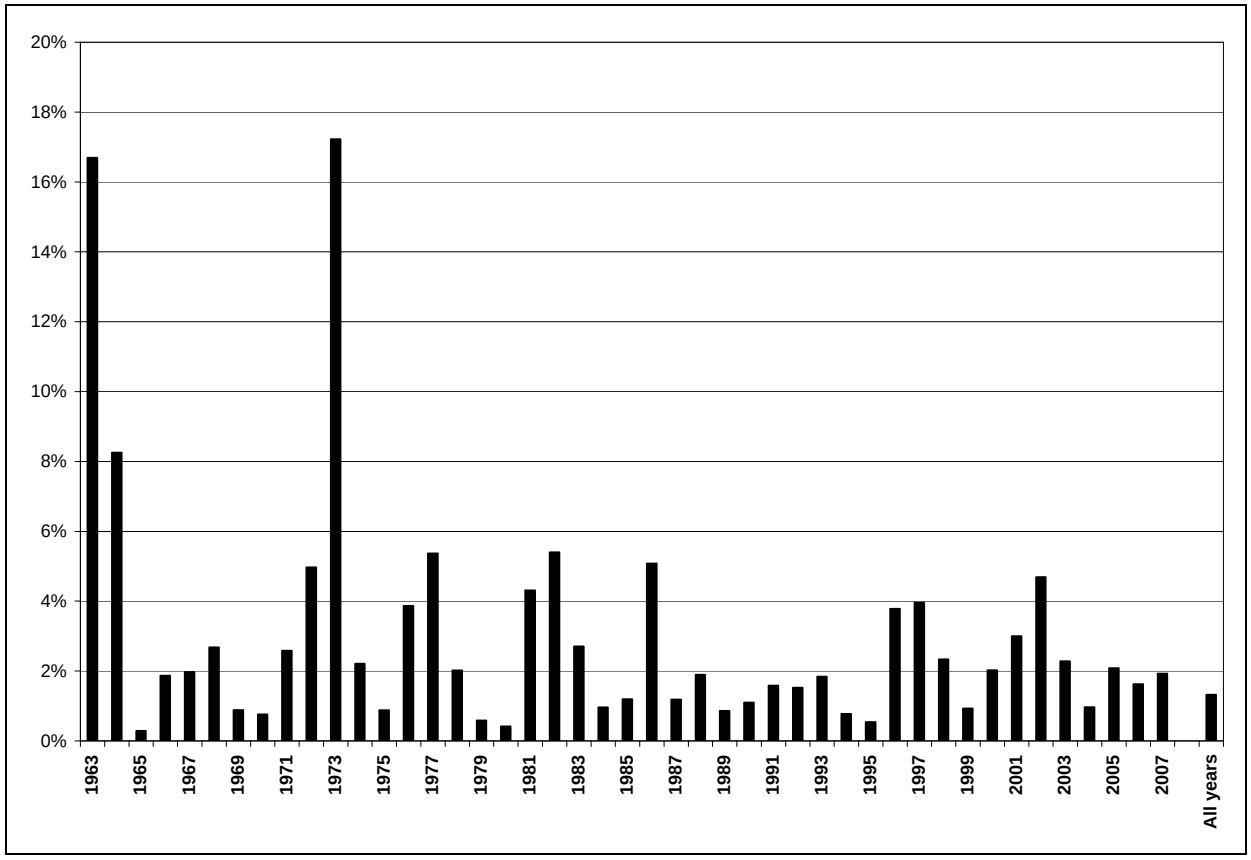

Figure 49.–Subsistence harvests of Kvichak River sockeye salmon as a percentage of total escapement, 1963–2007.

However, the analysis found that in years when escapement estimates into the Kvichak system dropped below about 2 million sockeye salmon, subsistence harvest rates, as measured by the average number of

fish reported harvested per day fished, dropped (Fall et al. 2003). Over the long term, the average harvest per day for this fishery (subsistence set gillnets), according to records from returned permits, has been around 40 salmon. However, in years when the escapement fell below 2 million salmon, the daily harvest rate dropped to around 30 fish per day (e.g., 1996, 1997, 1998, 2000, 2001, 2002, and 2003), with no significant change in the number of permits issued to Bristol Bay residents for the Kvichak watershed (Table 2). This relationship, between the size of the escapement and catch rates in the subsistence fishery, does not exist in years of average to high abundance because, as shown in the several case studies presented in this report, daily harvest goals in the subsistence fishery are not set by absolute harvest capacity but by processing capacity. Indeed, when salmon are abundant, case study families applied strategies to prevent harvests larger than their goals.

As shown in Figure 47, sockeye salmon escapements in the Kvichak system from 2000 to 2003 were very low. In 2000, subsistence fishers reported to ADF&G that they were experiencing difficulties in achieving subsistence harvest goals (see also Stickman et al. 2003:26). Division of Subsistence staff interviewed representatives of about 29 households in 6 Kvichak watershed communities (Igiugig, Iliamna, Kokhanok, Levelock, Newhalen, and Nondalton) about their subsistence harvests in 2000 (Fall et al. 2001). Systematic interviewing did not occur in 2001, 2002, or 2003, but less formal interaction between division staff and local fishers suggested that similar assessments pertain to those years as well:

> Generally, subsistence fishers reported that returns of sockeye salmon were late in 2000. Also, once the runs began, fish returned in "bunches" or "spurts" unlike the steadier runs of prior years. Consequently, fishers needed to keep their nets in the water longer to achieve their harvest goals. However, some fishers reported in 2000 that even with the increased effort, fishing was so "slow" that they eventually stopped fishing before reaching their harvest goals. They intended to compensate for poor salmon harvests with more fishing over the winter for nonsalmon fish (although recent warm winters have inhibited these harvests as well), and more caribou and moose harvests. (Fall et al. 2003:9–10, drawing from Fall et al. 2001)

When the sockeye salmon escapement estimate into the Kvichak system increased to 5.5 million fish in 2004, the subsistence harvest estimate also increased and was 53,225 sockeye salmon. This suggests that salmon abundance in 2004 sufficiently supported subsistence uses and achievement of harvest goals while effort remained about the same. Correspondingly, in the 2 study years of 2007 and 2008, with escapements of 2.81 million and 2.76 million sockeye salmon, respectively, study community residents reported that salmon run sizes were average and healthy, and, as discussed earlier, a larger percentage of subsistence fishers achieved their harvest goals, even though, as noted previously, estimated harvests were below the minimum ANS range of 55,000 sockeye salmon.

In their discussion of salmon escapements and subsistence salmon harvests since 1963, Fall et al. (2006: 219) concluded that the 5-year average harvest in the Kvichak subsistence sockeye salmon fishery from 2000 through 2004 did not demonstrate a continuing decline in harvest goals in local communities, but rather a failure to reach harvest goals due to poor escapements and consequent low salmon abundance. Poor sockeye salmon escapements in 2000–2003 resulted in subsistence salmon harvests well below the goals of local families. When escapement increased in 2004, so too did subsistence harvests.

In summary, salmon abundance probably accounts for low subsistence harvests in years of very poor escapements but not for annual variations when escapements exceed 2 million salmon. Although poor escapements from 2000 through 2003 probably account for the low subsistence harvests in those years, there is no evidence of a long term trend towards lower subsistence harvests caused by reductions in salmon abundance.

Other Environmental Conditions

In addition to salmon abundance, other environmental factors appear to play an important role in subsistence fishers' decisions on when and how to fish. In 2007, water levels were low, demonstrated by residents' observations of changes in the shorelines and in dry docks. Water levels were higher in 2008. Residents associated water levels with the timing of the salmon return.

In 2007, study community residents regarded salmon as smaller in size and running later than in previous seasons, although, as shown in Figure 11, the timing of the run past the Newhalen River counting tower in 2007 was similar to most other years since 2000 and earlier than in 2006 and 2008. Residents also commented about the number of Chinook salmon harvested in 2007, saying there were many more than usual, although they did not give reasons for this perceived increase in harvest.

As noted in several Nondalton case studies, the presence of brown bears in 2008 inhibited activities at the respondents' fish camps, including participation by young children. In 2008, three bears were reported shot in the village, and several more reported shot at fish camps. One family reported that a bear destroyed a wall at their fish camp at the end of the season, after their return to Nondalton. Additionally, as noted in several case examples, fishers intentionally placed nets in locations that would minimize disturbances by bears and freshwater seals.

Weather appeared to play a critical role for the 4 case study families when it came time for them to decide the timing of their subsistence harvest activities. They reported that weather could hinder activities, or that they were enthusiastic about subsistence activities during periods of fine weather. Compared to fishing for nonsalmon fish, picking berries, or hunting, however, weather appeared to be less of a factor when deciding to participate in the summer sockeye salmon fishery, success for which is more dependent on the timing of the run. As noted in several case examples, however, rainy weather did affect processing strategies and harvest goals in 2008.

In summary, these environmental conditions clearly contributed to differences between the 2 study years in participation, processing methods, and harvest goals, but it did not appear that these factors were shaping long term trends in the subsistence salmon fishery.

AVAILABILITY OF OTHER RESOURCES

As noted earlier, land mammals have generally ranked second to salmon in the subsistence harvests of study community families (Figures 5–8). However, according to community residents, declining populations of caribou and moose may result in higher harvest goals for salmon. The Mulchatna caribou herd has not been readily available for several years; herd size has declined and the Alaska Board of Game (BOG) has reduced seasons and annual limits (Fall et al. 2006; Krieg et al. 2009). Respondents reported that a successful caribou hunt now takes a tremendous effort of time and money, and they said that moose have also been scarce in recent years. Community residents said they had to decide whether to travel, all by ATV or snowmachine, the long distances snowmachine to the Nushagak River drainage or to Lime Village, for example, when relatives or friends from those communities informed them of the presence of caribou. Since the increases in gasoline prices (Plate 47), many community residents have said that costs are too great to invest in what might be an unsuccessful hunt. Therefore, they said, they have focused more of their harvest efforts on salmon.

Plate 47.–Sign showing almost $7.71 per gal at a gasoline pump in Iliamna.

Based upon the results of systematic surveys in the study communities (e.g., Fall et al. 2006), fish other than salmon supply a large portion of the annual supply of subsistence foods for many local households (see Figures 5–8). But as noted by several case study families, warmer weather may be affecting access to freshwater fishes. The Newhalen case family, for example, said that they traditionally fished by jigging through the ice for nonsalmon species in the fall. However, they said, because of seasonal changes ice was taking longer to form at Landing and other traditional fishing locations. They said they were relying more and more on rod and reel to harvest these resources. Also, this family noticed that freshwater fishes caught at Landing were becoming "skinny." They attributed this change in part to fluctuations in temperature as well as a later onset of winter.

ECONOMIC FACTORS

The Rising Cost of Fuel

Subsistence salmon fishing in contemporary rural Alaska, including the study communities, takes place in a mixed economy, one with a cash sector and a subsistence harvest sector (Wolfe 2000:3–4). Subsistence fishers need cash to purchase the equipment, supplies, and fuel necessary to successfully harvest and process subsistence fish and wildlife.

The rising price of fuel for transportation and home heating was of particular concern to residents of the study communities in 2007 and 2008. In Iliamna and Newhalen by mid 2008, researchers observed that the price of gasoline had risen to $7.70 per gal. The cost of fuel in Nondalton during summer 2008 was

$7.77 per gal, and by November 2008 the price had only dropped to $6.05 per gal. In June 2008, those who purchased fuel in Port Alsworth were paying $6.50 per gal, up from about $5.00 per gal in the previous summer. The price of fuel then rose to about $7.25 per gal and had only dropped to about $6.50 by November. Researchers observed more variation in the gasoline prices in the Iliamna Lake area than in Dillingham and other communities on the coast, because an air cargo service was able to make weekly air deliveries of fuel from Kenai, Alaska, where prices were very responsive to the market.

Case study families appeared to face the rising costs of fuel by working together, as exemplified by the Newhalen man (Case Study F) who set and picked nets and delivered salmon harvests for multiple households. In turn, he received processed fish or money "to help pay for gasoline."

Increasing fuel costs also apparently encouraged subsistence fishers to develop strategies to reduce expenditures. At Newhalen, fishers set nets in the nearby Newhalen River in order to minimize the distance they had to travel by boat to harvest salmon. By waiting for salmon to enter the river instead of harvesting them along the lake shore, fishers most likely saved money on fuel. When making fewer boat trips in order to reduce expenses, fishers apparently also had to increase cooperative planning efforts.

Although costs affected decision making and harvest strategies, they apparently were not a barrier to residents' high priority summer subsistence salmon fishing. Valerie Engebretson at Nondalton explained:

> I think [the high cost of gasoline] is not really affecting our subsistence. We do that anyways. No matter how much it costs, we'll get gas to get down to fish camp. But we're just not [doing] a lot of traveling like we used to, [just] here and there, where we need to.

Thus the high price of fuel seemed to affect the way people conducted their subsistence activities but not the amounts they harvested and processed. Remarks by Lary Hill of Iliamna further illustrate this point:

> It's very obvious how much more expensive it is to travel on this lake with the price of fuel, but we feel like what we have up there [at their fish camp] is so valuable that we don't want to be without it—that experience plus the food that we get there. It's so valuable to us, we will skimp on other things to make that possible in the summer. It's such a valuable experience to us and our family, and the food we get.

Lary and Emma Hill also observed the impacts that increasing costs of fuel had on families with limited access to cash resources:

> The ones who have jobs still go on with subsistence as they usually do. But the ones who don't have jobs, that really puts a curb on their subsistence gathering. Because gas is so expensive. We do see a lot more combined families working together, though, because of the cost of fuel. And we get fewer visitors up this way and fewer people out hunting seals just because of the cost of fuel.

The high cost of gasoline as well as weather conditions also appeared to affect respondents' harvest efforts on spawning sockeye salmon at Newhalen in the fall. Usually there are about 5 smokehouses along the Newhalen River beach at which fall fish can be seen hanging to dry. In 2007, however, these "redfish" could be seen at only 2 smokehouses.

In addition to reduced subsistence activities, families that do not have enough cash to pay for other expenses, such as home heating fuel, food, or other supplies and services, may leave the community in search of employment. For example, in Newhalen in January 2008, some families ran out of home heating fuel after a period of extreme cold. By December 2008, many residents of Newhalen said they were again feeling the stress of rising fuel costs. Ray Wassillie said:

> At almost eight dollars a gallon, we were barely to able to buy five hundred gallons of fuel for the remaining use this winter. And my household, we burn a thousand gallons a year. I don't know if we're going to be buying it by the gallon [instead of by the barrel]. Because usually right after [commercial] fishing, I'd be able to buy fuel for the whole

> year. [But] the price [for commercial salmon] wasn't there for us, the market wasn't there for us, because everything was inflated, and [the cost of] all the parts to our boat all jumped sky high, and we didn't even make no money this summer. We had to pay everything up in front, to cover our bills for the summer. And I'm still trying to figure out where I'm going to buy my oil come January, when it gets to the coldest part in January, or in February.

An adjustment made by some families, as noted by Emma and Lary Hill of Iliamna, was to burn more wood. Homes that had typically relied upon fuel oil to heat their homes were apparently returning to wood as fuel.

The extreme cold and the rise in fuel costs also seemed to affect ice fishing efforts at Newhalen, since residents said they decided to make fewer spontaneous daily trips to out-of-community fishing locations. They had to plan ahead and schedule a specific day to travel. Respondents also said that one of their preferred locations for large rainbow trout, Lower Talarik Creek, was too far for frequent trips, given the increase in fuel prices.

Ray Wassillie of Newhalen stated his belief that there would be short term increases in subsistence harvests in his community as a result of the rising costs of living. People will need to pool their funds to harvest caribou or moose, he said, and they will need to work together more. He anticipated a greater interest in harvesting and processing salmon at subsistence fish camps in 2009.

Employment Opportunities and Cash Income

Because subsistence salmon fishing takes place in a mixed economy, employment opportunities often influence, both positively and negatively, participation in subsistence fishing, a trend that was apparent in the study communities. Because there are often more cash earning opportunities during the summer months, families must balance the need to earn cash with the time required to harvest and process salmon for subsistence uses.

Households with multiple adults may have 1 or more adult members working full time in the summer months, commercial fishing in Bristol Bay, for example, or fighting wild fires. In the Port Alsworth family case study, the father spent his summers guiding recreational hunters. The mother therefore was able to rely on other community members to assist in the family's summer fishing efforts.

The development of the Pebble Project, a mineral deposit in an advanced exploration stage located approximately 17 mi northwest of Iliamna, resulted in the employment of several residents of Newhalen and Iliamna, but few from Nondalton or Port Alsworth. In 2007 and 2008, according to respondents, the Pebble Limited Partnership allowed time off to employees in the project communities during the fishing season. In some cases, respondents said, the jobs were shift positions that allowed up to 10 days to 2 weeks off to participate in subsistence fishing. These residents then perhaps had cash income available to purchase gasoline for boats or to invest in maintaining the fish camp.

Several study community families did not have a successful commercial fishing season in 2008. Some community leaders, therefore, expressed gratitude for the employment opportunities that PLP provided. Other than commercial fishing, they noted, there was little else people could do to earn money while staying in the community.

Residents who participate in the Bristol Bay commercial fisheries may miss the peak of the subsistence salmon fisheries in their communities. The family in the case study from Newhalen, for example, fished their son's limited entry commercial salmon permit in 2008 and missed the peak of the salmon run "back home." They were only able to participate in the harvest of spawning sockeye salmon upon their return to the community.

In addition to employment schedules, salmon run timing and abundance appear to be factors that influence a household's achievement of its harvest goals. Households that can spend extended periods of

time engaged in subsistence salmon fishing over the summer appear to be able to achieve their harvest goals even during years of below average runs. However, if a household was able to fish only for short periods of time, or only on the weekend (as in Port Alsworth), it apparently could not achieve its harvest goals. Also, some of the typical processing methods observed in all 4 communities, such as hanging fish outside to dry and processing large batches of salmon at one time, may not be the best methods for a household with minimal time during the summer, especially during inclement weather. A household that could afford more time to process and properly care for drying fish appeared to be least affected by inclement weather. Some case study families, the ones that could spend more time in camp and thus make fewer trips home, were able to harvest and process smaller batches of salmon more frequently during extended periods of rain, often placing cut salmon immediately into the smokehouse and taking advantage of breaks in the rain. Although they described 2008 as wetter and colder than 2007, many residents reported that they were still able to achieve their harvest goals. Those with less time for subsistence salmon processing due to job obligations harvested fewer salmon during these periods of inclement weather.

The Importance of Subsistence Salmon as a Food Source

Another factor that appeared to shape the continuity of subsistence harvests of salmon in the study communities was the significant contribution of salmon to the annual food supply. According to permit records and household survey data, as summarized in Table 24, residents in the 4 study communities harvested about 25,000 salmon in 2007 and 23,000 salmon in 2008. At about 4 pounds of usable weight per fish (an approximate conversion factor based on the average weight of commercially-caught fish), these subsistence harvests provided about 100,000 lb of food per year. Key respondent families clearly had set annual goals that they worked hard to achieve. An adequate supply of salmon appeared to be especially important given the high costs of purchasing food locally or importing foods from urban centers. For example, in discussing change and continuity, Michelle Davis of Port Alsworth stated that the "subsistence lifestyle" was generally consistent from year to year. She said that although the caribou have left the area and were not readily available to harvest, her family relied on all other resources—salmon, other fishes, berries, grouse, and other wild game—which they and other families in Port Alsworth harvested with regularity. The Newhalen case family commented that they "do not see subsistence going away" because of, in part, the high prices of store-bought foods. They also noted a long term decline in their commercial fishing income, which, in their view, placed further importance on subsistence salmon harvests.

Another key point made by several key respondents was that families in the study communities have traditionally harvested hundreds of salmon for subsistence use annually, and they will continue to do so. In their view, these harvest levels are not subject to annual variations in the cash sector of the economy. These families harvest and process salmon in part because they are a preferred traditional food.

The Proposed Development of the Pebble Project

The Pebble Project, in the exploration phase while this research was underway, is an example of an economic development project that may have long term economic and environmental consequences on the future of the subsistence salmon fishery. For example, Michelle Davis in Port Alsworth expressed grave concerns not just about the Pebble development, but also that many other people and corporations were staking mining claims throughout the region.

In 2007, some residents worked for Northern Dynasty Mines, Inc., while other residents actively protested the potential development of the mine, going so far as to use personal resources to communicate their opposition. In Nondalton, researchers observed that anti-Pebble Mine buttons, hats, banners, flags, posters, and stickers decorated much of the village scenery. Banners hung on fish racks, flags whipped in the air behind boats, posters were stapled to the exterior walls of nearly every home, stickers appeared on everything from docks to windshields, and buttons and patches adorned clothing. In 2007, one family hosted a number of documentary film crews and provided them with interviews, an immaculately

manicured lawn, and newly lacquered fish racks. This family invested much time and effort in preparing the fish camp for the camera. Throughout the study area, individuals expressed anxiety about the future of the salmon runs due to possible pollution from mining activities.

DEMOGRAPHIC FACTORS

Demographic trends can be considered an index of social and economic conditions in communities, especially since, as the case studies showed, an adequate labor pool is essential for successful subsistence salmon fishing and processing.

Individuals interviewed for this project noted that several families had moved from the study communities in recent years. Population trends in the study communities have varied since 1960 (Figure 50). Population estimates from the federal decennial census are available for 1960, 1970, 1980, 1990, and 2000. The Alaska Department of Labor and Workforce Development (ADWLD) published annual population estimates for 2001 through 2008. Estimates based on Division of Subsistence household surveys are available for 2004 (see Table 3), 2008, and 2009. In Figure 50, federal decennial census and ADLWD estimates are depicted for 1960 through 2007, and Division of Subsistence estimates are shown for 2008 and 2009.

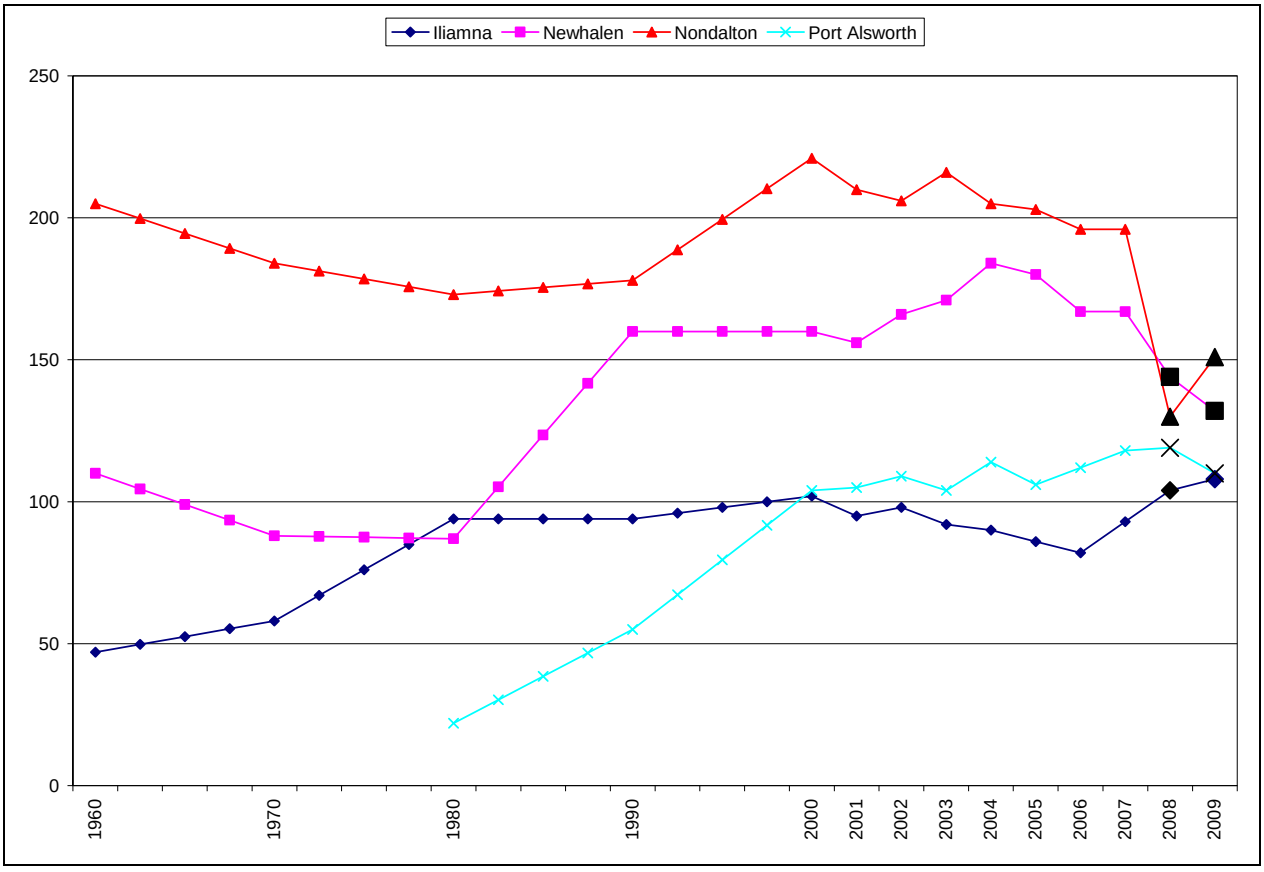

Figure 50.–Population of study communities, 1960–2009.

According to all data sources, the population of Iliamna and Newhalen rose gradually from 1960 until the early 2000s. Since then, based on ADLWD data, Newhalen's population has declined (from 184 in 2004 to 167 in 2007) as has Iliamna's population (102 in 2000, 93 in 2007). Division of Subsistence data

suggest a larger drop in population for Newhalen, with an estimate of 125 in 2004 (compared to the ADLWD estimate of 184), 144 in 2008, and 132 in 2009. Division surveys also counted fewer people in Iliamna in 2004 (72) compared to the ADLWD estimate of 90, but estimated an increased population of 104 in 2008 and 108 in 2009. The lower population estimates from the division's household surveys may be the result of conducting these interviews during winter and the absence of seasonal community residents. Also, division surveys are not conducted with households that have not lived in the community for the majority of the study year, such as new arrivals. Enrollment in the Newhalen School (which serves Iliamna as well) was 89 in 2008 and 83 in 1999, which suggests a stable population, at least over that 10-year period (Figure 51; ADE&ED 2009). The combined population of Newhalen and Iliamna was 157 in 1960 and 262 in 2000, according to the federal census, and 240 in 2009 according to Division of Subsistence household surveys.

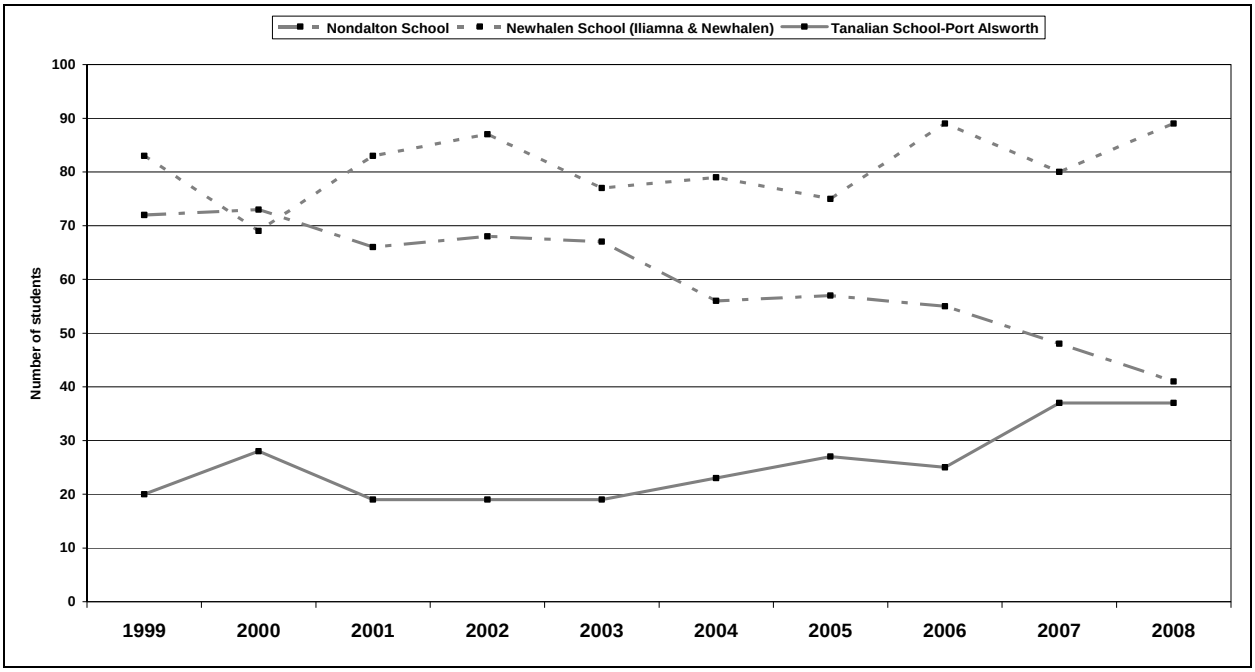

Figure 51.–School enrollment, preschool and K–12, study communities, 1999–2008

Source Alaska Department of Education and Early Development 2009: http://www.eed.state.ak.us/stats/

Federal decennial census and ADLWD estimates show little change in the population of Nondalton from 1960, when 205 people were counted, to 2007, when the ADLWD estimated a population of 196 (Figure 50, Table 1). However, Division of Subsistence surveys (administered in winter and including only year-round residents) found a lower population in 2004 (164; Table 2), 2008 (130), and 2009 (151). This is a decline of 32% from the federal count of 221 in 2000. Enrollment data for the Nondalton school suggest a declining population trend similar to that derived from division household surveys (Figure 51): from 73 students in 2000 to 41 students in 2008, which is a decline of 44%.

Census data are available for Port Alsworth beginning with the 1980 federal census. Overall, Port Alsworth's population rose from 1980 to the early 2000s and has been steady or increasing slightly since then (Figure 50). Compared to the other 3 study communities, Division of Subsistence population estimates for Port Alsworth based on household surveys are close to ADLWD estimates: for 2004, 109 based on division surveys, 114 estimated by ADLWD; and for 2008, 119 based on division surveys, 125

estimated by ADLWD. School enrollment data since 1999 suggest an increasing population of children in the community, growing from 20 in 1999 to 37 in 2008 (Figure 51).

Based on the federal decennial census for 1960 and division surveys conducted in early 2009, the population of the combined study communities rose by an annual rate of 0.8% over this 49 year period (Figure 52) (this comparison does not include families living in Port Alsworth in 1960 or in remote locations in either year). Over the same time period, in contrast, the population of Alaska grew at an annual rate of 4.1%. Since 2000, the combined population of the 4 study communities has declined by an annual rate of 1.6% while Alaska's population over the same 9 years grew 0.9% annually.

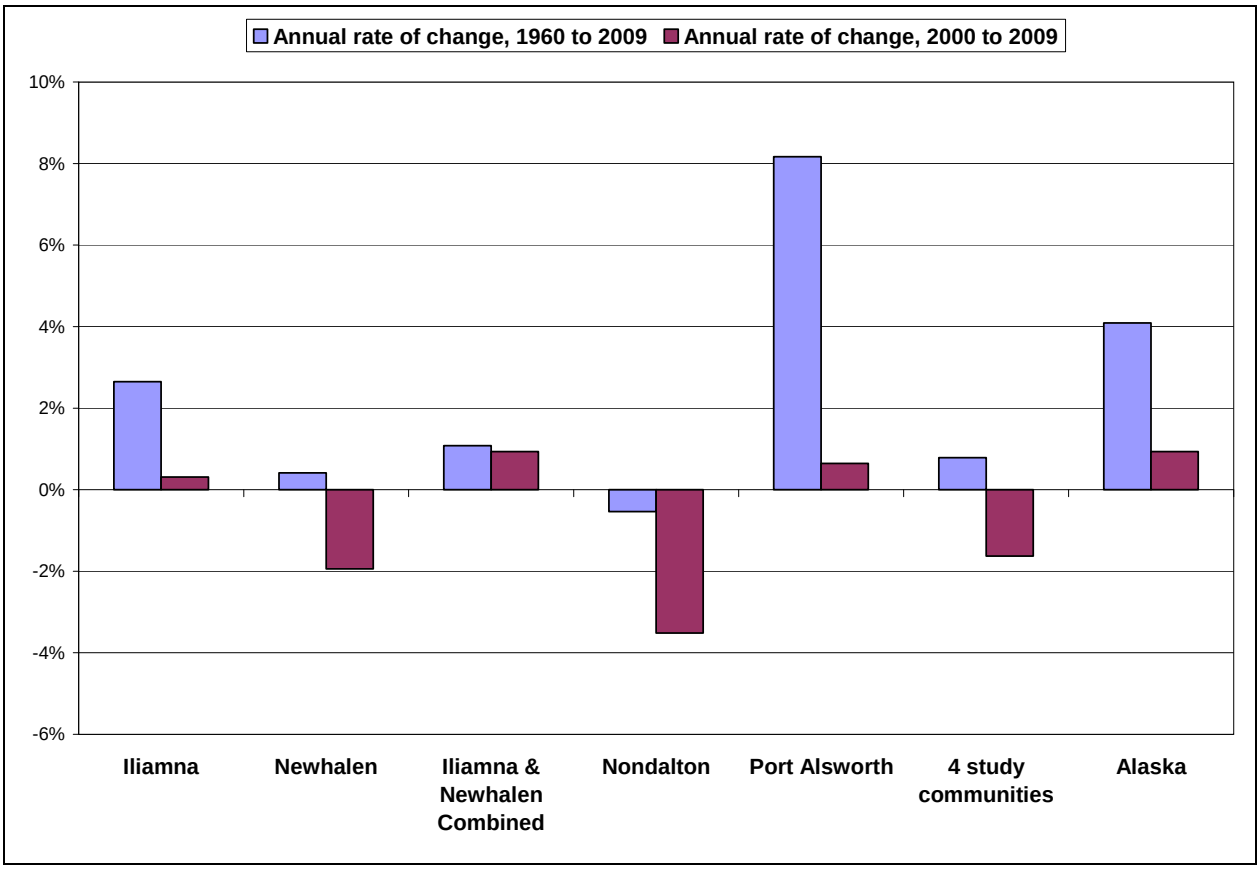

Figure 52.–Annual rates of change of population, Iliamna, Newhalen, Nondalton, 4 combined study communities, and Alaska, since 1960.

Although data suggest an generally stable or declining population for the study communities, it is important to note that demographic trends can suddenly be reversed. Ray Wassillie observed that people have moved out of Newhalen and into Anchorage, but people have also moved back:

> I've got to tell you something: all the kids that went out to find work, came back. Only a couple of them are out there working, I mean, teaching, but all the kids that left to go find employment are coming back to work for PLP. So I don't see a [population] decline in my village, because of PLP.

SUBSISTENCE FISHING REGULATIONS

Although a few project area families continued to seine despite the state and federal regulations prohibiting it, most others, including many children, were not able to use this method until its reauthorization. Thus, the reauthorization of this method provided more opportunity for people to participate in the subsistence fishery and helped to strengthen families as they worked cooperatively to harvest and deliver salmon to fish camps for processing. Respondents also reported that seining promoted the traditional values of conservation because the size of the harvest could be better managed and excess fish released, as well as cooperation and sharing. The skills and knowledge necessary for effectively operating the seine, hidden from sight for decades, were openly passed on to others in 2007 and 2008.

Lary Hill provided an additional perspective. He recalled that when he was a child, in Nondalton, people organized large family units to seine for salmon. Starting about the first of the year, they made and repaired their own seine nets. When summer arrived, they were able to catch the salmon they needed in short, orchestrated efforts. Seining, he said, enabled people to keep only the fish they could process at that time. They could complete processing faster, eliminating damage and waste. With a set gillnet, harvesting and processing tend to occur over a longer period of time. Fishers must keep all the fish that are in the net, regardless of preference or goals, because the fish are usually too damaged to survive if released.

As a factor that shapes trends in the Kvichak watershed subsistence salmon fishery, this example shows how an unnecessary regulation can stifle effective traditional management of subsistence fishing, impede efficient harvesting and processing, and prevent the teaching of traditional knowledge and skills. Other potential regulatory actions, such as harvest limits inconsistent with traditional levels of use, burdensome documentation requirements of traditional activities such as the sharing of harvests, or local residency rules that prohibit family members who live outside the local communities from assisting with fishing or processing, could result in reduced opportunity and more conflict between community residents and resource managers. Efforts to impose regulations without local community input or recognition of traditional systems of management could also reduce participants' sense of "ownership," and thus their motivation for conservation of the subsistence fishery.

SOCIAL AND CULTURAL FACTORS

Based upon the work with the case study families and participant observation at fishing and processing sites, there appeared to be several sociocultural factors that shape variations in subsistence harvests and long term trends in the fishery, as well as influence decisions about subsistence fishing in 2007 and 2008. These factors include 1) community cooperation, 2) the desire to continue traditional cultural practices, 3) the opportunity for extended family members to reunite at fish camps and processing sites, and 4) respondents' perception that youth participation in subsistence fishing has declined.

The Social Context of Subsistence Salmon Fishing, Processing Sites, and Fish Camps

The case studies show that a skilled labor pool is necessary for subsistence salmon fishing and processing throughout the year. Prior to the salmon return, study community families helped each other to prepare for subsistence fishing and processing by cutting wood; repairing cutting tables, racks, nets, and smokehouses; and assembling equipment. Whether based in fish camps, as in Nondalton, or at fish processing sites near peoples' homes, as in Newhalen, Iliamna, and Port Alsworth, subsistence fishing and processing clearly promoted the health and wellbeing of each community by providing the basis for integration. Specifically, individuals as well as families continue subsistence salmon fishing and processing because their skills and knowledge are needed by others. Subsistence fishers demonstrated many links, both of obligation and dependence, to other members of their community. Shared family and communal efforts, for example, as well as widespread sharing of the resource were particularly helpful for young families and for elders, both of whom lacked the equipment to effectively fish for themselves although they were usually able to process and keep the fish they did receive. The persistence of this

network of social roles and tasks helps explain the continuing commitment and investment that local community members make annually to the subsistence fishery. Factors that disrupt this network threaten the fishery's future.

In the Iliamna, Newhalen, and Nondalton subsistence salmon fisheries there was a clear division of labor by sex. In Case Study F in Newhalen, for example, it was a single male who harvested salmon for several other households. Of the 11 individuals to whom this fisher delivered salmon, 9 were women. In these 9 cases, the senior male members of the households were unable to harvest subsistence salmon due to an inoperable boat or motor, or because they were commercial fishing, or because they were busy at other work. While salmon harvesting was thus largely a job performed by men, the processing of salmon was almost always directed by women. For example, on only 2 occasions did researchers at the processing site in Case Study F observe a man help with processing after he delivered salmon to the fish box, and even then he was clearly under the supervision of the women. Usually, a single female elder is in charge of the fish camp activities.

This division of labor was also observed in Nondalton fish camps. In Case Study J, the female elder received her salmon from a son who had set and picked the net for her. In this case, as in Newhalen, some processed fish were then given to him. Nets were usually owned by the female and it was usually the males who picked the net and delivered the harvest. In Nondalton as well, it was the women, usually the eldest female, who set harvest goals and directed the processing of the harvest. In addition, as illustrated in Figures 20 and 22, these fish camps were composed of individuals linked through matrilineal kinship.[20] This pattern may have arisen because sisters (as well as their daughters, who are often raised together as sisters) who processed salmon together in childhood continued to do so as adults. In another example, illustrated in Figure 19, females linked by marriage also processed salmon together. Matrilineal organization in the subsistence salmon fishery at Nondalton is a long standing principle, as described by Ellanna and Balluta (1992). Matrilineal organization of fish camp activities is also evident in the Dena'ina community of Tyonek on Cook Inlet (Fall et al. 1984).

A division of labor by sex could also be emerging in Port Alsworth, as evidenced by Case Study N and the Davis family case study. However, case studies L and M from Port Alsworth show a different pattern, in which the male in the family did the majority of both the harvesting and the processing.

Fish camps are clearly a context in which traditional skills and knowledge are applied, shared, and learned. The camps were a social context even for young children, a place to learn traditional knowledge, skills, and values. For example, during Hay's visit to Nondalton as described in Case I, the owner's 3-year-old grandson, although too young to pull a net, cut salmon, or hang fish in the smokehouse, "instructed" Hay to place harvested salmon in the appropriate buckets. By observing and listening, and through his play at the camp, he learned not only empirical skills, such as how to count, but also work ethics, respect for the environment, and other cultural lessons, all through the daily rhythm of life at the camp.

Nondalton elders interviewed in 2001 (Stickman et al. 2003:43–45) reported that fewer people were participating in subsistence salmon harvesting and processing activities at fish camps, and people were spending less time at the camps. Respondents from Nondalton for this project also reported this trend. For example, Clyde Trefon of Nondalton reported that over his lifetime he had witnessed a decrease in the number of people living at fish camps. He said that some people may process their fish at a camp, but then they preferred to return to Nondalton at the end of the day. When this occurs, he said, the quality of fish could be compromised because no one was present to watch the flies, which can ruin the fish. He also expressed concerns that fewer people were interested in harvesting and processing fish, and that families

[20] "Matrilineal" refers to tracing descent exclusively through the female line, in contrast to "patrilineal," descent through the male line, or "bilateral" descent through both male and female lines. Traditionally, all Dena'ina individuals belonged to one of several matrilineal clans. Because descent was traced matrilineally, persons belonged to the clan of their mother.

were not requiring that young people accompany them to fish camp. He feared that this decline would continue until his community lost its subsistence way of life. He said, "A lot of them are going to be losing their subsistence way of life, and just cow and chicken is going to be the only foods that they know how to get." His key point appeared to be that if fewer families participated directly in the subsistence salmon fishery, the result would be not only lower harvests but also a loss of the knowledge and skills needed to support the traditional subsistence fishery.

Enculturation of Children

A common theme that arose during interviews and fieldwork was that children were showing less interest in participating in subsistence harvesting and processing activities (see Nondalton Case C, for example). These respondents suggested that new recreational technologies, such as console gaming devices (often called "play station" by community members) and handheld gaming devices ("game boy"), as well as the preference to watch television and movies, interfered with young people's interest in fish camp. The Wassillies in Newhalen observed that most of the people in their community who led the fish processing groups were in their 40s and 50s, while younger people appeared uninterested in subsistence activities, including hunting for various species of ptarmigan, grouse, hares, or other small game species. Clyde and Valerie said that many young people liked to go hunting for big game, but the same young people were not interested in fish camp, perhaps, they suggested, because of the more sustained work effort involved in processing fish. They said that young people who harvest big game can bring the animal back to the community and let others process the meat. They were concerned that this resulted in a lack of self-sufficiency in the community and more reliance on store-bought and commercially-processed foods.

Changes in technology may also affect the social organization of salmon processing as well as opportunities for children to learn. For example, Emma Hill noted that when she was young, the first "job" she was able to do at fish camp was tie backbones together and hang them for dog food. This job was assigned to the very young because other jobs, such as picking nets, heading and gutting the salmon, or even hanging split fish, were either too dangerous for young children or required greater skill or strength. When asked about the differences in teaching today's children about fish camp and why fewer children were involved in the process, Emma said:

> Because we no longer tie bones, because no one has [a large] amount of dogs anymore. They don't need to do that. And we put up just a small percent of what we used to put up. And so the kids don't really do anything.

She did say that her grandsons helped in the camp in other ways, but her point was that not only did the loss of dog teams result in a decline in harvest, it also eliminated an important fish camp task for the young. The majority of respondents over 40 said that the first step in learning to process fish was tying the bones together and that their responsibilities naturally progressed with their skills and abilities. This important step in the learning process did not appear to be available at most camps, with a few exceptions, such as at Clyde and Valerie's camp where they wanted their children to learn the process and be involved and not because they needed to feed large numbers of dogs.

Emma and Lary Hill noted that although they had taught their children and grandchildren how to fish and hunt, their children left the community and were working in the Anchorage area, and did not have time to participate in their style of subsistence hunting and fishing. They observed that some children from area communities, especially the generation that grew up with many of the amenities of present day village life, had not had the opportunity to live in camps located outside the modern village. On the other hand, they said, their grandsons enjoy spending summers and vacations with their grandparents at Chekok. The grandchildren have promised to always return and continue the traditions they have been taught.

In some families, it appeared that people became fully contributing and invested participants at fish camp at a later age, as exemplified by 2 of the young women encountered during fieldwork. Both had been raised in families that practiced subsistence fishing and that valued a traditional way of life. The women

had had positive experiences at fish camp and their childhoods had revolved around fish camp and other subsistence harvest activities. As children, they both had hung bones on the bone rack. However, both had been absent from the community for extended periods before they started to process salmon, and one still lived outside the region, returning, with her son, only for seasonal visits. Even after their return to the community as young mothers, they did not immediately resume involvement in subsistence salmon processing until an elder family member (an uncle in one case and a parent in the other) chided them for not knowing how to properly prepare salmon. One of the young women said, "I wanted to learn. My uncle got mad at us about not learning and not being interested in taking on the tradition [as] the next generation."

An adult daughter of Emma and Lary Hill also began assisting at their fish camp for the first time in 2008. The Hills explained:

> She's been around for years, but this is actually the first year she got in and started cutting the fish. We were talking to her about us being the last of the breed [laughs] to come out here [to the fish camp] and do this stuff, and she made an effort to quit her job, and came out to do this!

Despite respondents' apparently prevailing view that young people were not interested and not involved in subsistence salmon fishing and processing, observations during 2007–2008 fieldwork found that, among many families, youth involvement was important and extensive. See, for example, the following essay by Jennifer Shaw, a doctoral candidate in anthropology at Case Western Reserve University. Shaw, who is engaged in research with youth in Nondalton, participated in several teleconferences with project staff about her self-funded research findings. Her essay was prepared specifically for this report.

Contemporary Nondalton Youth Fish Camp

by Jennifer Shaw

> When a young person is growing up, his life is like a toolbox. From a very young age one begins to fill the toolbox with the things one learns. Then . . .if one doesn't get confused and fumble and lose the contents, they can give one strength and prosperity.

These words were spoken by Yup'ik Elder Paul John from Toksook Bay in conversation with anthropologist Ann Fienup-Riordan (2000). The constellation of values, knowledge, skills and practices associated with living on the land—also known collectively as *subsistence*—has long been essential tackle in the toolbox of youth coming of age across Alaska. Encircling the seasonal round, the subsistence way of life has survived and thrived across Alaska through centuries of sociocultural change, economic expansion and technological innovation, passed continuously from one generation to the next. Today, however, many Elders and other community members throughout Alaska express concern that youth participation in subsistence is declining and worry that this signifies a shrinking toolbox for contemporary youth and corrosion of the strength and prosperity of the communities they will someday need to lead (Fall et al. 2008).

Between May 2008 and June 2009, I spent six months in the village of Nondalton conducting ethnographic research on the role of subsistence in the well-being and aspirations of contemporary indigenous youth in rural Alaska. The key objectives of this in-depth case study are to understand how youth engage in subsistence activities, how these activities figure into the broader context of their lives, and how youth themselves think about subsistence and its role in their aspirations for the future.

On seven trips to the village made throughout the seasonal round, I administered 47 questionnaires and conducted 63 semi-structured interviews with 21 youth between the ages of 10 and 19. Questionnaires surveyed youths' perceived well-being, activities, and future aspirations. Interviews covered a broad range of questions related to six life domains: school, family, friends, self, community and culture. Additionally, I conducted unstructured interviews with Elders, parents, younger children, young adults, teachers, former teachers, clinic staff, missionaries and city and tribal council members and administrators. I attended and participated in community events, including memorial and celebratory potlatches, Russian Christmas, Winter Carnival, family wellness circles and spring clean-up. I substitute taught at the village school, cheered the high school basketball team, attended Culture Week and traveled to a neighboring village to watch Nondalton teens compete in the regional Native Youth Olympics. I took walks with youth of all ages and welcomed them into my village home almost daily to play games, do crafts, surf the internet and share countless cups of cocoa. I visited with ice fishers in winter and helped put up salmon in summer through every stage of the process, from seining and splitting to making salt fish and dry strips. In July and August, I spent six weeks in the village and at nearby Fish Village during the annual summer salmon and berry harvest. This brief overview offers a few observations and preliminary conclusions. The final study report will be complete in spring 2010.

Among my initial observations at Fish Village, one in particular commanded my interest: *few kids were present, especially teens.* The summer salmon harvest is arguably the most important subsistence event of the entire year. With declining moose and caribou populations, salmon comprises an increasingly greater share of the community's subsistence diet and as one resident related, "People feel more at home at fish camp than they are in the village." So where were the kids?

Some children were doing what kids in "the ville,"[a] like kids in the city, do in the summer—riding bikes, walking, swimming and playing video games. Many of the teenagers, however, who were conspicuously absent from fish camp were engaged in a variety of other "camps," or the constellation of summer activities that comprise modern life for a village teenager. Interestingly, some of these activities are, like the grandmother of them all—fish camp—actually called camps: science camp, natural resources camp, bible camp. Like fish camp, these camps aim to provide experiential learning in a communal setting to promote positive youth development and skill acquisition. Other activities comprise a category of work "camps" in which youth interned with local organizations (health clinic, city, tribal council), usually through the regional Native Corporation. They also worked in neighboring communities for the National Park Service, on a nearby mining exploration project, and outside the state on wild land firefighting crews. Some kids visited family and friends in other villages, Anchorage or elsewhere, an activity that has become more common in recent years with regular air taxi service. The answer to the question of "where were the kids" is: they were all over!

With so many options for occupying their time, what do kids think about subsistence? Does their relative absence at fish camp indicate a lack of interest in their culture or the time-honored ways that have sustained and nourished their families for centuries? Preliminary analysis of interviews conducted with youth throughout the year suggests the answer is no. Repeatedly, I heard from youth and Elders alike that they needed the skills to live on the land because a day may come when they must depend on the land to provide entirely for them again. It was a slow hunting season for the community, primarily due to declining animal populations, demanding work schedules and high fuel costs. Still, I observed teenagers frequently "going after" wood or splitting logs to heat family homes. They reported hunting for upland game birds, recounted favorite stories of time spent on the land with family, invited me along to check traps and proudly displayed beaver- and rabbit-fur

mittens they made during the school's Culture Week. In the darkest, coldest days of winter, they exclaimed their eagerness for the return of summer and warm days spent at fish camp. They anticipated spending fun time with family, eating "tasty" fish, and swimming in the then-frozen lake. One older teen, who had recently completed her GED, cancelled two interviews (later rescheduled) because she was busy planing logs for new construction at the family fish camp, while gearing up to fish for salmon in spring with her relatives in a neighboring village. Meanwhile, she is contemplating vocational school for heavy equipment and information technology training in the fall. Additionally, nearly every youth interviewed expressed a desire to learn the Dena'ina language, participate in Native dance groups, tell traditional stories, learn from their Elders and/or someday work for their tribe or other Native organizations in some capacity. And, when asked to rate the personal importance of 13 traditional Athabascan values, they *almost exclusively rated <u>every</u> value as "very important."* Many indicated an interest in going to college or seeking vocational training and traveling to explore the world beyond the village and even Alaska, though many talked about returning to the village each summer to put up fish or to live when they are "ready to settle down." While urban youth across the country are reported to suffer from "nature deficit disorder" (Louv 2006), Nondalton youth are firmly rooted in their heritage and their connection to the land.

Rather than a decline in youths' interest in or value for subsistence—and by proxy, their culture—the absence of kids at fish camp suggests that they have options and opportunities that were hardly imaginable to previous generations of youth. The choices available to contemporary youth were largely not available to their parents and grandparents, who recount vividly the era of packing everything, including the portable washing machine, large families and dog teams onto the family skiff and traveling for hours to fish camp, where they remained from the day school let out in spring until the day it resumed in fall.

Contemporary youth, by contrast, are more mobile and more connected to the "outside" world than previous generations. Their social networks extend well beyond southwest Alaska to places as far away Africa. They are at fish camp *and* on Facebook. They know how to set a net *and* shop for iTunes—and use both simultaneously. They compete in the Native Youth Olympics *and* successfully invest in the stock market online. Youth coming of age today must master multiple skills sets and make complex decisions about *what* to learn, *where* to be, and *who* to incorporate into their extensive social networks as they approach adulthood. It is a formidable challenge at any age, and time is limited. One consequence of this shift in social patterns may be that it takes young people longer in the developmental trajectory than their forebears to learn the ways of living on the land. The observed presence of young adults and young families at fish camp supports this conclusion, and it may be a sign that youth will continue to take up the cultural project of subsistence, even as they explore new territories and adopt new technologies. Young adults in their twenties who now reside in locations stretching from Kokhanok to California told me they had returned to the village last summer to learn how to put up fish from their mothers and grandmothers "before it is too late."

Rather than shrinking their toolboxes, youth coming of age in Nondalton are expanding them in historically unprecedented ways. Tradition is taking a turn, but it will not die if those who steward the cultural, natural and human resources of this region do not "fumble and lose the contents." History is a cautionary tale and the next chapter will largely be written by those with the power—families, educators, land managers and law makers—to protect those precious resources. Dena'ina youth today are eager to integrate new skills, knowledge and practices with those that have stood the test of time, and all of these they wish to one day teach their own children with strength and prosperity.

Endnote

a. This moniker for Nondalton came from conversations at fish camp with one of the youths who commented that the only reason to go back to "the ville" in summer was to take a steam bath, do laundry and play video games. In his parents' and grandparents' younger days, all of these activities—with non-electronic games—would have been done exclusively at fish camp.

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As Shaw notes, youth do express interest in subsistence activities. However, during the summer, their time is often taken up with work, camps of various sorts, family visits to urban areas, and other activities. Despite these competing activities, youth were present at camps and processing and harvest locations. For example, children in the Port Alsworth case study family participated in the majority of the subsistence activities. The parents made an effort to involve the entire family in fishing. In Nondalton, the parents in the case study family said that their children ask to go to fish camp early every summer. The entire family stays at fish camp until the salmon harvest is finished.

Another possible trend, particularly apparent in Nondalton, was the apparent decline in the number of children who live year-round in the community, as evidenced by school enrollment (see "Demography," above). Fewer children at fish camps may be simply the consequence of fewer children in the community. Several children participated in fish camp activities at the camp occupied by the Case Study I family in Nondalton. However, at least 2 or more of these children lived in another community during winter. A similar situation was found at another nearby camp: the couple and their child lived in Anchorage and the fish camp belonged to the grandparents.

Researchers also observed several Newhalen camps in which children were participating. For example, a family at one camp hosted many children, most of whom were new to the community (Plate 48). The male picked the nets along with the other community residents, and the female helped the other women at the processing table. The children watched and learned from the elder women who were processing the salmon. Although some of the younger children, who were judged too young to cut fish effectively, were more engaged in catching small fish nearby or in other play, they were given smaller fish processing tasks as well as observing the activities of the older children. Their chores, observations, and "play" may lead to full participation, including working at the cutting table, after they are older.

Plate 48.–Newhalen fish camp where a youth was learning to cut fish.

Cultural Values, Social Obligations, and Commitments to Community and Culture

The case examples appear to illustrate that an individual's or family's level of participation in the subsistence salmon fishery reflects life choices and commitment to a way of life, and perhaps this factor is becoming more important. For example, some key respondents believed that substance abuse and alcoholism were increasing, and they attributed this rise in part to less participation in subsistence fishing and hunting. Many extended families continued to gather annually at fish camps, and participation and continuity with traditions appeared to be major objectives of these family gatherings. Many family members had traveled long distances in order to participate in camp activities.

As expressed by the 4 case study families, involvement in subsistence activities was primarily a consequence of their desire to maintain their quality of life, which respondents suggested was more than just a certain standard of living. For all the families, personal, family, and cultural values appeared to be deeply tied to and expressed through their subsistence way of life. Emma Hill explained:

> I can't put a finger on it. OK, I'm not going to die if I don't get my seagull eggs this year, but boy, they sure would taste good, and we always have so much fun when we go to do it. It's a tradition, it's just something you do! Did you ever see these commercials where it says, "The cost of this, and the cost of that, and a smile is priceless?" OK, that's what I'm trying to get across.

And Lary Hill added:

> It's not the matter of cost … It's the taste. Our bodies crave this stuff, you know? Special occasions, when we have Christmas parties and birthday parties in the community, there are almost all Native foods. At a funeral, [the] forty days [memorial]—the meal after the funeral. They will make that person's favorite traditional foods.

The comments by the Hills correspond with Stickman's views in the previous chapter about the connection between subsistence fishing, being at fish camp, and spirituality. Respondents repeatedly expressed that their participation followed a pattern that connected them with the resource, the place, and other people, especially with those who grew up in this way of life. They said that this pattern was also linked to the seasons, since, many explained, when summer arrives, subsistence fishing is "what people do." They said that there was an almost unconscious urgency to "get ready."

Subsistence activities such as fishing and processing salmon also appeared to provide opportunities to recall family members no longer living who had taught them, often as they worked side by side, not only the mechanics of fish harvesting and processing but also the meaning and significance of the subsistence way of life. Respondents explained that when they were at fish camp, they were once again with those elders and family members from whom they had learned in past summers. That this cycle was continuing was evident to respondents not only in terms of returning fish, but also because of the presence of the next generation, who were learning from them.

The case study families in Iliamna, Newhalen, and Nondalton often stated that fewer people from their communities, especially those of the next generation, were participating in subsistence salmon fisheries. They cited this observation as a reason behind their desire to include all family members, especially the children, in subsistence focused activities. Clyde Trefon explained:

> There are kids that want to stay at home, [and] the parents will just let them stay at home and not go down there [to fish camp] and really try learning. Versus us—we take our kids down there, and it's like, [we tell them] "This is something that you're going to learn, because some day you might not have it as easy as the way you got it right now!"

Raymond and Joanne Wassillie also often commented about the need to plan for economic opportunities as well as the need for children to learn subsistence skills. As village administrators and leaders, the Wassillies appeared to be particularly aware of factors that affected their community's ability to thrive.

At Nondalton, most fish camps were located 5 minutes by boat from the community. Although a short ride away, many village residents spent considerable time, money, and effort in maintaining a permanent presence at fish camp when the sockeye salmon were running. Thus, based on discussions with fishery participants, "fish camp" can be viewed as communal work that incorporates cultural values, meets social obligations and commitments, and provides a context for learning as well as a place for self-expression and connection to your community.

Observing fish camps at Nondalton, as well as the fish harvest and processing sites associated with Newhalen, Iliamna, and Nondalton, provided insights about the modern context of TEK, an essential component of the contemporary subsistence fishery. TEK should not be viewed as a remnant of past knowledge about the environment, but as a living knowledge about the environment derived from the contemporary actions and activities of people who interact with that environment. As Menzies and Butler (c. 2006:8) assert: "TEK is not just knowledge of the past, but also knowledge of the present." Individuals' perceptions of their world are shaped as they apply TEK during their engagement with natural environments and social networks. TEK, "as with all systems of knowledge...grows in spits and spurts. It degrades, changes, and transforms, and ultimately its integrity is dynamically linked to wider social and economic processes" (Menzies and Butler c. 2006:6).

Harvesting and processing subsistence salmon had more significance for residents of the study communities than simply providing food for the winter or a recreational diversion from work. Participation in the subsistence salmon fishery can be symbolic of community residents' ancestral traditions as well as of their commitment to the maintenance of their culture and their community. This aspect also emerged in Stickman's account of the meaning of her participation in fish camp. Fishing with one's family, she said, in this communal setting was one way to continue a cultural activity that expressed a modern identity, a sense of belonging to a group as well as to the land, and a link to one's past.

Some respondents in this study expressed concerns that children no longer participated in the subsistence fishery, which could be interpreted as a concern about the eventual loss of TEK in their communities. In contrast, however, other respondents offered the observation that as long as families of multiple generations continued to work together at fish camps and processing sites, TEK would be shared and learned. Although TEK may change as subsistence fishers adapt to changing circumstances, the opportunity to teach this knowledge to others was a strong motivation for respondents to continue to participate in the fishery.

The study findings from all 4 communities illustrate how TEK was also applied to residents' self-management of subsistence fisheries, which included setting harvest goals and practicing other conservation measures. These self-management actions contributed to the more institutionalized, agency management of commercial and sport fisheries on the salmon stocks of the Kvichak River watershed. Residents of these communities managed their subsistence fisheries long before state and federal managers arrived, and they were observed to continue this during the course of this project (Figure 53). Local subsistence fishers were observed to employ sustainable best practices that helped to achieve their harvest goals.

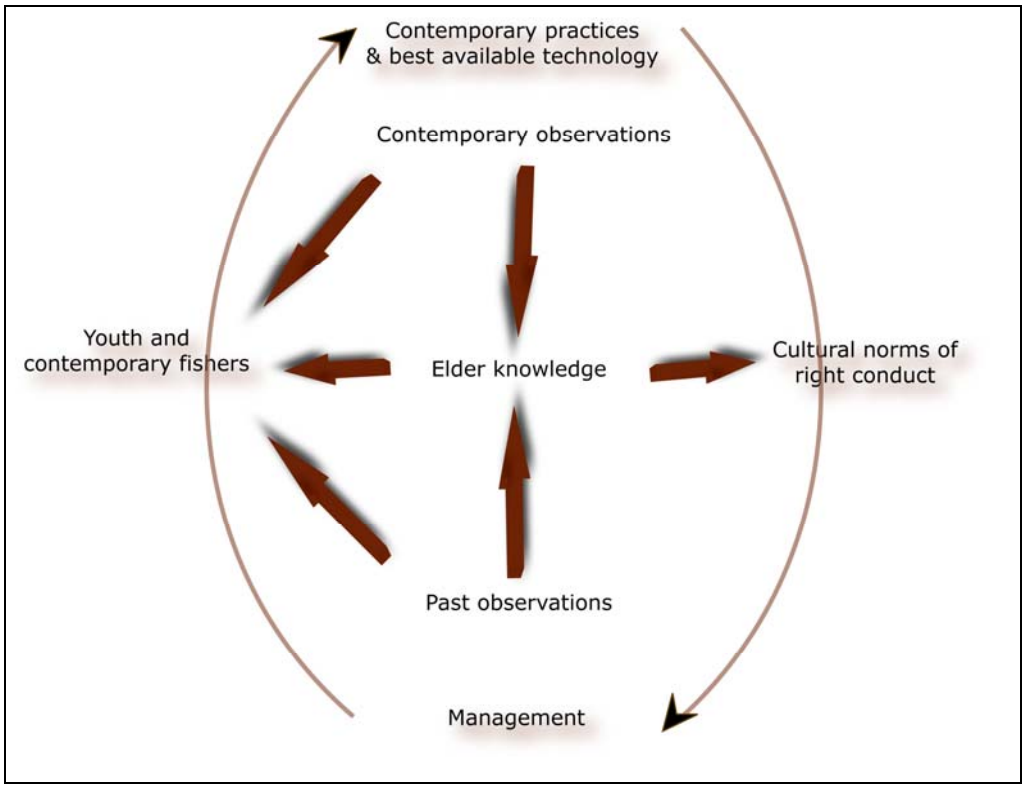

Figure 53.–TEK: understanding the "traditional" in traditional ecological knowledge and its relation to resource management.

SUMMARY: FACTORS THAT SHAPED ANNUAL VARIATIONS AND LONG TERM TRENDS

In summary, annual variations in subsistence salmon harvests at both the household and community level were most likely shaped by the following factors:

1. Environmental factors, specifically annual variations in salmon run size and timing; weather, especially the amount of rainfall, the wind, and the temperatures; water levels; and the presence of bears at processing facilities and bears and freshwater seals at harvesting sites.
2. Economic factors, specifically the rising costs of fuel and supplies; jobs for wage employment that removed individuals from the harvesting or processing labor pool; wage employment that limited the time individuals could devote to harvesting and processing; the availability of alternative resources, such as big game; and the scarcity of wage employment and commercial fishing jobs, which reduced the cash available to support subsistence activities.
3. Sociocultural factors, specifically the availability of labor; the commitments by individuals and families to fishing and processing; and the availability of traditional knowledge about fishing and processing methods.

Long term trends, characterized by a decline in subsistence harvests over the last 40 years, were most likely shaped by several factors, including technological changes, such as the replacement of dog teams with snowmachines; economic conditions, including an increasing commitment to the cash component of a mixed economy, a commitment that appears to have encouraged residents to accept jobs with schedules that interfere with subsistence activities; cultural changes that remove youth, young adults, or entire families from subsistence activities and the labor pool; and the migration of individuals out of the community for economic or other reasons. Another long term factor in the decline of harvests appears to be the regulations that prohibited seining in the subsistence fishery, which inhibited teaching this method to the younger generation. Now that the prohibition has been lifted, perhaps these traditional knowledge and skills will not be lost.

Over the last 40 years, subsistence harvests have only remained at their significant levels because of well-managed salmon runs; residents' commitment to sustainable harvesting practices informed by traditional knowledge; their commitment to a way of life connected to subsistence salmon fishing and processing; the guidance of elders and parents, who are teaching their children and grandchildren the values of cooperation and sharing; the strong integration of the subsistence fishery into local social organizations and expressions of cultural values; and the significant contribution of subsistence salmon harvests to the local food supply, a supply that could be replaced only at extreme cost and hardship, if at all.

The future of the subsistence fisheries will depend on maintaining the health of the salmon runs and of resident fish, especially in light of mineral development; maintaining access to the resource; and providing wage employment opportunities in the local mixed economy. The future of the fisheries also depends on the choices that families and individuals make about practicing the traditional subsistence activities of their communities.

ASSESSMENT OF FAMILY CASE STUDY METHODS

The information provided by each case study family, in addition to the 18 interviews conducted by La Vine, provided excellent context and insight to project research questions and objectives. The goal of the family case study method was to provide an "insider's" perspective to the research questions of this project. Through the data generated by project participants, researchers hoped to gain a deeper understanding of the social context of the subsistence fishing practices and decision making process of 4 families' annual subsistence harvest of salmon and other wild foods. Although derived from more traditional ethnographic methods, such as long term fieldwork and continued contact with community, this method involved a more experimental approach of involving the families in their own documentation, by which researchers anticipated finding a unique and detailed perspective of subsistence fisheries in the

Kvichak watershed. In particular, researchers hoped that the family case study method would provide an opportunity for greater community and participant involvement in the research and perhaps allow a more intimate means of sharing and developing knowledge.

During development of the family case study method, La Vine initially hoped that the families themselves would not only produce data, but also provide insights on those data, insights that could be inserted directly into the project's final report. While this did not take place as expected (the synthesis and presentation of data was accomplished by the project staff) the family case study method proved successful in that it was able to engage the families in the objectives of the research as well as to provide families with multiple opportunities for reflection. Families could choose the means by which they recorded their activities, and as a result they were able to highlight aspects of their way of life that they felt were most significant. In addition, as they reported during the bimonthly interviews, case study families were able to achieve a heightened awareness of their own, as well as their community's, subsistence activities.

As expected, some families were more active than others, and of those active families, some provided more documentation than others. Every household was comfortable using the camera, 3 used some form of journaling (written notes and observations), 2 used the subsistence harvest activity logs, 1 family marked subsistence use locations on maps, and 1 family used the digital cassette recorder. The 2 most active families used a combination of 4 of the 5 methods provided, 1 family used 2 methods, and 1 used a single method to document its activities.

Two aspects of this approach appear to be most useful: 1) self-documentation provided a continuous year-round opportunity for project participants to reflect on the objectives of the research project and their relationship to the meaning and value of their way of life; and 2) self-documentation provided context, reference, and verification of responses to questions raised during bimonthly interviews. During the process of reviewing transcribed interviews, La Vine found it particularly beneficial to refer to the photos and sometimes very detailed notes and descriptions of trips or events in order to determine the date of the activities, the participants, the resources harvested, and the methods used. A respondent often recalled an event but not the species of wild fowl or freshwater fish that was caught. By referring to the photos, the species and harvest quantities were clearer.

The case study family methodology was also useful in providing information that supplemented and augmented the data gathered through participant observation, key respondent interviews, and household surveys (objectives 1 and 2), as follow-up questions could be asked. This was particularly helpful for the production of annual reports, as well as for the compilation and summarization of preliminary data. Results from Objective 3 also contributed to the final analysis of the social context, annual variations, and long term trends of the subsistence sockeye salmon fishery.

CONCLUSIONS

We conclude this report with a summary of our key findings, followed by a list of recommendations directed primarily to fisheries managers but also intended for local community residents and leadership.

1. Despite documented declines in harvests, the vitality of the subsistence salmon fishery in the project communities of the Kvichak watershed, based on case studies, field observations, interviews, and harvest data from returned permits and household surveys, is indisputable. The fishery is "vital" in 2 senses of the word as defined by the American Heritage Dictionary (2004 [Dell reissue edition]). First, it is "necessary to the continuation of life;" e.g., subsistence salmon fishing provides substantial quantities of food to local community residents, ties extended families and neighbors together through bonds of mutual support and cooperation, establishes a context for sharing and learning traditional knowledge and values, and nourishes cultural and spiritual connections to the natural environment and the long history of the Iliamna Lake and Lake Clark area. Second, the subsistence fishery is "full of life; animated;" e.g., most families harvest, process, and share salmon; people of all ages

participate; and there is evident pride and satisfaction as people work together to prepare another year's supply of traditional and healthy foods.

2. The 2 years of household survey data demonstrate that relying solely on returned subsistence salmon permits results in an underestimate of subsistence harvests in the 4 study communities, particularly in Nondalton. In many cases, this appears to be the consequence of a) several households working together under a single permit but neglecting to fully document the harvests by all households; and b) key fishers (such as a family that owns a seine net) providing salmon to many households. Much of this harvest appears to go unreported on permits. In addition, some fishing households simply fail to obtain a permit. On the other hand, researchers encountered virtually no reluctance on the part of subsistence fishers to report harvests since most who obtained permits returned them and others readily agreed to be surveyed about their harvests.
3. The extended family social organization of subsistence harvesting and processing, and the extensive sharing of equipment and harvests, is a key feature and strength of the fishery, although it creates challenges for a harvest monitoring program that focuses on household permits.
4. Additional outreach about the benefits of accurate and complete reporting of subsistence harvests is necessary in each community in order to encourage households to obtain permits and record their harvests. In the meantime, postseason surveys need to continue in order to develop reliable final harvest estimates. Discussions within the permitting agencies (ADF&G and NPS) about the permit program also need to take place, with the goals of improving permit harvest records, perhaps allowing such circumstances as multiple households fishing a single permit, and thus improving harvest reporting and accountability.
5. The trends in the subsistence fishery need to be understood in the context of limitations in the documentation of harvests, especially in recent years. The level and rate of decline in harvests may be overstated if based solely on the permit database. Further, the transition from dog teams to snowmachines in the 1960s and 1970s that apparently resulted in substantially reduced subsistence salmon harvests likely exaggerate the dimensions of changes in harvests for human consumption.
6. Legalization of seines for subsistence salmon fishing was a significant action, especially for Nondalton residents. It opened opportunities to harvest salmon in a sustainable and efficient manner and to teach traditional skills and knowledge.
7. Family decision making about subsistence salmon fishing each summer is affected by various sociocultural, economic, and environmental circumstances. No single factor appeared to determine levels of effort and harvest. In general, families appear to have goals for subsistence salmon harvests that are fairly stable over time. Run abundance and timing, weather, alternative resources, costs, wage employment, the available labor pool, personal circumstances, and personal and family commitments to traditional subsistence fishing all come into play.
8. Annual variations in subsistence salmon harvests are shaped by most of the same factors that influence family decisions about participation in the fishery and harvest goals. Several factors that affect annual variations, such as salmon abundance and weather, did not appear to affect trends in the subsistence salmon fishery.
9. Factors that likely contribute to reduced subsistence harvests include technological change (such as the elimination of dog teams), smaller community populations, the development of a cash sector in the local economy, cultural change that affects youth involvement in the fishery, and unfounded regulatory restrictions, such as the ban on seining. Conditions that harm the salmon runs, cause people to leave the local communities, or restrict subsistence fishing unnecessarily will pose threats to the subsistence fishery and the viability of local communities.

10. On the other hand, factors that support the vitality of the subsistence salmon fishery in the study communities include abundant salmon runs, commitments by individuals and families to the subsistence way of life, the strong role that subsistence fishing and processing plays in integrating and connecting families and communities, the spiritual and cultural meanings that the fishery supports, and the essential production of many thousands of pounds of nutritious, virtually irreplaceable food.
11. Many fishery participants expressed concerns that young people did not share their commitment to the subsistence salmon fishery and the subsistence way of life, which they believe are among the foundations of their communities. They cited the reduced presence of youth at fish camps and the many distractions that draw youth from subsistence fishing, hunting, and processing activities. However, the project documented much evidence of the involvement of youth and the commitment of parents and elders to teaching traditional skills and values.
12. Finally, the project provides ample evidence of the sustainability of the Kvichak watershed subsistence salmon fishery. Subsistence fishers have developed fishing and processing practices that promote conservation and self-management, such as strategies to achieve, but not exceed, harvest goals and prohibitions against waste. Fostering the continuation of local communities' self management traditions is key to the long term health and sustainability of the subsistence fishery and the salmon of the Kvichak watershed.

RECOMMENDATIONS

These recommendations are based on the project's findings regarding factors that have shaped trends in the Kvichak watershed subsistence salmon fishery, with the goal of supporting the sustainability of the fishery, the communities, and the way of life that the fishery supports. These recommendations are intended for fisheries managers, for community residents, and for the leadership of these communities.

1. A comprehensive and reliable subsistence salmon harvest assessment program needs to continue for the fishery. This program is necessary so that trends in the fishery can be tracked and understood. (See the "guiding principles" for a unified subsistence fisheries harvest assessment program in Fall and Shanks 2000[:B-8]).
2. Continuing outreach needs to occur in the communities about the need for accurate subsistence harvest data, including full participation by all subsistence fishers in the harvest monitoring program. Full support for these programs and outreach efforts needs to come from local governments and community leaders.
3. Because the subsistence permit system may underestimate harvests, the permit system should continue to be supplemented with postseason household surveys or other methods to verify the harvest data and assure that the harvests of all fishery participants are counted when harvest estimates are developed. (See also Fall and Shanks 2000[B-16–B-18]) for recommendations about harvest data collection procedures, supplementation of permits, and inseason data collection via postseason interviews.)
4. The research found strong evidence that the involvement of multihousehold extended families in harvesting and processing, their specialization in harvesting activities, and their frequent sharing of harvests, created challenges for documenting harvests. Therefore, discussion among fishery managers and community residents should take place to assess potential changes to the permit program in order to improve harvest records, and perhaps to allow for such circumstances as multiple households fishing a single permit.
5. In the Kvichak subsistence salmon fishery, as in most other traditional subsistence fisheries in Alaska, extended families work together to harvest and process salmon. Some of these family members are not year-round residents of the area communities. Regulations that limit or prohibit participation by these nonlocal family members are ill advised. These regulations can disrupt harvesting and

processing groups and create hardships for local residents who depend on the contributions of these family members to the family's production of their annual food supply. Furthermore, such regulations could prevent youth from outside the communities from learning fishing and processing methods, as well as other traditional knowledge, from their relatives and elders in their ancestral communities.

6. Residents of local communities and community leaders need to be active in the fish and wildlife regulatory system, including participation on advisory committees, regional councils, and in the regulatory board process. The effective management of fish and wildlife and the protection of subsistence fishing and hunting opportunities depend upon the involvement of people who have direct knowledge of these resources and their habitats.

7. Fishery managers should acknowledge the sustainable, self-management practices at work in this subsistence fishery. Community families set sustainable harvest goals and have developed fishing and processing methods that enable them to achieve their goals in a nonwasteful manner. Families and neighbors organize themselves to set and check nets, deliver harvests, provide adequate labor for the myriad tasks needed to properly process the harvest, and generously share their harvests. This is accomplished without formal regulation by state or federal agencies. It is a system that works because the residents of these communities know that the future of their traditions and way of life depend upon healthy runs of salmon and they are willing to do their part to conserve this vital resource.

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APPENDIX A: INTERVIEW PROTOCOL

KVICHAK WATERSHED FISH CAMP ETHNOGRAPHIC PROJECT
INTERVIEW PROTOCOL

Interviewer – This is a general list of questions. The interview can be as open-ended as you wish. The major questions that should be asked are marked with an asterisk. The rest depend on how the interview is going? Feel free to reword the questions. These interviews can be taped or you can just take notes, depending on how comfortable you and the interviewee feel with each method.

We are going to discuss salmon fishing in your area including both the summer run of mainly sockeye salmon and the fall run of red fish. **Your answers to these questions are anonymous. If we use any quotes citing your name we will ask your permission first**.

DEMOGRAPHICS

*Date
*Researcher
*Name
*Age
*Parents Residence when Born
*Current Residence
*Years in Community

PAST

*When did *you* start fishing in the area?

How long has *your family* had your current fish camp?

Before this camp where did your family fish?

How has the technology of fishing changed in your lifetime?

Are there specific locations in the area that are known for good runs of salmon? Has this changed in your lifetime?

FAMILY AND THE CAMP

*Who makes up your fish camp? How many families? How are you related?

*Is there a person who is the "head" of the camp?

*Is the land that the camp resides on owned by someone in your household? How are you related?

*Who in the camp has a permit, if anyone and how many people are on this permit? Are there people participating in the fishery who are not on the permit? If so, how many?

Do you spend long periods of time at fish camp?

What age groups spend time at the camp? Do young people stay overnight? Do they stay for long periods of time? Why or why not?

Do elders stay at camp for long periods of time?

How do you get to fish camp?

What kind of permanent structures are at your camp?

What do you eat at fish camp?

PRESENT

*Are there places today that are known as good fishing locations? (Map these and get local contemporary place names and/or known Dena'ina and/or Yup'ik names.) How are fish camps or fishing locations chosen?

*Do you participate in seining for fish? If so do you think the low water has had an affect on this activity?

*What species of other fish, besides salmon, do you get in your nets? Do you keep these?

How do you select fish? Do you keep all the fish you catch?

What species of salmon do you catch in your nets?

Are some types of freshwater fish that you catch in your salmon nets preferred over others?

Do you do any sports (rod and reel) fishing for salmon?

PRESERVATION AND STORAGE

*In what ways do you cut and preserve your salmon (freezing, drying, smoking, canning)?

*How has modern technology changed the way you preserve your salmon? Does this make processing the fish quicker?

Is there a difference between how you preserve sockeye versus other species as far as preservation?

How many people participate in cutting fish? Is it mostly family cutting fish with you? Who does what?

When you smoke fish what kind of wood do you use? How long do you smoke the fish for?

What do you do with the bones and skin of the fish? Why do you do this?

Is there a difference now as to how much fish is wasted, versus in the past?

TRANSITION AND THE FUTURE

*What natural/environmental changes are affecting your subsistence fishing for salmon (for example water levels, gravel bars, silting, beaver dams, weather patterns)? Do you feel like the fishery is becoming unpredictable as far as run times, abundance, health of the fish, etc?

*Now that seining is legal do you think you will spend more time participating in this activity?

*Do you think more young people will participate in seining?

*Do people really spend much time at fish camp anymore? Can you get all the fish you need while spending less time at fish camp?

Have you noticed a change in the size or health of certain species?

Are fish populations declining? Why do you think this is?

Are there streams that no longer have fish that used to have fish?

If fish populations continue to decline will you continue to fish?

Are there as many people participating in fish camp as in the past? If there aren't as many why do you think this is?

(If applicable) Does commuting from the village to the camp affect your fishing effort?

What changes do you see among the younger generation in regards to fishing effort? If they don't find much interest in fishing does this affect your personal effort (for people in their 30s and older).

How would you like your knowledge of fishing passed onto the next generation?

SPECIES INTERACTION AND CONSERVATION

*In your opinion, what is affecting the abundance of salmon today?

Are there animals that affect the abundance of salmon?

Were there ways in the past of regulating these interactions? How about today?

Is there an interaction between salmon and freshwater fish species? Can the decline of one tell you about the future of the other?

How would people make sure in the past that there were enough fish? Did they do anything to protect the salmon spawning stream?

How have regulations influenced your fishing (gear, restrictions, etc.)? What changes would you like to see?

APPENDIX B: QUESTIONS REGARDING PERMITS

QUESTIONS REGARDING PERMITS

Do they usually get a permit?

Most said they did get a permit.

A couple said that they always get permits every season.

A couple of people said they didn't get one this season but usually do.

One person never gets a permit

When do they usually get a permit, at the beginning or end of season?

The beginning of the season.

If they don't get a permit do they keep a log of their fish?

Yes.

How many households on a permit? Does this include family or friends that they send fish to?

Many include the names of people who do not fish, but still receive fish.

Is it usually one permit per camp, or one per net?

One permit by head of camp.

How would you like to obtain a permit? Would you like it to be handed to you? Do you want them do still be distributed at the community center? What would be the easiest possible way for you to get a subsistence salmon fishing permit?

Half of the respondents said they like picking it up at the local office.

The rest of the respondents said that it would be easier if it was handed to them out at fish camp or have it mailed to them.

Do you seine?

Only one family and their friends use one seining net to seine.

If so, do you use a seine net or a gillnet? What method do you prefer?

All of the people who seined used a seine net. Most people had said that they have seen or heard of gillnets being used to seine.

What are your attitudes toward seining?

Most people did not know that it was legal. Most said that they know of people who do seine, but do not do it themselves. One person said that some people use gillnets to seine, but the fish still get hurt and tangled in the net and has the same outcome as regular gillnetting.

APPENDIX C: WORKSHOP AGENDA

DATA REVIEW AND REPORT PREPARATION WORKSHOP
KVICHAK WATERSHED SUBSISTENCE SALMON FISHERY (Project 07-452)

Dates: January 29 & 30, 2009
Location: Aerie Conference Room, ADF&G, 333 Raspberry Road, Anchorage

Purposes of the workshop:

1. Review study findings to date
2. Organize assignments for preparation of draft final report (due July 1, 2009) and draft annual report (due May 1, 2009)

AGENDA

Day One: January 29

8:30 a.m.	Overview of workshop agenda: Jim Fall
9:00 a.m	Researcher report: Robbin LaVine (focusing on project objectives 3 & 4)
10:15 a.m.	Break
10:30	Continue with LaVine (and discussion, especially regarding objective 4)
11:45	Lunch (on your own)
1:00 p.m.	Researcher report: Krieg
1:30 p.m.	Researcher report: Holen
2:00 p.m.	Researcher report: Stickman
2:30 p.m.	Research report: Ravenmoon
3:00 p.m	Break
3:15 p.m.	Update on analysis of survey data: Fall, Holen, Krieg
4:00 p.m.	Discussion/summary, especially focused on Objectives 5 & 6 and 3 research questions
5 p.m.	Recess for the day

Day Two: January 30

8:30 a.m. Planning second round of surveys

9:00 a.m. Planning community review meetings

10 a.m. Break

10:15 a.m. Content and schedule for draft final report preparation (due July 1)

11:15 a.m. Content and schedule for annual report (due May 1)

11:45 Schedule next meeting/teleconference

12 Noon. Adjourn

[Room is reserved to 5 p.m. if any participants wish to have follow-up discussions.]

APPENDIX D: SURVEY INSTRUMENT

SALMON SUBSISTENCE SURVEY

NONDALTON, ALASKA

January to December, 2007

This survey is used to estimate subsistence harvests and to describe community subsistence economies. We will publish a summary report, and send it to all households in your community. We share this 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:	252
RESPONDENT ID:	
INTERVIEWER:	
INTERVIEW DATE:	
START TIME:	
STOP TIME:	
DATA CODED BY:	
DATA ENTERED BY:	
SUPERVISOR:	

COOPERATING ORGANIZATIONS

DIVISION OF SUBSISTENCE ALASKA DEPT OF FISH & GAME 333 RASPBERRY ROAD ANCHORAGE, AK 99518	BRISTOL BAY NATIVE ASSOCIATION BOX 310 DILLINGHAM, AK 99576	LAKE CLARK NATIONAL PARK AND PRESERVE 240 W. 5TH AVENUE, SUITE 236 ANCHORAGE, AK 99501	NONDALTON TRIBAL COUNCIL P.O. BOX 49 NONDALTON, AK 99640
267-2353	842-5257	644-3638	294-2220

HOUSEHOLD MEMBERS

HOUSEHOLD ID _____

Between JANUARY and DECEMBER, 2007…
…who lived in your household?

ID#	IS THIS PERSON ANSWERING QUESTIONS *ON THIS SURVEY?* (circle)	MALE OR FEMALE? (circle)	HOW IS THIS PERSON RELATED TO HEAD 1? (relation)	IN WHAT YEAR WAS THIS PERSON BORN? (year)	ALASKA NATIVE? (circle)	IN 2007, WAS THIS PERSON AN ACTIVE SUBSISTENCE FISHERMAN? (circle)
HEAD 1	Y N	M F			Y N	Y N
HEAD 2	Y N	M F			Y N	Y N
03	Y N	M F			Y N	Y N
04	Y N	M F			Y N	Y N
05	Y N	M F			Y N	Y N
06	Y N	M F			Y N	Y N
07	Y N	M F			Y N	Y N
08	Y N	M F			Y N	Y N
09	Y N	M F			Y N	Y N
10	Y N	M F			Y N	Y N
11	Y N	M F			Y N	Y N
12	Y N	M F			Y N	Y N
13	Y N	M F			Y N	Y N
14	Y N	M F			Y N	Y N
15	Y N	M F			N Y	Y N

PERMANENT HH MEMBERS: 01

SALMON HOUSEHOLD ID

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

Between JANUARY and DECEMBER, 2007...
...Did members of your household USE or TRY TO HARVEST salmon?..... Y N

If YES, continue on this page...

SALMON 110000000

Last year, did your household get enough SALMON for your own household's needs?.....	Y N	
If NO ...how MANY salmon did you need?.....	(#)	
Last year, did your household get enough SALMON?.....	Y N	
If NO ...how MANY salmon did you need?.....	(#)	
...why did your household NOT get enough?		
Last year, did your household get a salmon permit?.....	Y N	
If YES ...how many members of your household were listed on the permit?	(#)	
...where there other people outside of your household listed on the permit?	Y N	
...if yes how many people besides those in your household were listed on the permit?	(#)	
...where any of these people from outside of the community?	Y N	
...if yes how many people from outside of the community were listed on the permit?	(#)	
...did you share your net with another household?	Y N	
... if yes how many other households?	(#)	
If NO ...were you listed on another household's permit?	Y N	

NON-COMMERCIAL SALMON: 04 **NONDALTON: 252**

SALMON

HOUSEHOLD ID

Please estimate how many salmon ALL MEMBERS OF YOUR HOUSEHOLD HARVESTED for subsistence use this year, including with a rod and reel. INCLUDE salmon 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 2007 DID MEMBERS OF YOUR HH... …USE _____? (circle)	…TRY TO HARVEST _____? (circle)	IN 2007, HOW MANY (_____) DID YOUR HOUSEHOLD HARVEST? CAUGHT WITH GILL NET (number taken by each gear type)	CAUGHT WITH SEINE	CAUGHT WITH ROD AND REEL	HOW MANY OF THOSE WERE JUST FOR DOGS? (number)	UNITS (ind)	IN 2007... ...DID YOUR HH SHARE _____ WITH OTHERS? (circle)	...DID OTHERS SHARE _____ WITH YOUR HH? (circle)
SOCKEYE SALMON	Y N	Y N					IND	Y N	Y N
115000003									
SPAWNING SOCKEYE	Y N	Y N					IND	Y N	Y N
117050000									
COHO SALMON	Y N	Y N					IND	Y N	Y N
112000003									
CHUM SALMON	Y N	Y N					IND	Y N	Y N
111020003									
KING SALMON	Y N	Y N					IND	Y N	Y N
113000003									
PINK SALMON	Y N	Y N					IND	Y N	Y N
114000003									
UNKNOWN SALMON	Y N	Y N					IND	Y N	Y N
119000003									

These columns should include all the salmon harvested by members of this household in 2007.

Between JANUARY and DECEMBER, 2007…
…WHERE did members of your household CATCH salmon?

Mark all harvest locations on MAP

NON-COMMERCIAL SALMON: 04 **NONDALTON: 252**

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 **NONDALTON: 252**

APPENDIX E: LETTER OF INVITATION

Kvichak Watershed Subsistence Salmon Fishery Ethnographic Study
Case Study Family Project
Bristol Bay Native Association, Division of Subsistence ADF&G, and NPS

Dear Family:

We are inviting you to participate as consultants and collaborators on our report of the subsistence sockeye salmon fishery of the Kvichak Watershed. The purpose of this project is to learn about the importance of the fishery to the local people in light of environmental, social, and economic changes. Through careful documentation we hope to aide in the preservation of this major subsistence effort and ensure that all activities from harvest methods to sharing will continue well into the future. This is an opportunity for you to add your own unique perspective to this research project by collecting and documenting your own data. We hope that as a representative family of your community, you will take the time to demonstrate the importance of subsistence fishing and related activities for your family and those that you know.

Some of the questions we hope to answer are:

- Who participates in subsistence fishing activities through out the year?
- In what way do people participate?
- Who does what?
- What factors influence your decision to fish and why?
- How often do you eat or share fish through out the year?
- How have things changed in regards to subsistence fishing over the course of family members' lives and memories?
- Are young people participating in subsistence fishing?
- Are family elders?
- How do you think things will change in the future?
- In particular, we hope to learn what YOU think is most important about subsistence fishing.

Participating families will be financially compensated for their time and expertise. You will receive $600 monthly stipend during those months in which subsistence salmon fishing is a primary activity (June, July, August, and October) and $400 monthly stipend during those months in which nonsalmon fish are a focus of subsistence fishing (September, and November through May). However, we understand that you may not be engaged in fishing activities every month of the year. During the slow months we hope that you will find quiet times to reflect on activities past or as you look forward to fishing opportunities in the future. We hope you will also record the times when you use, give, or share at meal times, fish or wild caught food that was harvested earlier in the year, or shared with you by others.

You will have the freedom to use a variety of media to help you tell your story. A digital camera will be provided, and you are encouraged to keep a journal of your thoughts on activities related to subsistence fishing. Following are a list of means for you to record your activities:

- Subsistence Harvest Activity Log: Families are requested to document subsistence harvest outings *as they occur* using the Subsistence Harvest Activity Log. The log will record when the activity took place, where, what species were targeted, what was actually caught, how did you catch it, and quantity estimates (1 fish, 1 bucket, 1 gallon, a bundle [40 fish] etc.). There will also be room to describe who participates (Are they from the family? Other community members? Visiting from another place?) and what factors

influenced the decision to fish (harvest goals, the number of people available to help with processing, storage capacity, the need or desire for fresh food, weather, and season). During the 2008 sockeye salmon season, harvest activity logbooks will be modified to document a daily record of the activities that took place, including where, what fish you wanted to catch, what was actually caught, what methods were used, and quantity estimates; and a weekly record of harvest effort by family members, gear type, location; and what influenced the decision to fish.

- Journals: You may also document your harvest activities through journaling which can include mapping, illustrations, thoughts, and reflections. This activity can occur at the end of each month or throughout the month for the purpose of reflection on the recent harvest efforts and any relationships these activities have to the past and approaching sockeye salmon seasons. You can also record any preparations being made for the coming sockeye salmon season or other fish harvests. A digital recorder will be provided as another means whereby family members can "journal" or interview each other.
- Digital Cameras: Families will be given and encouraged to use digital cameras to document each subsistence harvest outing, especially during the non-sockeye season. Photographic files will be downloaded to a project computer by the field researchers during each bi-monthly visit.

Over the course of the year, I or another member of our research team will work closely with you in order to answer any questions and assist in processing your information. Some of the ways in which I will work with you will include:

- Training: I will help introduce you to the process of recording subsistence harvest activities using logbooks, journals, digital recorders, and digital cameras. During this time, the project will be described in detail and consent forms will be signed.
- Introductory Interviews: During our first meeting we will conduct an introductory interview for the purpose of defining past and recent subsistence fishing harvest activities as well as the composition and identification of who you consider is "family." This initial interview is intended to provide family background and context for the following year.
- Bi-monthly in-person contacts. I will try to visit you in person every other month to review data collected and conduct interviews. These interviews will focus on providing comparative perspectives on past years' efforts in relation to the current year. Interviews will explore the reasons behind the decisions to conduct subsistence harvesting activities.
- As needed telephone contact: Between in-person visits, I will keep in touch with you every other week or so by telephone, and more or less frequently as needed, to answer questions, address concerns, and evaluate the workload and progress in documenting activities.

The Final Product

Consider the final product to be your own chapter in our book. It will be written and illustrated (photos, drawings, maps) by you, and will not go to print without your consent and approval. As we work to put together your "chapter" I will provide assistance as you decide what you want to include, and what you may decided to leave out. In short, you will have complete editorial control of what your family produces and what the final product looks like.

I look forward to working with you!
Robbin La Vine

APPENDIX F: CONSENT FORM

Kvichak Watershed Subsistence Salmon Fishery Ethnographic Study
Case Study Family Consent Form

"We have read the Case Study Family Letter and understand the level of work required to participate in this project. We understand that we will receive a stipend for the months that we produce writing, photos, recordings, or other materials related to the documentation of the importance of subsistence fish for our family and community. For the months that we may not or cannot produce any documentation, we understand that we will not receive any stipend. We understand that the stipend will equal $600 per month for the months of June, July, August, and October, and $400 per month for the months of September, and November through May. We understand that the checks will be issued every other month after Robbin La Vine, or another project associate, visits with us to discuss our work and recent activities."

"In return, we understand that we shall fill out a subsistence harvest activity log, each time we go subsistence fishing. We will also "journal" our activities and thoughts through audio recordings, photographs, drawings, and writings. We understand that with the assistance of Robbin La Vine, or another project associate, we will create a chapter or report to be included in the Kvichak Watershed Subsistence Salmon Fishery Ethnographic Study. We also understand that as the primary authors of our report/chapter we will have the final say on what our chapter will look like and what will be included."

"We agree to participate in this study based on the statements above,"

Signature_____ Date_____

Signature_____ Date_____

Robbin La Vine
Subsistence Fisheries Social Scientist
Bristol Bay Native Association
PO Box 310
Dillingham, AK 99576
1-800-478-5257
rlavine@bbna.com

APPENDIX G: SUBSISTENCE HARVEST ACTIVITY LOG

Subsistence Harvest Activity Log

Family Name: _____

Date/Time left: _____ Date/Time returned: _____

Person or Persons: _____

_____

_____

_____

Location/Locations of activity: _____

Target Species: _____

Species Harvested/Quantity: _____

_____

_____

_____

_____

_____

Methods/Gear type: _____

_____

Weather Conditions: _____

_____

Processing/Use:_____

_____

_____

Giving and Receiving (who did you give fish to or gave you fish?):_____

_____

_____

What factors influenced your decision to fish today – harvest goals, processing capacity, storage capacity, need/desire for fresh food, weather, seasonality: _____

_____

_____

_____

_____

_____

_____

Continue on the other side...

APPENDIX H: CONTACT INFORMATION SHEET

Kvichak Watershed Subsistence Salmon Fishery Ethnography
Case Study Families Project
Contact Information Sheet

Research partners on this project are:

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Bristol Bay Native Association
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Please feel free to contact any one of us with questions, suggestions, or supplies needs.