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Nushagak River Chinook Salmon: Local and Traditional Knowledge and Subsistence Harvests

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



Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

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

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by

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ABSTRACT

This report presents findings to address knowledge gaps about Chinook salmon in the Nushagak River. Five Bristol Bay area communities located on or near the Nushagak River were selected to participate in research about salmon use and harvest, and participation in the subsistence fishery and harvest monitoring program. Post-season salmon harvest surveys were administered to households in Clarks Point, Ekwok, New Stuyahok, and Koliganek in 2013 and 2014, and in Dillingham in 2014 and 2016. The surveys were used to develop household use and harvest estimates for salmon; identify fishing and harvest locations and gear types used to harvest salmon; and gather assessments of changes to harvests and sufficiency of salmon supply. Households were also asked about their participation in the subsistence salmon permit program. Key respondent interviews and participant observation were also used throughout the study period to more fully explore the social and economic relationship that the communities have to salmon: there was a specific emphasis to collect local traditional knowledge about Nushagak River Chinook salmon stock abundance, health, habitat, and fisheries management, as well as individual experiences and histories regarding subsistence practices in Bristol Bay. This research was recommended in 2013 by the Alaska Department of Fish and Game (ADF&G) Chinook Salmon Research Team.

Each community revealed unique characteristics related to subsistence salmon uses and harvest, but there also were commonalities. For instance, either sockeye or Chinook salmon was the most harvested species, in pounds usable weight, for all the study communities in every study year. Most households traveled some distance away from their community to obtain the salmon they needed for home use. Subsistence gillnet was the most common gear type used to harvest salmon, but coho salmon accounted for more of the rod and reel gear harvest than any other species at every community that used rod and reel gear. For both study years, the range of per capita harvests for all salmon spanned from 91 lb to 701 lb per person, and for Chinook salmon spanned from 42 lb to 218 lb per person.

Post-season household surveys identified salmon harvests that were not reported to the harvest monitoring program, which yielded recommendations for improved community participation in subsistence fishing reporting. Key respondent interviews collected statements from community residents about their concerns for the health of salmon stocks in Bristol Bay and valuable descriptions of changed salmon habitat and abundance. Overall, this research produced household harvest and use estimates for the study communities that indicate salmon remain a vital resource for these communities in Southwest Alaska and that sharing is a necessary component to the sustainability of each community's well-being.

Key words: salmon, Chinook, subsistence, sockeye, setnet, Nushagak River, Wood River, harvest, permits

1. INTRODUCTION

This report presents information about five Nushagak River communities and discusses their social and economic relationship to salmon, and, more specifically, Chinook salmon. The communities that participated in this project are Clarks Point, Ekwok, New Stuyahok, Koliganek, and Dillingham, which are located in the Bristol Bay area in Southwest Alaska (Figure 1-1). Research for this report spanned two years for each community.

The size of the study communities spans a wide range. Populations cited below are from the five-year (2012–2016) American Community Survey (ACS) estimated average (U.S. Census Bureau n.d.). This range encompasses the two study years for which research was conducted in every study community. Dillingham is the regional center in this part of Bristol Bay, with an estimated population of 2,296. The next largest community is New Stuyahok (pop. 566). The difference in population of the three remaining study communities was less pronounced: Koliganek (pop. 162), Ekwok (pop. 79), and Clarks Point (pop. 47). The same range of years was used to obtain the population of Alaska Native individuals in each community. The majority of the population in all of the study communities is Alaska Native, with Dillingham's population at 67% Alaska Native. New Stuyahok's population was 99% Alaska Native, Koliganek's was 86%, Ekwok's was 96%, and Clarks Point's was 100%. Population estimates based on the survey results by the Division of Subsistence will be discussed in the individual community chapters.

Residents of these communities use a variety of fish and wildlife resources such as salmon, nonsalmon fish, caribou, and berries, and harvest data gathered by the Division of Subsistence confirm varied and ongoing uses (Evans et al. 2013; Fall et al. 1986; Holen et al. 2012; Krieg et al. 2009; Schichnes and Chythlook 1991). This project focused on subsistence salmon use and harvest characteristics and trends.

The study years for this project were the calendar years 2013, 2014, and 2016. To gain a broad understanding of subsistence salmon fishery participation and harvest, the study used multiple-year data collection and analyses to supply information about the uses, processing, and importance of, and observations regarding, all five salmon species found in Alaska. Although Chinook salmon subsistence harvests, spawning escapement, and total run were variable during the study years of this project, the overall decline and concern by users pointed to the necessity of research into Chinook salmon abundance and health (Salomone et al. 2017). The purpose of this research project is to address subsistence uses and harvest of salmon for the five listed communities, and record observations about the status of Chinook salmon.

The mandate of the Division of Subsistence requires research about the subsistence uses of wild resources by Alaska residents, and this research is used to inform management decisions regarding the customary and traditional uses of those resources (Fall 2016).[1] This project aligns with this mandate by providing important information to support best management practices for the salmon fisheries of the Nushagak River watershed.

Project Background

This project is part of the Chinook Salmon Stock Assessment and Research Plan (ADF&G Chinook Salmon Research Team 2013), developed in 2013 by the Alaska Department of Fish and Game (ADF&G) Chinook Salmon Research Team. The Chinook Salmon Research Initiative (CSRI) program was a multi-year initiative to fund a variety of statewide research projects assessing Chinook salmon dynamics and declines, with a recognition that these declines have caused "social and economic hardships across many communities in rural and urban Alaska" (ADF&G Chinook Salmon Research Team 2013:1). Twelve watersheds were chosen as Chinook salmon indicator stocks for recommended research, including the Nushagak River. One goal of the CSRI program was to address knowledge gaps essential to furthering scientific understanding of Chinook salmon, thereby increasing management potential for this species. Local and traditional

1. Alaska Department of Fish and Game. n.d. "Division of Subsistence, Division Overview." http://www.adfg.alaska.gov/index.cfm?adfg=divisions.subsoverview (accessed Dec. 1, 2017).

knowledge (LTK) was identified as a source of "detailed observations about abundance, distribution, run timing, condition, and habitat, often focused on specific locations and informed by considerable time depth" (ADF&G Chinook Salmon Research Team 2013:16). LTK research methods identified by the Chinook Salmon Research Team included key respondent interviews, participant observation, literature review, and recording comments during harvest surveys, all of which were employed as part of this study.

Nushagak River

The Nushagak River is located in Southwest Alaska and flows about 390 km from its headwaters to Bristol Bay near Dillingham (Figure 1-1). Two main tributaries flow into the Nushagak: the Nuyakuk River and the Mulchatna River, which support a number of communities, including Dillingham, Ekwok, New Stuyahok, and Koliganek. Other communities that depend on the Nushagak River include Clarks Point, Ekuk (in Nushagak Bay), Aleknagik, and Manokotak. The Nushagak River also supports a long history of fish camp use, and the Lewis Point and Portage Creek sites, northeast of Dillingham, continue to be used by local residents (Stariwat and Krieg 2016).

Management Implications

Each river watershed focused upon for the CSRI program included an evaluation of current stock assessment methods and recommended stock assessment strategies. The Nushagak River Chinook stock inriver abundance is considered "biased [due to the] inability to ensonify the entire width of the river," meaning that not all fish are able to be captured and enumerated using sonar; additionally, commercial harvest estimates of Chinook salmon are also considered "biased low" due to underreporting in the high-volume, sockeye-dominant commercial fishery (ADF&G Chinook Salmon Research Team 2013:32). Evaluation of the stock would require multiple strategies for a more holistic approach to the overall assessment of Chinook salmon in the Nushagak watershed and five projects were identified as critical to this research (ADF&G Chinook Salmon Research Team 2013:32). This study satisfies two of the five recommended assessment projects: the study of LTK for the Nushagak River Chinook salmon stock, and "improvements to the existing subsistence harvest monitoring and assessment program" (ADF&G Chinook Salmon Research Team 2013:32).

This project incorporates data from two study years to estimate harvest values and characteristics, fishing locations, subsistence salmon permit and net sharing information, and households' assessments of salmon harvests. A household survey was used to collect these data (see Appendix A), and three of the four previously mentioned LTK study methods were executed at the time surveys were administered. Recording comments shared by household survey respondents, and conducting key respondent interviews and participant observation activities, contributed to a richer understanding of the continued customary and traditional uses of salmon in this area of Bristol Bay, as well as the economic and cultural importance of Chinook salmon and the local salmon stock. The subsistence salmon permit system was also evaluated by reconciling harvest and fishery participation data gathered from returned permits against data from household surveys.[2] This information will be valuable to managers seeking reliable data on subsistence uses and harvests of salmon in the Nushagak River area communities.

Regional Background

All communities featured within this report are located within the boundaries of the Bristol Bay Native Association (BBNA), a nonprofit corporation of 31 tribes; this includes Dillingham's Curyung Tribal Council, Clarks Point Village Council, Ekwok Village Council, New Stuyahok Traditional Council, and the New Koliganek Village Council.[3] No federal lands support subsistence salmon fisheries near any of the study communities; all are State of Alaska, municipal, or tribal corporation lands (Figure 1-1).

2. The reconciliation of harvests based on returned permits and household survey data was only possible for the study year 2013 for the communities of Clarks Point, Ekwok, New Stuyahok, and Koliganek, as well as Dillingham for the study year 2016. Data management staff were unable to provide a comparison between permit and household survey harvest data for study year 2014 due to method discrepancies.
3. Bristol Bay Native Corporation. 2018. "Tribal Councils." https://www.bbna.com/councils/ (accessed Dec. 12, 2017).

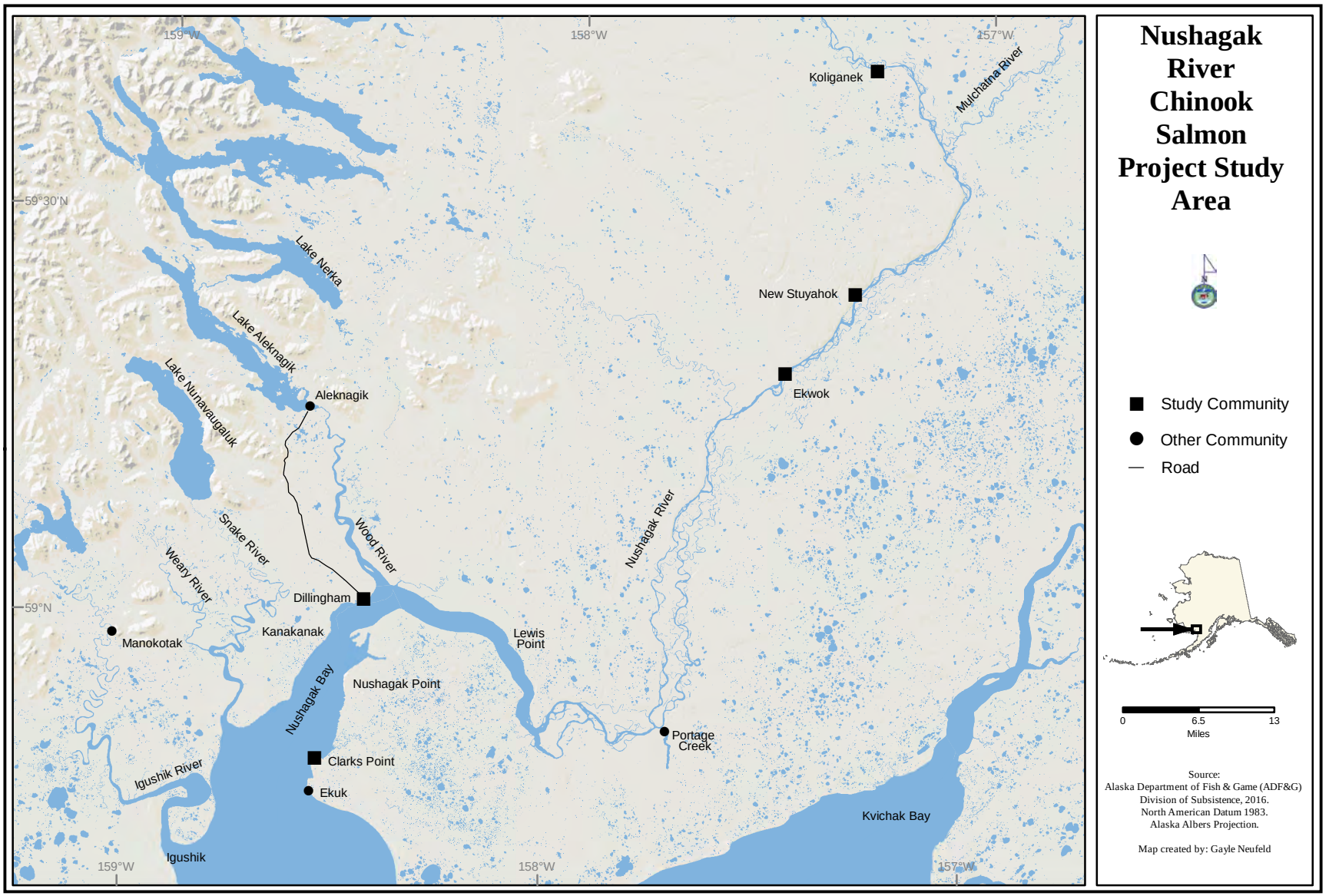


Figure 1-1.–Map of study communities, 2013, 2014, and 2016.

Historical occupation and use of the Nushagak River watershed incorporated both Central Yup'ik and Athabascan peoples (VanStone 1967). Three main indigenous groups occupied western Bristol Bay: the *Alegmiut* along the coast of Nushagak Bay, the *Kiatagmiut* of the Nushagak River, and the *Tuyuryarmiut* along the Togiak River (Stariwat and Krieg 2016; VanStone 1967). Once contact was established, initially with the Russian-American Company, these three distinct groups "blurred" with population movement, establishment of the commercial fishery, and general effects of colonization, such as disease (VanStone 1967; Wright et al. 1985). In 1818, the Alexandrovski Redoubt trading post was established on Nushagak Point, the bluff across from present-day Dillingham (Stariwat and Krieg 2016; VanStone 1971). In 1841, missionaries of the Russian Orthodox Church began to travel to the Nushagak River communities, converting and eventually settling the Yup'ik populations (Stariwat and Krieg 2016; VanStone 1968).

The Nushagak Packing Company established a cannery at Clarks Point in 1888 and soon after the commercial fishery came to dominate the cash economy of Bristol Bay (Stariwat and Krieg 2016; VanStone 1968). According to the ethnographies by VanStone (1967, 1971), scattered fish camps and villages began to organize themselves around missionary churches and schools. By 1940, most of the communities on the Nushagak watershed were located in their present-day locations, and increasing government involvement solidified their stationary and year-round occupation in permanent community sites (Stariwat and Krieg 2016).

Presently, sockeye salmon runs in the region continue to be among the world's largest wild salmon stocks, supporting a commercial fishery with record harvests. The commercial fishery continues to be the primary component of the region's cash economy, with a 2017 inshore Bristol Bay sockeye salmon run of 57.6 million fish, and an ex-vessel value (the post-season adjusted price per pound for the first purchase of commercial harvest) of $216.4 million (all salmon species combined), which was 50% above the 10-year (2007–2016) average of $144.6 million (Elison et al. 2018:4, 28). Yet, despite community reliance on commercial fishing, subsistence harvests persist, marked by caribou hunting of the Mulchatna herd in the fall, ice fishing for whitefish and other resident species in the winter, traveling for "spawning" sockeye (red) or coho (silver) salmon going to Lake Aleknagik in the fall, trapping, marine mammal hunting, and salmon fishing in the spring, summer, and early fall months (Evans et al. 2013; Holen et al. 2012; Krieg et al. 2009; Schichnes and Chythlook 1991; Stariwat and Krieg 2016).

The three moderately populated Nushagak River communities in this study—Ekwok, Koliganek, and New Stuyahok—all contain facilities such as a tribal office building, a school, and clinic. Clarks Point has a tribal office building, but no store or school, and all students attend the elementary or high schools in Dillingham, the regional center.

Regulatory Context

The harvest of salmon for subsistence uses is of utmost value to residents of the Nushagak watershed communities. All five salmon species found in Alaska are harvested, including pink *Oncorhynchus gorbuscha* and chum *O. keta* salmon, with the most sought-after being Chinook *O. tshawytscha*, sockeye *O. nerka*, and coho *O. kisutch* salmon (Fall et al. 2017). Subsistence permits (one per household per year) are required in the Bristol Bay Area and subsistence regulations are found in Title 5, Part 1, Chapter 01, Article 6 of the 2016–2017 edition of *Alaska Fish and Game Laws and Regulations Annotated* (State of Alaska 2016).[4] Since 1990, under state regulations, "all Alaska state residents have been eligible to participate in subsistence salmon fishing in all Bristol Bay drainages" (Fall et al. 2017:137). The Nushagak District includes all of the study communities: Clarks Point, Ekwok, New Stuyahok, Koliganek, and Dillingham. There are two main areas where subsistence fishing may occur in the Nushagak District: an area overlapping the portion of the district where commercial fishing is allowed, and an area of subsistence-only fishing.

In the area where commercial fishing occurs, "from May 1 through May 31 and October 1 through October 31, subsistence fishing for salmon is permitted from 9:00 a.m. Monday until 9:00 a.m. Friday. From June 1 through September 30 … salmon may be taken only during open commercial fishing periods. In the

4. For Bristol Bay Area finfish subsistence regulations, see 5 AAC 01.300–5 AAC 01.349.

Nushagak District, the commissioner, by emergency order, shall also provide for subsistence salmon fishing during periods of extended [commercial fishing] closures" (State of Alaska 2016:212). In this area, salmon may be taken only by drift and set gillnets. According to regulations, a gillnet is "a net primarily designed to catch fish by entanglement in the mesh and consisting of a single sheet of webbing hung between cork line and lead line, and fished from the surface of the water"; a drift gillnet is a "drifting gillnet that has not been intentionally staked, anchored, or otherwise fixed"; and a set gillnet is a "gillnet that has been intentionally set, staked, anchored, or otherwise fixed" (5 AAC 39.105 (d) (1–3)). When subsistence fishing occurs within this portion of the district due to an emergency order subsistence fishing opening, subsistence set gillnets may be no longer than 10 fathoms and must be set 450 feet apart.

As mentioned previously, subsistence fishing is allowed in an area that does not overlap with the portion of the district where commercial fishing occurs. Only subsistence fishing is allowed in the Nushagak River area from the line that extends between Nushagak Point and near Bradford Point upstream to Lewis Point, including the lower Wood River section until Red Bluff (Figure 1-2). There are two sets of gear restrictions within the Nushagak District's subsistence-only fishing area. One gear restriction area encompasses all beach areas around the city of Dillingham that are generally road-accessible from Snag Point Beach, located northeast of town, to the edge of the commercial-only fishing boundary that is south of Kanakanak Beach near Bradford Point. In this area, known as the Dillingham Beaches, set gillnets may not exceed 10 fathoms and must be placed at least 100 feet from another set gillnet. Upriver from Nushagak Point, the boundary of the commercial-only area, to Red Bluff and Lewis Point, excluding the Dillingham Beaches area, set gillnets are limited to 25 fathoms in length and must be 300 feet apart from another set gillnet. In this entire subsistence-only fishing area of the Nushagak District, drift gillnet use is prohibited, beach seines may not exceed 25 fathoms, and set gillnets may not obstruct more than one-half the width of any stream; also, subsistence fishing is open July 2–17 for three periods per week lasting 24 hours.[5] There are no bag or possession limits in the Nushagak District subsistence salmon fishery.

Salmon in Bristol Bay have a customary and traditional use finding and a finding regarding the amount necessary for subsistence (ANS) for the Bristol Bay Area of 157,000–172,000 salmon (State of Alaska 2016:214–215).

Nushagak–Mulchatna King Salmon Management Plan

The Nushagak–Mulchatna King Salmon Management Plan (5 AAC 06.361) is based upon sustained yield principles and the subsistence priority. The ADF&G Division of Commercial Fisheries manages

5. During the writing of this report, the Board of Fisheries Bristol Bay Finfish meeting was held in Dillingham, AK, during November 28–December 3, 2018 (see 2018 Alaska Board of Fisheries Meeting Information available online: https://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.meetinginfo&date=11-28-2018&meeting=dillingham). During this meeting, three subsistence finfish fishery regulations were changed. The changes are as follows:

   5 AAC 01.310(d) is amended to read:

   (d) In the Nushagak District, in all waters upstream of a line from a point approximately two miles south of Bradford Point at 58° 58.63' N. lat., 158° 33.62' W. long., to Nushagak Point at 58° 56.79' N. lat., 158° 29.53' W. long., to a point at Red Bluff on the west shore of the Wood River at 59° 09.58' N. lat., 158° 32.36' W. long., and to Lewis Point on the north shore on the Nushagak River at 58° 59.46' N. lat., 158° 05.57' W. long., salmon may be taken at any time.

   5 AAC 01.320(a) is amended to read:

   (a) Within any district, salmon, herring, and capelin may be taken only by drift and set gillnets, except that dip nets, as defined in 5 AAC 39.105, may be used to harvest salmon in a section of the Nushagak District specified in 5 AAC 01.310(d). Dip nets may not be operated from a vessel.

   5 AAC 01.320(d)(1) is amended to read:

   (1) In the Nushagak District from a point approximately two miles south of Bradford Point at 58° 58.63' N. lat., 158° 33.62' W. long., to Snag Point at 59° 03.18' N. lat., 158° 25.59' W. long., no part of a set gillnet may be operated within 100 feet of any part of another set gillnet.

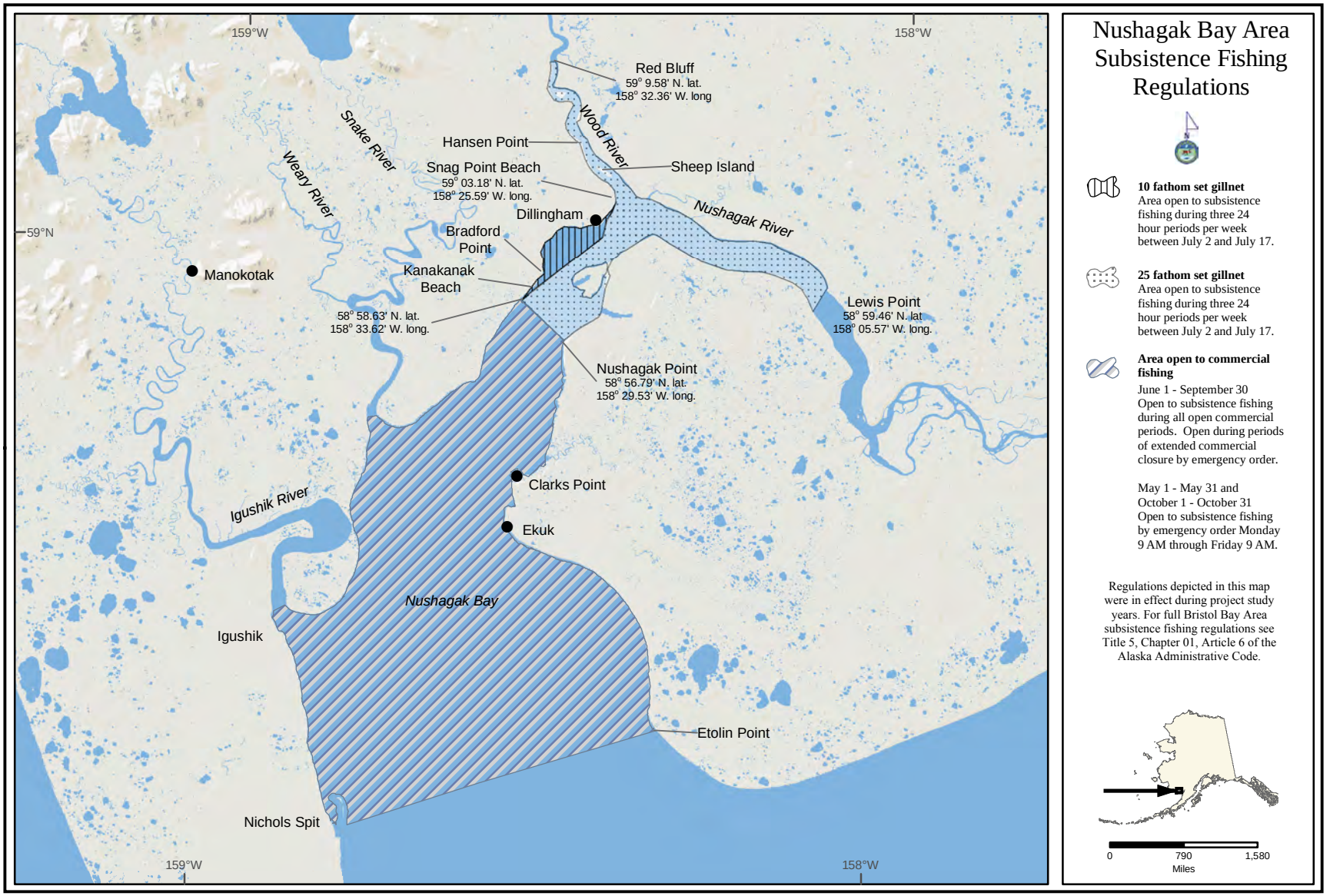


Figure 1-2.–Map of Nushagak Bay subsistence fishing gear and timing restrictions in the study area.

the commercial and subsistence fisheries in the Nushagak District; the Division of Sport Fish manages the sport fisheries. The plan is designed to achieve an inriver goal of 95,000 Chinook salmon upstream from the ADF&G sonar, and a biological escapement of 55,000–120,000 fish (State of Alaska 2016:284). This management plan attempts to address the allocation concerns of different user groups. A variety of management actions (closures and openers of commercial, sport, and subsistence fisheries) are based on projected spawning escapement and are found in the plan.

Study Objectives

The Division of Subsistence identified four overarching research questions relating to the CSRI program's recommended stock assessment projects. These were:

1. What is the character of the contemporary Nushagak River Chinook salmon fishery?
2. How well does the current subsistence permit system document harvest levels?
3. Based on observations and documented LTK of subsistence fishers, what is causing the variation observed in Chinook salmon escapement of the Nushagak River?
4. Have subsistence users of the Nushagak River fishery been affected by fluctuating Chinook salmon escapements? If yes, when, and in what ways?

The research questions were addressed through the following objectives:

- Conduct a literature review to compile and analyze existing subsistence harvest and escapement data from the Nushagak River drainage, and subsistence harvests of the local communities (Clarks Point, Ekwok, Koliganek, New Stuyahok, and Dillingham), and to provide comprehensive information about past harvests in relation to fluctuating Chinook salmon stocks.
- Conduct household salmon harvest surveys and key respondent interviews in the selected communities to characterize the contemporary harvest and use of salmon for home use with a focus on Chinook salmon and to evaluate the current subsistence harvest reporting system based on permit returns. Harvests for home use from all sources will be estimated, including subsistence nets, rod and reel, and removal of fish from a household's commercial harvest ("home pack").
- Conduct participant observation and key respondent interviews to collect LTK to gain a better understanding from local users about potential causes of variation in local fisheries.
- Synthesize the quantitative and qualitative data to better inform resource managers of possible factors affecting Chinook salmon fluctuations.

Further, a more specific component of the objective for identifying salmon harvest and use characteristics was to map harvest locations and gear types used for each community's subsistence salmon harvests. Also, the study incorporates reviewing data with community members and obtaining comments prior to publishing a final report of the research findings.

Research Methods

Ethical Principles for the Conduct of Research

The project was guided by the research principles outlined in the *Alaska Federation of Natives Guidelines for Research*[6] and by the National Science Foundation, Office of Polar Programs in its *Principles for*

6. Alaska Federation of Natives. 2006. "Alaska Federation of Natives Guidelines for Research." Alaska Native Knowledge Network. http://www.ankn.uaf.edu/IKS/afnguide.html (accessed December 2018).

the Conduct of Research in the Arctic[7], the *Ethical Principles for the Conduct of Research in the North* (Association of Canadian Universities for Northern Studies 2003), as well as the Alaska confidentiality statute (AS 16.05.815). These principles stress community approval of research designs, informed consent, anonymity or confidentiality of study participants, community review of draft study findings, and the provision of study findings to each study community upon completion of the research.

Project Planning and Approvals

The CSRI program was funded largely under the Dingell-Johnson Act (D-J), the Alaska Sustainable Salmon Fund (AKSSF), and the Pacific Salmon Commission's (PSC) Chinook Technical Committee's Letter of Agreement (LOA) (ADF&G Chinook Salmon Research Team 2013). For the Nushagak River, research coordination under ADF&G's CSRI program included multiple divisions, including the Division of Commercial Fisheries, the Division of Sport Fish, and the Division of Subsistence. The three main components to studying this watershed were: 1) escapement or inriver assessment (using mark-recapture methods), 2) smolt assessment (using coded-wire-tagging recaptures), and 3) LTK assessment (studying LTK and potential improvements to the subsistence harvest monitoring and assessment program). Activity No. 3 was assigned to the Division of Subsistence. As mentioned previously, there were five recommended assessment projects generated from these three components, and this Division of Subsistence study addresses two of those five projects.

Partnerships and Community Support

Each community was contacted prior to the research and scoping meetings were held in 2013 to present the goals of the CSRI program. Tribal council approvals and letters of support were sought for most of the communities in this project and available letters are provided in Appendix B. Each community was also informed that a community review meeting would occur as the project report was drafted in order for community members to give feedback and review data. Community review meetings occurred in spring 2018.

Community Scoping Meetings

Community scoping meetings were held by the project lead, Theodore Krieg, in three of the five communities (Table 1-1). A meeting was not held in Clarks Point, but verbal confirmation was given by the Clarks Point Village Council to begin research in that community. A project scoping meeting was not held in Dillingham.

7. National Science Foundation Interagency Social Science Task Force. 2012. "Principles for the Conduct of Research in the Arctic." http://www.nsf.gov/od/opp/arctic/conduct.jsp (accessed December 2018).

Table 1-1.–Community scoping meetings, study communities, 2013, 2014, and 2016.

Community	Date
Ekwok	11/12/2013
Clarks Point[a]	
New Stuyahok	10/14/2013
Koliganek	10/2/2013
Dillingham[b]	

a. No meeting occurred; verbal confirmation by the village council to proceed with research in the community was received by Theodore M. Krieg.

b. No meeting occurred.

Systematic Household Surveys

The primary method for collecting subsistence harvest and use information in this project was a systematic household survey specifically focusing on salmon harvests, household harvest assessments, and the subsistence permit system. Appendix A is the survey form used in Dillingham in 2016 and serves as an example of the survey instrument used in this project. A key goal was to structure the survey instrument to collect demographic, resource harvest and use, harvest assessments, and other data that are comparable with data collected in previous household surveys in the study communities and with data in the Community Subsistence Information System (CSIS[8]). Estimated salmon harvests by study community households are reported in numbers of salmon and in pounds usable weight. The estimates include resources harvested by any member of the surveyed households during the study years and the use estimates include all salmon resources taken, given away, or used by a household, and resources acquired from other harvesters, either as gifts, by barter or trade, through fishing partnerships, or as meat given by fishing guides and non-local fishers. Additionally, the household survey included a series of questions about subsistence salmon permits to address the study objective to evaluate the current harvest reporting system based on permit returns. Note that when completing the post-season surveys, division staff, if possible, brought a copy of the returned permit to each surveyed household that obtained a permit before the fishing season and returned the permit before survey administration occurred. When harvest amount questions were asked for the survey, the permit was used to verify harvest numbers. In addition, the households were asked if any more harvests occurred after the permit was returned and, if so, those harvests were added to the permit. For those households for which division staff were unable to bring or obtain the household's permit, members of the household used recall to answer harvest amount questions for surveys. Also, researchers issued permits during survey administration to those surveyed households that harvested subsistence salmon but did not originally obtain a permit.

The boundaries for the study communities were defined by the boundaries of each community's housing area: Clarks Point, Ekwok, Koliganek, and New Stuyahok. Dillingham has three main roads leading out of the central area of town; these roads include Wood River Road, Aleknagik Lake Road, and Kanakanak Road. For the purpose of this study, the area in which stratified random samples of households occurred was within the boundaries of a section of Aleknagik Lake Road just north of the Waskey Road intersection, the end of Wood River Road (at the Wood River), and the end of Kanakanak Road, at the intersection of Antenna Road. These boundaries were provided by the City of Dillingham Planning Department and delineated the boundaries of city property, which became the guide for households to include in the sample achievement.[9]

The Division of Subsistence collects the majority of its data using the base unit of a household. The development of harvest estimates and fishery participation rates are presented at the community level, and the Nushagak CSRI program is no exception. In small communities of fewer than around 100 households, a census survey is attempted, which is an attempt to survey all households in the community. This was the case in Clarks Point, Ekwok, Koliganek, and New Stuyahok. Dillingham surveys were based upon a random sample, stratified to survey 100 households that held a subsistence salmon permit and 100 households that did not hold a permit.

During the survey effort for all communities (i.e., stratified sample and census surveyed communities), a disposition was applied to each residence that researchers attempted to contact. The disposition categories included:

8. ADF&G Community Subsistence Information System: http://www.adfg.alaska.gov/sb/CSIS/ (hereinafter cited as CSIS).
9. City of Dillingham maps were produced by Alaska Map Company, LLC, based on data sourced by the Alaska Department of Natural Resources and City of Dillingham Planning Department. City of Dillingham maps are available online: https://www.dillinghamak.us/index.asp?SEC=F807EC64-C0E3-4CF9-8B1C-DEA7E9FC01B9&Type=B_BASIC.

- Contains residents that are eligible to participate in the survey based on length of residency (survey attempted).
- Household occupants are nonresident based on minimum length of residency (less than three months).
- Vacant (no survey attempted).
- Not a dwelling (commercial building or no dwelling exists) (no survey attempted).

If researchers were initially unsuccessful at making contact with an eligible household, two more attempts to survey the household were made. When a reasonable effort was made to survey the household and no contact could be made, this household was assigned a "no contact" disposition.

In the four communities where a census survey was attempted, sample achievement in 2013 and 2014 spanned 74%–90% and refusal rates did not exceed 9%. In Dillingham, where a stratified random sample survey method was conducted, about 25% of the total households in the community were interviewed each study year; survey refusal rates for both groups (permit holder and non-permit holder households) ranged over the study years from 4%–23%. In each community chapter detailed sample achievement information will be provided.

Mapping Locations of Subsistence Salmon Fishing

During household interviews, the researchers asked respondents to indicate the locations of their fishing activities during the study year. To collect fishing and harvest location data, paper maps were used in 2013 and in 2014 for the communities of Ekwok, New Stuyahok, and Koliganek, and also Clarks Point in 2013 only. Digital data collection methods were used in 2014 in Clarks Point and in 2014 and 2016 in Dillingham. ADF&G staff established a standard mapping method. Points, lines, and polygons were used to mark salmon harvest and fishing locations, regardless of successful harvest. Points represented a stationary location where a specific gear type was used—in this case, gillnet, rod and reel, and other gear. Polygons used to mark areas where fishing occurred, regardless of method, were reorganized as lines on the maps in this report to depict the appropriate fishing method by gear type. A line feature represents the appropriate fishing method by gear type, which may include using a gillnet from a boat as the boat is moving or trolling with a rod and reel from a moving boat. As mentioned above, regarding subsistence regulations in the Nushagak District, only set gillnet is a legal gear type in the portion of the district that does not overlap with the legal commercial fishing area. However, this project sought harvest information by all gear types used for salmon harvests, including removal from commercial catches for home use, rod and reel, set gillnet, drift gillnet, and other gear. Only fishing and harvest locations by gillnet (set and drift combined), rod and reel, and other gear (including dip net, seine, and unspecified gear types) were depicted spatially. The data were first sorted by community, and then resource. Maps were then produced at the species-specific level for each community.

The paper maps were 11x17 inches at a scale of 1:250,000 and 1:500,000 and only documented activity within the survey area. Interviewers asked the respondents to mark on maps the sites of each harvest, the species harvested, the amounts harvested, gear used, and the months of harvest. The paper maps were not digitized until 2017, with all efforts made to preserve comments and accuracy.

In 2014 and 2016 in Clarks Point and Dillingham, salmon harvest locations were documented using an application designed on the ArcGIS Runtime SDK for iOS platform: a mapping data collection application for iPad.[10] A point or line was digitized using a U.S. Geological Survey topographic relief map loaded on the iPad as a reference for survey respondents to indicate the locations of harvest activities. The iPad allowed the user to zoom in and out to the appropriate scale, and the ability to document harvesting activities wherever they occurred in Alaska. Once a feature was accepted, an attribute box was filled out by the researcher that noted the species harvested, amount, method of access to the resource, harvest gear type,

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

and month(s) of harvest. The data were uploaded via Wi-Fi to a server. Once data collection was complete the data were downloaded into an ArcGIS file geodatabase. The application was developed by HDR, Inc., an environmental research firm located in Anchorage.

Although each household survey included a mapping component, not every household shared harvest locations with researchers. Each map contains a specific sample size in relation to the total sample achieved in each community. Thus, each map is a partial representation of areas used for salmon fishing and harvest.

Key Respondent Interviews

While researchers were in the study communities they consulted with tribal governments, community councils, and LRAs to identify key respondents to interview. The number of key respondent interviews varied among communities, but typically ranged from 2–5 per community. Key respondent interviews were semi-structured and directed by a key respondent interview protocol designed by the project lead, Krieg, with assistance from another researcher, Sarah Hazell (Appendix C). The questions ranged from personal life histories of the respondents in terms of salmon use, Chinook salmon populations, habitat, fisheries, and changes over time, as well as recommendations for management. A full thematic breakdown is provided in Chapter 8: "Local and Traditional Knowledge of Salmon and Subsistence on the Nushagak River." Along with gathering qualitative data through the key respondent interview protocol, ADF&G staff took notes during interviews and while administering household surveys to provide additional qualitative context for this report. Additionally, the open-ended comment section at the end of each household survey was used as a part of the qualitative analyses. Key respondents were informed that, to maintain anonymity, their names would not be included in this report.

Participant Observation

Researchers observed subsistence salmon fishers to supplement information shared by key respondents about contemporary subsistence salmon fishing and recent changes to the fishery. Participant observations occurred during active fishing months at Lewis Point in 2014 and at Ekwok, New Stuyahok, and Koliganek in 2015.

Household Survey Implementation

Coordinating efforts over multiple years required many staff members and local research assistants (LRAs) (Table 1-2). The Division of Subsistence was the sole entity responsible for conducting household surveys, harvest activity mapping, key respondent interviews, and participant observation. LRAs assisted with surveys, mapping, logistics for rural travel and household identification, and other necessary tasks for successful project implementation. The first two years of the project, 2013 and 2014, Krieg was the project lead, and was assisted by division staff members Cameron Welch, Hannah Johnson, Hazell, Sarah Evans, Bronwyn Jones, and Dustin Murray. Many LRAs assisted throughout all the study years. In project year 2016 Krieg retired, and Gabriela Halas became the project lead. Halas and Krieg completed key respondent interviews in Koliganek, Clarks Point, and Dillingham in 2016. Halas, with division staff Jones and Erica Mitchell, collected year two of the Dillingham household surveys, thus completing all project data collection tasks by July 17, 2017.

Data Analysis and Review

Survey Data Entry and Analysis

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

Table 1-2.–Project staff.

Task	Name	Organization
Southern Regional Program Manager	Brian Davis	ADF&G Division of Subsistence
Principal Investigators	Theodore M. Krieg, Gabriela Halas	ADF&G Division of Subsistence
Project Leads	Theodore M. Krieg, Gabriela Halas	ADF&G Division of Subsistence
Data Management Leads	David Koster, Megan Hellenthal	ADF&G Division of Subsistence
Administrative support	Jennifer Bond	ADF&G Division of Subsistence
	Maegan Smith	ADF&G Division of Subsistence
	Lehua Otto	ADF&G Division of Subsistence
Programmer	Margaret Cunningham	ADF&G Division of Subsistence
Data entry	Barbara Dodson	ADF&G Division of Subsistence
	Anita Humphries	ADF&G Division of Subsistence
	Nicholas Jackson	ADF&G Division of Subsistence
	Jonathan Jeans	ADF&G Division of Subsistence
	Zayleen Kalalo	ADF&G Division of Subsistence
	Vanessa Oquendo	ADF&G Division of Subsistence
	Lehua Otto	ADF&G Division of Subsistence
	Kayla Schommer	ADF&G Division of Subsistence
Data cleaning/validation	Margaret Cunningham	ADF&G Division of Subsistence
	Zayleen Kalalo	ADF&G Division of Subsistence
Data analysis	David Koster	ADF&G Division of Subsistence
	Garrett Zimpelman	ADF&G Division of Subsistence
	Margaret Cunningham	ADF&G Division of Subsistence
Cartography	Gayle Neufeld	ADF&G Division of Subsistence
Editorial Review Lead	Mary Lamb	ADF&G Division of Subsistence
Production Lead	Mary Lamb	ADF&G Division of Subsistence
Field research staff (2013)	Sarah Evans	ADF&G Division of Subsistence
	Sarah M. Hazell	ADF&G Division of Subsistence
	Hannah Z. Johnson	ADF&G Division of Subsistence
	Theodore M. Krieg	ADF&G Division of Subsistence
	Cameron Welch	ADF&G Division of Subsistence
Field research staff (2014)	Sarah Evans	ADF&G Division of Subsistence
	Sarah M. Hazell	ADF&G Division of Subsistence
	Bronwyn E. Jones	ADF&G Division of Subsistence
	Theodore M. Krieg	ADF&G Division of Subsistence
	Dustin Murray	ADF&G Division of Subsistence intern
Field research staff (2016)	Gabriela Halas	ADF&G Division of Subsistence
	Bronwyn E. Jones	ADF&G Division of Subsistence
	Theodore M. Krieg	ADF&G Division of Subsistence
	Erica Mitchell	ADF&G Division of Subsistence intern
Field research staff (2017)	Gabriela Halas	ADF&G Division of Subsistence
	Bronwyn E. Jones	ADF&G Division of Subsistence
	Erica Mitchell	ADF&G Division of Subsistence intern
Local research assistants (2013)	Nadine Wassily	Clarks Point
	Crystal Clark	Ekwok
	Sergai Andrew	New Stuyahok
	Sophia Petla	New Stuyahok
Local research assistants (2014)	Andrew Wassily	Clarks Point
	Crystal Clark	Ekwok
	Sergai Andrew	New Stuyahok
	Sophia Petla	New Stuyahok
	Alberta Hoseth	Dillingham
	Sophie V. Sorensen	Dillingham
Local research assistants (2016)	Molly Dischner	Dillingham
	Dan Dunaway	Dillingham
	Devin Lisac	Dillingham

-continued-

Table 1-2.–Page 2 of 2.

Task	Name	Organization
Local research assistants (2016)	Steve Wassily	Dillingham
Local research assistants (2017)	Molly Dischner	Dillingham
	Dan Dunaway	Dillingham
	Devin Lisac	Dillingham
	Steve Wassily	Dillingham

a catastrophic failure. All survey data were entered twice and each set compared in order to minimize data entry errors.

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

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

Analysis for Census Communities

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

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

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

where:

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

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

$h_i =$ the total harvest reported in returned surveys,

$n_i =$ the number of returned surveys, and

$S_i =$ the number of households in a community.

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

varies slightly depending upon the size of the community. Though there are numerous ways to express the formula below, it contains the components of SD, V, and SE:

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

where:

$s =$ sample standard deviation,

$n =$ sampled households,

$N =$ total number of households in the community,

$t_{\alpha/2} =$ student's *t* statistic for alpha level (α=0.95) with n–1 degrees of freedom, and

$\bar{x} =$ sample mean.

Analysis for Stratified Community

Harvest estimates and responses to all questions were calculated based upon the application of weighted means (Cochran 1977). These calculations are standard methods for extrapolating sampled data. Since Dillingham was sampled in multiple strata, each stratum is expanded separately. As an example, the formula for harvest expansion is:

$$H_i = \bar{h}_i S_i \quad (1)$$

$$\bar{h}_i = \frac{h_i}{n_i} \quad (2)$$

where:

$H_i =$ the total estimated harvest (numbers of resource or pounds) for each stratum *i*,

$\bar{h}_i =$ the mean harvest per returned survey for each stratum *i*,

$h_i =$ the total harvest reported in returned surveys for each stratum *i*,

$n_i =$ the number of returned surveys, and

$S_i =$ the number of households in a community.

In order to obtain the total community estimate, the estimate for each stratum is added, as represented by:

$$X = \sum_{i=1}^{z} H_i \quad (3)$$

where:

$z =$ the total number of strata in the community, and

$X =$ the total community harvest estimate.

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

$$C.L.\%(\pm) = \frac{t_{a/2}\sqrt{\frac{1}{N^2}\sum_{i=1}^{z} N_i(N_i - n_i)\frac{s^2}{n_i}}}{\bar{x}} \quad (4)$$

where:

$s =$ sample standard deviation,

$n =$ sampled households,

$N =$ total number of households in the community,

$z =$ the total number of strata in the community,

$t_{\alpha/2} =$ student's *t* statistic for alpha level (α=0.95) with n–1 degrees of freedom, and

$\bar{x} =$ mean.

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

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

Comparisons of Harvest Estimates From Subsistence Permits and Surveys

Harvest amounts from household surveys were reconciled against data from subsistence permits that were issued and returned both before and during the time when post-season surveys were administered. For each community, a set of tables is provided that compares: 1) subsistence salmon permit participation based on surveys and returned permits, and 2) harvest estimates from before and after the time that post-season surveys occurred.

The first table in the set shows the number of permits issued to and returned from a community before the household surveys occurred, along with an initial permit return rate. During post-season household survey administration, permits could be returned to the researcher; this generally occurred if a household forgot to send its permit to ADF&G but located it when researchers visited. Additionally, any surveyed household that had not obtained a permit and reported harvests using subsistence nets on the post-season survey was issued a permit; the table notes the number of households that were issued a permit during the survey and an estimated number of community households that fished without a permit based on the household survey sample achievement of the census (Clarks Point, Ekwok, New Stuyahok, and Koliganek) or stratified random sampling (Dillingham) goal. A final tally of permits issued in each study community is provided with the revised permit return rate.

Participation following the conclusion of the household surveys is also summarized in the first table in the set. The total number of households is all households identified as eligible for the post-season survey combined with the number of households that obtained a permit and cited the study community as the place of residence but were not found to be eligible for the survey. The total contacts represents the sum of the number of households that completed a post-season survey, unsurveyed households that returned a permit in the mail, and the number of households that obtained and returned a permit citing the study community as the place of residence but not found to be eligible for the survey.

The second table in the set is an account of reported and estimated subsistence salmon harvests, by species, based on returned permits and post-season surveys. Harvests reported on permits returned to ADF&G before the surveys were administered are presented in the first row of this table. The second row is a community harvest estimate based on harvests reported by permit holders; note that without face-to-face post-season household surveys occurring, these are the harvest estimates that would have been published in the Alaska Subsistence Fisheries Database (ASFDB) and used to inform fisheries management decisions.

As mentioned previously, if more salmon were harvested by permit holders after the permit was returned, the permit was updated to increase the reported harvest. Additionally, permits could be returned by a

household during the survey (the household obtained and completed the permit, but had not returned it). Post-season surveys also recorded harvests by households that fished without a permit and these harvests also contributed to the overall revised reported harvests. A community harvest estimate based on the revised harvest numbers from both the permits and post-season surveys is provided in the table to reflect the overall estimated salmon harvest (using only subsistence gear) for the study year. Lastly, since the Division of Subsistence did not survey every household in the study communities, the final row of the table shows the estimated harvest based on returned permits only, which includes permits returned by households that were not surveyed and permits obtained and returned by households that cited the study community as a place of residence but were not included in the post-season household survey list of permanent community households. Note that only harvests reported by surveyed households that fished without a permit were added to the permit database, and not the estimated harvest for the estimated number of households in each study community that fished without a permit. These harvest estimates are published in the ASFDB and the Division of Subsistence's annual report summarizing subsistence and personal use fisheries; these values represent the permit system's estimation of each community's total harvest.

Note that the reconciliation of harvests based on returned permits and household survey data was only possible for the study year 2013 for the communities of Clarks Point, Ekwok, New Stuyahok, and Koliganek, as well as Dillingham for the study year 2016. Data management staff were unable to provide a comparison between permit and household survey harvest data for study year 2014 due to method discrepancies. However, this snapshot of one study year shows characteristics of community compliance with the permit system, as well as differences in a community's subsistence salmon harvest estimate based on the two methods.

Population Estimates and Other Demographic Information

As noted above, a goal of the research was to collect demographic information for all interviewed year-round households in each study community. For this study, "year-round" was defined as being domiciled in the community when the surveys took place and for at least three months during each study year. Because not all households were interviewed, population estimates for each community were calculated by multiplying the average household size of interviewed households by the total number of year-round households, as identified by Division of Subsistence researchers in consultation with community officials and other knowledgeable respondents.

There may be several reasons for the differences among the population estimates for each community generated from the division's surveys and other demographic data developed by the 2010 federal census (U.S. Census Bureau 2011), the U.S. Census Bureau's American Community Survey (U.S. Census Bureau n.d.), and the Alaska Department of Labor and Workforce Development (ADLWD n.d.). Sampling of households, depending on when surveys are conducted or eligibility criteria for inclusion in the survey, may explain differences in the population estimates. In addition, for the community of Clarks Point, population discrepancies between division estimates for the study years of 2013 and 2014 and the 2010 U.S. census are likely the result of the school closure in Clarks Point in 2012. This resulted in students leaving the community for attending school elsewhere; this decreased the overall population somewhat rapidly.

Map Data Entry and Analysis

As discussed above, maps were generated based on data collected using an iPad or on 11x17-inch paper maps. All data were entered on the iPad in the field during interviews, or by ADF&G research staff while coding survey data. Map features were matched to the survey form to ensure that all harvest data were recorded accurately. Once all data were entered, an ArcGIS file geodatabase was downloaded by ADF&G researchers from the server and maps showing harvest locations for each species created in ArcGIS 10.2 using a standard template for reports. Maps were reviewed at a community review meeting to ensure accuracy as well identify any data the community would like to keep confidential. Table 1-3 summarizes the number of households that provided search and harvest location data on maps in each study year.

Table 1-3.–Number of households that provided search and harvest location data, study communities, 2013, 2014, and 2016.

	Number of households		
Community	2013	2014	2016
Clarks Point	8	11	–
Ekwok	23	22	–
New Stuyahok	73	78	–
Koliganek	35	42	–
Dillingham	–	103	92

Note "–" indicates when there was no study year for the community.

Table 1-4.–Community review meetings, study communities, 2013, 2014, and 2016.

Community	Date	Location	Community attendance
Clarks Point	3/15/18	Saguyak Incorporated office	5
Ekwok	3/22/18	Ekwok School	7
New Stuyahok	3/26/18	Stuyahok Limited office	14
Koliganek	3/27/18	Koliganek Natives Limited office	7
Dillingham	5/7/18	University of Alaska–Bristol Bay Campus	3

Key Respondent Analysis

Following transcription of the recorded key respondent interviews to complement notes from interviews where no audio recording occurred, analyses for the key respondent interviews were done with QSR NVIVO version 10.0, a qualitative program that allowed the researcher to thematically group the interview content. This iterative process organized themes and sub-themes into categories of linked responses. This allowed for quick and effective retrieval of respondent narratives related to each theme. QSR NVIVO version 10.0 software is able to produce a series of reports based on themes, creating an efficient tool from which to draw out quotations and ethnographic information. This analysis process was also applied to survey comment data, which were open-ended questions, and respondents were able to add any comment regarding subsistence salmon fishing or regulations.

Participant Observation Analysis

Field notes from the participant observation trips in 2014 and 2015 were analyzed for themes and sub-themes pertaining to the qualitative information categories developed during key respondent interview analysis.

Community Review Meetings

Standard practice for the Division of Subsistence is to return to study communities and present preliminary findings in a public meeting. This method of engagement is used to solicit feedback, comments, and answer questions about the draft data. Each community participating in this project was given assurance that a public data review meeting would occur prior to publication of the final report. ADF&G staff presented preliminary survey findings, associated search area and harvest maps, subsistence harvest change over time, and permit data at a meeting in each community in the spring of 2018. Table 1-4 shows when a community review meeting occurred in each study community, where the meeting was located, and how many community residents attended. Each meeting was coordinated with village tribal councils, and

advertising consisted of posters, individual phone calls to tribal council members, announcements on the community VHF radios, and a radio announcement for Dillingham on the local FM station KDLG. Krieg, the previous project lead and principal investigator, accompanied Halas to each community review meeting, and assisted with meeting materials, taking notes, and general project communication.

Several helpful comments and questions contributed to this study from the data review meetings. The comments and feedback are integrated with the results presented in each community chapter.

Final Report Organization

This report summarizes the results of systematic household surveys (with mapping), key respondent interviews, and participant observation conducted by staff from ADF&G with assistance from locally hired community residents. This report also summarizes resident feedback provided at community review meetings.

Chapters 2–6 present community household survey results, including tables and figures that report estimates on demographic characteristics, individual participation in harvesting and processing of subsistence salmon, harvest by gear type, impact assessments, harvest and use trends over time, and harvest locations. The maps in those chapters compile data collected for each community and provide fishing and harvest area results that are organized by community.

Chapter 7 provides an analysis of the subsistence salmon permit system based on comparisons of division survey results with salmon permit harvest results, as well as a literature review of salmon escapement data for the Nushagak District during the study years.

Chapter 8 provides an in-depth collection of local and traditional knowledge of the subsistence salmon fishery in the Nushagak River communities of this study and offers insight into the rich and diverse knowledge of salmon held by residents of all the study communities. The final chapter provides a general overview and discussion of subsistence salmon harvests and fishery characteristics of the Nushagak River communities.

After the community review meetings, ADF&G finalized this report and mailed copies of a short summary of the study findings to every study community's tribal council office (Appendix E).

2. CLARKS POINT

Community Background

Clarks Point is a small community located 15 miles across Nushagak Bay from Dillingham and 337 miles by air from Anchorage. The Yup'ik name for Clarks Point is *Saguyak,* although no evidence exists of a settlement at the site prior to the establishment of the Nushagak Packing Company (Holen et al. 2012). The community of Ekuk, just south of Clarks Point, is one of three communities to have existed prior to European contact (Seitz 1996). In 1818, just north of Clarks Point, on Nushagak Point, the Russian-American Company established the trading post of Alexandrovski Redoubt (Seitz 1996). Two years after the Alaska Purchase in 1867, the Alaska Commercial Company took over the Nushagak Post (Seitz 1996). In 1880, John W. Clark became the main trader at Nushagak, establishing a fish salting operation (Holen et al. 2012). In 1888, the Nushagak Packing Company established the now-permanent community in order to support a new cannery, naming it after Clark, the manager of the Alaska Commercial Company store (Holen et al. 2012). Seasonal fishing work expanded the population of the community for a number of years; however, in 1952 the processing plant permanently closed and the population dramatically decreased.

A major flood in 1929 promoted resettlement of the community onto the bluff above the beaches and present-day Clarks Point is situated there, overlooking Nushagak Bay (Holen et al. 2012). Newer construction began in 1982 when several families moved to higher ground, with most residents continuing to live on the bluff, and only a small group continuing to live in the lower beach areas (Holen et al. 2012). Clarks Point is only accessed by airplane and boat, or travel by snowmachine occurs between nearby communities in winter. There is no store in Clarks Point, but basic facilities and amenities exist, such as an electrical utility, cell phone service, a landfill, a health clinic, and a tribal administration building for the village corporation, Saguyak Incorporated. The name of the federally recognized tribe is the Village of Clarks Point. The Clarks Point School closed in May 2012 due to declining enrollment, but re-opened in August 2017 (D. Aikins, Village of Clarks Point administrator, Clarks Point, personal communication).

The geography of Clarks Point is considered a tundra landscape interspersed with boreal forest characterized by short, warm summers, and long, cold winters. Nushagak Bay does not freeze in winter, although smaller sloughs, as well as the Nushagak River near Lewis Point, typically do freeze. This allows Clarks Point residents to travel by snowmachine by crossing the Nushagak River at Lewis Point, north at the frozen Wood River, and then following winter trails to Dillingham (T. Krieg, Dillingham resident and retired Division of Subsistence staff, Dillingham, personal communication).

Population Estimates and Demographic Information: 2013 and 2014

Table 2-1 shows population information for Clarks Point during 2013 and 2014. The estimated population for Clarks Point in 2013 was 30 people, with the Alaska Native population estimated at 28 individuals (Table 2-1; Figure 2-1). Eligible households in the community (those living in the community at least three months) were estimated at 15 with a mean household size of 2 (Table 2-1). Alaska Native households (where one head of the household is Alaska Native) was also 15, composing 100% of the community residences. In 2014, the population in Clarks Point remained stable with an estimate of 31 individuals, and with the same number of households as in 2013 (15). The Alaska Native population was estimated at 30 people, again composing 15 households, or 100% of the community residences (Figure 2-1; Table 2-1). The average age of a Clarks Point resident during the study was 43–45, with the minimum age being 4 years old and the maximum being 83.

In May 2012, the Clarks Point School closed due to low student enrollment. At its closure the school had 11 students, with 5 full-time staff positions, and 1 part-time staff position (D. Piazza, Southwest Region School District superintendent, Dillingham, personal communication). Over time the population of Clarks Point has decreased dramatically from roughly 130 individuals in 1950, to 80 individuals in 1980, to the current estimate of 30 individuals (Figure 2-2). The high population in 1950 is likely indicative of the still-

Table 2-1.–Sample and demographic characteristics, Clarks Point, 2013, and 2014.

Characteristics	Clarks Point 2013	Clarks Point 2014
Sampled households	13	13
Eligible households	15	15
Percentage sampled	86.7%	86.7%
Sampled population	26	27
Estimated community population	30.0	31.2
Range[a]	26 – 34	27 – 35
Household size		
Mean	2.0	2.1
Minimum	1	1
Maximum	4	4
Age		
Mean	43.0	45.1
Minimum[b]	15	4
Maximum	82	83
Median	51	51
Alaska Native		
Estimated households[c]		
Number	15.0	15.0
Percentage	100.0%	100.0%
Estimated population		
Number	27.7	30.0
Percentage	92.3%	96.3%
Range[a]	24 – 31	26 – 34
U.S. Census 2010[d]		
Households	24	24
Population	62	62
Alaska Native population	55	55
American Community Survey 5-year average[e]		
Households	25	19
Range[f]	16 – 34	12 – 26
Population	84	75
Range[f]	55 – 113	52 – 98
Alaska Native population	84	75
Range[f]	55 – 113	52 – 98

Source ADF&G Division of Subsistence household surveys, 2014 and 2015.

a. Estimated range is 95% confidence interval.

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

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

d. Source is U.S. Census Bureau (2011).

e. Source is U.S. Census Bureau for American Community Survey (ACS); 2009–2013 ACS estimates used for 2013, 2010–2014 ACS estimates used for 2014.

f. ACS data range is the reported margin of error.

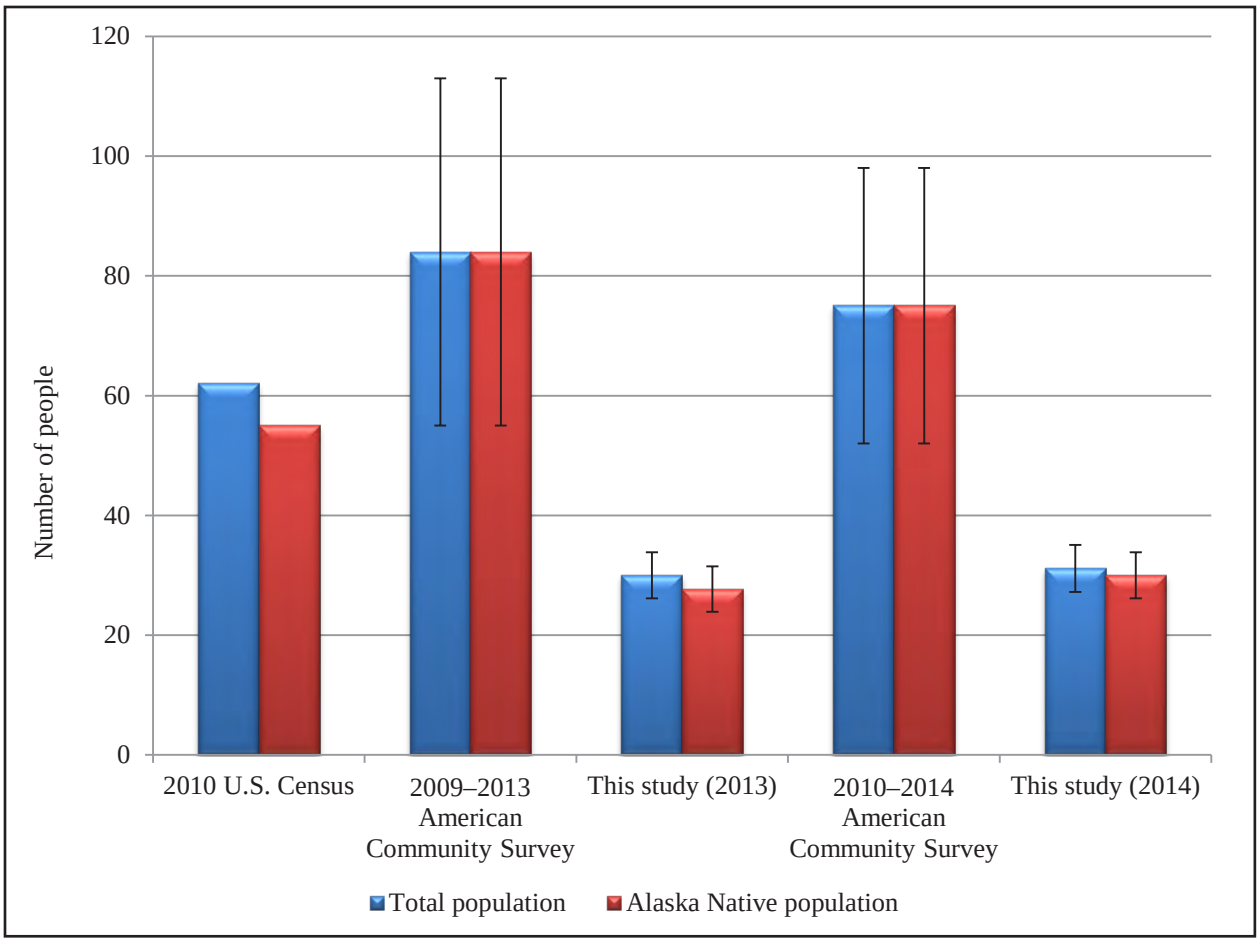


Figure 2-1.–Alaska Native and overall population estimates, Clarks Point, 2010, 2013, and 2014.

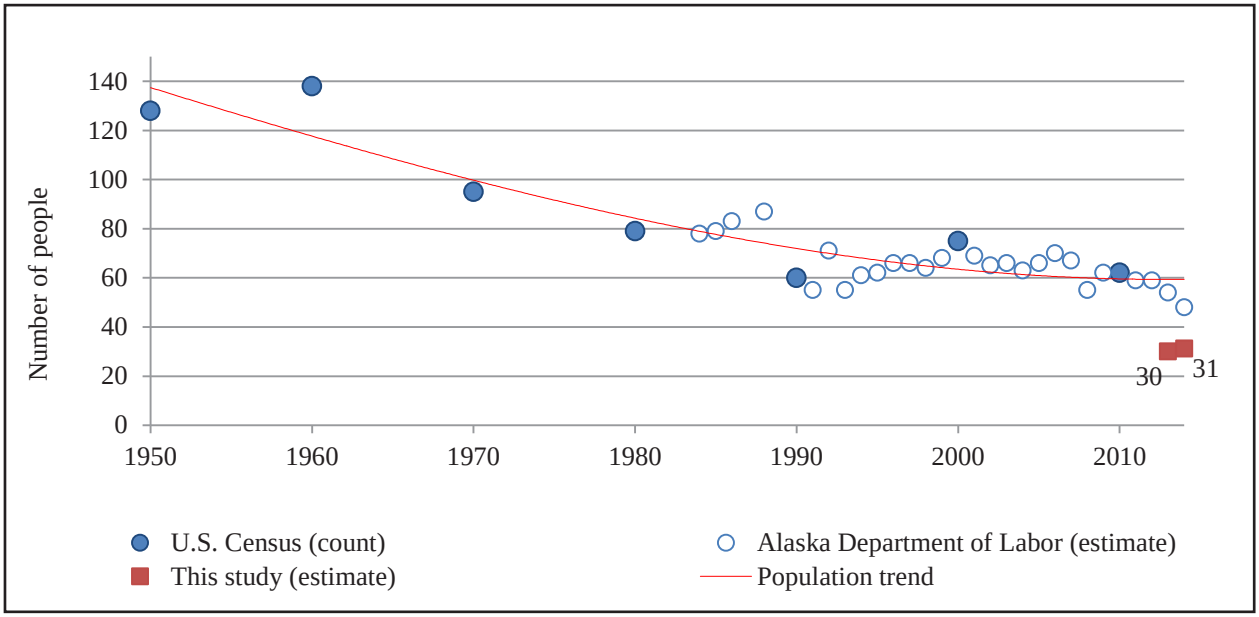


Figure 2-2.–Historical population estimates, Clarks Point, 1950–2014.

Table 2-2.–Population profile, Clarks Point, 2013.

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	0.0	0.0%	0.0%	0.0	0.0%	0.0%	0.0	0.0%	0.0%
5–9	0.0	0.0%	0.0%	0.0	0.0%	0.0%	0.0	0.0%	0.0%
10–14	0.0	0.0%	0.0%	0.0	0.0%	0.0%	0.0	0.0%	0.0%
15–19	0.0	0.0%	0.0%	1.2	8.3%	8.3%	1.2	3.8%	3.8%
20–24	0.0	0.0%	0.0%	2.3	16.7%	25.0%	2.3	7.7%	11.5%
25–29	1.2	7.1%	7.1%	0.0	0.0%	25.0%	1.2	3.8%	15.4%
30–34	0.0	0.0%	7.1%	1.2	8.3%	33.3%	1.2	3.8%	19.2%
35–39	1.2	7.1%	14.3%	0.0	0.0%	33.3%	1.2	3.8%	23.1%
40–44	0.0	0.0%	14.3%	1.2	8.3%	41.7%	1.2	3.8%	26.9%
45–49	2.3	14.3%	28.6%	1.2	8.3%	50.0%	3.5	11.5%	38.5%
50–54	3.5	21.4%	50.0%	1.2	8.3%	58.3%	4.6	15.4%	53.8%
55–59	2.3	14.3%	64.3%	1.2	8.3%	66.7%	3.5	11.5%	65.4%
60–64	2.3	14.3%	78.6%	2.3	16.7%	83.3%	4.6	15.4%	80.8%
65–69	0.0	0.0%	78.6%	0.0	0.0%	83.3%	0.0	0.0%	80.8%
70–74	0.0	0.0%	78.6%	0.0	0.0%	83.3%	0.0	0.0%	80.8%
75–79	0.0	0.0%	78.6%	0.0	0.0%	83.3%	0.0	0.0%	80.8%
80–84	1.2	7.1%	85.7%	1.2	8.3%	91.7%	2.3	7.7%	88.5%
85–89	0.0	0.0%	85.7%	0.0	0.0%	91.7%	0.0	0.0%	88.5%
90–94	0.0	0.0%	85.7%	0.0	0.0%	91.7%	0.0	0.0%	88.5%
95–99	0.0	0.0%	85.7%	0.0	0.0%	91.7%	0.0	0.0%	88.5%
100–104	0.0	0.0%	85.7%	0.0	0.0%	91.7%	0.0	0.0%	88.5%
Missing	2.3	14.3%	100.0%	1.2	8.3%	100.0%	3.5	11.5%	100.0%
Total	**16.2**	**100.0%**	**100.0%**	**13.8**	**100.0%**	**100.0%**	**30.0**	**100.0%**	**100.0%**

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

Table 2-3.–Population profile, Clarks Point, 2014.

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	1.2	6.7%	6.7%	0.0	0.0%	0.0%	1.2	3.7%	3.7%
5–9	1.2	6.7%	13.3%	0.0	0.0%	0.0%	1.2	3.7%	7.4%
10–14	0.0	0.0%	13.3%	0.0	0.0%	0.0%	0.0	0.0%	7.4%
15–19	0.0	0.0%	13.3%	1.2	8.3%	8.3%	1.2	3.7%	11.1%
20–24	1.2	6.7%	20.0%	2.3	16.7%	25.0%	3.5	11.1%	22.2%
25–29	1.2	6.7%	26.7%	0.0	0.0%	25.0%	1.2	3.7%	25.9%
30–34	0.0	0.0%	26.7%	1.2	8.3%	33.3%	1.2	3.7%	29.6%
35–39	0.0	0.0%	26.7%	0.0	0.0%	33.3%	0.0	0.0%	29.6%
40–44	1.2	6.7%	33.3%	0.0	0.0%	33.3%	1.2	3.7%	33.3%
45–49	1.2	6.7%	40.0%	2.3	16.7%	50.0%	3.5	11.1%	44.4%
50–54	3.5	20.0%	60.0%	2.3	16.7%	66.7%	5.8	18.5%	63.0%
55–59	4.6	26.7%	86.7%	1.2	8.3%	75.0%	5.8	18.5%	81.5%
60–64	1.2	6.7%	93.3%	2.3	16.7%	91.7%	3.5	11.1%	92.6%
65–69	0.0	0.0%	93.3%	0.0	0.0%	91.7%	0.0	0.0%	92.6%
70–74	0.0	0.0%	93.3%	0.0	0.0%	91.7%	0.0	0.0%	92.6%
75–79	0.0	0.0%	93.3%	0.0	0.0%	91.7%	0.0	0.0%	92.6%
80–84	1.2	6.7%	100.0%	1.2	8.3%	100.0%	2.3	7.4%	100.0%
85–89	0.0	0.0%	100.0%	0.0	0.0%	100.0%	0.0	0.0%	100.0%
90–94	0.0	0.0%	100.0%	0.0	0.0%	100.0%	0.0	0.0%	100.0%
95–99	0.0	0.0%	100.0%	0.0	0.0%	100.0%	0.0	0.0%	100.0%
100–104	0.0	0.0%	100.0%	0.0	0.0%	100.0%	0.0	0.0%	100.0%
Missing	0.0	0.0%	100.0%	0.0	0.0%	100.0%	0.0	0.0%	100.0%
Total	**17.3**	**100.0%**	**100.0%**	**13.8**	**100.0%**	**100.0%**	**31.2**	**100.0%**	**100.0%**

Source ADF&G Division of Subsistence household surveys, 2015.

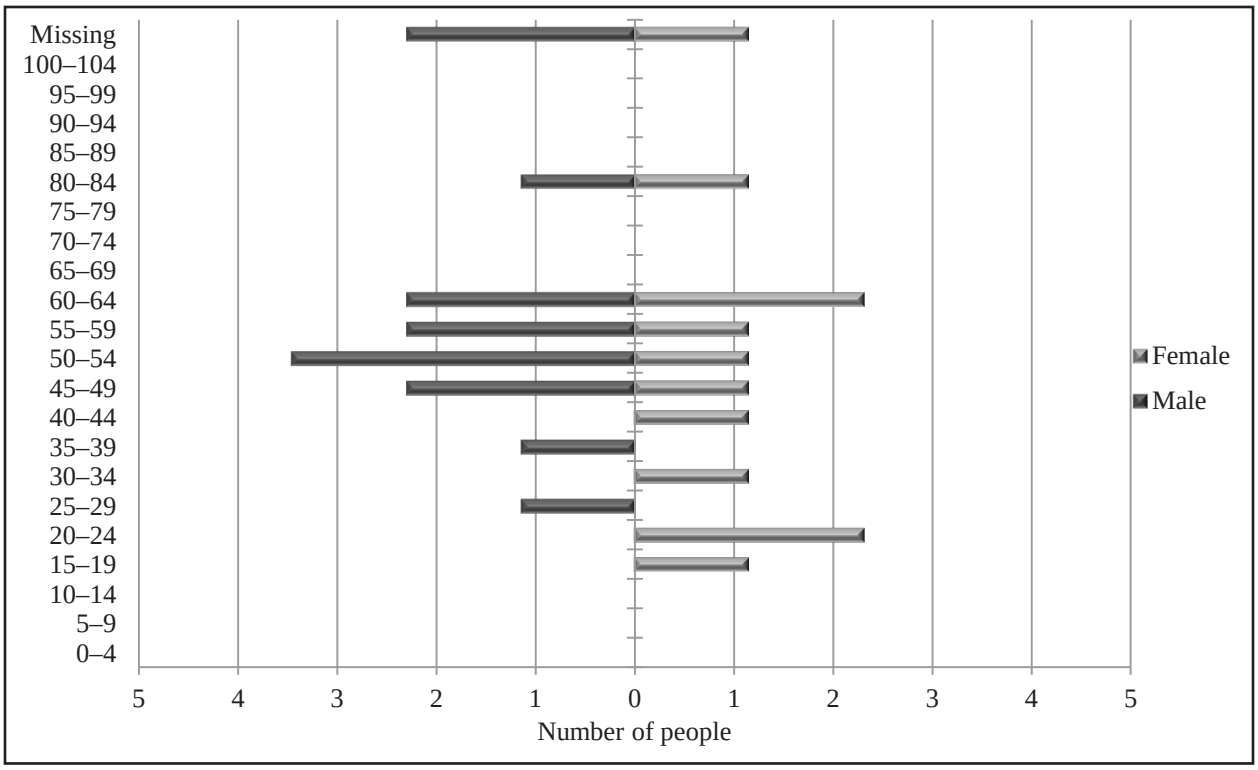


Figure 2-3.–Population profile, Clarks Point, 2013.

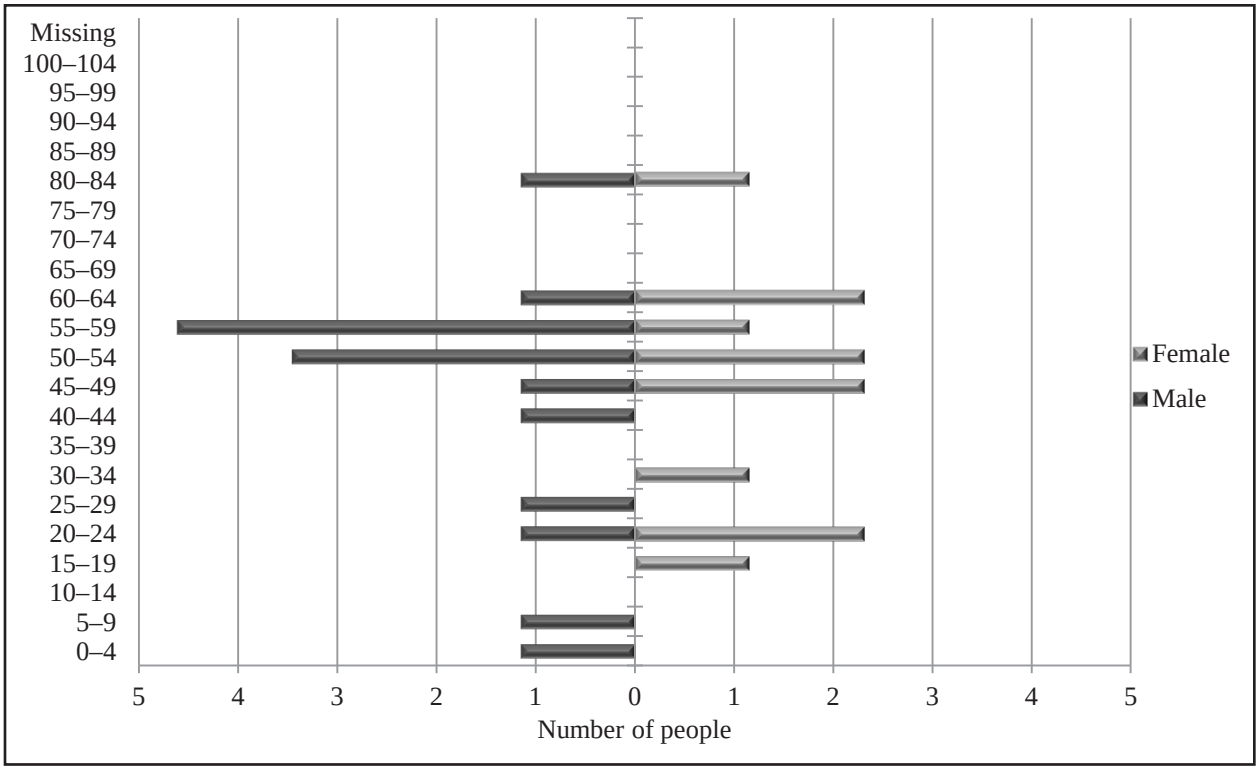


Figure 2-4.–Population profile, Clarks Point, 2014.

Table 2-4.–Sample achievement, Clarks Point, 2013 and 2014.

Sample information	2013	2014
Number of dwelling units	15	16
Interview goal	15	16
Households interviewed	13	13
Households failed to be contacted	1	1
Households declined to be interviewed	1	1
Households moved or occupied by nonresident	0	1
Total households attempted to be interviewed	15	15
Refusal rate	7.1%	7.1%
Final estimate of permanent households	15	15
Percentage of total households interviewed	86.7%	86.7%
Interview weighting factor	1.2	1.2
Sampled population	26	27
Estimated population	30.0	31.2

Source ADF&G Division of Subsistence household surveys, 2014 and 2015.

functioning cannery, which closed in 1952. The steady decline in population likely marks a downturn in employment and families leaving the community of Clarks Point as fishery-related employment decreased. Although outside of the scope of study years for this project, in August 2017 the Clarks Point School reopened with 14 students, with 6 full-time staff, and 2 part-time staff members (D. Piazza, Southwest Region School District superintendent, Dillingham, personal communication).

In 2013 more males (21%) were aged 50–54, and more females (17%) were adults aged 20–24 and 60–64, than any other age cohort (Table 2-2). In 2014, more males (27%) were aged 55–59, and more females (17%) were in the following four age groups: 20–24, 45–49, 50–54, and 60–64 (Table 2-3). In both study years, slightly more males than females resided in Clarks Point (Figure 2-3; Figure 2-4).

Sampling in 2013 resulted in the identification of 15 dwelling units, or households, 13 of which were successfully interviewed, making the percentage sampled 87% (Table 2-4). In 2014, dwelling units increased to 16, but a single household moved or was occupied by a nonresident; the number of eligible permanent households remained 15, with 13 interviewed. In each of the study years one household failed to be contacted and one household declined to be surveyed. The refusal rate for both study years was 7%. Beyond basic population, age, and sex demographics, no other information, such as employment characteristics, was obtained from Division of Subsistence surveys. According to the American Community Survey (ACS) average five-year estimate for 2012–2016, which encompasses both study years for this community, the median household income in Clarks Point was $21,875 (U.S. Census Bureau n.d.).

Summary of Salmon Harvest and Use Patterns

Survey participants were asked about their engagement with the salmon fisheries, and varying amounts of use, attempt to harvest, successful harvest, and sharing of salmon were estimated from survey results. Sharing was identified by survey respondents as fulfilling a large proportion of salmon consumed by households. Salmon were shared in one form or another, which could have included unprocessed or processed fish. The survey effort included two ways to identify gear type use in the study communities. First, respondents were asked to identify the gear type used for salmon harvests reported on the household survey. Second, when identifying fishing and harvest locations on a map, respondents were asked to identify the type of harvest gear used at each location. Note that not every surveyed household provided spatial data (see Table 1-3) and some households did not provide clarification about the gear used at specific fishing and harvest locations. Therefore, the survey results provide two different depictions of harvest patterns by gear type. Also,

respondents were not asked to identify where commercial harvests retained for home use came from, but tables showing harvests by gear type do depict the estimated amount of salmon retained from commercial catches. Note that based on comments collected during survey administration, set gillnet was the gillnet gear type most commonly used for subsistence salmon fishing, but some drift gillnet use occurred. The following sections summarize results for harvest and use patterns for each study year.

Individual Participation in the Harvesting and Processing of Salmon: 2013 and 2014

All salmon species in Alaska were harvested by Clarks Point residents in the 2013 and 2014 study years: Chinook, sockeye, chum, coho, and pink salmon, as well as spawning sockeye salmon. Figure 2-5 is a visual representation of the level of individual participation in the subsistence harvesting and processing of salmon by members of households in Clarks Point. An estimated 76% of individuals (23 people) subsistence fished for salmon, and 91% (27 people) processed salmon in the 2013 study year (Table 2-5). Similarly, in 2014, an estimated 74% percent (23 people) subsistence fished for salmon, and 81% (25 people) processed harvested salmon.

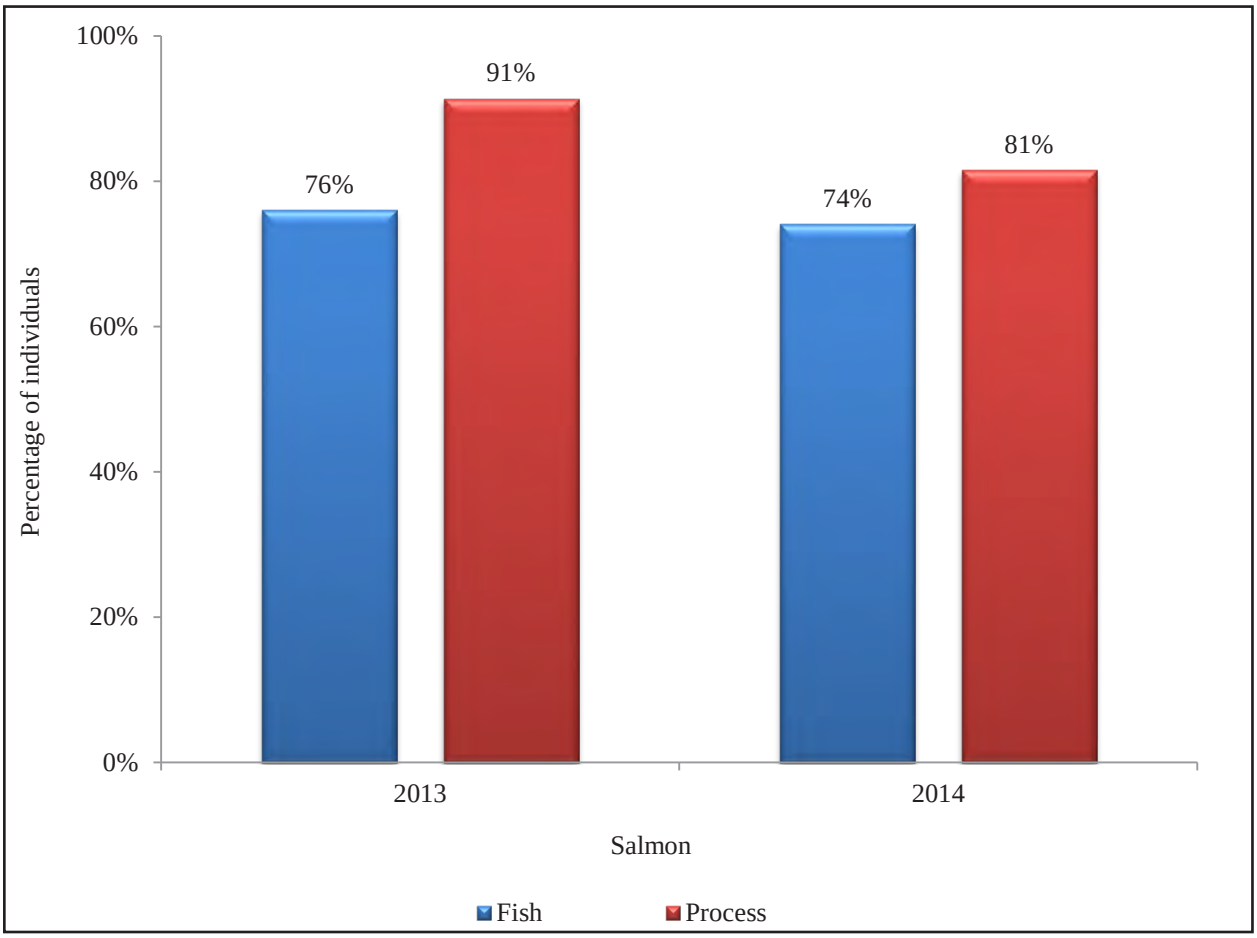


Figure 2-5.–Individual participation in subsistence salmon harvesting and processing activities, Clarks Point, 2013 and 2014.

Table 2-5.–Individual participation in subsistence salmon harvesting and processing activities, Clarks Point, 2013 and 2014.

	2013	2014
Total number of people	**30.0**	**31.2**
Salmon		
Fish		
Number	22.8	23.1
Percentage	76.0%	74.1%
Process		
Number	27.4	25.4
Percentage	91.3%	81.5%

Source ADF&G Division of Subsistence household surveys, 2014 and 2015.

Household Salmon Harvest and Use Characteristics in Clarks Point: 2013

The total estimated number of all salmon species harvested in 2013 was 2,206 individual fish totaling 11,456 lb harvested (Table 2-6). The highest portion of harvested salmon was sockeye salmon at 3,561 lb (119 lb per capita), followed by coho salmon at 3,193 lb (106 lb per capita). This community's total salmon harvest accounted for 764 lb per household, or 382 lb per capita. Chinook salmon accounted for 2,751 lb harvested in 2013, or 92 lb per capita. Harvests from these three species combined accounted for 83% of the total salmon harvest weight (Figure 2-6). Sockeye, coho, and Chinook salmon each contributed close to one-third of the harvest weight. Harvests of spawning sockeye salmon contributed 9% to the total harvest weight, which was more than the portion from chum salmon, the species with the next highest harvest, which contributed 6% of the total harvest weight.

Overall Use by Households and Salmon Harvests by Gear Type

All households in Clarks Point used salmon (100%), with 77% attempting harvest, 69% successfully harvesting, 77% receiving salmon, and 54% giving salmon away (Figure 2-7; Table 2-6). The highest percentages of salmon use were for Chinook and coho salmon, with 85% of households using either of these species. Sockeye salmon was the next highest used species at 62%, followed by chum salmon at 54%. Well more than the majority of Clarks Point households gave away or received salmon from either other community members or from outside of the community. Chinook salmon was the most received fish species (69% of households received Chinook salmon) and was also given away by nearly one-half of households (46%). Coho salmon was also highly shared, with 46% of households sharing and 54% receiving this species.

Methods used to harvest salmon included removals from commercial catches and subsistence gillnetting (Table 2-7; Figure 2-8). Subsistence gillnetting accounted for 97% of the salmon harvest weight, followed by 3% of the harvest provided by removal from commercial catches (Table 2-8). No salmon were harvested using rod and reel or other methods in Clarks Point. An estimated 325 lb of Chinook salmon (or 24 individual fish) were harvested by commercial catch removals, which was the only species to be removed for home use (Table 2-7). The remainder of all other salmon harvested (11,132 lb) were harvested by subsistence gillnet.

Salmon Harvests by Location and Harvest Gear Type

The salmon harvest areas used by Clarks Point residents in 2013 are depicted by species in Figure 2-9. The species with harvest locations depicted include Chinook, coho, and sockeye salmon, as well as spawning sockeye salmon. No chum or pink salmon harvest locations were mapped in 2013, although chum salmon composed 6% of the total harvest composition, and pink salmon composed 2% (Figure 2-9; Figure 2-6). The majority of salmon harvests occurred on the beaches immediately north and south of the community site. Chinook salmon were also harvested by Clarks Point residents at the entrance of the Wood River and

Table 2-6.–Estimated use and harvest of salmon, Clarks Point, 2013.

Resource	Percentage of households: Use %	Attempt %	Harvest %	Receive %	Give %	Harvest weight (lb): Total	Mean per household	Per capita	Harvest amount: Total	Unit	Mean per household	95% confidence limit (±) harvest
Salmon	**100.0**	**76.9**	**69.2**	**76.9**	**53.8**	**11,456.2**	**763.7**	**381.9**	**2,206.2**	**ind**	**147.1**	**42.0**
Chum salmon	53.8	30.8	30.8	38.5	23.1	655.8	43.7	21.9	138.5	ind	9.2	65.7
Coho salmon	84.6	61.5	61.5	53.8	46.2	3,193.3	212.9	106.4	709.6	ind	47.3	33.4
Chinook salmon	84.6	69.2	61.5	69.2	46.2	2,750.5	183.4	91.7	205.4	ind	13.7	43.9
Pink salmon	23.1	15.4	15.4	7.7	7.7	271.6	18.1	9.1	120.0	ind	8.0	76.3
Sockeye salmon	61.5	61.5	53.8	38.5	23.1	3,560.5	237.4	118.7	801.9	ind	53.5	38.1
Spawning sockeye salmon	46.2	15.4	7.7	30.8	15.4	1,024.6	68.3	34.2	230.8	ind	15.4	79.6
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ind	0.0	0.0

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

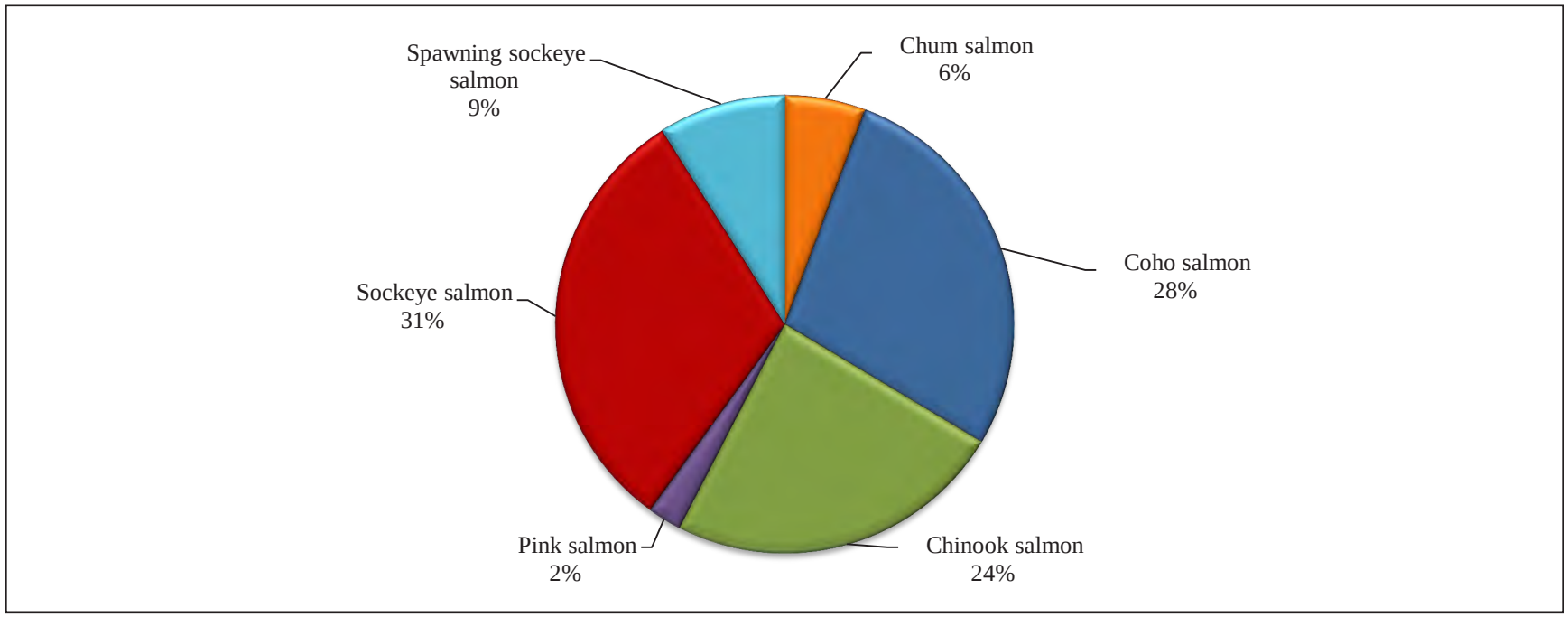


Figure 2-6.–Composition of salmon harvest in pounds usable weight, Clarks Point, 2013.

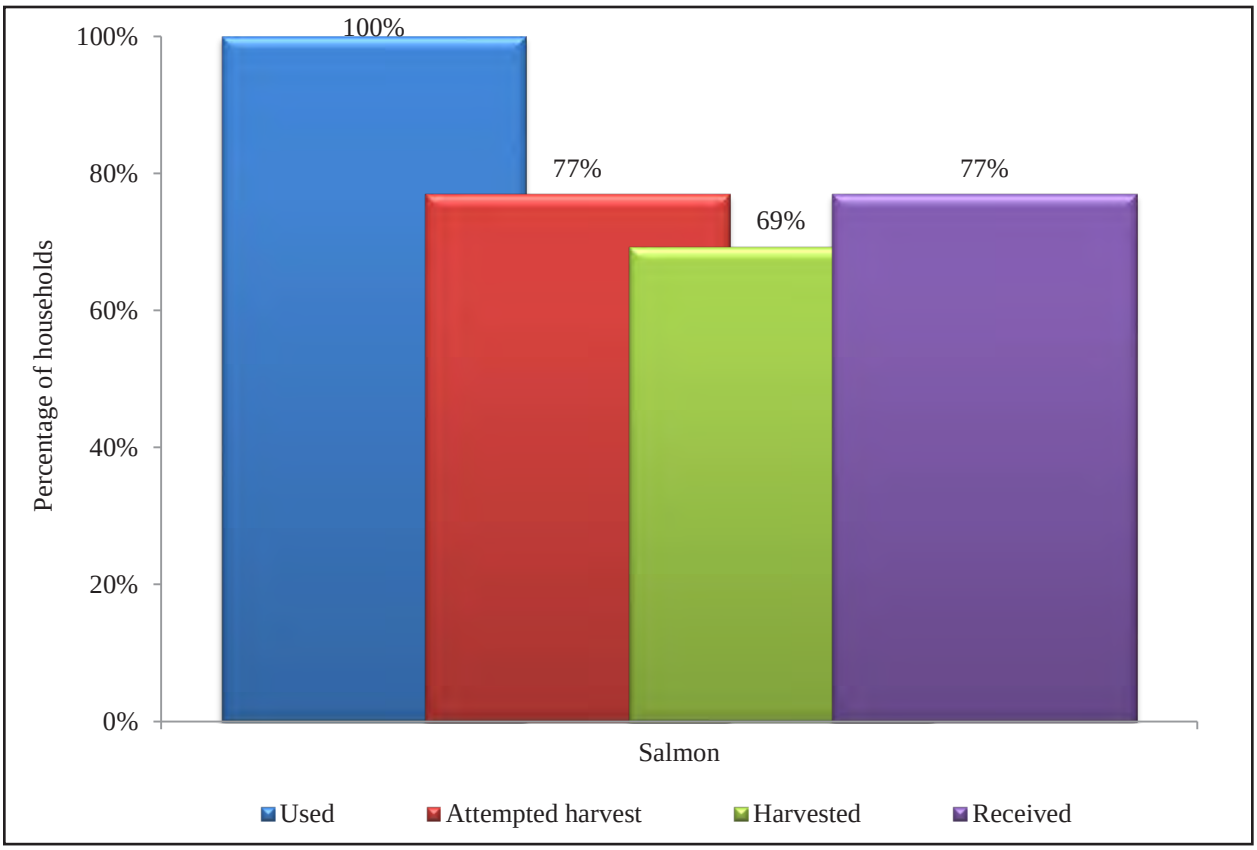


Figure 2-7.–Percentage of households using, attempting to harvest, harvesting, and receiving salmon, Clarks Point, 2013.

Table 2-7.–Estimated harvest of salmon by gear type and resource, Clarks Point, 2013.

	Removed from commercial catch		Subsistence methods									
			Gillnet[a]		Other method		Subsistence gear, any method		Rod and reel		Any method	
Resource	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Salmon	**24.2**	**324.5**	**2,181.9**	**11,131.7**	**0.0**	**0.0**	**2,181.9**	**11,131.7**	**0.0**	**0.0**	**2,206.2**	**11,456.2**
Chum salmon	0.0	0.0	138.5	655.8	0.0	0.0	138.5	655.8	0.0	0.0	138.5	655.8
Coho salmon	0.0	0.0	709.6	3,193.3	0.0	0.0	709.6	3,193.3	0.0	0.0	709.6	3,193.3
Chinook salmon	24.2	324.5	181.2	2,426.0	0.0	0.0	181.2	2,426.0	0.0	0.0	205.4	2,750.5
Pink salmon	0.0	0.0	120.0	271.6	0.0	0.0	120.0	271.6	0.0	0.0	120.0	271.6
Sockeye salmon	0.0	0.0	801.9	3,560.5	0.0	0.0	801.9	3,560.5	0.0	0.0	801.9	3,560.5
Spawning sockeye salmon	0.0	0.0	230.8	1,024.6	0.0	0.0	230.8	1,024.6	0.0	0.0	230.8	1,024.6
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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

Note The harvested number of salmon is represented as individual fish harvested.

a. Gillnet harvests include both set and drift gillnet gear types.

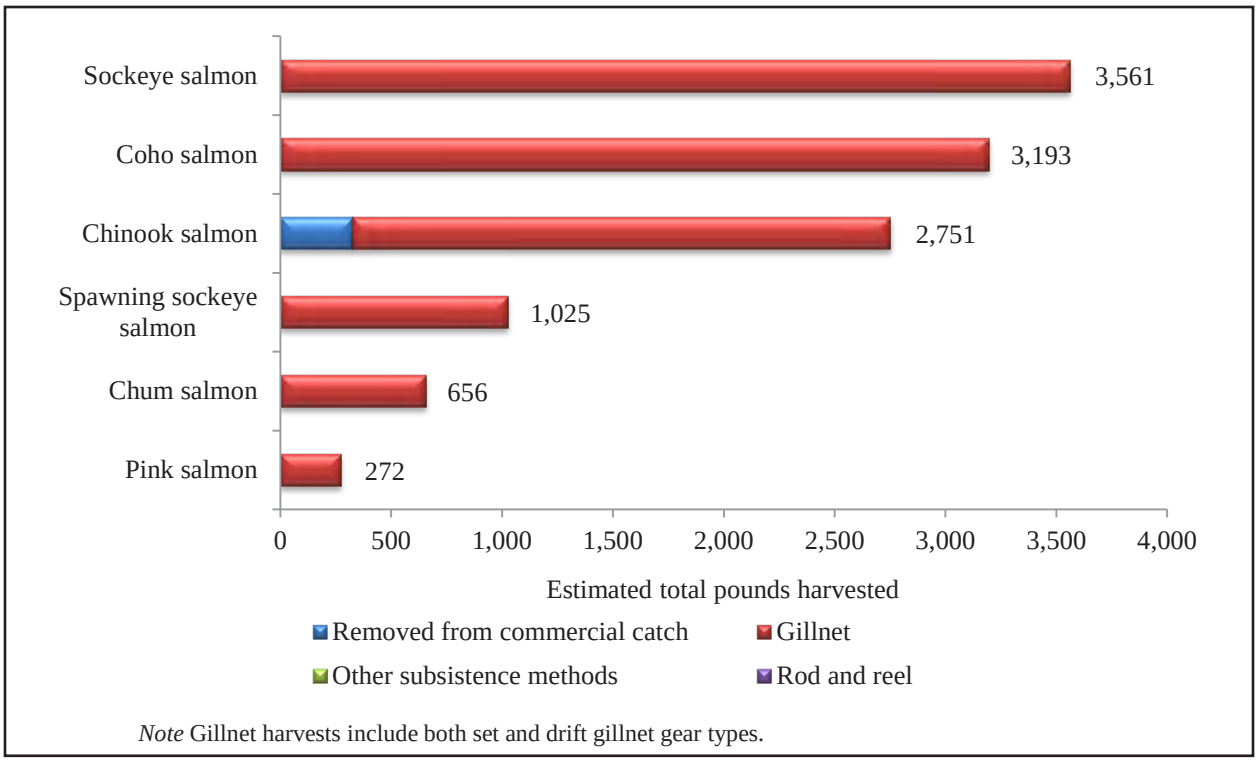


Figure 2-8.–Estimated harvest of salmon in pounds usable weight by gear type and resource, Clarks Point, 2013.

Nushagak River near Lewis Point. Two hundred thirty-one spawned-out sockeye salmon, a late-season fish valued by Clarks Point harvesters, came from the waters of Lake Aleknagik (Figure 2-9; Table 2-7). As such, Chinook and spawning sockeye salmon were the two species sought the farthest from the community.

Chinook salmon harvest locations by gear type are shown in Figure 2-10. The harvests of Chinook salmon follow the same pattern as all salmon, with Chinook harvested by gillnet in three locations on the Clarks Point beaches, and by a different or unspecified method at one location near Lewis Point and the mouth of Wood River. Although community resident comments suggested that Chinook salmon are no longer migrating past Clarks Point at historical volumes, some subsistence gillnetters were still able to harvest Chinook near the community. Harvests of coho salmon were more consolidated by comparison to Chinook salmon harvests with coho salmon harvests by gillnet identified at two locations on the beaches near Clarks Point (Figure 2-11). Consistent with the main pattern of subsistence gillnetting, sockeye salmon were also harvested from similar beach locations as Chinook and coho salmon (Figure 2-12). Other salmon harvests, which in 2013 only included spawned-out sockeye salmon caught by gillnet, are shown in Figure 2-13, and is the singular harvest point in Lake Aleknagik.

Table 2-8.–Estimated percentages of salmon harvest in pounds usable weight by gear type, resource, and total salmon harvest, Clarks Point, 2013.

Resource	Percentage base	Removed from commercial catch	Subsistence methods				
			Gillnet[a]	Other method	Subsistence gear, any method	Rod and reel	Any method
Salmon	**Gear type**	**100.0%**	**100.0%**	**0.0%**	**100.0%**	**0.0%**	**100.0%**
	Resource	**2.8%**	**97.2%**	**0.0%**	**97.2%**	**0.0%**	**100.0%**
	Total	**2.8%**	**97.2%**	**0.0%**	**97.2%**	**0.0%**	**100.0%**
Chum salmon	Gear type	0.0%	5.9%	0.0%	5.9%	0.0%	5.7%
	Resource	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%
	Total	0.0%	5.7%	0.0%	5.7%	0.0%	5.7%
Coho salmon	Gear type	0.0%	28.7%	0.0%	28.7%	0.0%	27.9%
	Resource	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%
	Total	0.0%	27.9%	0.0%	27.9%	0.0%	27.9%
Chinook salmon	Gear type	100.0%	21.8%	0.0%	21.8%	0.0%	24.0%
	Resource	11.8%	88.2%	0.0%	88.2%	0.0%	100.0%
	Total	2.8%	21.2%	0.0%	21.2%	0.0%	24.0%
Pink salmon	Gear type	0.0%	2.4%	0.0%	2.4%	0.0%	2.4%
	Resource	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%
	Total	0.0%	2.4%	0.0%	2.4%	0.0%	2.4%
Sockeye salmon	Gear type	0.0%	32.0%	0.0%	32.0%	0.0%	31.1%
	Resource	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%
	Total	0.0%	31.1%	0.0%	31.1%	0.0%	31.1%
Spawning sockeye salmon	Gear type	0.0%	9.2%	0.0%	9.2%	0.0%	8.9%
	Resource	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%
	Total	0.0%	8.9%	0.0%	8.9%	0.0%	8.9%
Unknown salmon	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

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

a. Gillnet harvests include both set and drift gillnet gear types.

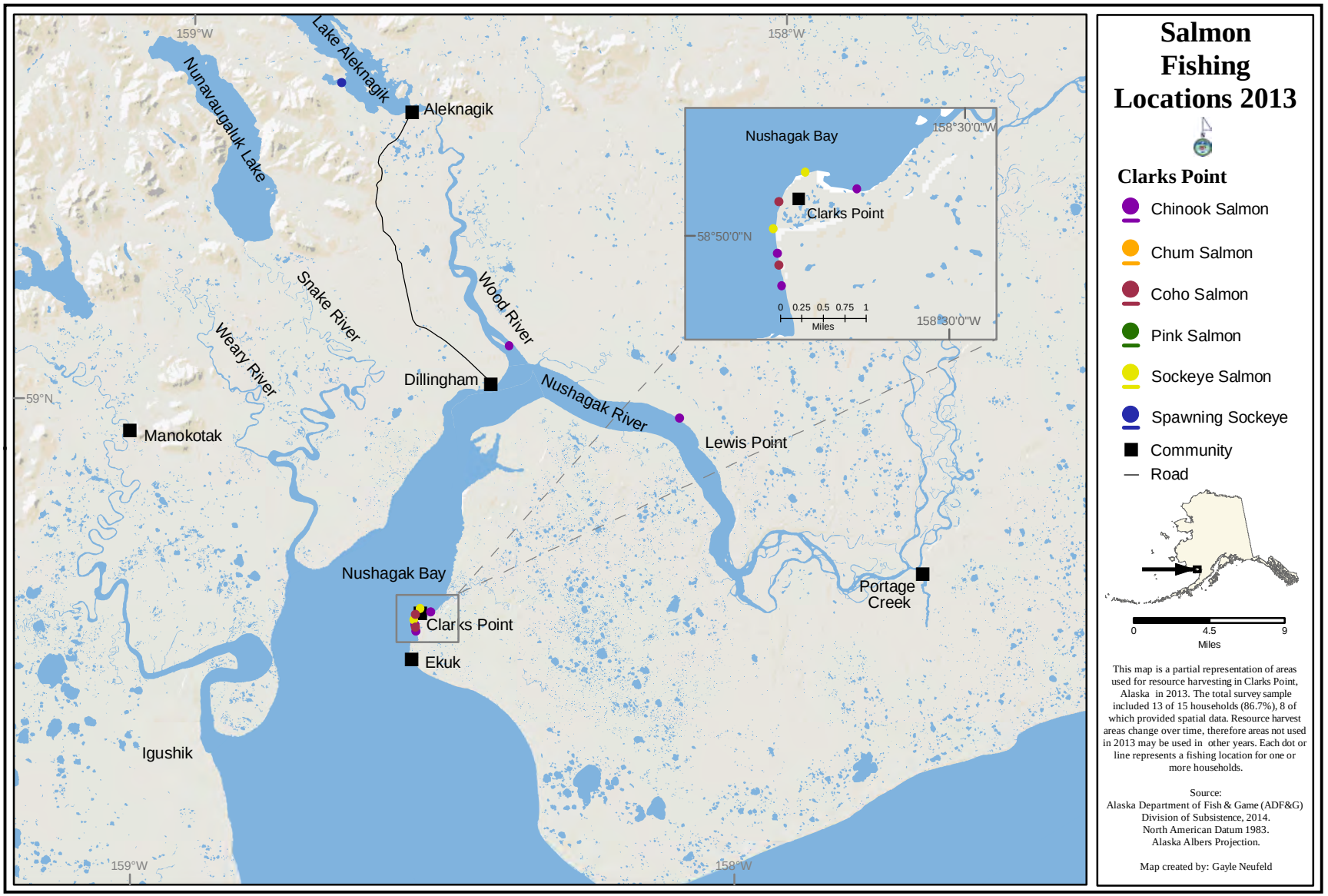


Figure 2-9.–Fishing and harvest locations of salmon, Clarks Point, 2013.

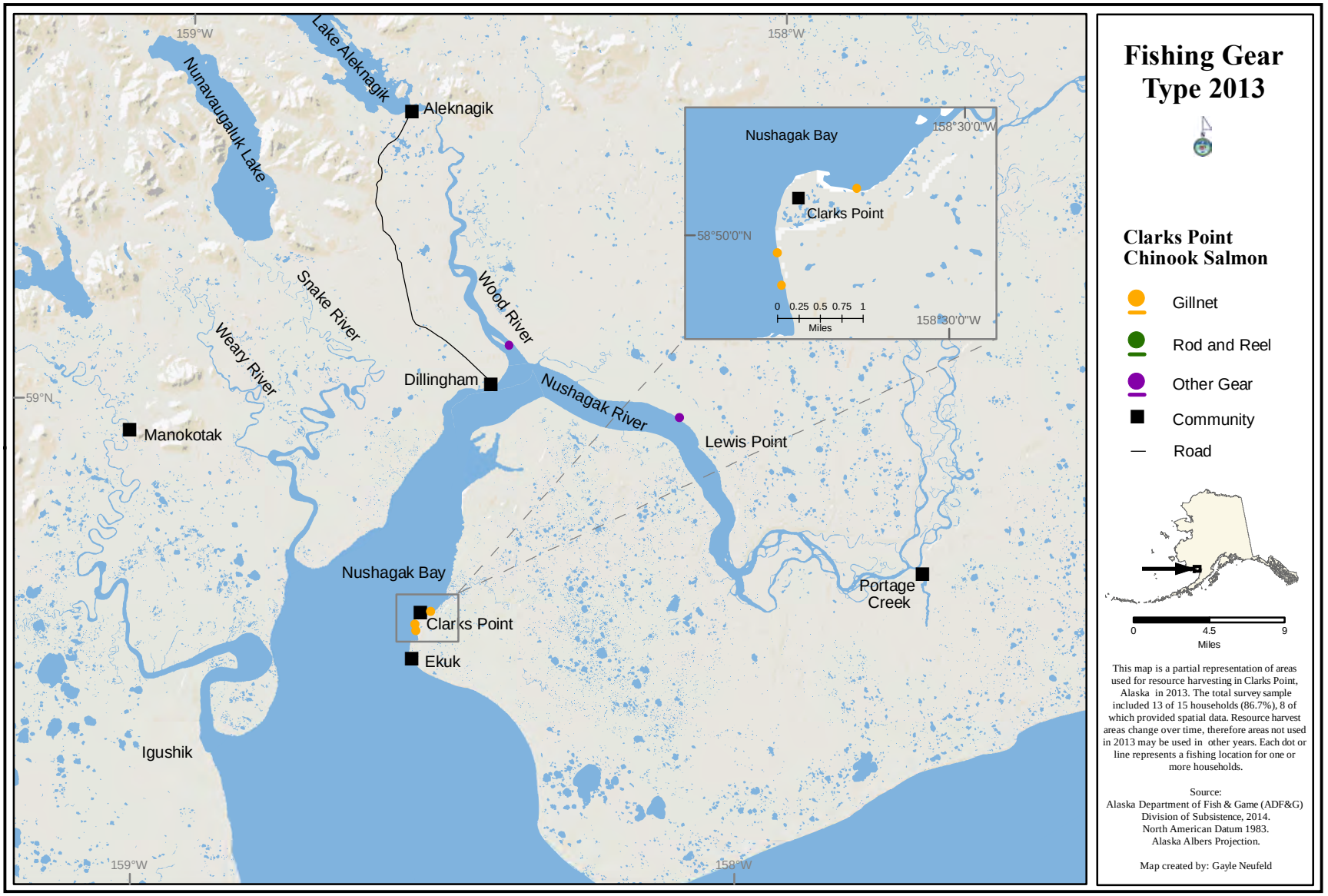


Figure 2-10.–Fishing and harvest locations by gear type, Chinook salmon, Clarks Point, 2013.

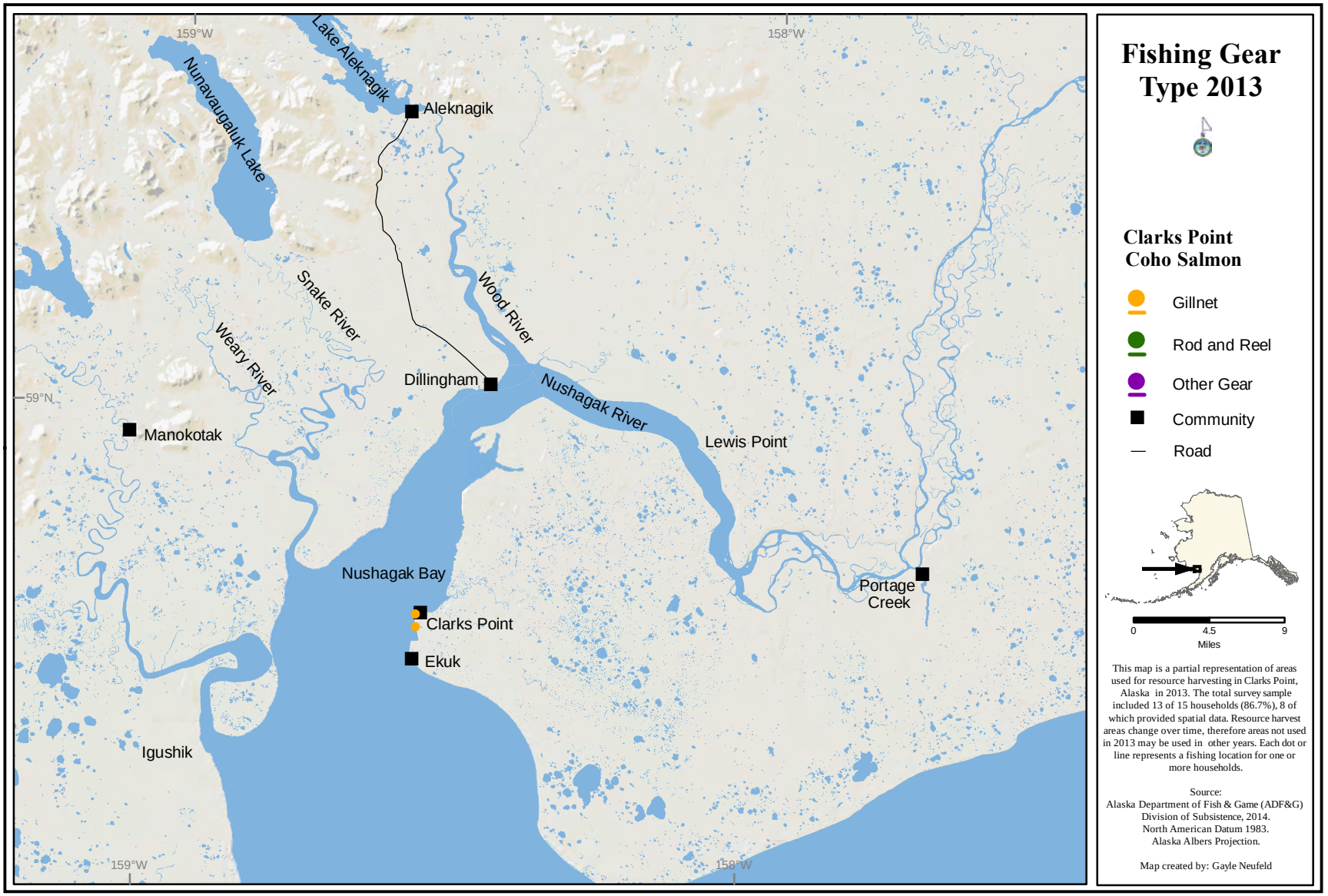


Figure 2-11.–Fishing and harvest locations by gear type, coho salmon, Clarks Point, 2013.

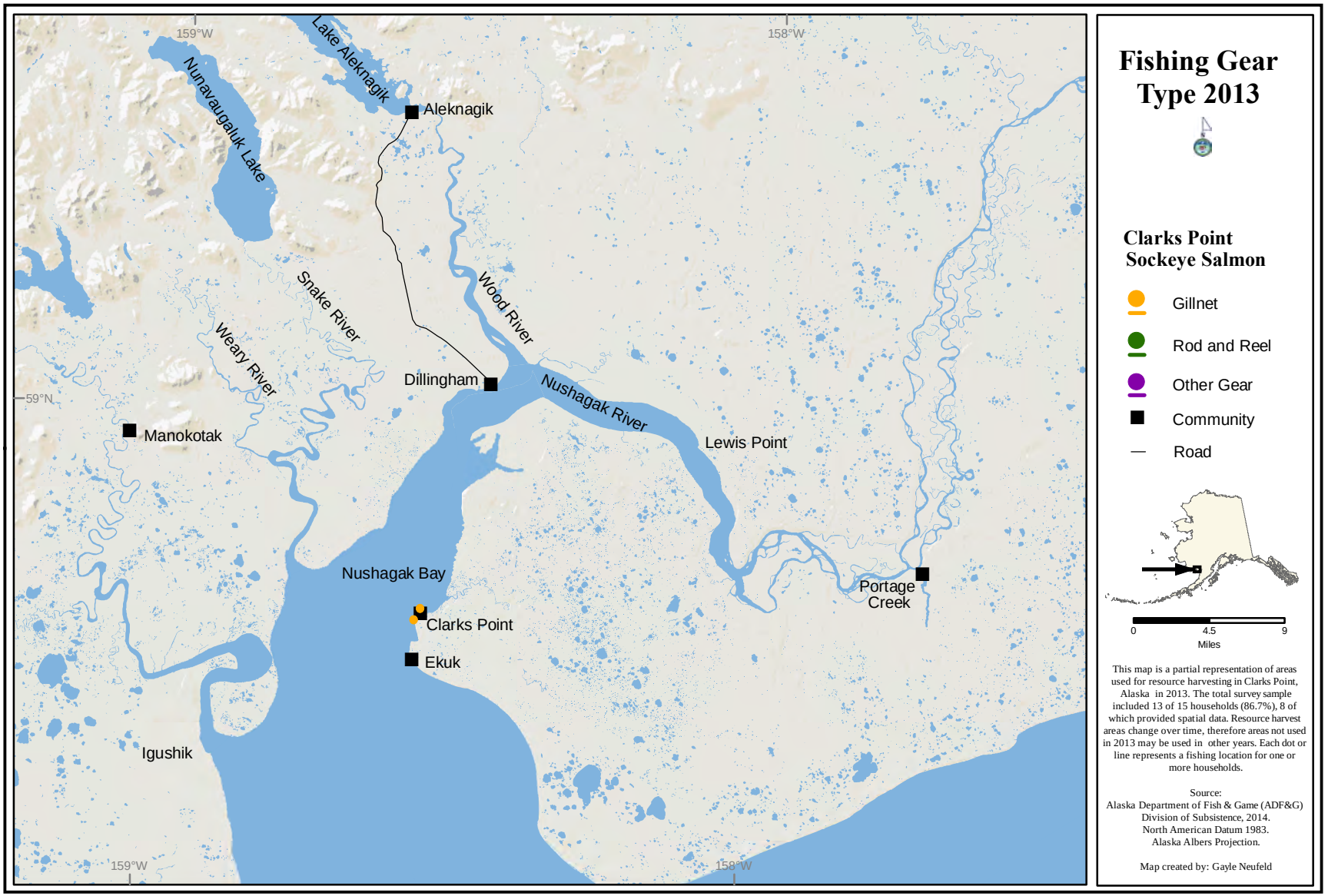


Figure 2-12.–Fishing and harvest locations by gear type, sockeye salmon, Clarks Point, 2013.

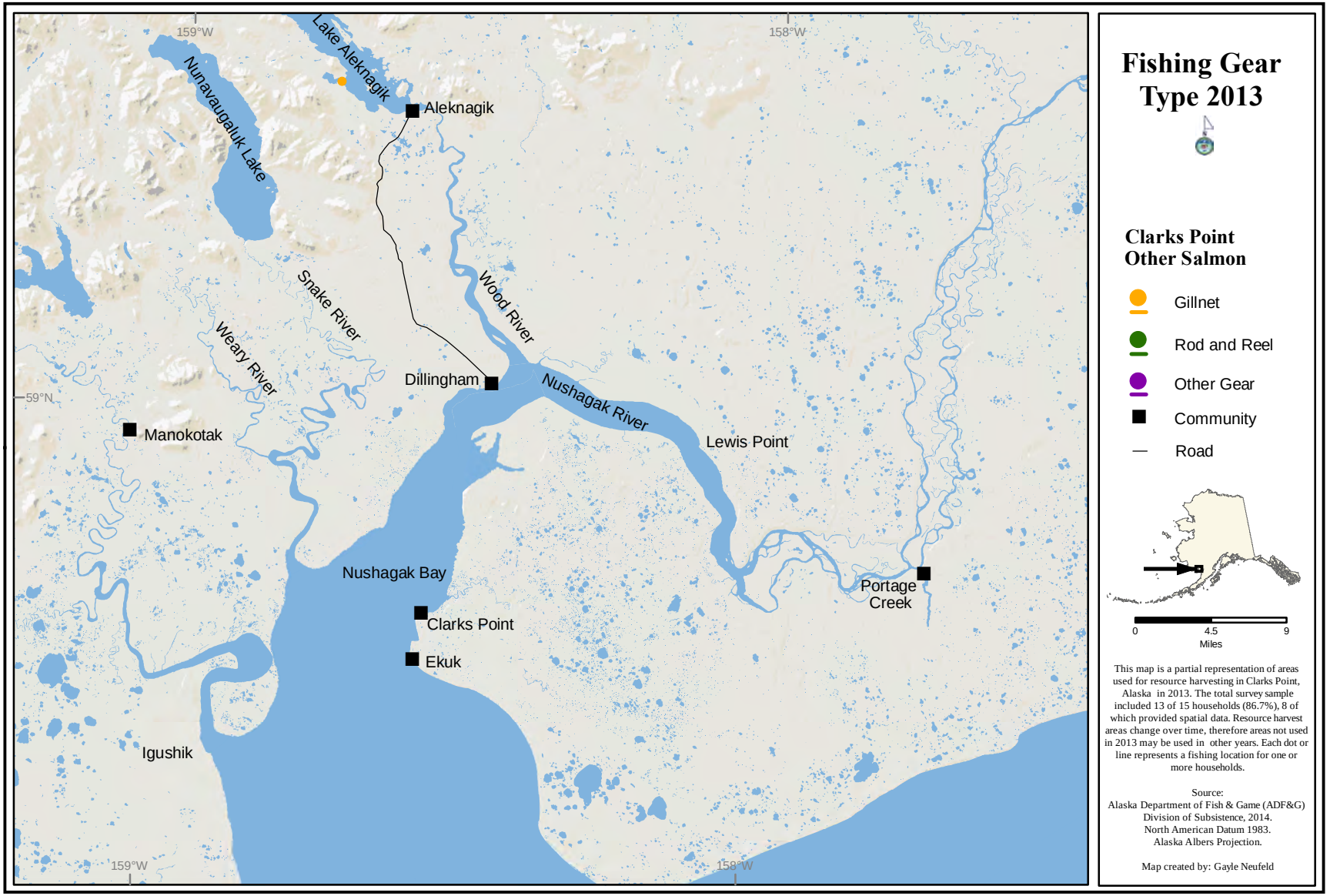


Figure 2-13.–Fishing and harvest locations by gear type, other salmon, Clarks Point, 2013.

Household Salmon Harvest and Use Characteristics in Clarks Point: 2014

The total number of all salmon species harvested in 2014 was 4,735 individual fish totaling 21,829 lb, which is almost double the amount from the previous year (Table 2-9). The highest portion of harvested salmon was sockeye salmon at 11,614 lb (373 lb per capita), followed by coho salmon at 8,209 lb (264 lb per capita). The total salmon harvest accounted for 1,455 lb per household, or 701 lb per capita. Chinook salmon accounted for 1,313 lb harvested in 2014, or 42 lb per capita. As the most harvested species, sockeye salmon was 53% of the harvest, followed by coho salmon at 38%, Chinook salmon at 6%, chum salmon at 2%, and pink salmon at 1% of the total harvest weight (Figure 2-14).

Overall Use by Households and Salmon Harvests by Gear Type

All households in Clarks Point used salmon, with 92% attempting and successfully harvesting, and 85% receiving salmon (Figure 2-15). Chinook salmon was used by the highest percentage of households with 100% of Clarks Point households having used Chinook salmon in 2014 (Table 2-9). Well above the majority of Clarks Point households gave away or received salmon from either other community members or from outside the community. Chinook salmon was received the most with 77% of households receiving this species. Sockeye and coho salmon were also highly shared, with 39% and 62% of households sharing these species, respectively.

Methods used to harvest salmon included removal from commercial catches and subsistence gillnetting (Table 2-10; Figure 2-16). Subsistence gillnetting accounted for 89% of the salmon harvest weight, followed by 11% of the harvest provided by removal from commercial catches (Table 2-11). No salmon were harvested using rod and reel or other methods in Clarks Point. In the 2014 study year, all species were removed from commercial catches. An estimated 1,066 lb of Chinook salmon (or 80 individual fish) were harvested by commercial catch removals, followed by 115 coho and 115 sockeye salmon, then pink salmon at 58 fish, and chum salmon at 29 fish (Table 2-10). The total harvest of all species removed from commercial catches amounted to 2,365 lb. The remainder of all other salmon harvested (19,464 lb) were harvested by subsistence gillnet.

Salmon Harvests by Location and Harvest Gear Type

The salmon harvest locations used by Clarks Point residents in 2014 are depicted by species in Figure 2-17. The species with harvest locations depicted include all five salmon species, as well as spawning sockeye, which composed a nominal proportion of the 2014 salmon harvest (less than 1%) (Figure 2-14). The majority of salmon harvests occurred on the beaches immediately north and south of the community site. In 2014, all salmon species were harvested at beaches west of the community site, a slight change from 2013, which had included beach sites further north and northeast of the community. Chinook salmon were harvested by Clarks Point residents at the mouth of the Wood River and sockeye salmon were harvested at a Lake Aleknagik location.

Harvest locations of Chinook salmon by gear type are shown in Figure 2-18. Gillnet was the gear type used exclusively by Clarks Point residents to harvest Chinook salmon primarily at beaches west of the community, and at one location at the mouth of the Wood River. Coho salmon harvests by gillnet were represented at a series of spots at the local beaches west of Clarks Point that reached south along the shore of Nushagak Bay (Figure 2-19). Sockeye salmon harvests by gillnet were mapped at numerous locations west of the community in proximity to where coho salmon harvests occurred that year, but also included one sockeye salmon harvest location at Lake Aleknagik (Figure 2-20). Chum and pink salmon gillnet harvest locations were mapped in 2014 and show a similar pattern to all other species of salmon harvested at the beaches west of the community, including one point in Lake Aleknagik, which shows one gillnet fishing area for the spawning sockeye salmon harvested in that year (Figure 2-21).

Overall Clarks Point subsistence gillnet harvesters used the same beach sites for their subsistence salmon harvests in both study years. The most significant change was that Lewis Point was not identified as a harvest location in 2014. Only a small proportion of households travel to Lake Aleknagik for either spawned-out or fresh sockeye salmon, yet this harvest is still a part of the annual subsistence salmon harvest and use characteristics by Clarks Point residents.

Table 2-9.–Estimated use and harvest of salmon, Clarks Point, 2014.

Resource	Percentage of households: Use %	Attempt %	Harvest %	Receive %	Give %	Harvest weight (lb): Total	Mean per household	Per capita	Harvest amount: Total	Unit	Mean per household	95% confidence limit (±) harvest
Salmon	**100.0**	**92.3**	**92.3**	**84.6**	**84.6**	**21,828.8**	**1,455.3**	**700.7**	**4,735.4**	**ind**	**315.7**	**57.4**
Chum salmon	30.8	23.1	23.1	15.4	7.7	355.2	23.7	11.4	75.0	ind	5.0	61.0
Coho salmon	84.6	76.9	76.9	53.8	61.5	8,209.0	547.3	263.5	1,824.2	ind	121.6	59.6
Chinook salmon	100.0	76.9	61.5	76.9	53.8	1,313.4	87.6	42.2	98.1	ind	6.5	45.8
Pink salmon	30.8	23.1	23.1	7.7	7.7	214.1	14.3	6.9	94.6	ind	6.3	52.4
Sockeye salmon	69.2	53.8	53.8	46.2	38.5	11,614.0	774.3	372.8	2,615.8	ind	174.4	62.2
Spawning sockeye salmon	15.4	15.4	15.4	7.7	0.0	123.0	8.2	3.9	27.7	ind	1.8	72.7
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ind	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2015.

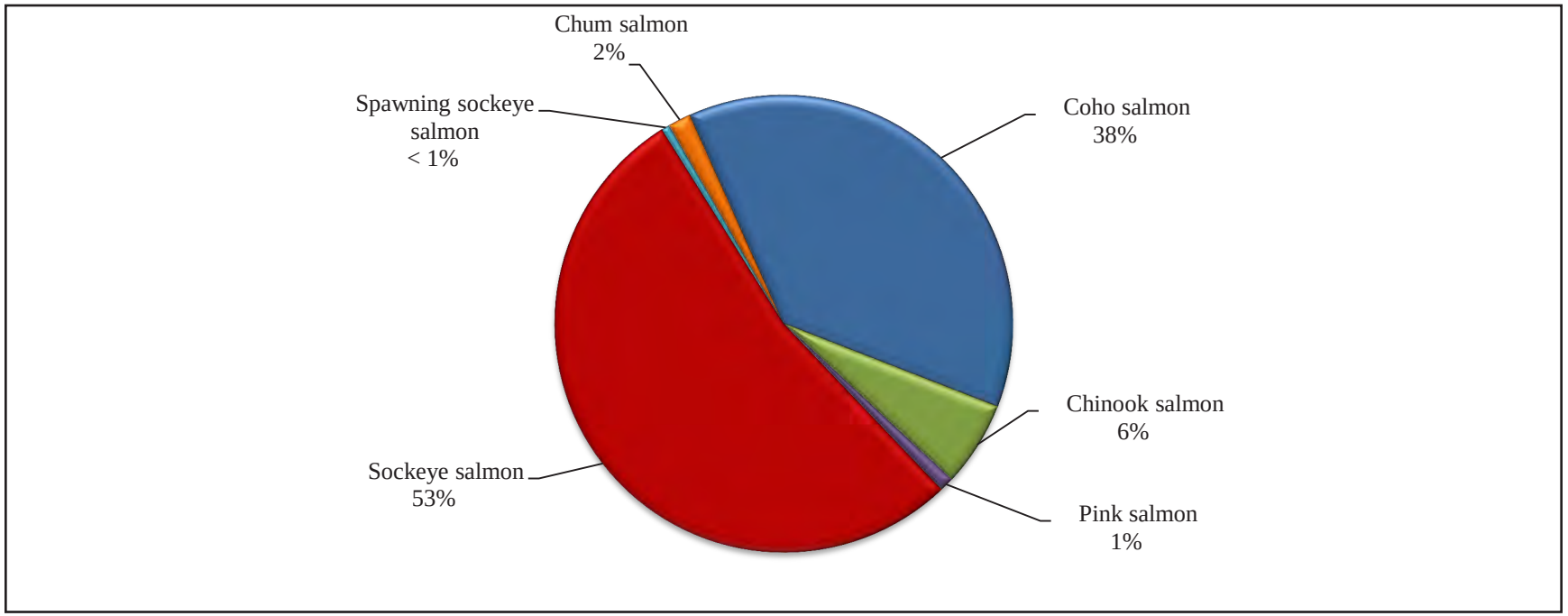


Figure 2-14.–Composition of salmon harvest in pounds usable weight, Clarks Point, 2014.

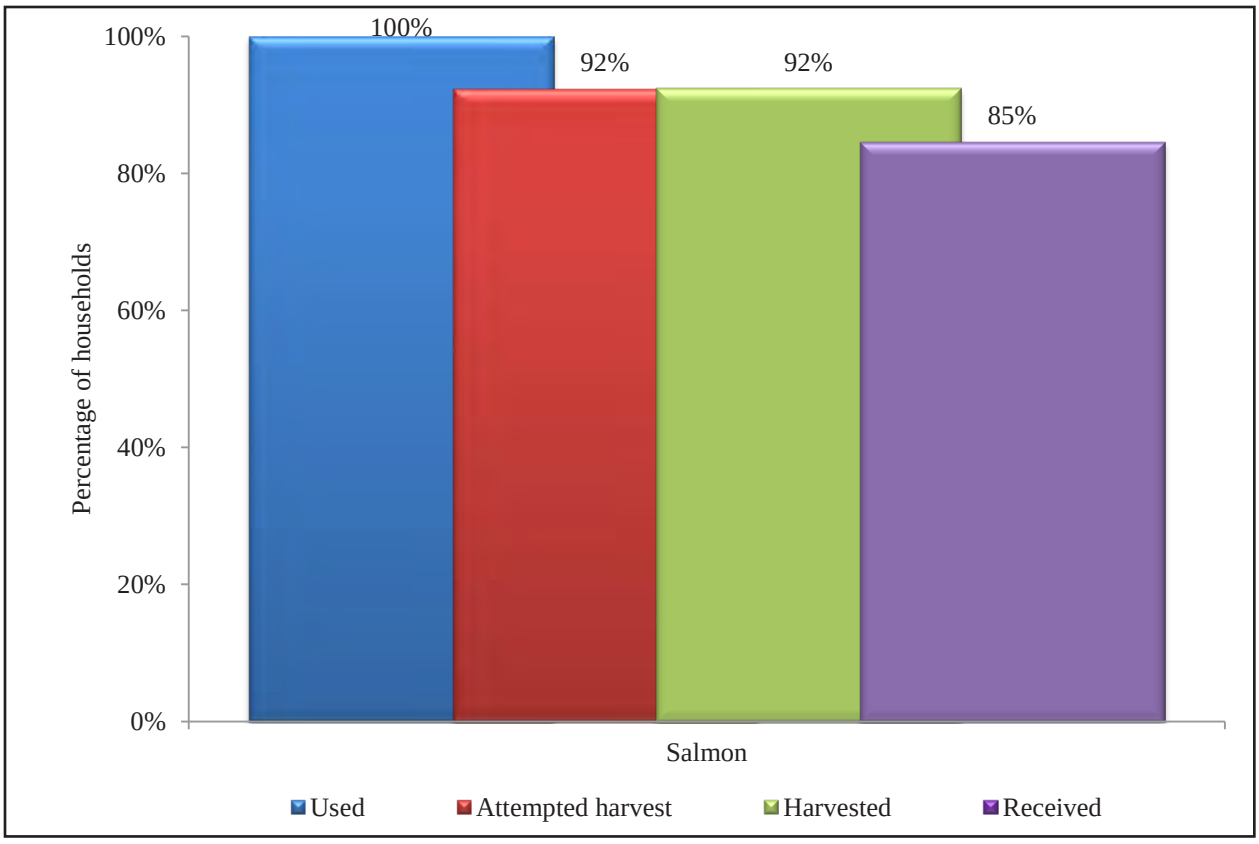


Figure 2-15.–Percentage of households using, attempting to harvest, harvesting, and receiving salmon, Clarks Point, 2014.

Table 2-10.–Estimated harvest of salmon by gear type and resource, Clarks Point, 2014.

	Removed from commercial catch		Subsistence methods									
			Gillnet[a]		Other method		Subsistence gear, any method		Rod and reel		Any method	
Resource	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Salmon	**396.9**	**2,364.9**	**4,338.5**	**19,463.8**	**0.0**	**0.0**	**4,338.5**	**19,463.8**	**0.0**	**0.0**	**4,735.4**	**21,828.8**
Chum salmon	28.8	136.6	46.2	218.6	0.0	0.0	46.2	218.6	0.0	0.0	75.0	355.2
Coho salmon	115.4	519.2	1,708.8	7,689.8	0.0	0.0	1,708.8	7,689.8	0.0	0.0	1,824.2	8,209.0
Chinook salmon	79.6	1,066.2	18.5	247.2	0.0	0.0	18.5	247.2	0.0	0.0	98.1	1,313.4
Pink salmon	57.7	130.6	36.9	83.6	0.0	0.0	36.9	83.6	0.0	0.0	94.6	214.1
Sockeye salmon	115.4	512.3	2,500.4	11,101.7	0.0	0.0	2,500.4	11,101.7	0.0	0.0	2,615.8	11,614.0
Spawning sockeye salmon	0.0	0.0	27.7	123.0	0.0	0.0	27.7	123.0	0.0	0.0	27.7	123.0
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2015.

Note The harvested number of salmon is represented as individual fish harvested.

a. Gillnet harvests include both set and drift gillnet gear types.

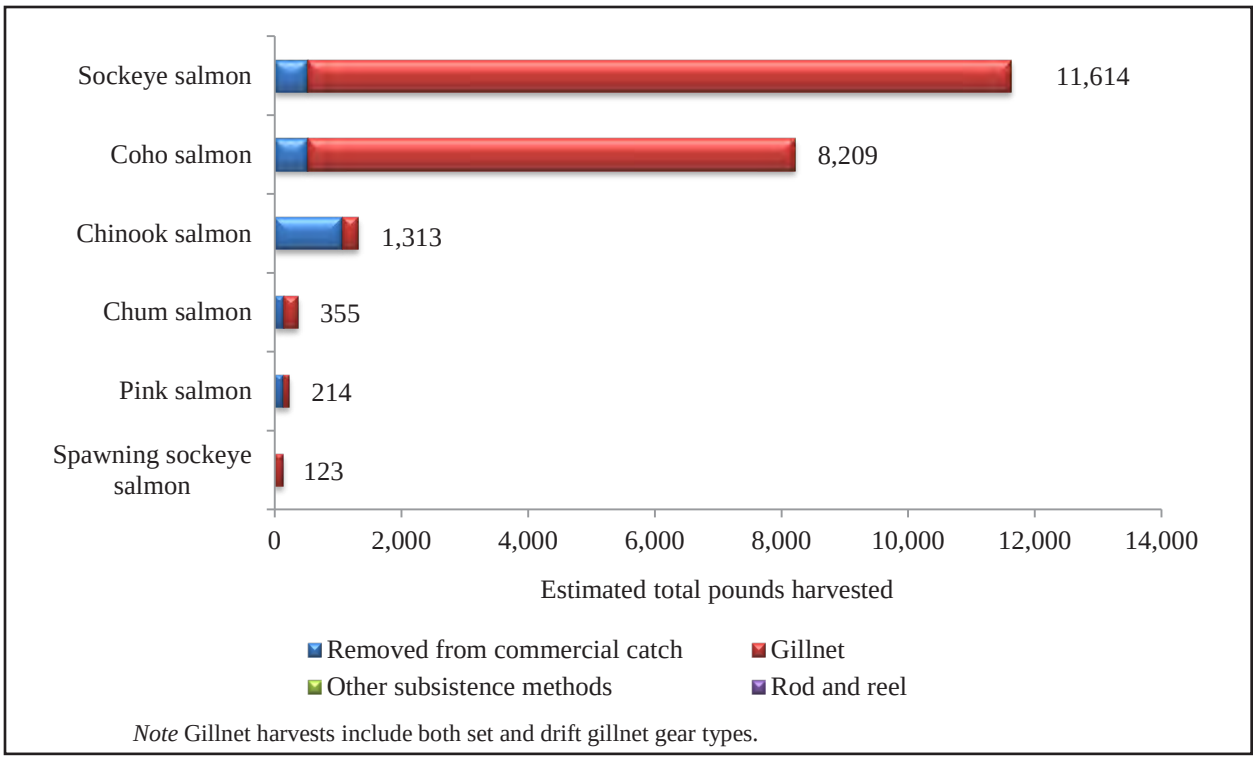


Figure 2-16.–Estimated harvest of salmon in pounds usable weight by gear type and resource, Clarks Point, 2014.

Table 2-11.–Estimated percentages of salmon harvest in pounds usable weight by gear type, resource, and total salmon harvest, Clarks Point, 2014.

Resource	Percentage base	Removed from commercial catch	Subsistence methods				
			Gillnet[a]	Other method	Subsistence gear, any method	Rod and reel	Any method
Salmon	**Gear type**	**100.0%**	**100.0%**	**0.0%**	**100.0%**	**0.0%**	**100.0%**
	Resource	**10.8%**	**89.2%**	**0.0%**	**89.2%**	**0.0%**	**100.0%**
	Total	**10.8%**	**89.2%**	**0.0%**	**89.2%**	**0.0%**	**100.0%**
Chum salmon	Gear type	5.8%	1.1%	0.0%	1.1%	0.0%	1.6%
	Resource	38.5%	61.5%	0.0%	61.5%	0.0%	100.0%
	Total	0.6%	1.0%	0.0%	1.0%	0.0%	1.6%
Coho salmon	Gear type	22.0%	39.5%	0.0%	39.5%	0.0%	38.5%
	Resource	6.3%	93.7%	0.0%	93.7%	0.0%	100.0%
	Total	2.4%	35.2%	0.0%	35.2%	0.0%	38.5%
Chinook salmon	Gear type	45.1%	1.3%	0.0%	1.3%	0.0%	2.1%
	Resource	81.2%	18.8%	0.0%	18.8%	0.0%	100.0%
	Total	4.9%	1.1%	0.0%	1.1%	0.0%	2.1%
Pink salmon	Gear type	5.5%	0.4%	0.0%	0.4%	0.0%	2.0%
	Resource	61.0%	39.0%	0.0%	39.0%	0.0%	100.0%
	Total	0.6%	0.4%	0.0%	0.4%	0.0%	2.0%
Sockeye salmon	Gear type	21.7%	57.0%	0.0%	57.0%	0.0%	55.2%
	Resource	4.4%	95.6%	0.0%	95.6%	0.0%	100.0%
	Total	2.3%	50.9%	0.0%	50.9%	0.0%	55.2%
Spawning sockeye salmon	Gear type	0.0%	0.6%	0.0%	0.6%	0.0%	0.6%
	Resource	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%
	Total	0.0%	0.6%	0.0%	0.6%	0.0%	0.6%
Unknown salmon	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source ADF&G Division of Subsistence household surveys, 2015.

a. Gillnet harvests include both set and drift gillnet gear types.

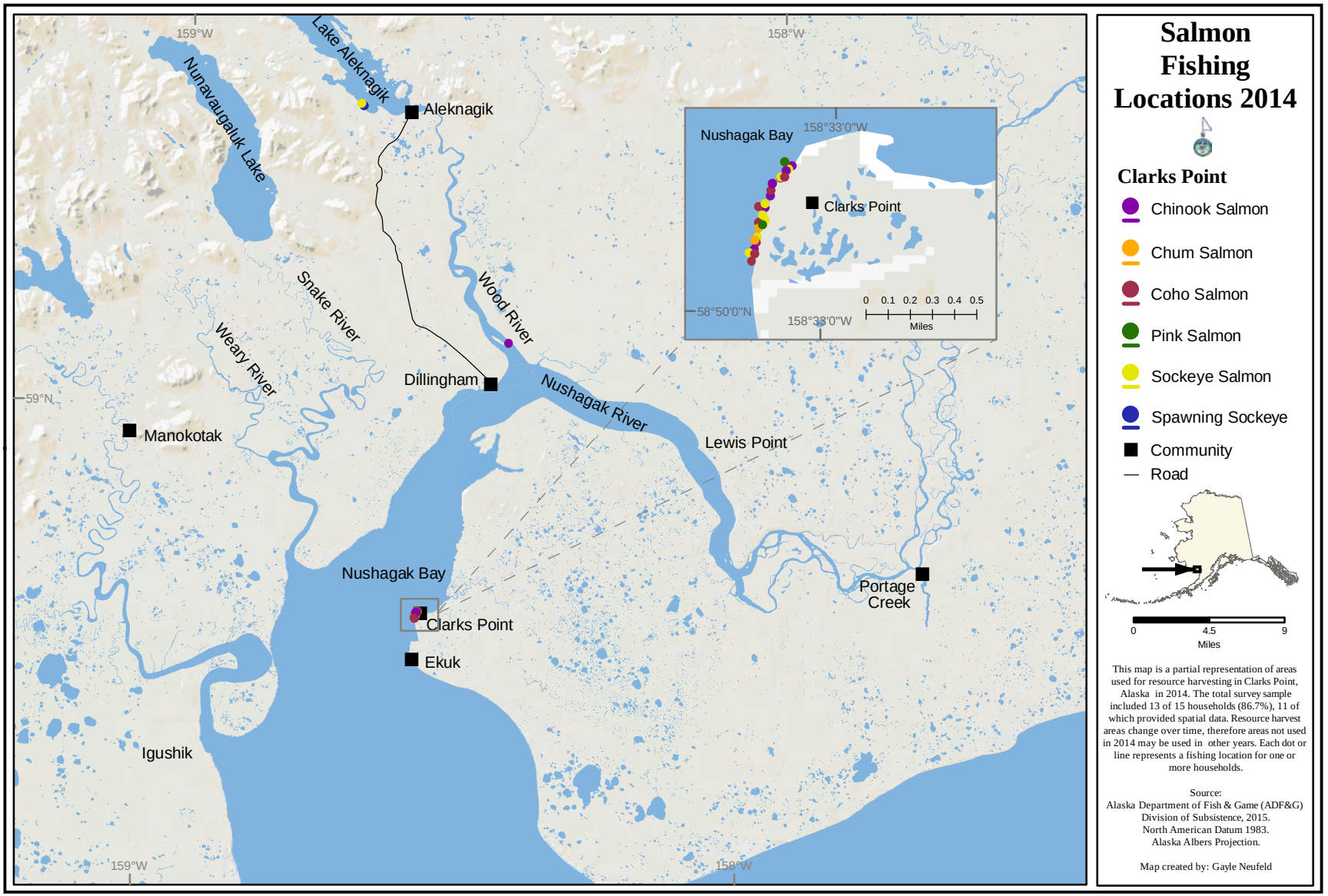


Figure 2-17.–Fishing and harvest locations of salmon, Clarks Point, 2014.

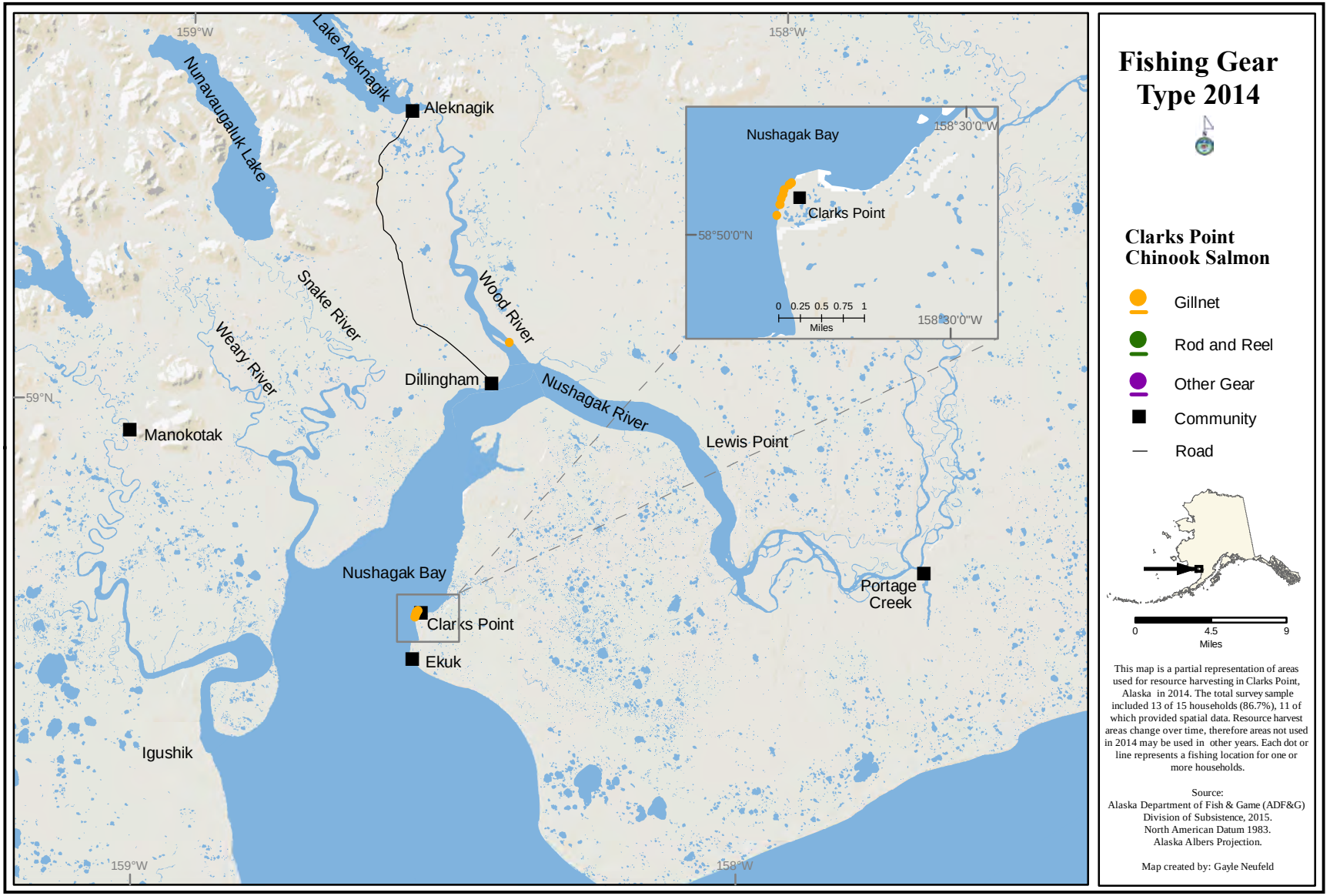


Figure 2-18.–*Fishing and harvest locations by gear type, Chinook salmon, Clarks Point, 2014.*

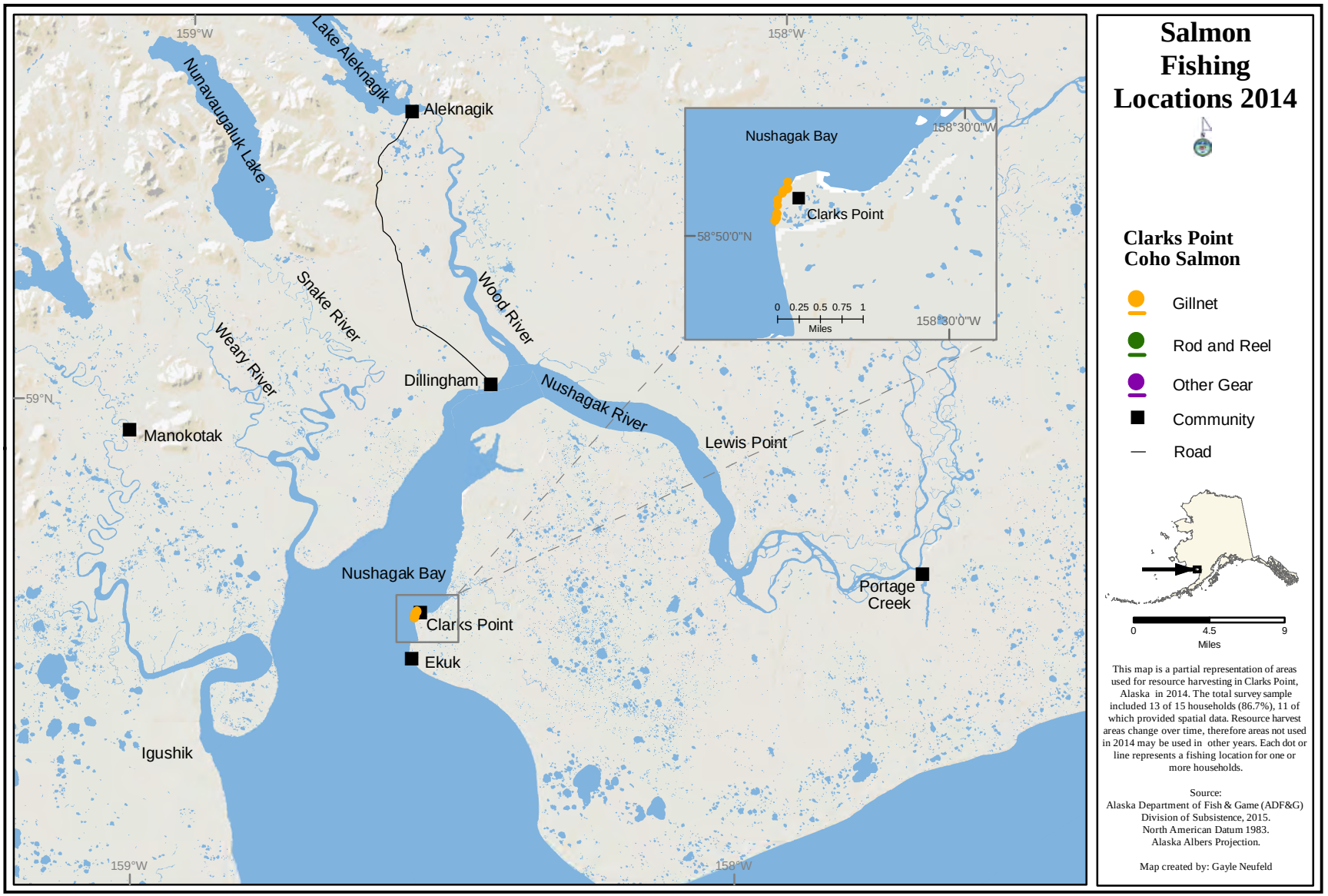


Figure 2-19.–Fishing and harvest locations by gear type, coho salmon, Clarks Point, 2014.

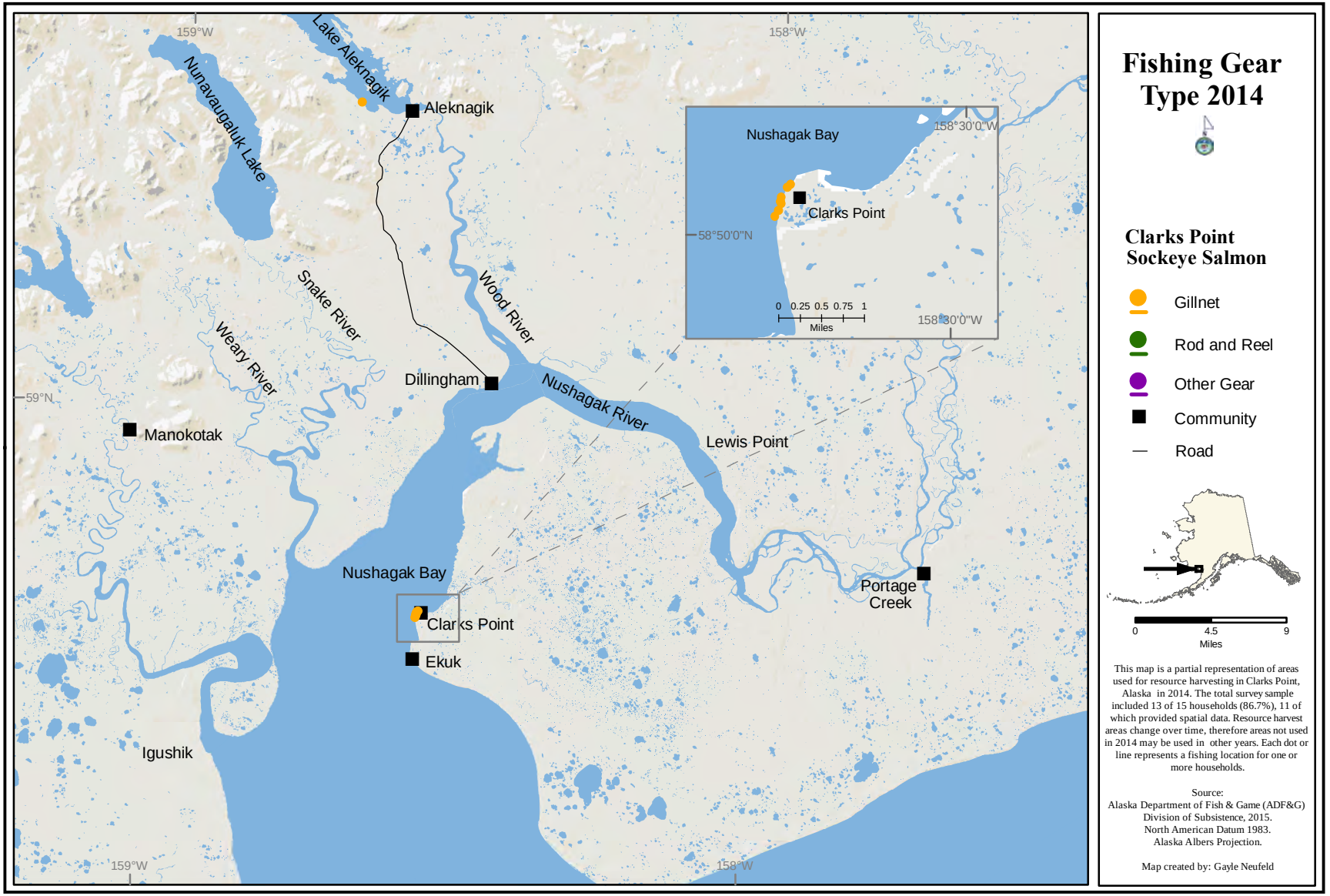


Figure 2-20.–Fishing and harvest locations by gear type, sockeye salmon, Clarks Point, 2014.

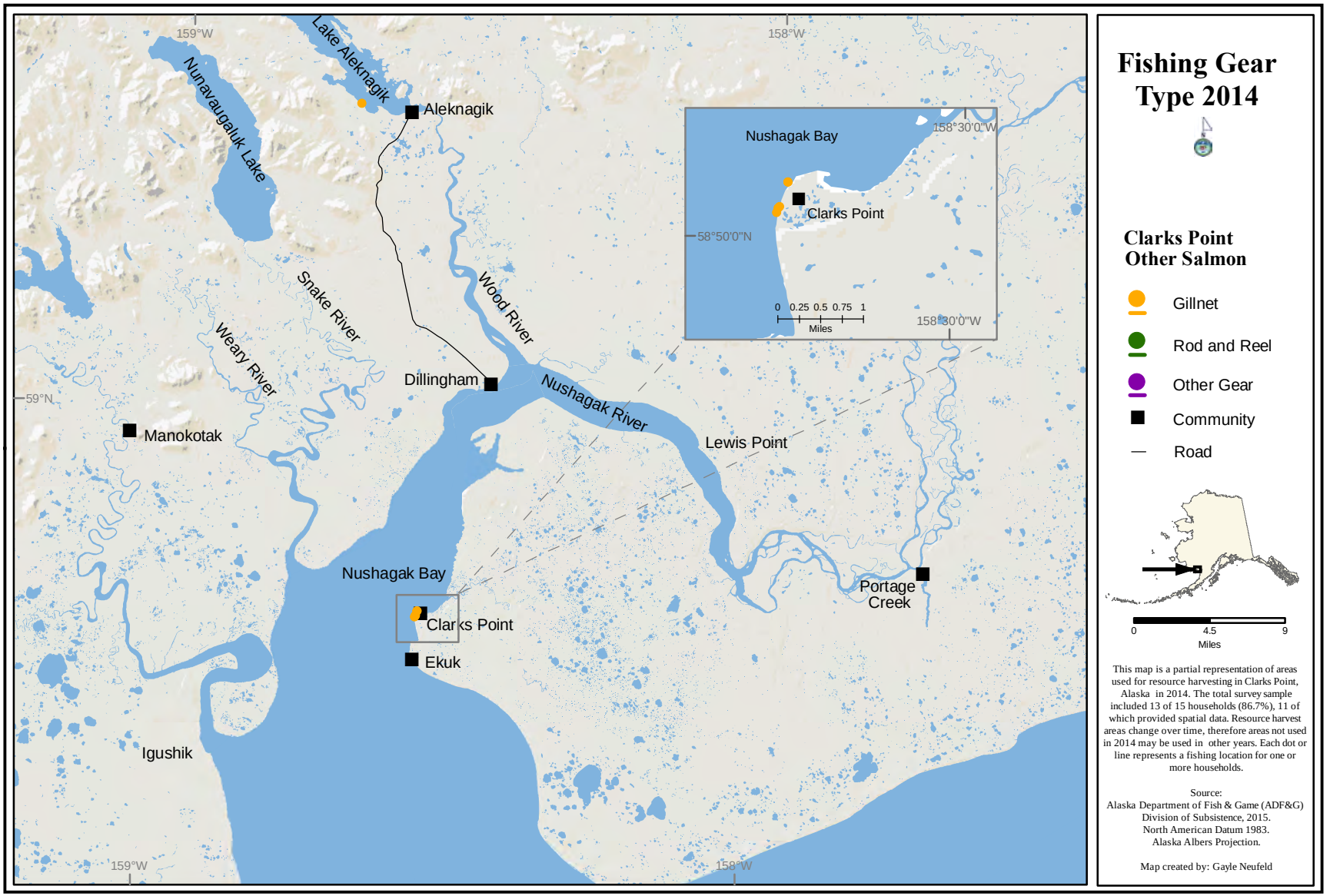


Figure 2-21.–Fishing and harvest locations by gear type, other salmon, Clarks Point, 2014.

Harvest Assessments: 2013 and 2014

Researchers asked two questions regarding Chinook salmon use and harvest. The first question asked participants if they "got enough" Chinook salmon to use for their own household's needs, either through their own harvest efforts or sharing. If they did not, a numeric value was requested to determine how many fish would be the preferred amount for the household. The household was then asked why they did not get enough, either through their own efforts or sharing. This question was also asked for sockeye and coho salmon and responses for the three species are given below, under the subheading "Assessments of Use of Chinook, Sockeye, and Coho Salmon Through Harvest or Sharing." For the second assessment question, households were asked to describe their harvest of Chinook salmon in the study year, as compared to the past five years, and characterize whether the harvest was "less, same, or more." Reasons why were recorded, if the household offered anything to report. This comparison question, and reasons for less or more harvest, was also asked in relation to salmon other than Chinook (all other salmon species grouped), and is discussed under the subheading "Comparing Harvests of Chinook and Other Salmon Over Time." For both assessment questions, households could give more than one reason for not having enough salmon and changes to harvest amounts. These assessments highlight households' economic relationship to salmon and the integral role salmon availability plays in the subsistence way of life, both of which are affected in part by cash economy factors such as employment schedules, access to harvesting equipment, and fuel expense.

Assessments of Use of Chinook, Sockeye, and Coho Salmon Through Harvest or Sharing: 2013

Figure 2-22 and Table 2-12 provide a broad overview of Clarks Point households' assessments of the availability of salmon for use in 2013. Seventy-seven percent of households (10 households) explained that they did not get enough Chinook salmon in 2013, with only 23% reporting that they did get enough of the resource (through either their own efforts or sharing). Sixty-two percent of households (eight) did not get enough sockeye salmon in 2013, with 38% indicating they did get enough of the resource. Lastly, four households (31%) did not get enough coho salmon.

When asked why they did not get enough Chinook salmon, 60% of responses indicated that this was due to resource availability (Table 2-13). Other reasons for not getting enough Chinook salmon included personal/family reasons (30% of responses), not enough time (30%), weather (10%), and did not receive as much (10%). Not having enough sockeye salmon was primarily reported due to not having enough time (63% of responses), as well as personal/family reasons (25%), less effort (13%), and other reasons (13%). Two responses indicated that households did not get enough coho salmon due to personal/family reasons (50%) and not having enough time (50%); other cited reasons were less effort (25%, one household), and other reasons (25%, one household). Ten households reported that they needed more Chinook salmon to meet their food security needs; the average amount of fish needed per household was 71 (Table 2-14). Eight households indicated that they needed more sockeye salmon, with the average amount needed being 181 fish per household. Four households reported that they would ideally like to have had more coho salmon at an average of 355 fish per household, which is a significantly higher number than either Chinook or sockeye salmon.

Comparing Harvests of Chinook and Other Salmon Over Time: 2013

Out of 13 sampled households that responded to the question about whether the household experienced a change in harvest, 9 households (69%) indicated that they harvested fewer Chinook salmon in 2013 than in the past five years, with 4 households reporting the same level of harvest (Table 2-15; Figure 2-23). The top reason cited for less harvest of Chinook salmon was the resource being less available (seven households); all other reasons (each indicated by one household) were family/personal reasons, weather/environment, working/no time, and equipment/fuel expense (Table 2-16).

Six households reported less harvest for all other salmon species (Table 2-15). Less harvest compared to the last five years of all other salmon species was reported as primarily due to less resources being available

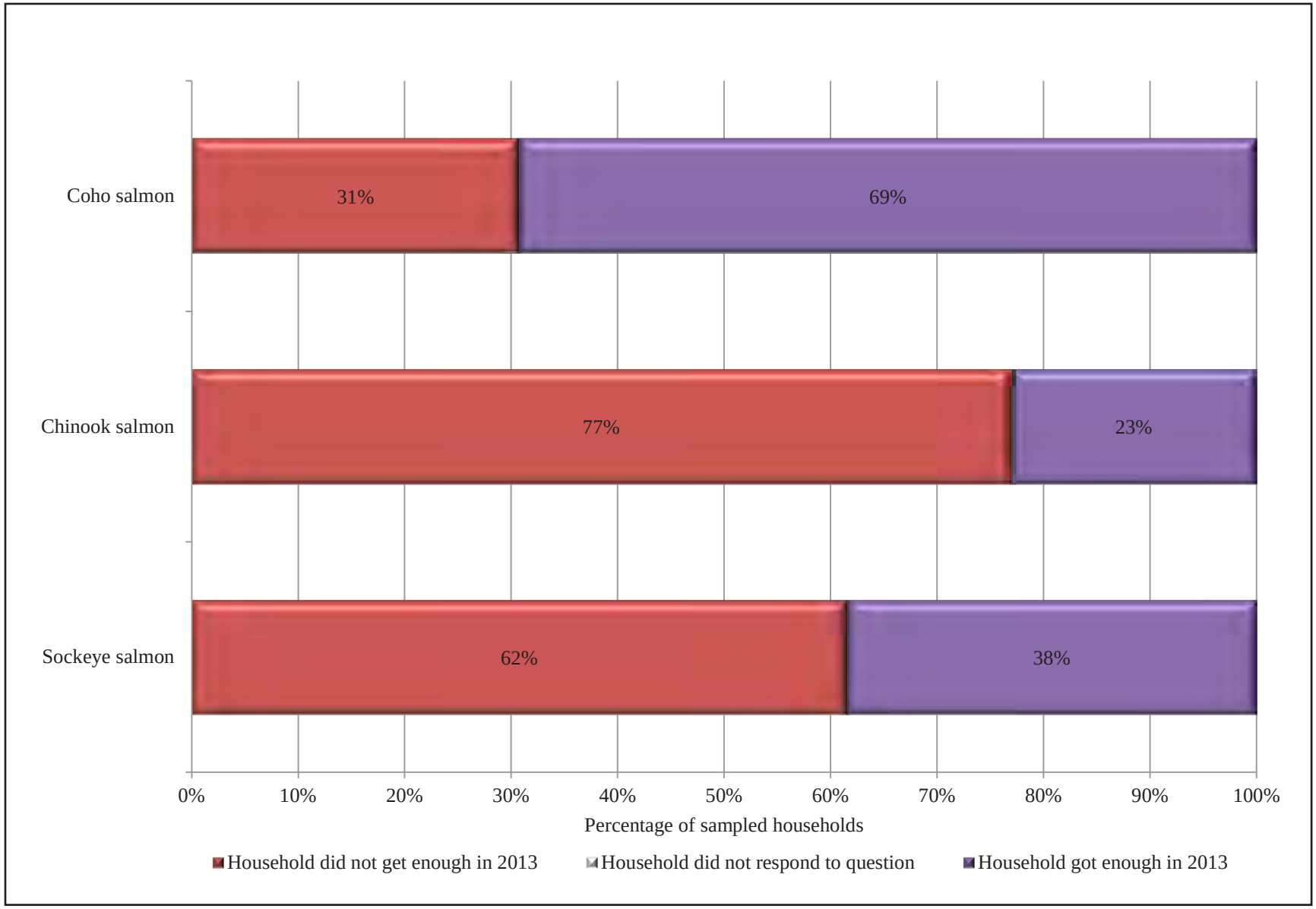


Figure 2-22.–Percentage of sampled households reporting whether they had enough salmon resources, Clarks Point, 2013.

Table 2-12.–Percentage of households reporting whether they had enough salmon resources, Clarks Point, 2013.

		Households not getting enough _____ .			
	Sampled	Valid responses[a]		Did not get enough	
Resource	households	Number	Percentage	Number	Percentage
Coho salmon	13	13	100.0%	4	30.8%
Chinook salmon	13	13	100.0%	10	76.9%
Sockeye salmon	13	13	100.0%	8	61.5%

Source ADF&G Division of Subsistence household surveys, 2014.
a. Does not include households that did not respond to the question or those households that never use the resource.

Table 2-13.–Reasons why households did not have enough salmon resources, Clarks Point, 2013.

Resource	Valid responses[a]	Personal or family reasons		Resource availability		Too far to travel		Lack of equipment		Did not receive as much	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	4	2	50.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	10	3	30.0%	6	60.0%	0	0.0%	0	0.0%	1	10.0%
Sockeye salmon	8	2	25.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

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Table 2-13.–Continued.

Resource	Valid responses[a]	Less effort		Unsuccessful		Weather		Other reasons		Not enough time	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	4	1	25.0%	0	0.0%	0	0.0%	1	25.0%	2	50.0%
Chinook salmon	10	0	0.0%	0	0.0%	1	10.0%	0	0.0%	3	30.0%
Sockeye salmon	8	1	12.5%	0	0.0%	0	0.0%	1	12.5%	5	62.5%

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Table 2-13.–Continued.

Resource	Valid responses[a]	Regulations		Animals too small or diseased		Fuel too expensive	
		Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	4	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	10	0	0.0%	0	0.0%	0	0.0%
Sockeye salmon	8	0	0.0%	0	0.0%	0	0.0%

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

Note Households may provide more than one response to the question.

a. Includes those households providing a valid reason for not getting enough.

Table 2-14.–Salmon resources that sampled households reported needing, Clarks Point, 2013.

Resource	Households needing	Total amount needed	Average amount needed
Coho salmon	4	1,420	355
Chinook salmon	10	710	71
Sockeye salmon	8	1,445	181

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

Table 2-15.–Changes in household harvests of salmon resources compared to recent years, Clarks Point, 2013.

			Households reporting harvest								Households not harvesting in 2013	
			Total households		Less		Same		More			
Resource	Sampled households	Valid responses[a]	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	13	13	13	100.0%	12	92.3%	10	76.9%	0	0.0%	0	0.0%
Chinook salmon	13	13	13	100.0%	9	69.2%	4	30.8%	0	0.0%	0	0.0%
Other salmon	13	13	13	100.0%	6	46.2%	7	53.8%	0	0.0%	0	0.0%

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

a. Valid responses do not include households that did not provide any response.

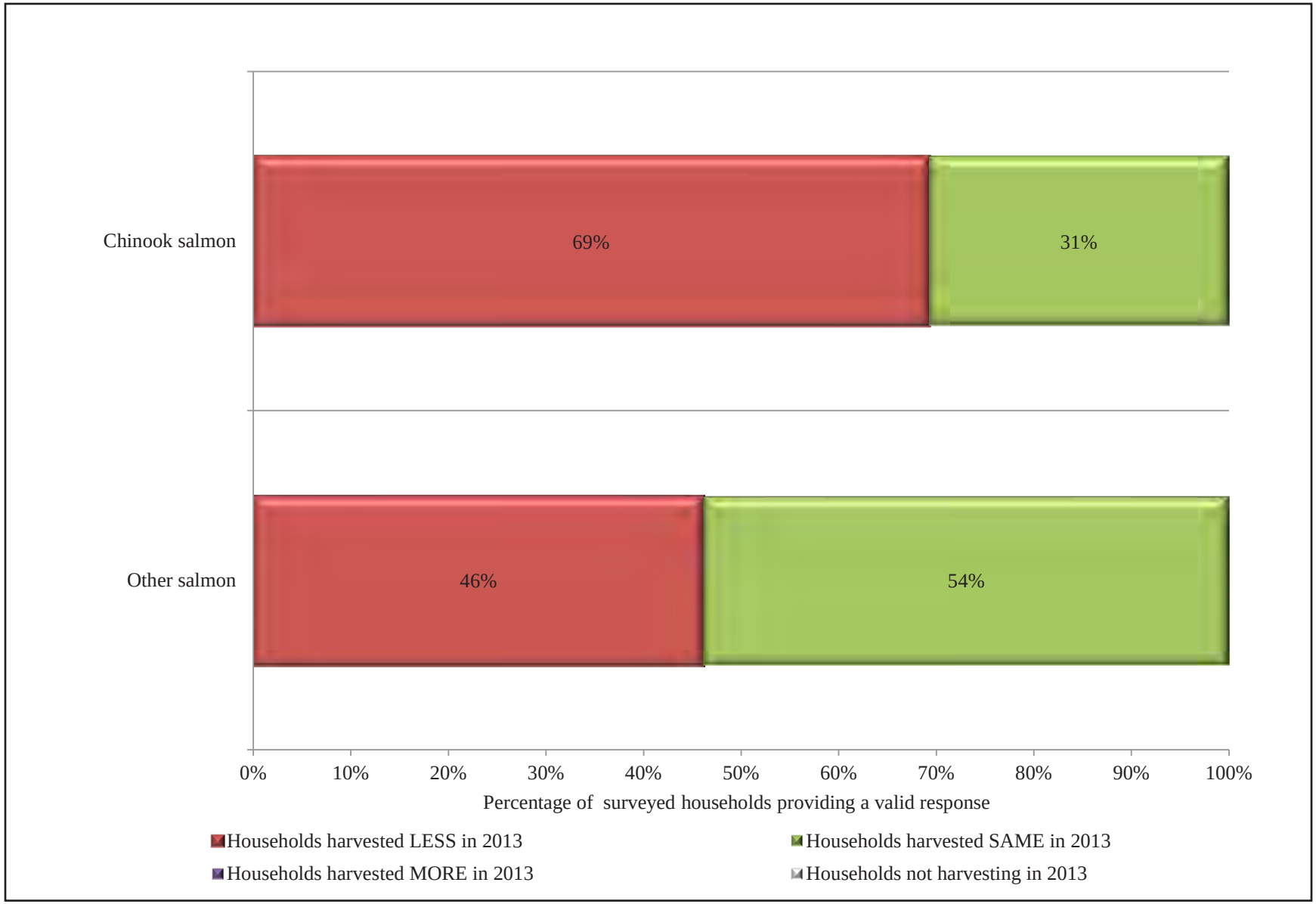


Figure 2-23.–Changes in household harvests of salmon resources compared to recent years, Clarks Point, 2013.

Table 2-16.–Reasons for less household harvests of salmon resources compared to recent years, Clarks Point, 2013.

Resource	Households reporting reasons for less harvest	Family/ personal		Resources less available		Too far to travel		Lack of equipment		Less sharing		Lack of effort		Unsuccessful		Weather/ environment	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	12	1	8.3%	8	67%	0	0.0%	0	0%	0	0%	1	8%	0	0.0%	1	8.3%
Chinook salmon	9	1	11.1%	7	78%	0	0.0%	0	0%	0	0%	0	0%	0	0.0%	1	11.1%
Other salmon	6	1	16.7%	2	33%	0	0.0%	0	0%	0	0%	1	17%	0	0.0%	0	0.0%

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Table 2-16.–Continued.

Resource	Households reporting reasons for less harvest	Other reasons		Working/ no time		Regulations		Small/ diseased animals		Did not get enough		Did not need		Equipment/ fuel expense		Too much competition	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	12	0	0%	2	16.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	8.3%	1	8.3%
Chinook salmon	9	0	0%	1	11.1%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	11.1%	0	0.0%
Other salmon	6	0	0%	1	16.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	16.7%

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

(two households), followed by personal/family reasons (one), lack of effort (one), working/no time (one), and too much competition (one) (Table 2-16).

There were 12 households (92%) that reported less harvest of any salmon species (Table 2-15). No household indicated more harvest of any species as compared to the last five years.

Assessments of Use of Chinook, Sockeye, and Coho Salmon Through Harvest or Sharing: 2014

Figure 2-24 and Table 2-17 provide a broad overview of Clarks Point households' assessments of the availability of salmon for use in 2014. Forty-six percent of households (six) explained that they did not get enough Chinook salmon in 2014, with 54% reporting that they did get enough of the resource (through either their own efforts or sharing). Thirty-one percent of households (four) did not get enough sockeye salmon in 2014, with 69% indicating that they did get enough of the resource. Lastly, three households (23%) reported that they did not get enough coho salmon.

When asked why they did not get enough Chinook salmon, 68% of responses indicated that this was due to resource availability (Table 2-18). Other reasons, which were each cited by one household (17% of responses), for not getting enough Chinook salmon included: personal/family reasons, too far to travel, less effort expended, and general lack of success. Not having enough sockeye salmon was primarily reported due to personal/family reasons (75%, three households) and less effort (25%, one household). Two households indicated that they did not get enough coho salmon due to personal/family reasons, and one household cited not having enough time. Six households reported that they needed more Chinook salmon to meet their food security needs, with the average amount of fish needed per household at 61 (Table 2-19). Four households indicated that they needed more sockeye salmon, with the average amount needed being 45 fish. Three households reported they would ideally like to have had more coho salmon at an average of 20 fish per household, a lower number than either Chinook or sockeye salmon.

Comparing Harvests of Chinook and Other Salmon Over Time: 2014

Six households indicated that they harvested fewer Chinook salmon in 2014 than in the past five years, with two households reporting the same level of harvest (Table 2-20; Figure 2-25). One household reported more Chinook salmon were harvested in 2014 than the previous five years. The reason most frequently given for less harvest of Chinook salmon was the resource being less available (six households); all other reasons were general lack of success (one household) and that Chinook salmon were too small or diseased (one) (Table 2-21). The household that indicated harvesting more Chinook salmon specifically noted Chinook salmon were larger in 2014 than in previous harvest years (Table 2-22).

Three households reported less harvest for all other salmon species (Table 2-20). Less harvest compared to the last five years of all other salmon species was reported as due to less resources being available (one household), lack of effort (one), and working/no time (one) (Table 2-21). The household that reported more harvest of all other salmon species indicated that household members specifically targeted coho salmon in 2014 and had not done so in the previous five years (Table 2-22).

There were seven households that reported less harvest of any salmon species (Table 2-20). As such, approximately one-half of the surveyed households harvested fewer Chinook salmon, all other salmon, or both.

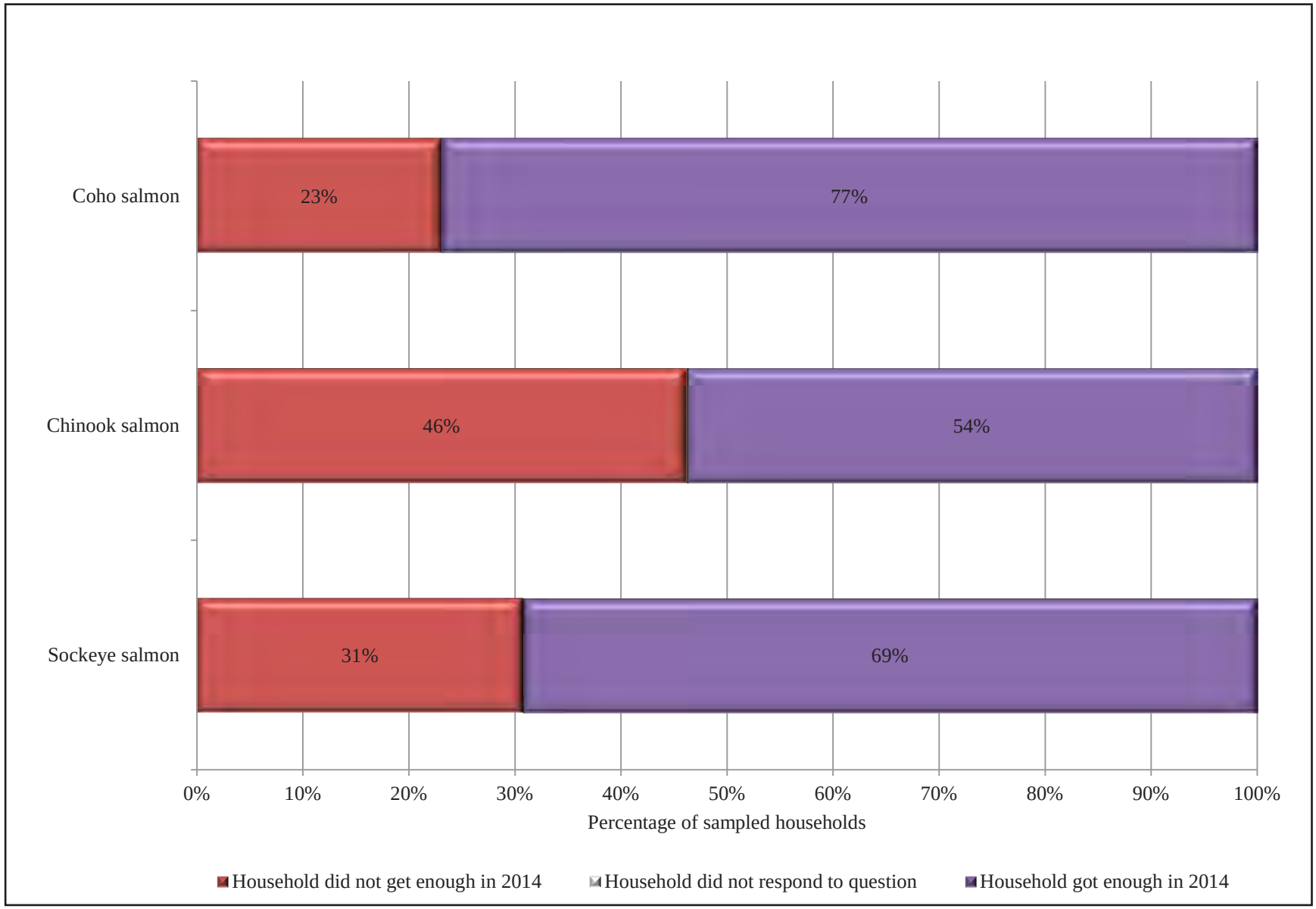


Figure 2-24.–Percentage of sampled households reporting whether they had enough salmon resources, Clarks Point, 2014.

Table 2-17.–Percentage of households reporting whether they had enough salmon resources, Clarks Point, 2014.

		Households not getting enough _____ .			
	Sampled	Valid responses[a]		Did not get enough	
Resource	households	Number	Percentage	Number	Percentage
Coho salmon	13	13	100.0%	3	23.1%
Chinook salmon	13	13	100.0%	6	46.2%
Sockeye salmon	13	13	100.0%	4	30.8%

Source ADF&G Division of Subsistence household surveys, 2015.
a. Does not include households that did not respond to the question or those households that never use the resource.

Table 2-18.–Reasons why households did not have enough salmon resources, Clarks Point, 2014.

Resource	Valid responses[a]	Personal or family reasons		Resource availability		Too far to travel		Lack of equipment		Did not receive as much	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	3	2	66.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	6	1	16.7%	4	66.7%	1	16.7%	0	0.0%	0	0.0%
Sockeye salmon	4	3	75.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

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Table 2-18.–Continued.

Resource	Valid responses[a]	Less effort		Unsuccessful		Weather		Other reasons		Not enough time	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	3	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	33.3%
Chinook salmon	6	1	16.7%	1	16.7%	0	0.0%	0	0.0%	0	0.0%
Sockeye salmon	4	1	25.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

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Table 2-18.–Continued.

Resource	Valid responses[a]	Regulations		Animals too small or diseased		Fuel too expensive	
		Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	3	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	6	0	0.0%	0	0.0%	0	0.0%
Sockeye salmon	4	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2015.

Note Households may provide more than one response to the question.

a. Includes those households providing a valid reason for not getting enough.

Table 2-19.–Salmon resources that sampled households reported needing, Clarks Point, 2014.

Resource	Households needing	Total amount needed	Average amount needed
Coho salmon	3	60	20
Chinook salmon	6	367	61
Sockeye salmon	4	180	45

Source ADF&G Division of Subsistence household surveys, 2015.

Table 2-20.–Changes in household harvests of salmon resources compared to recent years, Clarks Point, 2014.

			Households reporting harvest								Households not harvesting in 2014	
			Total households		Less		Same		More			
Resource	Sampled households	Valid responses[a]	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	13	13	11	84.6%	7	53.8%	8	61.5%	1	7.7%	4	30.8%
Chinook salmon	13	13	9	69.2%	6	46.2%	2	15.4%	1	7.7%	4	30.8%
Other salmon	13	13	11	84.6%	3	23.1%	7	53.8%	1	7.7%	2	15.4%

Source ADF&G Division of Subsistence household surveys, 2015.

a. Valid responses do not include households that did not provide any response.

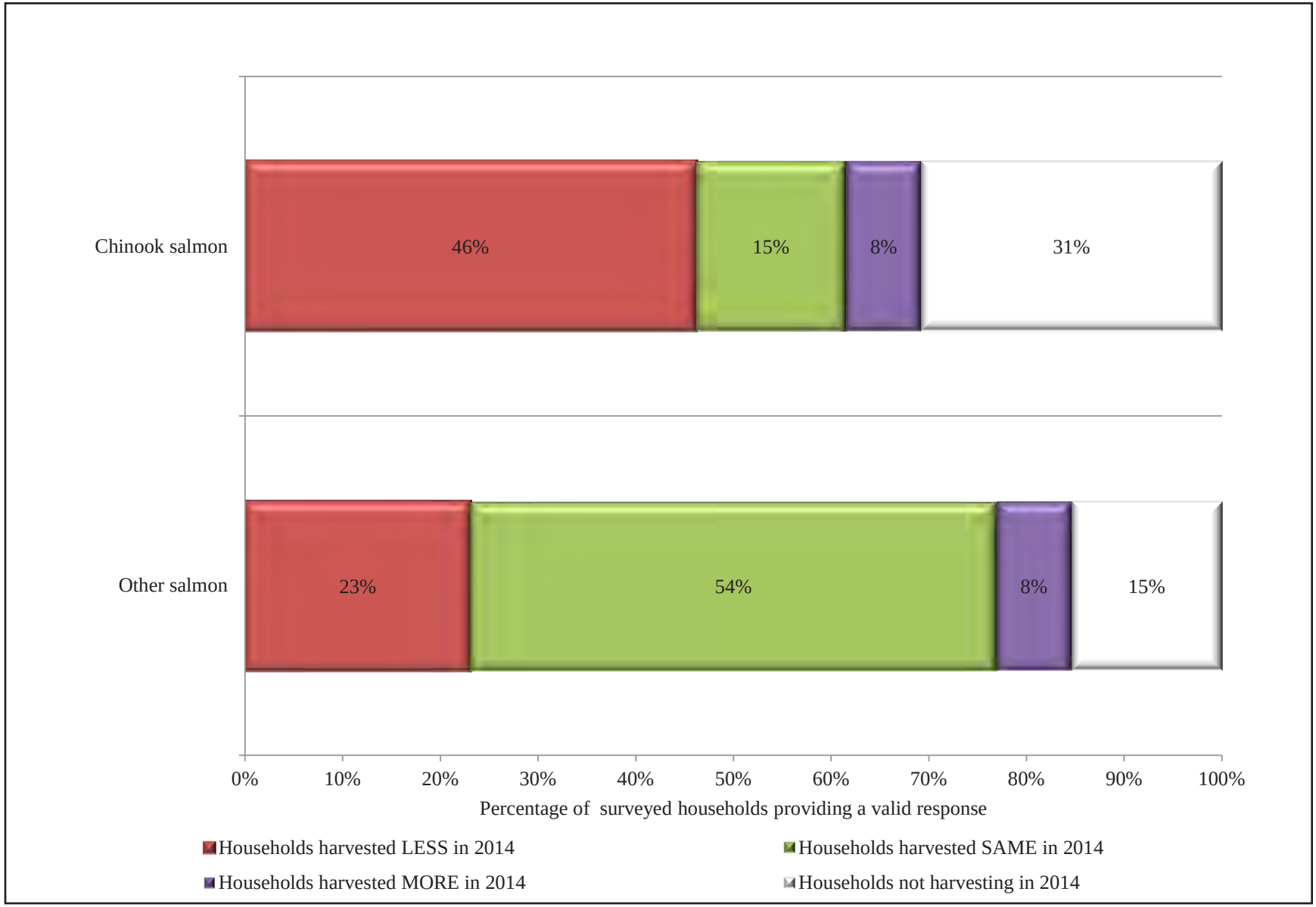


Figure 2-25.–Changes in household harvests of salmon resources compared to recent years, Clarks Point, 2014.

Table 2-21.–Reasons for less household harvests of salmon resources compared to recent years, Clarks Point, 2014.

Resource	Households reporting reasons for less harvest	Family/ personal		Resources less available		Too far to travel		Lack of equipment		Less sharing		Lack of effort		Unsuccessful		Weather/ environment	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	7	0	0.0%	6	86%	0	0.0%	0	0%	0	0%	1	14%	1	14.3%	0	0.0%
Chinook salmon	6	0	0.0%	6	100%	0	0.0%	0	0%	0	0%	0	0%	1	16.7%	0	0.0%
Other salmon	3	0	0.0%	1	33%	0	0.0%	0	0%	0	0%	1	33%	0	0.0%	0	0.0%

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Table 2-21.–Continued.

Resource	Households reporting reasons for less harvest	Other reasons		Working/ no time		Regulations		Small/ diseased animals		Did not get enough		Did not need		Equipment/ fuel expense		Too much competition	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	7	0	0%	1	14.3%	0	0.0%	1	14.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	6	0	0%	0	0.0%	0	0.0%	1	16.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Other salmon	3	0	0%	1	33.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2015.

Table 2-22.–Reasons for more household harvests of salmon resources compared to recent years, Clarks Point, 2014.

Resource	Households reporting reasons for more harvest	Increased availability		Used other resources		Favorable weather		Received more		Needed more		Increased effort		Had more help	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	1	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%	0	0.0%
Chinook salmon	1	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Other salmon	1	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%	0	0.0%

-continued-

Table 2-22.–Continued.

Resource	Households reporting reasons for more harvest	Other		Regulations		Traveled farther		More success		Needed less		Store-bought expense		Got/ fixed equipment	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	1	1	100.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	1	1	100.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Other salmon	1	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2015.

Assessment Comments

Selected survey comments from Clarks Point respondents are below, with more qualitative information provided in Chapter 8: "Local and Traditional Knowledge of Salmon and Subsistence on the Nushagak River." Survey respondents indicated the decreased (2013) or variable (2014) abundance of Chinook salmon (commonly referred to as "king salmon") was not necessarily due to declining stocks (this was not directly mentioned), but rather a change in Chinook salmon run patterns due to climate/water temperature, wind, and underwater topography changes.

Comments from 2013:

- Channels changed, no kings. [They] don't come to beach, go to Kanakanak [south of Dillingham].
- Kings come in depending on direction of wind.
- Used to get 100 kings with [my] mom in the past. Did 800 reds [sockeye salmon] in one day once in the past. Warm, no snow—so the winter is warmer and they [salmon] will go up [upriver] quick. They [salmon] mill around until the temperature is right and then the fish go upriver. Fish are affected by the amount of snow and ice.
- The sand bar outside of Ekuk has changed and it changes the way kings go upstream. They take the deep channels so they are out farther away from Clarks Point Beach.
- Global warming, fish [are] staying out and not coming in.
- Comments from 2014:
- Bum tides kept them [salmon] in the channel so they don't come onto the beach [at Clarks Point.]
- They [salmon] hit the beach (sandbar) by Ekuk and bounce across [Nushagak Bay].
- The channel changed for kings.
- Kings aren't here early due to channel changing.
- Very few kings that last four to five years north and west of Ekuk Cannery. The sandbar is building up so it stops the kings, so they end up in the channel.

Community Data Review Meeting

A data review meeting was held in Clarks Point on March 15, 2018, with five people in attendance. One resident believed the population of Clarks Point, as estimated by the Division of Subsistence in the study years, was too low. Although the local school had closed in 2012, the resident felt the population, estimated at 30 during the survey years of 2013 and 2014, was incorrect. This resident commented that the current (2018) Clarks Point population should be estimated at about 60 individuals.

Residents at the meeting mainly discussed the change in movement of Chinook salmon away from the Clarks Point beaches toward the western shores, across Nushagak Bay, and closer to Dillingham. Sockeye and coho salmon were confirmed as the main species currently being caught from Clarks Point beaches, which was a change from Chinook salmon being harvested during the previous several years until the main channel in Nushagak Bay had changed. As a result, Chinook salmon are increasingly removed from commercial catches for home use because they are still highly desired by Clarks Point residents.

A discussion also occurred regarding the opening and closing of the subsistence salmon season by the ADF&G Division of Commercial Fisheries in Dillingham. Several residents at the meeting expressed dissatisfaction that they are not informed when an Emergency Order (EO) is opened for subsistence. EO announcements are read on marine VHF channel 07a at the time of release. EOs are broadcast on local radio stations KDLG and KAKN at 9:00 a.m., 12:00 p.m., 3:00 p.m., 6:00 p.m., and 8:00 p.m. daily. EOs

are also available by calling recorded message lines in Dillingham and King Salmon and are published to the ADF&G website, and also a subscription is made available to receive EOs by email and fax (T. Sands, Division of Commercial Fisheries, ADF&G, Dillingham, personal communication). An apparent lack of communication was viewed by these residents as the main reason for their lack of knowledge of EO announcements.

A Brief Comparison of Harvest Data Between Study Years

Harvest information between the years of 2013 and 2014 indicated that 2014 seemed to be a more overall successful year based on fewer reported negative assessments regarding having enough salmon and changed harvests of Chinook and all other salmon.

The total estimated subsistence harvest of salmon in the entire Nushagak District in 2013, based on permit returns, was 54,176 fish, and in 2014 it was 58,425, which was the highest estimate since 1994 and indicates a general increase for the region's communities, with Clarks Point being no exception (Fall et al. 2015:120, 2017:119). In Clarks Point, the overall salmon harvest increased by 319 lb per capita in 2014 compared to 2013 (Table 2-6; Table 2-9).

In order to explain discrepancies in harvest methods and amounts between 2013 and 2014, different elements of change can be discussed. For example, price per pound for commercial salmon may affect how harvest efforts change from one method, such as subsistence gillnetting, to another, such as removal from commercial catches. Price per pound, per species, did not change dramatically between the study years except for a $0.30 increase for sockeye salmon from 2013 ($1.20) to 2014 ($1.50) (Jones et al. 2013). The coho salmon sale price rose by $0.10 per pound between 2013 and 2014. Typically, if fish are worth more commercially, harvesters may be less likely to retain home pack (removal from commercial catches for home use) and a household may attempt to harvest more by subsistence gillnet or other methods. Yet, due to the cultural and nutritional value of certain species, such as Chinook, sockeye, or coho salmon, these species may be retained, no matter their market value. The home pack contribution to the total harvest in Clarks Point increased in 2014 compared to 2013 (Table 2-8; Table 2-11).

By regulation, in the Clarks Point region, subsistence salmon fishing is open during commercial harvesting periods, yet the same gear or site cannot be used simultaneously for commercial and subsistence fishing. During commercial closures, subsistence fishing can be opened by emergency order. In some cases, depending on the regulatory year, commercial fishing households may focus efforts on retaining fish from home pack, then take the additional time to also set a subsistence gillnet. Gillnetting was the dominant subsistence fishing method used by fishers in Clarks Point and no fish were obtained by rod and reel. Interestingly, Chinook salmon was the only species harvested by removal from commercial catches in 2013, but all species were removed from commercial catches in 2014. While this difference between harvests by gear type may account for some of the harvest change between study years, it may be only a part of the explanation for the overall increased harvest amount from 2013 to 2014. Looking further at the survey data for the years 2013 and 2014, a high-harvester household not surveyed in 2013 likely accounted for the estimated increase in salmon harvested in 2014. These harvest values were confirmed by a follow-up phone call by division staff to this particular household surveyed for 2014. This one household in 2014 was responsible for a large increase in subsistence-caught salmon, and the respondent claimed that fishing for other households and sharing was an integral part of the high harvests.

Further changes in the harvest of salmon by Clarks Point residents can be understood through comparisons with findings from other study years. The most recent study done in Clarks Point was for 2008 and the results were published in Holen et al. (2012): *Subsistence Harvests and Uses of Wild Resources in Aleknagik, Clark's Point, and Manokotak, Alaska, 2008* (Technical Paper No. 368). The study prior to that was done in 1989 for the study months of November 1988 through October 1989; study results were published in Seitz (1996): *The Use of Fish and Wildlife in Clark's Point, Alaska* (Technical Paper No. 186). Both reports and data may be found online on the ADF&G website and CSIS. In Chapter 7: "The Subsistence Permit System" there is additional discussion about previous study year salmon harvest estimates, specifically under the subheading "Comparison of Household Survey and Permit Data for Study Years."

3. EKWOK

Community Background

Ekwok is a small community located along the west bank of the Nushagak River, 43 miles northeast of Dillingham, 285 miles by air from Anchorage, and 17 miles south of New Stuyahok (Schichnes and Chythlook 1991). The Yup'ik name for Ekwok is *Iquaq*, which means "end of the bluff" (Schichnes and Chythlook 1991). First European contact to the region was in 1778, with the arrival of Captain James Cook, which was closely followed by the Russian-American Company establishing the first trading post, Alexandrovski Redoubt, in 1818 (Schichnes and Chythlook 1991). The Russian fur trade, expanding commercial fishery, and Christian missionary movement into the area transformed seasonal camps into permanent villages. Ekwok was used primarily as a summer fish camp and in the fall for berry picking, and was likely established in the late 19th century, making it the longest continuously inhabited community on the Nushagak (Schichnes and Chythlook 1991). In 1930, a Bureau of Indian Affairs (BIA) school was established.[1] After a flood in the early 1960s, the community was relocated onto higher ground, and the city was incorporated in 1974.

Ekwok is only accessed by airplane and boat, or, in winter, snowmachine travel between regional villages is possible. There are a number of facilities in Ekwok, such as a store, a school, and a tribal administration building for the village corporation, Ekwok Natives Limited. Other amenities exist such as cell phone service, a landfill, a health clinic, and an airstrip that services local air transport companies, as well as larger commercial air operators. The community is also a part of the ANCSA (Alaska Native Claims Settlement Act) regional corporation Bristol Bay Native Corporation. The name of the federally recognized tribe is Ekwok Village.

Ekwok, like its neighboring Nushagak River communities, is surrounded by mixed spruce and deciduous forest, situated on a flat tundra landscape. Summers are short and warm, coupled with long, cold winters. Rivers and drainages of Bristol Bay and Nushagak Bay continue to provide the largest wild salmon breeding ground worldwide.

Population Estimates and Demographic Information: 2013 and 2014

Table 3-1 shows population information for Ekwok during 2013 and 2014. The estimated population for Ekwok in 2013 was 103 people, with the Alaska Native population estimated at 94 individuals (91%) (Table 3-1; Figure 3-1). Eligible households in the community (living in the community 3 or more months) were estimated at 34 with a mean household size of 3 (Table 3-1). Alaska Native households (where one head of the household is Alaska Native) totaled 32, composing 93% of the community. In 2014, the Alaska Native population was 95, making up 94% of the estimated community population (Table 3-1; Figure 3-1). Eligible households in the community were estimated at 36 with a mean household size of 2.8 (Table 3-1). The average age of an Ekwok resident during the study years was 35, with the minimum being less than 1 year old (infant) and the maximum being 78 years of age.

Over time the population of Ekwok has fluctuated from approximately 130 individuals in 1950, to a low of 77 individuals according to the U.S. census for 1980 and 1990, to 101–103 individuals in 2013 and 2014, respectively (Figure 3-2). During the study years, there were differing ratios of males and females in varying age groups (Figure 3-3; Figure 3-4). The population profile of residents in Ekwok during the study was 52–56 males and 47–49 females (Table 3-2; Table 3-3). Approximately one-quarter of the community population was youths aged 0–14.

1. *Community Database Online*, s.v. "Ekwok" (by Alaska Department of Commerce, Community, and Economic Development), https://www.commerce.alaska.gov/dcra/DCRAExternal/community/Details/bd8ff4d2-31bc-45c7-b405-9b1fced18032 (accessed January 31, 2018).

Sampling in 2013 and 2014 resulted in the identification of 34–36 dwelling units, respectively, of which 29 (2013) and 30 (2014) were successfully interviewed; the percentage of sampled households was 85% in 2013, and 83% in 2014 (Table 3-4). Four households in 2013 and 2014 failed to be contacted, and one household declined to be surveyed in both years. In 2014, a single household moved or was occupied by a nonresident. The refusal rate in both years was 3%. Beyond basic population, age, and sex demographics, no other information, such as employment characteristics, was obtained from Division of Subsistence surveys. According to the ACS average five-year estimate for 2012–2016, which encompasses both study years for this community, the median household income in Ekwok was $32,500 (U.S. Census Bureau n.d.).

Table 3-1.–Sample and demographic characteristics, Ekwok, 2013, and 2014.

Characteristics	Ekwok 2013	Ekwok 2014
Sampled households	29	30
Eligible households	34	36
Percentage sampled	85.3%	83.3%
Sampled population	88	84
Estimated community population	103.2	100.8
Range[a]	93 – 113	92 – 110
Household size		
Mean	3.0	2.8
Minimum	1	1
Maximum	8	7
Age		
Mean	34.8	35.0
Minimum[b]	0	1
Maximum	77	78
Median	31	28
Alaska Native		
Estimated households[c]		
Number	31.7	34.8
Percentage	93.1%	96.7%
Estimated population		
Number	93.8	94.8
Percentage	90.9%	94.0%
Range[a]	84 – 104	86 – 104
U.S. Census 2010[d]		
Households	37	37
Population	115	115
Alaska Native population	109	109
American Community Survey 5-year average[e]		
Households	46	35
Range[f]	31 – 61	25 – 45
Population	139	100
Range[f]	96 – 182	65 – 135
Alaska Native Population	116	98
Range[f]	77 – 155	60 – 136

Source ADF&G Division of Subsistence household surveys, 2014 and 2015.

a. Estimated range is 95% confidence interval.

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

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

d. Source is U.S. Census Bureau (2011).

e. Source is U.S. Census Bureau for American Community Survey (ACS); 2009–2013 ACS estimates used for 2013, 2010–2014 ACS estimates used for 2014.

f. ACS data range is the reported margin of error.

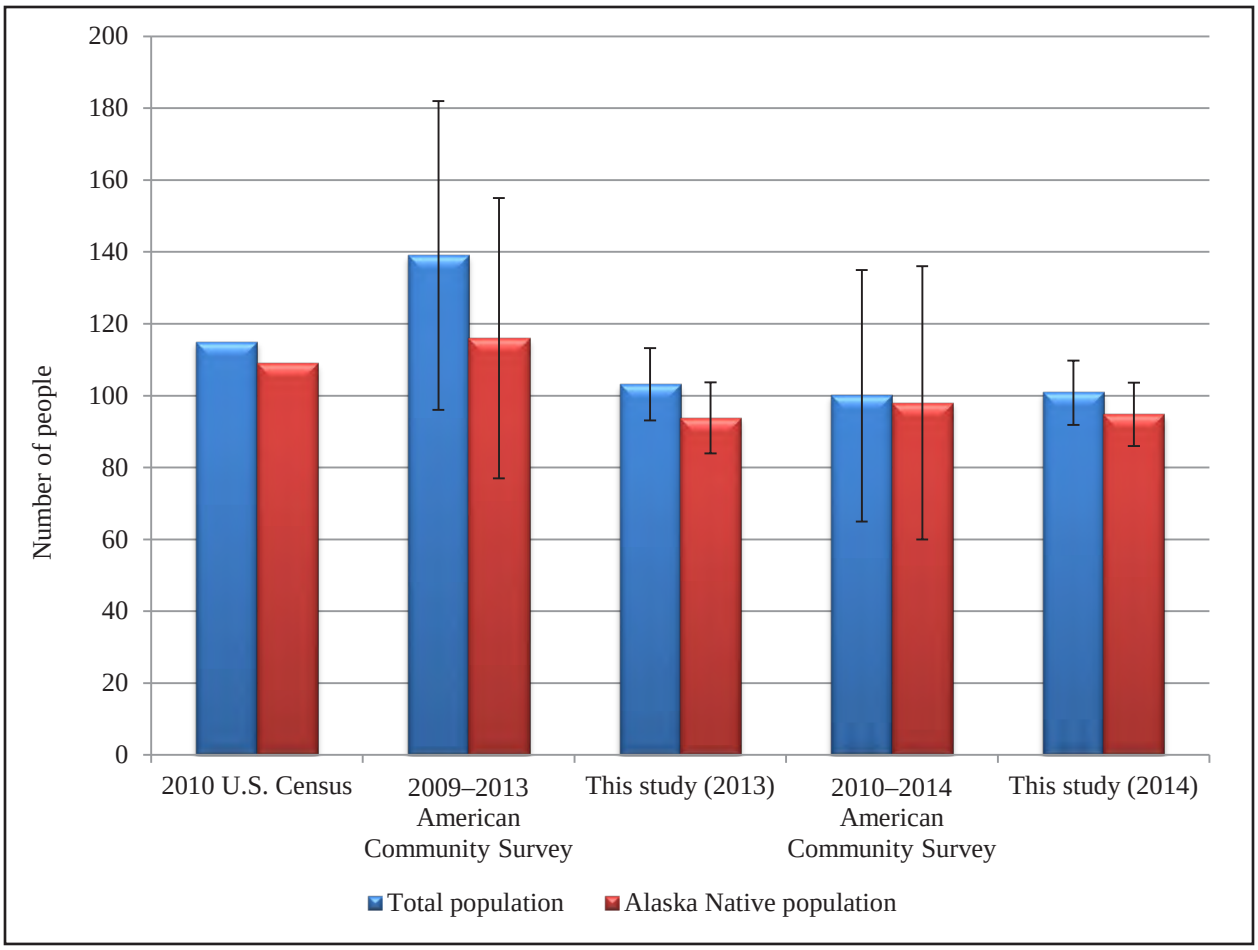


Figure 3-1.–Alaska Native and overall population estimates, Ekwok, 2010, 2013, and 2014.

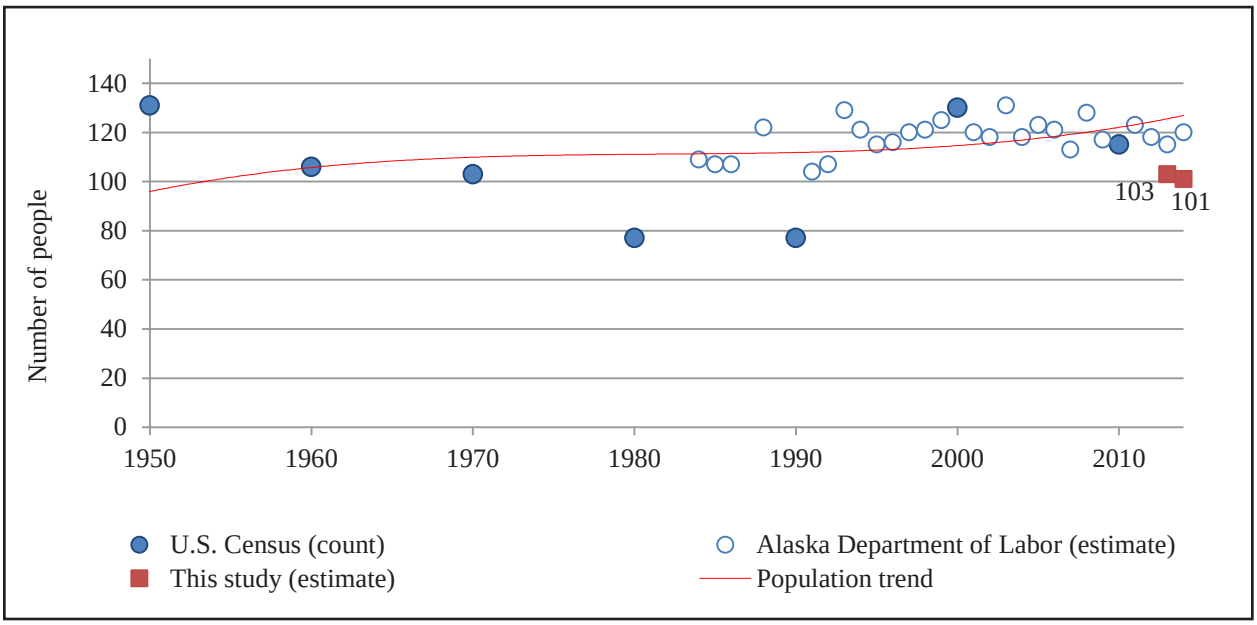


Figure 3-2.–Historical population estimates, Ekwok, 1950–2014.

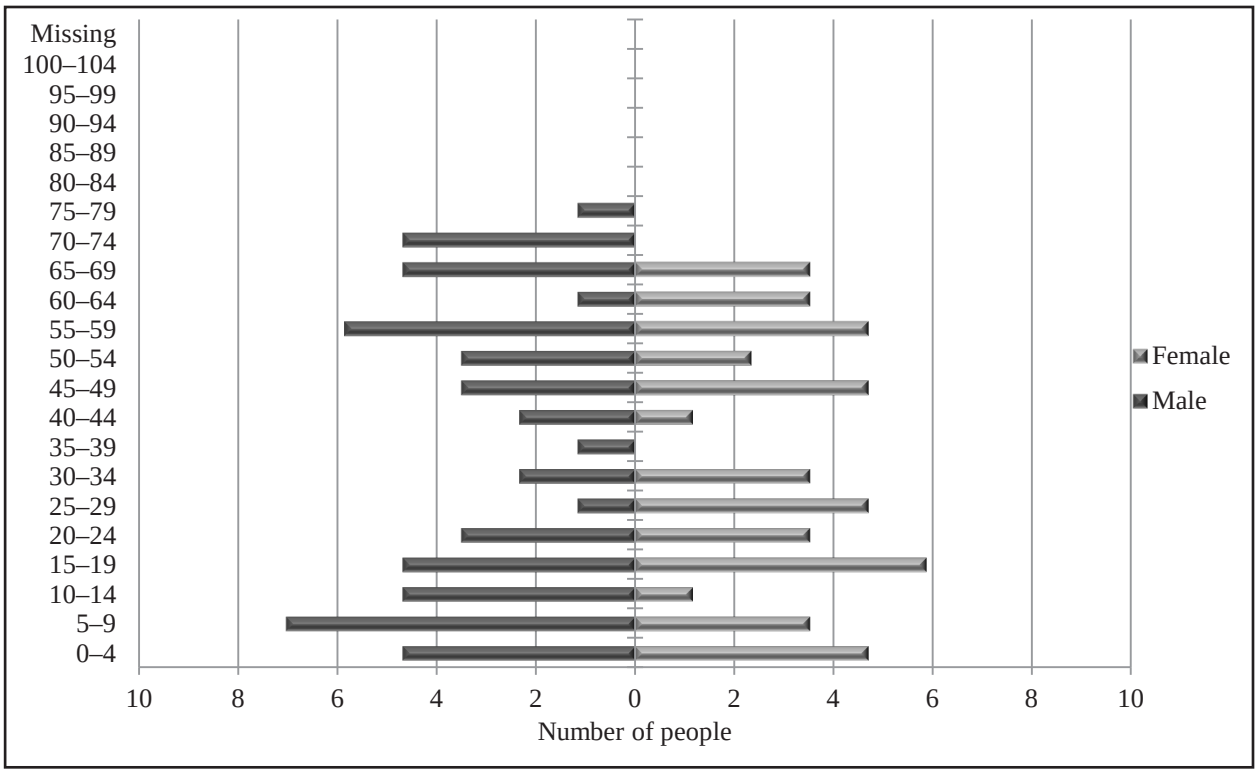


Figure 3-3.–Population profile, Ekwok, 2013.

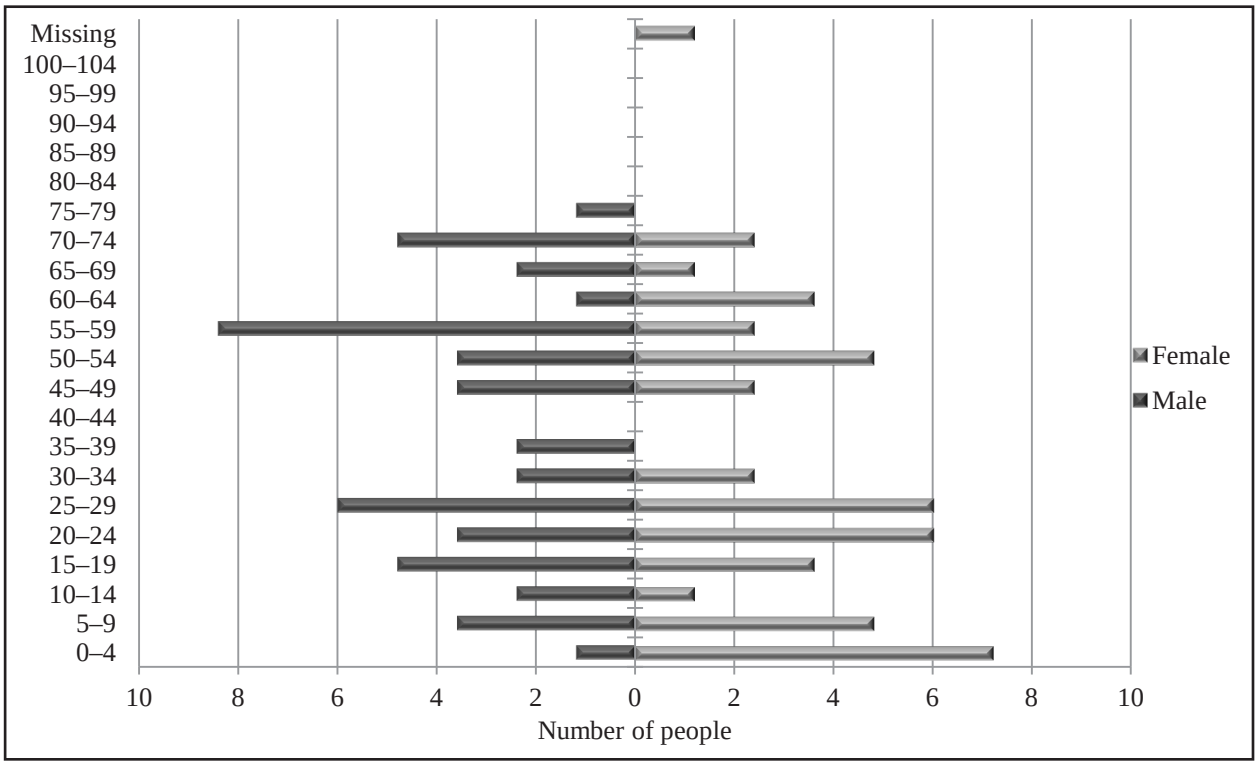


Figure 3-4.–Population profile, Ekwok, 2014.

Table 3-2.–Population profile, Ekwok, 2013.

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	4.7	8.3%	8.3%	4.7	10.0%	10.0%	9.4	9.1%	9.1%
5–9	7.0	12.5%	20.8%	3.5	7.5%	17.5%	10.6	10.2%	19.3%
10–14	4.7	8.3%	29.2%	1.2	2.5%	20.0%	5.9	5.7%	25.0%
15–19	4.7	8.3%	37.5%	5.9	12.5%	32.5%	10.6	10.2%	35.2%
20–24	3.5	6.3%	43.8%	3.5	7.5%	40.0%	7.0	6.8%	42.0%
25–29	1.2	2.1%	45.8%	4.7	10.0%	50.0%	5.9	5.7%	47.7%
30–34	2.3	4.2%	50.0%	3.5	7.5%	57.5%	5.9	5.7%	53.4%
35–39	1.2	2.1%	52.1%	0.0	0.0%	57.5%	1.2	1.1%	54.5%
40–44	2.3	4.2%	56.3%	1.2	2.5%	60.0%	3.5	3.4%	58.0%
45–49	3.5	6.3%	62.5%	4.7	10.0%	70.0%	8.2	8.0%	65.9%
50–54	3.5	6.3%	68.8%	2.3	5.0%	75.0%	5.9	5.7%	71.6%
55–59	5.9	10.4%	79.2%	4.7	10.0%	85.0%	10.6	10.2%	81.8%
60–64	1.2	2.1%	81.3%	3.5	7.5%	92.5%	4.7	4.5%	86.4%
65–69	4.7	8.3%	89.6%	3.5	7.5%	100.0%	8.2	8.0%	94.3%
70–74	4.7	8.3%	97.9%	0.0	0.0%	100.0%	4.7	4.5%	98.9%
75–79	1.2	2.1%	100.0%	0.0	0.0%	100.0%	1.2	1.1%	100.0%
80–84	0.0	0.0%	100.0%	0.0	0.0%	100.0%	0.0	0.0%	100.0%
85–89	0.0	0.0%	100.0%	0.0	0.0%	100.0%	0.0	0.0%	100.0%
90–94	0.0	0.0%	100.0%	0.0	0.0%	100.0%	0.0	0.0%	100.0%
95–99	0.0	0.0%	100.0%	0.0	0.0%	100.0%	0.0	0.0%	100.0%
100–104	0.0	0.0%	100.0%	0.0	0.0%	100.0%	0.0	0.0%	100.0%
Missing	0.0	0.0%	100.0%	0.0	0.0%	100.0%	0.0	0.0%	100.0%
Total	**56.3**	**100.0%**	**100.0%**	**46.9**	**100.0%**	**100.0%**	**103.2**	**100.0%**	**100.0%**

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

Table 3-3.–Population profile, Ekwok, 2014.

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	1.2	2.3%	2.3%	7.2	14.6%	14.6%	8.4	8.3%	8.3%
5–9	3.6	7.0%	9.3%	4.8	9.8%	24.4%	8.4	8.3%	16.7%
10–14	2.4	4.7%	14.0%	1.2	2.4%	26.8%	3.6	3.6%	20.2%
15–19	4.8	9.3%	23.3%	3.6	7.3%	34.1%	8.4	8.3%	28.6%
20–24	3.6	7.0%	30.2%	6.0	12.2%	46.3%	9.6	9.5%	38.1%
25–29	6.0	11.6%	41.9%	6.0	12.2%	58.5%	12.0	11.9%	50.0%
30–34	2.4	4.7%	46.5%	2.4	4.9%	63.4%	4.8	4.8%	54.8%
35–39	2.4	4.7%	51.2%	0.0	0.0%	63.4%	2.4	2.4%	57.1%
40–44	0.0	0.0%	51.2%	0.0	0.0%	63.4%	0.0	0.0%	57.1%
45–49	3.6	7.0%	58.1%	2.4	4.9%	68.3%	6.0	6.0%	63.1%
50–54	3.6	7.0%	65.1%	4.8	9.8%	78.0%	8.4	8.3%	71.4%
55–59	8.4	16.3%	81.4%	2.4	4.9%	82.9%	10.8	10.7%	82.1%
60–64	1.2	2.3%	83.7%	3.6	7.3%	90.2%	4.8	4.8%	86.9%
65–69	2.4	4.7%	88.4%	1.2	2.4%	92.7%	3.6	3.6%	90.5%
70–74	4.8	9.3%	97.7%	2.4	4.9%	97.6%	7.2	7.1%	97.6%
75–79	1.2	2.3%	100.0%	0.0	0.0%	97.6%	1.2	1.2%	98.8%
80–84	0.0	0.0%	100.0%	0.0	0.0%	97.6%	0.0	0.0%	98.8%
85–89	0.0	0.0%	100.0%	0.0	0.0%	97.6%	0.0	0.0%	98.8%
90–94	0.0	0.0%	100.0%	0.0	0.0%	97.6%	0.0	0.0%	98.8%
95–99	0.0	0.0%	100.0%	0.0	0.0%	97.6%	0.0	0.0%	98.8%
100–104	0.0	0.0%	100.0%	0.0	0.0%	97.6%	0.0	0.0%	98.8%
Missing	0.0	0.0%	100.0%	1.2	2.4%	100.0%	1.2	1.2%	100.0%
Total	**51.6**	**100.0%**	**100.0%**	**49.2**	**100.0%**	**100.0%**	**100.8**	**100.0%**	**100.0%**

Source ADF&G Division of Subsistence household surveys, 2015.

Table 3-4.–Sample achievement, Ekwok, 2013 and 2014.

Sample information	2013	2014
Number of dwelling units	34	36
Interview goal	34	36
Households interviewed	29	30
Households failed to be contacted	4	4
Households declined to be interviewed	1	1
Households moved or occupied by nonresident	0	1
Total households attempted to be interviewed	34	32
Refusal rate	3.3%	3.2%
Final estimate of permanent households	34	36
Percentage of total households interviewed	85.3%	83.3%
Interview weighting factor	1.2	1.2
Sampled population	88	84
Estimated population	103.2	100.8

Source ADF&G Division of Subsistence household surveys, 2014 and 2015.

Summary of Salmon Harvest and Use Patterns

Survey participants were asked about their engagement with the salmon fisheries, and varying amounts of use, attempt to harvest, successful harvest, and sharing of salmon were estimated from survey results. Sharing was identified by survey respondents as fulfilling a large proportion of salmon consumed by households. Salmon were shared in one form or another, which could have included unprocessed or processed fish. The survey effort included two ways to identify gear type use in the study communities. First, respondents were asked to identify the gear type used for salmon harvests reported on the household survey. Second, when identifying fishing and harvest locations on a map, respondents were asked to identify the type of harvest gear used at each location. Note that not every surveyed household provided spatial data (see Table 1-3) and some households did not provide clarification about the gear used at specific fishing and harvest locations. Therefore, the survey results provide two different depictions of harvest patterns by gear type. Also, respondents were not asked to identify where commercial harvests retained for home use came from, but tables showing harvests by gear type do depict the estimated amount of salmon retained from commercial catches. Note that based on comments collected during survey administration, set gillnet was the gillnet gear type most commonly used for subsistence salmon fishing, but some drift gillnet use occurred. The following sections summarize results for harvest and use patterns for each study year.

Individual Participation in the Harvesting and Processing of Salmon: 2013 and 2014

All salmon species found in Alaska, except for pink salmon, were harvested by Ekwok residents in the 2013 study year. Harvested species included Chinook, sockeye, chum, and coho salmon, as well as spawned-out sockeye salmon. Figure 3-5 is a visual representation of the level of individual participation in the subsistence harvesting and processing of salmon by members of households in Ekwok. An estimated 62% of the community subsistence fished for salmon (64 people), and 78% processed salmon (81 people) (Table 3-5). All salmon species, including pink salmon, were harvested by Ekwok residents in the 2014 study year. An estimated 75% percent of the community subsistence fished for salmon (76 people), and 76% processed salmon (77 people).

Household Salmon Harvest and Use Characteristics in Ekwok: 2013

The total estimated number of all salmon species harvested in 2013 was 2,600 individual fish totaling 19,992 lb harvested (Table 3-6). The largest portion of harvested salmon was Chinook salmon at 12,420 lb (120 lb per capita), followed by coho salmon at 3,334 lb (32 lb per capita), which is nearly one-quarter less than the Chinook salmon harvest weight, and then sockeye salmon at 2,618 lb (25 lb per capita). The total

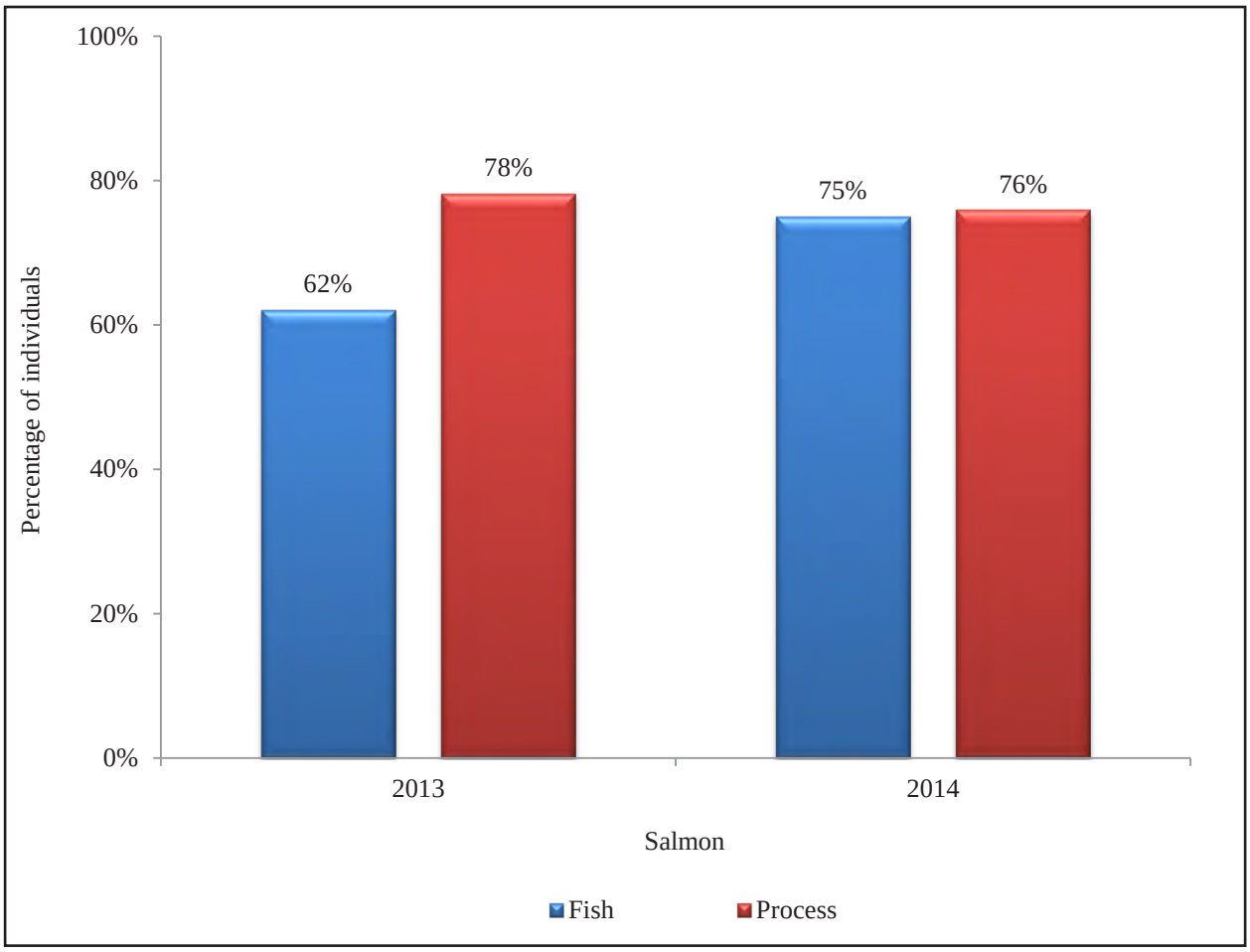


Figure 3-5.–Individual participation in subsistence salmon harvesting and processing activities, Ekwok, 2013 and 2014.

Table 3-5.–Individual participation in subsistence salmon harvesting and processing activities, Ekwok, 2013 and 2014.

	2013	2014
Total number of people	**103.2**	**100.8**
Salmon		
Fish		
Number	64.0	75.6
Percentage	62.1%	75.0%
Process		
Number	80.6	76.5
Percentage	78.2%	75.9%

Source ADF&G Division of Subsistence household surveys, 2014 and 2015.

Table 3-6.–Estimated use and harvest of salmon, Ekwok, 2013.

Resource	Percentage of households					Harvest weight (lb)			Harvest amount			95% confidence limit (±) harvest
	Use %	Attempt %	Harvest %	Receive %	Give %	Total	Mean per household	Per capita	Total	Unit	Mean per household	
Salmon	**100.0**	**82.8**	**79.3**	**72.4**	**51.7**	**19,991.8**	**588.0**	**193.8**	**2,600.4**	**ind**	**76.5**	**16.8**
Chum salmon	55.2	48.3	41.4	17.2	10.3	1,593.6	46.9	15.4	336.5	ind	9.9	43.1
Coho salmon	79.3	62.1	58.6	44.8	24.1	3,334.3	98.1	32.3	741.0	ind	21.8	19.9
Chinook salmon	93.1	75.9	72.4	62.1	48.3	12,419.5	365.3	120.4	927.4	ind	27.3	18.3
Pink salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ind	0.0	0.0
Sockeye salmon	89.7	69.0	62.1	51.7	17.2	2,618.4	77.0	25.4	589.7	ind	17.3	19.1
Spawning sockeye salmon	27.6	3.4	3.4	24.1	10.3	26.0	0.8	0.3	5.9	ind	0.2	78.6
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ind	0.0	0.0

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

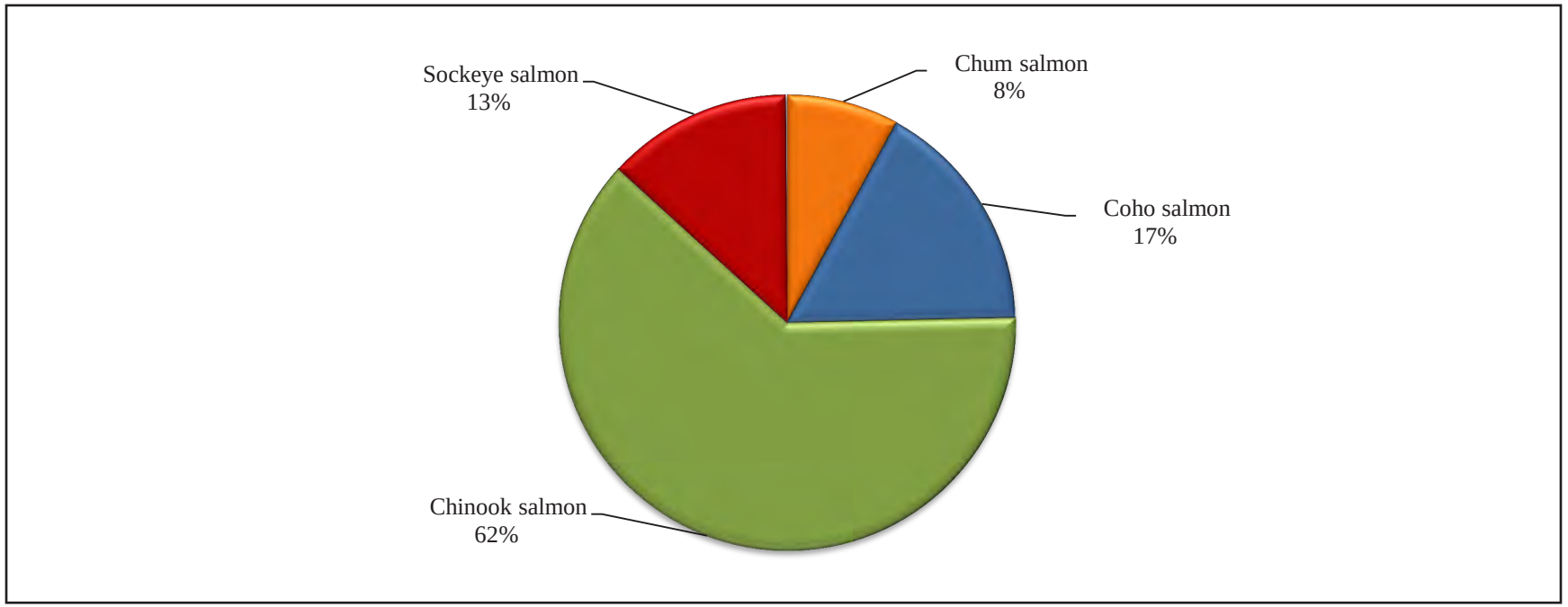


Figure 3-6.–Composition of salmon harvest in pounds usable weight, Ekwok, 2013.

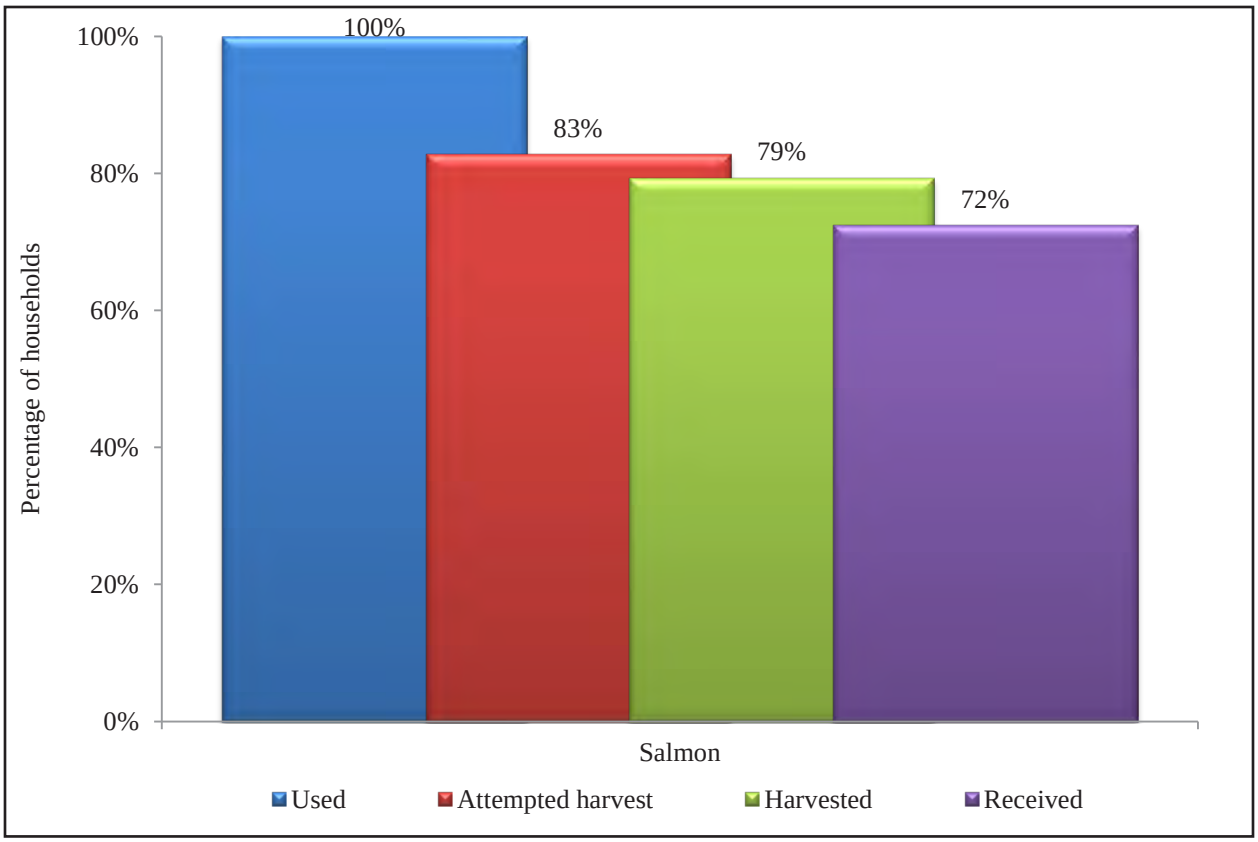


Figure 3-7.–Percentage of households using, attempting to harvest, harvesting, and receiving salmon, Ekwok, 2013.

salmon harvest contributed 588 lb per household, or 194 lb per capita. Chinook salmon accounted for 62% of the total harvest weight in 2013 (Figure 3-6).

Overall Use by Households and Salmon Harvests by Gear Type

All households in Ekwok used salmon (100%) in 2013, with 83% attempting harvest, 79% successfully harvesting, and 72% receiving salmon (Figure 3-7). The highest percentages of salmon use were for Chinook and sockeye salmon, with 93% and 90% of households using these species, respectively (Table 3-6). In terms of successful harvest, Chinook salmon had the highest household harvest rate at 72%, followed by sockeye (62%) and coho (59%) salmon. The majority of Ekwok households gave away or received salmon from either other community members or from outside of the community. Chinook salmon was the most received fish with 62% of households having received Chinook. Giving of salmon also occurred in Ekwok, with Chinook and coho salmon being the species most often given away by survey respondents (48% and 24% of households shared, respectively).

Methods used to harvest salmon included subsistence gillnetting and rod and reel fishing (Table 3-7; Figure 3-8). Gillnetting gear accounted for 90% of the salmon harvest weight, followed by 10% of the harvest caught from rod and reel (Table 3-8). No salmon were harvested by removal from commercial catches. An estimated 885 Chinook salmon were harvested by subsistence gillnet, and 42 by rod and reel (Table 3-7). Gillnetting was the dominant method for subsistence fishing for all salmon species in Ekwok (Table 3-8).

Salmon Harvests by Location and Harvest Gear Type

The salmon harvest areas used by Ekwok residents in 2013 are depicted by species in Figure 3-9. Harvest locations by species include those for Chinook, coho, sockeye, and chum salmon; fishing and harvest

locations for spawned-out sockeye salmon were not provided and there was no harvest of pink salmon in 2013. Most salmon harvesting occurred south of the community location on the Nushagak River, although Chinook salmon were pursued farther downriver from Ekwok than any other species.

Chinook salmon harvest locations by gear type are shown in Figure 3-10. The gear type primarily used to harvest Chinook salmon was gillnet, with rod and reel as the secondary harvest method used at four locations. Ekwok residents traveled approximately 15 miles downriver to harvest Chinook salmon, and most of these locations were fished by gillnet. The sites closest to Ekwok were also all across the river from the community location, indicating boat use for select locations.

Coho salmon was the second most highly harvested species (both by pounds and number of fish) in Ekwok in 2013, and the harvest of coho salmon by rod and reel was about one-half (238 fish) of the harvest by gillnet (503 fish); however, coho salmon harvested by rod and reel outnumbered all the other species combined by about twice as much in terms of rod and reel gear preference (Table 3-7). This shows the relative importance to the community of using rod and reel for harvesting this fish for home use. Most of the locations of rod and reel coho salmon harvests were on the same side of the Nushagak River as Ekwok is located (Figure 3-11). This may also show that rod and reel is a gear type that is easy to use, such as a resident walking downstream to fish for a few select fish, rather than putting more effort into gillnetting. In the survey comments, the use of rod and reel specifically was associated with being a conservation method. Comments collected from all communities indicated that rod and reel fishing is considered a subsistence method by community residents who use it to fish for certain species and to be able to control how many fish are harvested (Table 8-2). Additionally, some of the harvest of coho salmon was caught using gillnet, and at one harvest location other gear was used. All coho salmon harvest locations were located along roughly one mile of river, with four locations across from Ekwok, and the majority on the same side as the community.

Sockeye salmon harvests were located close to Ekwok and consisted of gillnet and rod and reel harvests (Figure 3-12). Harvest locations for other salmon, which in 2013 represents only chum salmon harvests, are shown in Figure 3-13. Chum salmon were harvested primarily by gillnet, in terms of total harvest amount, although the harvest locations were only given for rod and reel harvests (located downriver from Ekwok on the same side of the river as the community) (Table 3-7; Figure 3-13).

Table 3-7.–Estimated harvest of salmon by gear type and resource, Ekwok, 2013.

	Removed from commercial catch		Subsistence methods									
			Gillnet[a]		Other method		Subsistence gear, any method		Rod and reel		Any method	
Resource	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Salmon	**0.0**	**0.0**	**2,239.3**	**17,977.6**	**0.0**	**0.0**	**2,239.3**	**17,977.6**	**361.1**	**2,014.2**	**2,600.4**	**19,991.8**
Chum salmon	0.0	0.0	273.2	1,293.7	0.0	0.0	273.2	1,293.7	63.3	299.8	336.5	1,593.6
Coho salmon	0.0	0.0	503.0	2,263.3	0.0	0.0	503.0	2,263.3	238.0	1,071.0	741.0	3,334.3
Chinook salmon	0.0	0.0	885.2	11,854.2	0.0	0.0	885.2	11,854.2	42.2	565.2	927.4	12,419.5
Pink salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sockeye salmon	0.0	0.0	572.1	2,540.3	0.0	0.0	572.1	2,540.3	17.6	78.1	589.7	2,618.4
Spawning sockeye salmon	0.0	0.0	5.9	26.0	0.0	0.0	5.9	26.0	0.0	0.0	5.9	26.0
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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

Note The harvested number of salmon is represented as individual fish harvested.

a. Gillnet harvests include both set and drift gillnet gear types.

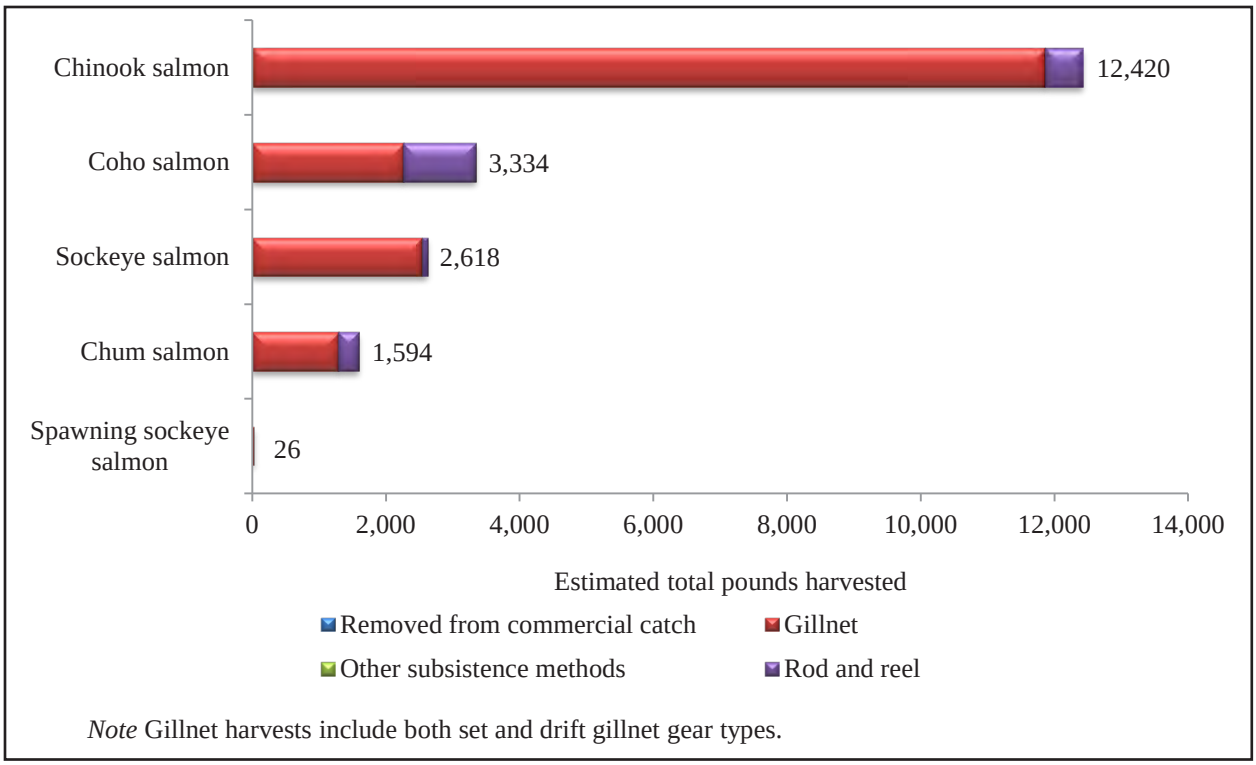


Figure 3-8.–Estimated harvest of salmon in pounds usable weight by gear type and resource, Ekwok, 2013.

Table 3-8.–Estimated percentages of salmon harvest in pounds usable weight by gear type, resource, and total salmon harvest, Ekwok, 2013.

Resource	Percentage base	Removed from commercial catch	Subsistence methods			Rod and reel	Any method
			Gillnet[a]	Other method	Subsistence gear, any method		
Salmon	**Gear type**	**0.0%**	**100.0%**	**0.0%**	**100.0%**	**100.0%**	**100.0%**
	Resource	**0.0%**	**89.9%**	**0.0%**	**89.9%**	**10.1%**	**100.0%**
	Total	**0.0%**	**89.9%**	**0.0%**	**89.9%**	**10.1%**	**100.0%**
Chum salmon	Gear type	0.0%	7.2%	0.0%	7.2%	14.9%	8.0%
	Resource	0.0%	81.2%	0.0%	81.2%	18.8%	100.0%
	Total	0.0%	6.5%	0.0%	6.5%	1.5%	8.0%
Coho salmon	Gear type	0.0%	12.6%	0.0%	12.6%	53.2%	16.7%
	Resource	0.0%	67.9%	0.0%	67.9%	32.1%	100.0%
	Total	0.0%	11.3%	0.0%	11.3%	5.4%	16.7%
Chinook salmon	Gear type	0.0%	65.9%	0.0%	65.9%	28.1%	62.1%
	Resource	0.0%	95.4%	0.0%	95.4%	4.6%	100.0%
	Total	0.0%	59.3%	0.0%	59.3%	2.8%	62.1%
Pink salmon	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Sockeye salmon	Gear type	0.0%	14.1%	0.0%	14.1%	3.9%	13.1%
	Resource	0.0%	97.0%	0.0%	97.0%	3.0%	100.0%
	Total	0.0%	12.7%	0.0%	12.7%	0.4%	13.1%
Spawning sockeye salmon	Gear type	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%
	Resource	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%
	Total	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%
Unknown salmon	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

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

a. Gillnet harvests include both set and drift gillnet gear types.

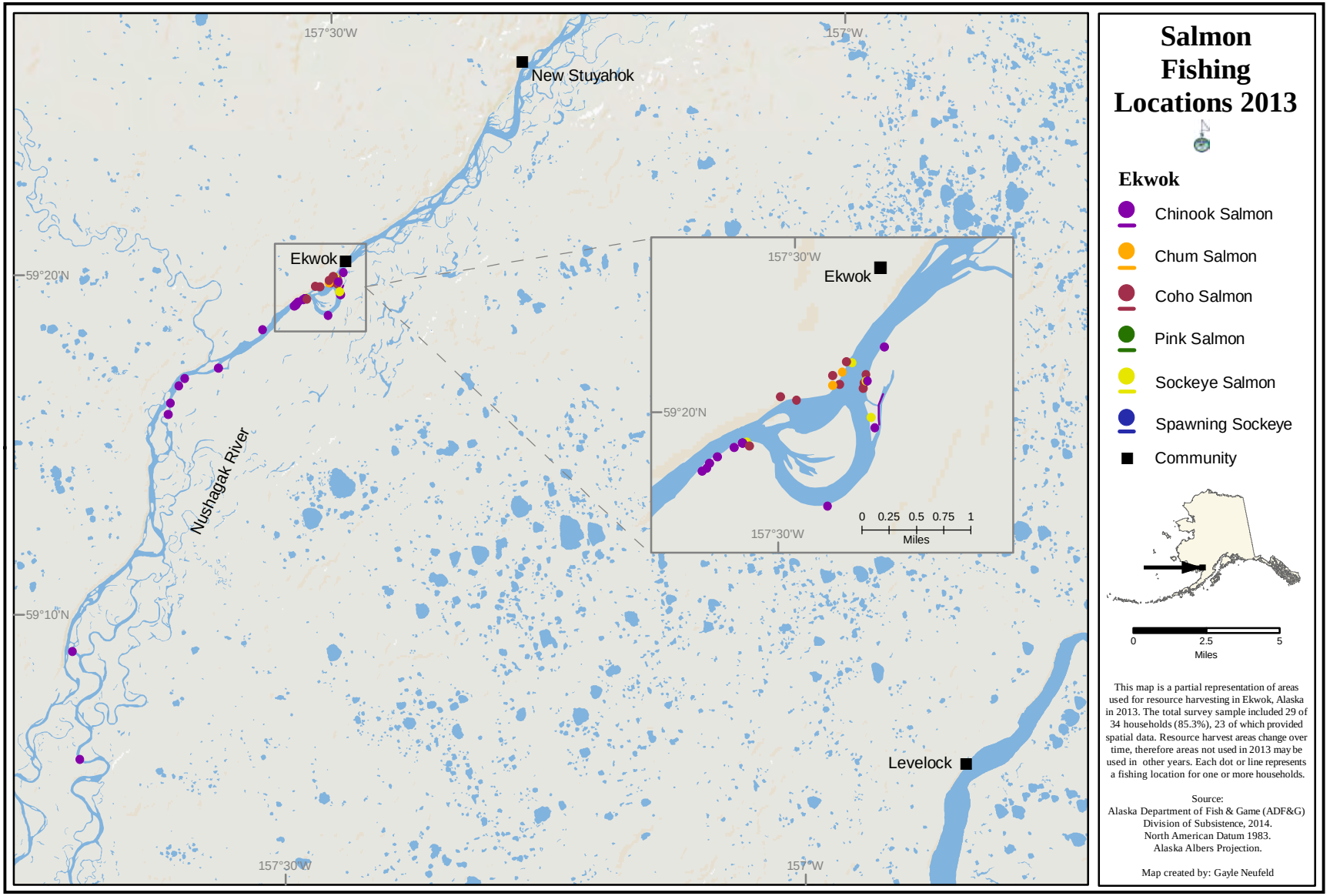


Figure 3-9.–Fishing and harvest locations of salmon, Ekwok, 2013.

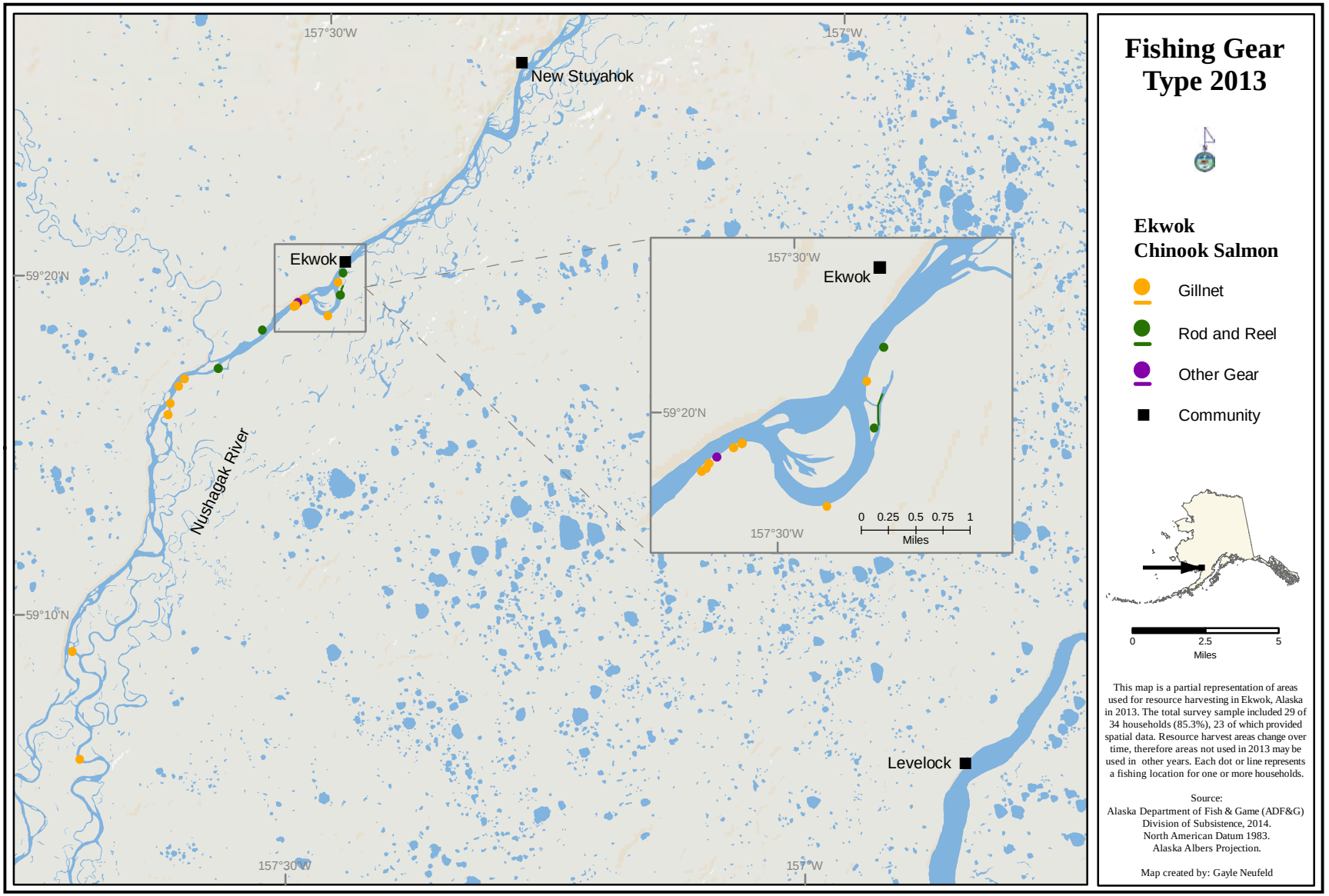


Figure 3-10.–Fishing and harvest locations by gear type, Chinook salmon, Ekwok, 2013.

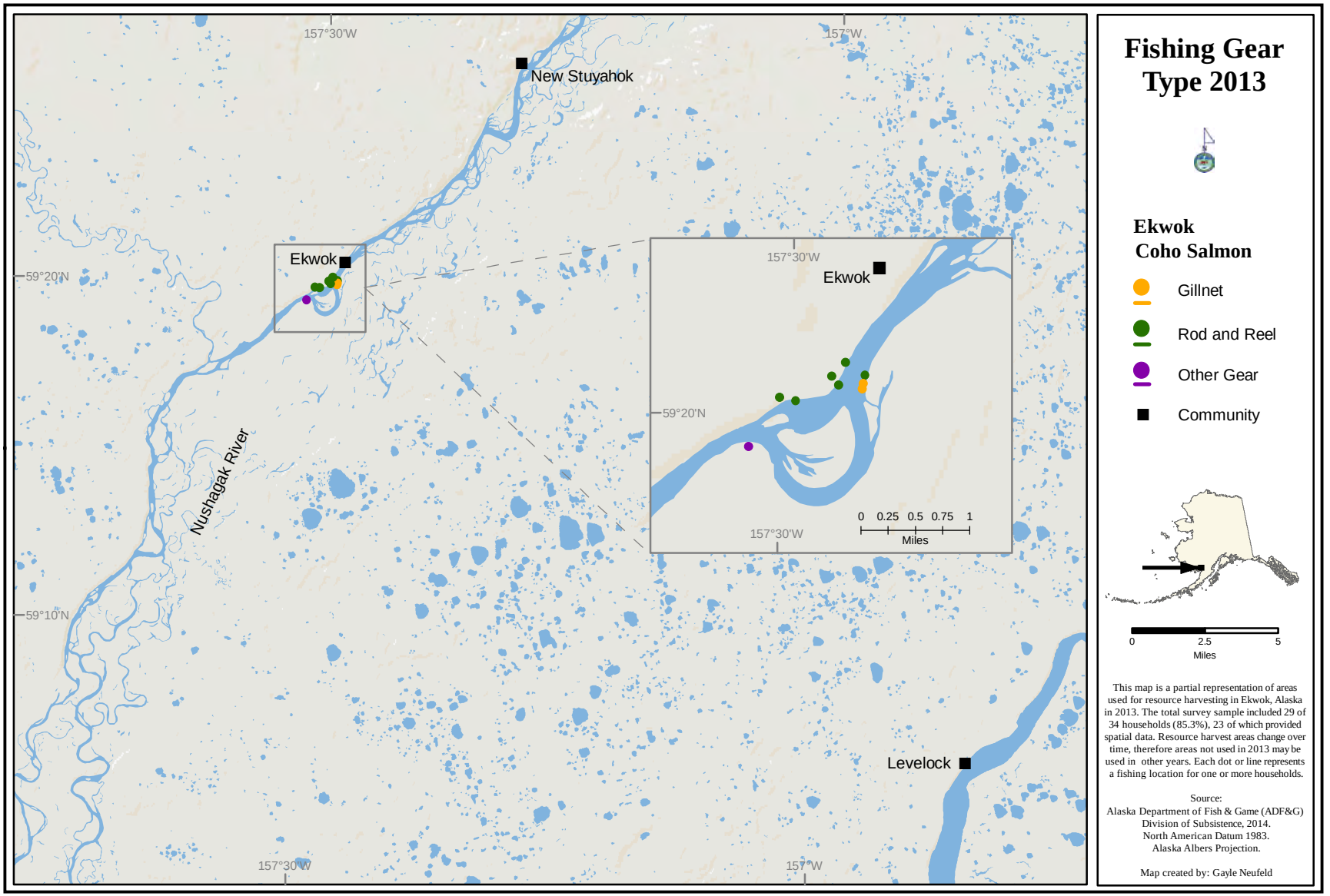


Figure 3-11.–Fishing and harvest locations by gear type, coho salmon, Ekwok, 2013.

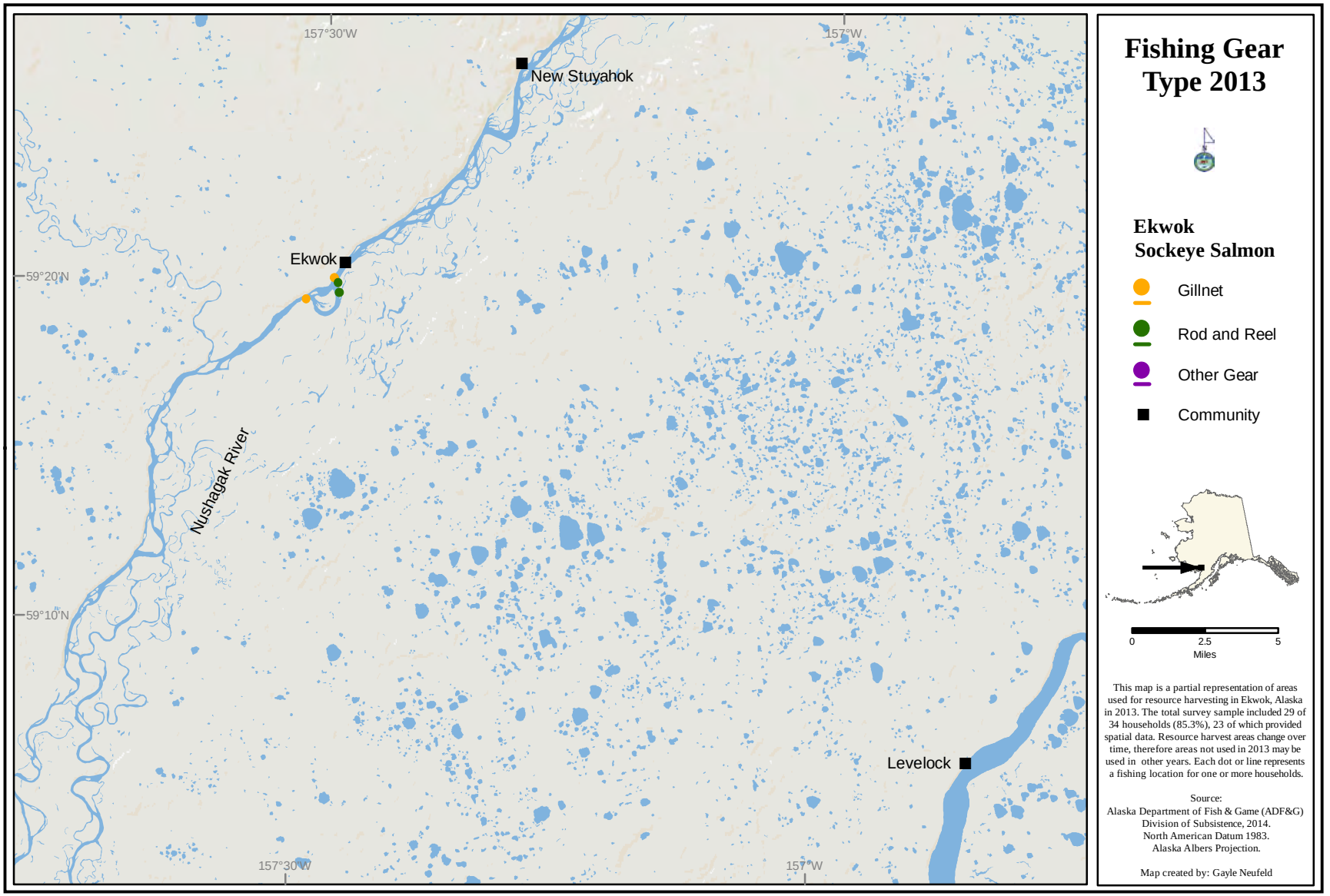


Figure 3-12.–Fishing and harvest locations by gear type, sockeye salmon, Ekwok, 2013.

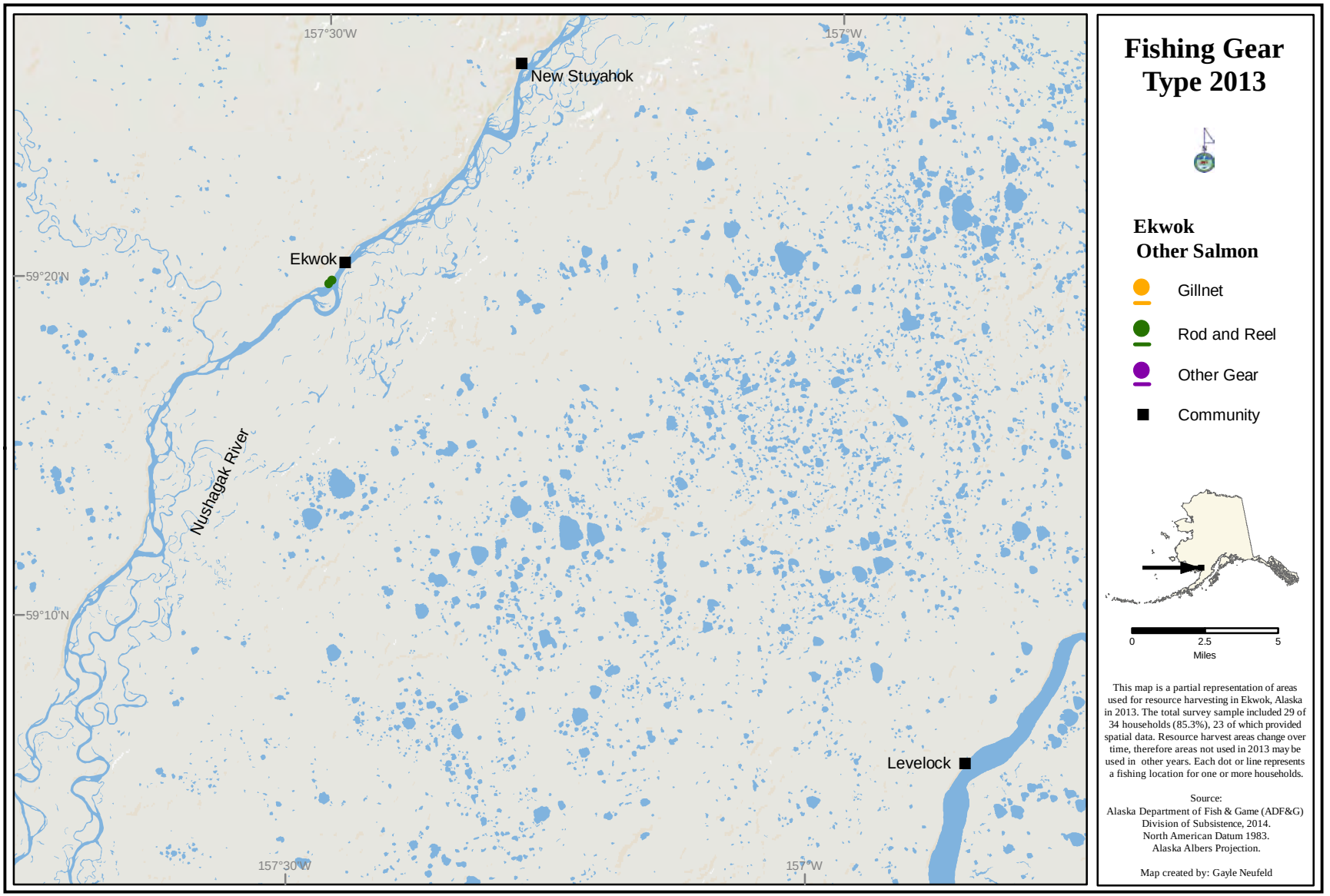


Figure 3-13.–Fishing and harvest locations by gear type, other salmon, Ekwok, 2013.

Household Salmon Harvest and Use Characteristics in Ekwok: 2014

The total number of all salmon species harvested in 2014 was 4,082 individual fish totaling 32,609 lb (Table 3-9). The highest portion of harvested salmon was Chinook salmon at 22,016 lb (218 lb per capita), followed by coho salmon at 6,221 lb (62 lb per capita). This total salmon harvest accounted for 906 lb per household, or 324 lb per capita. Chinook salmon accounted for 68% of the total pounds harvested in 2014 (Figure 3-14). Coho salmon contributed the second highest harvest weight (19%).

Overall Use by Households and Salmon Harvests by Gear Type

Ninety-three percent of Ekwok households used salmon in 2014, with 77% attempting harvest, 73% successfully harvesting, and 57% receiving salmon (Figure 3-15). The highest percentages of salmon use were for Chinook and coho salmon, with 93% and 83% of households using these species, respectively (Table 3-9). In terms of successful harvest, coho salmon was harvested the most, by 70% of households, followed by Chinook (63%) and sockeye (47%) salmon. The majority of Ekwok households gave away or received salmon from other households. Chinook salmon was received by the highest percentage of households with 50% of households having received Chinook salmon. Giving of salmon also occurred, with Chinook and coho salmon being the species most often given away by Ekwok households.

Methods used to harvest salmon included subsistence gillnetting and rod and reel fishing (Table 3-10; Figure 3-16). Gillnetting gear accounted for 88% of the salmon harvest weight, followed by 12% of the harvest caught from rod and reel (Table 3-11). No salmon were harvested by removal from commercial catches. An estimated 1,626 Chinook salmon were harvested by subsistence gillnet, and 18 by rod and reel (Table 3-10). Similar to the previous study year, gillnetting remained the dominant fishing method for subsistence users in Ekwok.

Salmon Harvests by Location and Harvest Gear Type

The salmon harvest areas used by Ekwok residents in 2014 are depicted by species in Figure 3-17. Harvest locations by species are depicted for Chinook, coho, sockeye, chum, and pink salmon. Although an estimated 24 spawning sockeye salmon were harvested by Ekwok residents, the locations of these harvests were not mapped (Table 3-10). The majority of salmon fishing and harvesting occurred clustered around Ekwok, but also included locations north and south on the Nushagak River, indicating different locations were used than in 2013. Specifically, coho and sockeye salmon were harvested farther from Ekwok than in the previous study year.

Chinook salmon harvest locations by gear type are shown in Figure 3-18. The gear type primarily used to harvest Chinook salmon was gillnet. Ekwok residents traveled approximately 20 miles downriver to harvest Chinook salmon, and most of these locations were gillnet sites. The fishing sites were predominantly located across the river from the community location, which indicated boat use for select fishing locations. Locations where an estimated 18 Chinook salmon were harvested by rod and reel were not mapped (Table 3-10).

Coho salmon continued to be the second most highly harvested species (both by pounds and number of fish) in Ekwok in 2014. Coho salmon harvested by rod and reel outnumbered all the other species, in terms of rod and reel gear preference, with 821 individual coho harvested by rod and reel, which is more coho salmon than were caught by gillnet (Table 3-10). This shows the relative importance to the community of using rod and reel for harvesting home-use fish. In 2014, coho rod and reel harvests were distributed north and south of Ekwok, including fishing sites on both sides of the Nushagak River (Figure 3-19). This may show that rod and reel is also an opportunistic gear type used by harvesters when doing other subsistence activities, such as hunting or berry picking.

Sockeye salmon harvests were located both close to and far from Ekwok and consisted of gillnet sites (Figure 3-20). Locations where an estimated 14 sockeye salmon were harvested by rod and reel were not mapped (Table 3-10). Harvest locations for other salmon, which in 2014 included chum and pink salmon, are shown in Figure 3-21. Harvests by gillnet and rod and reel were mapped for these less harvested species.

Table 3-9.–Estimated use and harvest of salmon, Ekwok, 2014.

Resource	Percentage of households: Use %	Attempt %	Harvest %	Receive %	Give %	Harvest weight (lb): Total	Mean per household	Per capita	Harvest amount: Total	Unit	Mean per household	95% confidence limit (±) harvest
Salmon	**93.3**	**76.7**	**73.3**	**56.7**	**60.0**	**32,609.0**	**905.8**	**323.5**	**4,082.4**	**ind**	**113.4**	**23.3**
Chum salmon	46.7	43.3	40.0	13.3	13.3	1,909.6	53.0	18.9	403.2	ind	11.2	27.9
Coho salmon	83.3	70.0	70.0	30.0	50.0	6,220.8	172.8	61.7	1,382.4	ind	38.4	28.4
Chinook salmon	93.3	66.7	63.3	50.0	53.3	22,016.4	611.6	218.4	1,644.0	ind	45.7	28.3
Pink salmon	20.0	16.7	16.7	10.0	6.7	453.5	12.6	4.5	200.4	ind	5.6	52.8
Sockeye salmon	66.7	50.0	46.7	36.7	33.3	1,902.1	52.8	18.9	428.4	ind	11.9	27.8
Spawning sockeye salmon	3.3	3.3	3.3	3.3	3.3	106.6	3.0	1.1	24.0	ind	0.7	83.5
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ind	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2015.

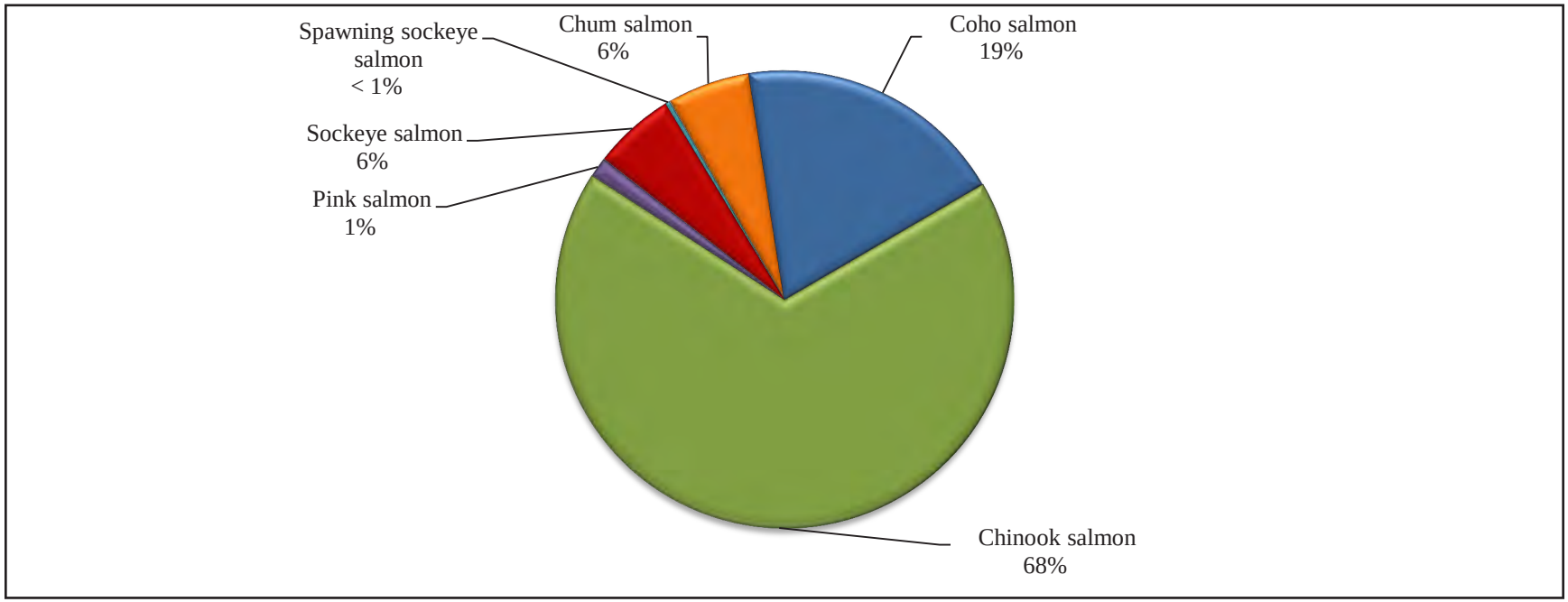


Figure 3-14.–Composition of salmon harvest in pounds usable weight, Ekwok, 2014.

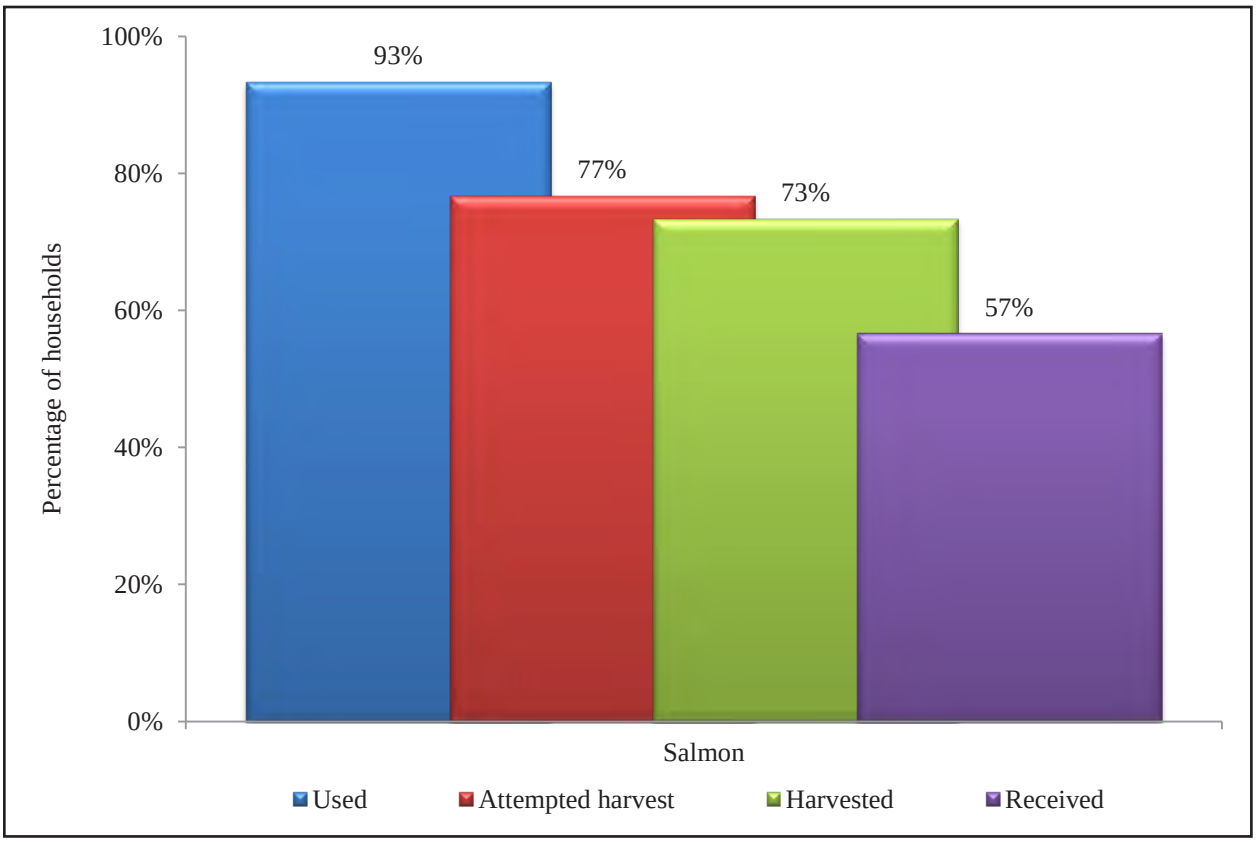


Figure 3-15.–Percentage of households using, attempting to harvest, harvesting, and receiving salmon, Ekwok, 2014.

Table 3-10.–Estimated harvest of salmon by gear type and resource, Ekwok, 2014.

	Removed from commercial catch		Subsistence methods									
			Gillnet[a]		Other method		Subsistence gear, any method		Rod and reel		Any method	
Resource	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Salmon	**0.0**	**0.0**	**3,228.0**	**28,607.7**	**0.0**	**0.0**	**3,228.0**	**28,607.7**	**854.4**	**4,001.3**	**4,082.4**	**32,609.0**
Chum salmon	0.0	0.0	403.2	1,909.6	0.0	0.0	403.2	1,909.6	0.0	0.0	403.2	1,909.6
Coho salmon	0.0	0.0	561.6	2,527.2	0.0	0.0	561.6	2,527.2	820.8	3,693.6	1,382.4	6,220.8
Chinook salmon	0.0	0.0	1,626.0	21,775.4	0.0	0.0	1,626.0	21,775.4	18.0	241.1	1,644.0	22,016.4
Pink salmon	0.0	0.0	199.2	450.8	0.0	0.0	199.2	450.8	1.2	2.7	200.4	453.5
Sockeye salmon	0.0	0.0	414.0	1,838.2	0.0	0.0	414.0	1,838.2	14.4	63.9	428.4	1,902.1
Spawning sockeye salmon	0.0	0.0	24.0	106.6	0.0	0.0	24.0	106.6	0.0	0.0	24.0	106.6
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2015.

Note The harvested number of salmon is represented as individual fish harvested.

a. Gillnet harvests include both set and drift gillnet gear types.

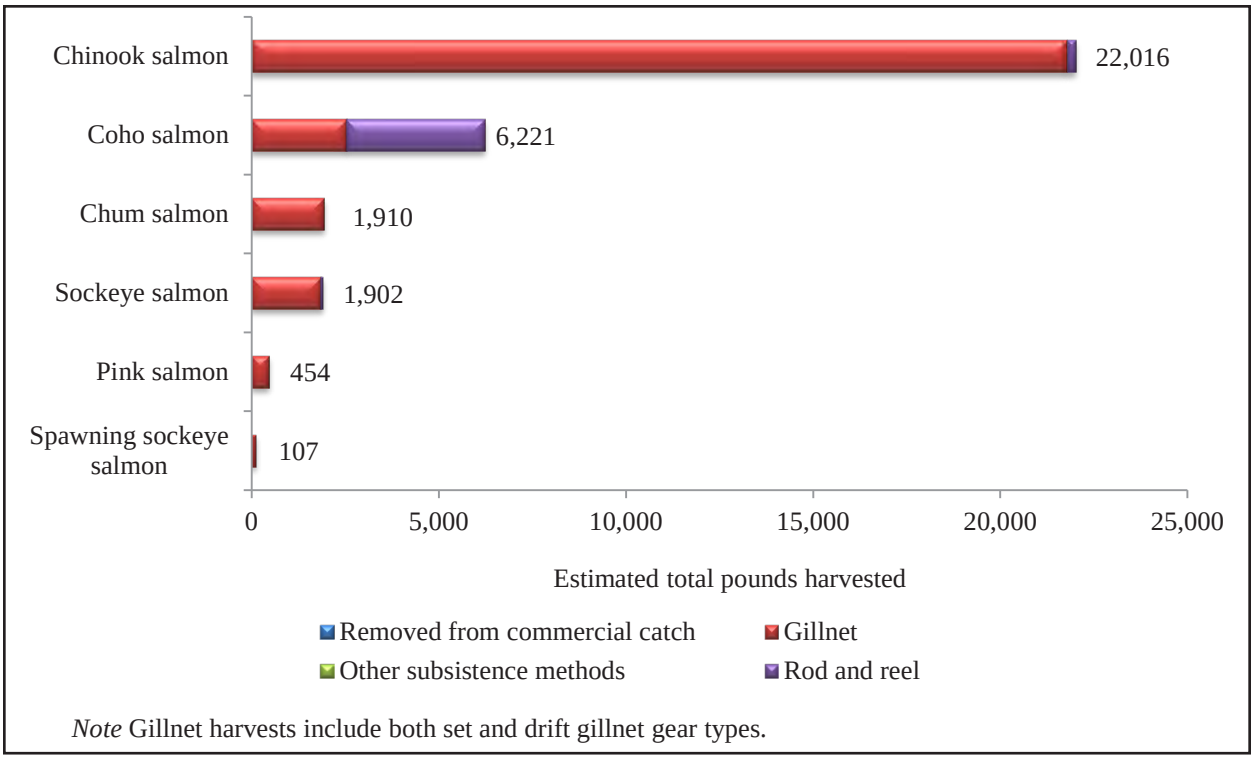


Figure 3-16.–Estimated harvest of salmon in pounds usable weight by gear type and resource, Ekwok, 2014.

Table 3-11.–Estimated percentages of salmon harvest in pounds usable weight by gear type, resource, and total salmon harvest, Ekwok, 2014.

Resource	Percentage base	Removed from commercial catch	Subsistence methods				
			Gillnet[a]	Other method	Subsistence gear, any method	Rod and reel	Any method
Salmon	**Gear type**	**0.0%**	**100.0%**	**0.0%**	**100.0%**	**100.0%**	**100.0%**
	Resource	**0.0%**	**87.7%**	**0.0%**	**87.7%**	**12.3%**	**100.0%**
	Total	**0.0%**	**87.7%**	**0.0%**	**87.7%**	**12.3%**	**100.0%**
Chum salmon	Gear type	0.0%	6.7%	0.0%	6.7%	0.0%	9.9%
	Resource	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%
	Total	0.0%	5.9%	0.0%	5.9%	0.0%	9.9%
Coho salmon	Gear type	0.0%	8.8%	0.0%	8.8%	92.3%	33.9%
	Resource	0.0%	40.6%	0.0%	40.6%	59.4%	100.0%
	Total	0.0%	7.8%	0.0%	7.8%	11.3%	33.9%
Chinook salmon	Gear type	0.0%	76.1%	0.0%	76.1%	6.0%	40.3%
	Resource	0.0%	98.9%	0.0%	98.9%	1.1%	100.0%
	Total	0.0%	66.8%	0.0%	66.8%	0.7%	40.3%
Pink salmon	Gear type	0.0%	1.6%	0.0%	1.6%	0.1%	4.9%
	Resource	0.0%	99.4%	0.0%	99.4%	0.6%	100.0%
	Total	0.0%	1.4%	0.0%	1.4%	0.0%	4.9%
Sockeye salmon	Gear type	0.0%	6.4%	0.0%	6.4%	1.6%	10.5%
	Resource	0.0%	96.6%	0.0%	96.6%	3.4%	100.0%
	Total	0.0%	5.6%	0.0%	5.6%	0.2%	10.5%
Spawning sockeye salmon	Gear type	0.0%	0.4%	0.0%	0.4%	0.0%	0.6%
	Resource	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%
	Total	0.0%	0.3%	0.0%	0.3%	0.0%	0.6%
Unknown salmon	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source ADF&G Division of Subsistence household surveys, 2015.

a. Gillnet harvests include both set and drift gillnet gear types.

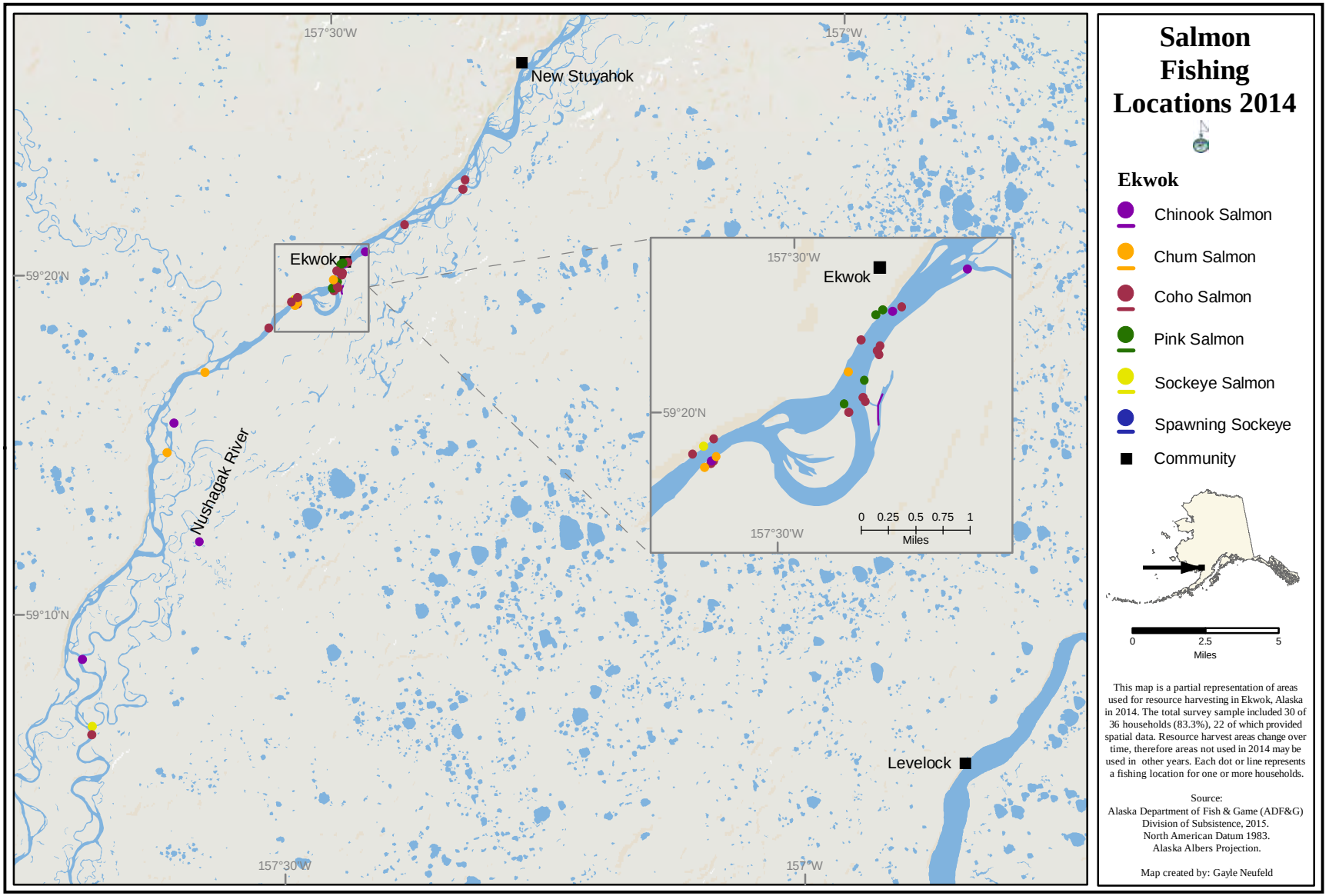


Figure 3-17.–Fishing and harvest locations of salmon, Ekwok, 2014.

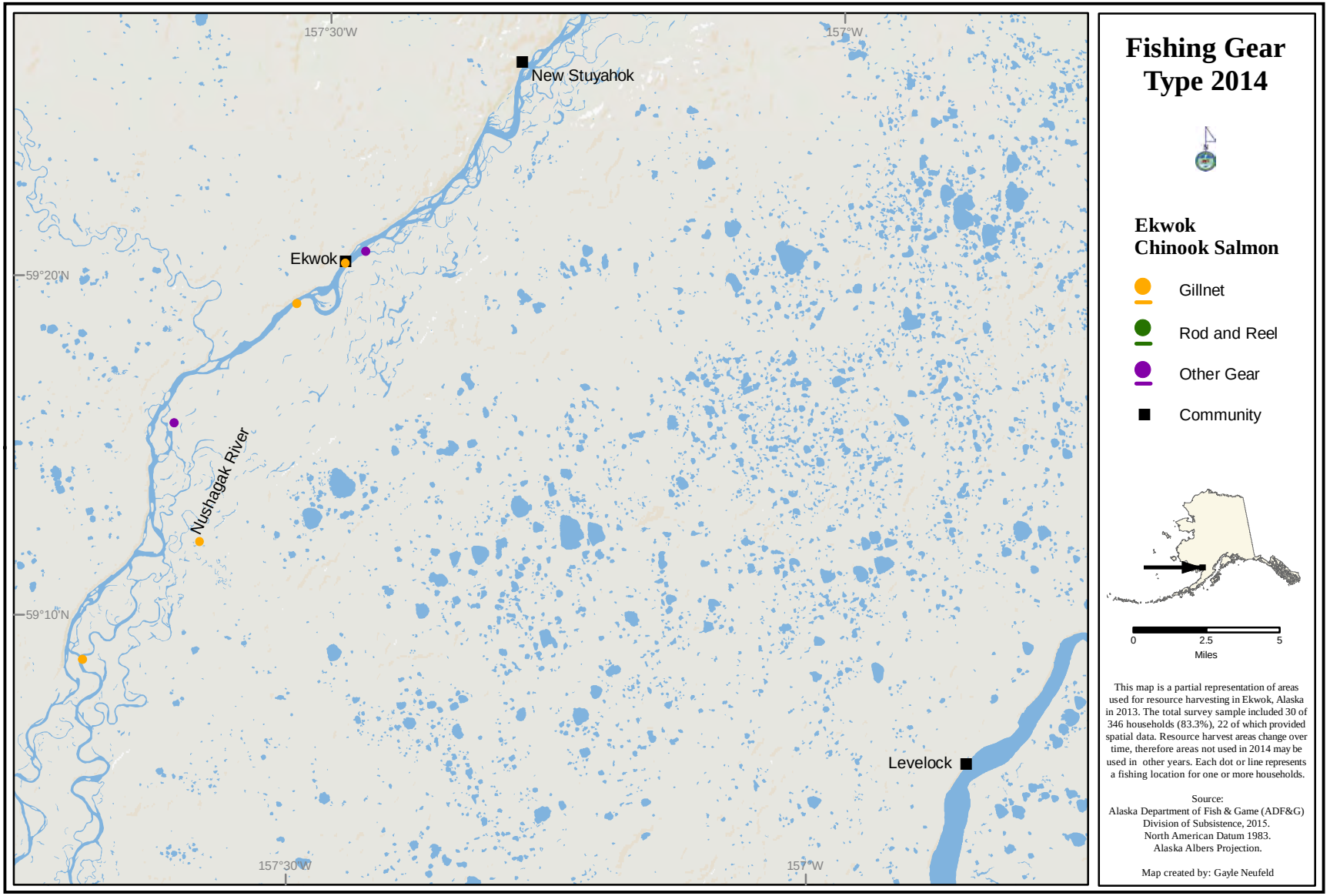


Figure 3-18.–Fishing and harvest locations by gear type, Chinook salmon, Ekwok, 2014.

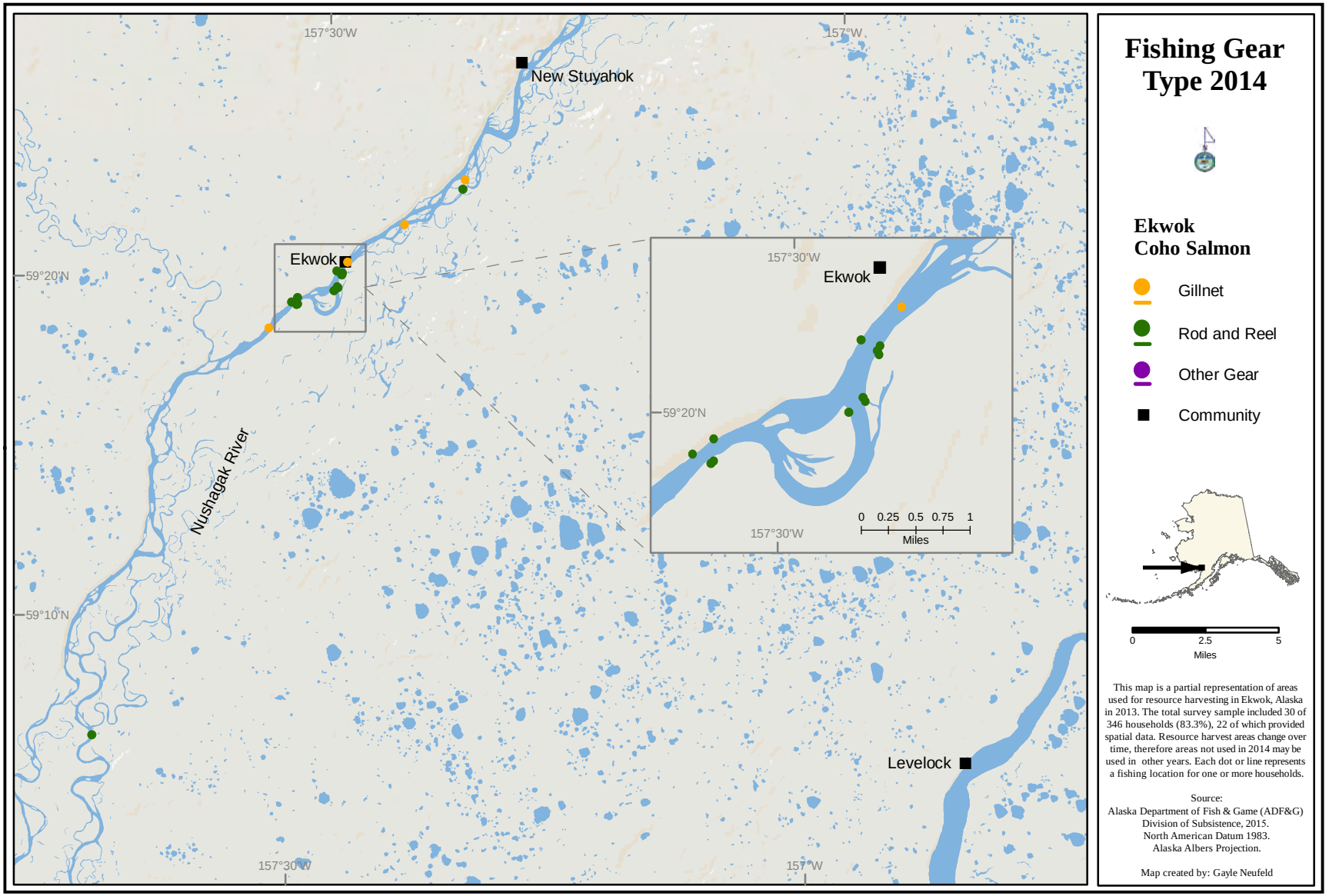


Figure 3-19.–Fishing and harvest locations by gear type, coho salmon, Ekwok, 2014.

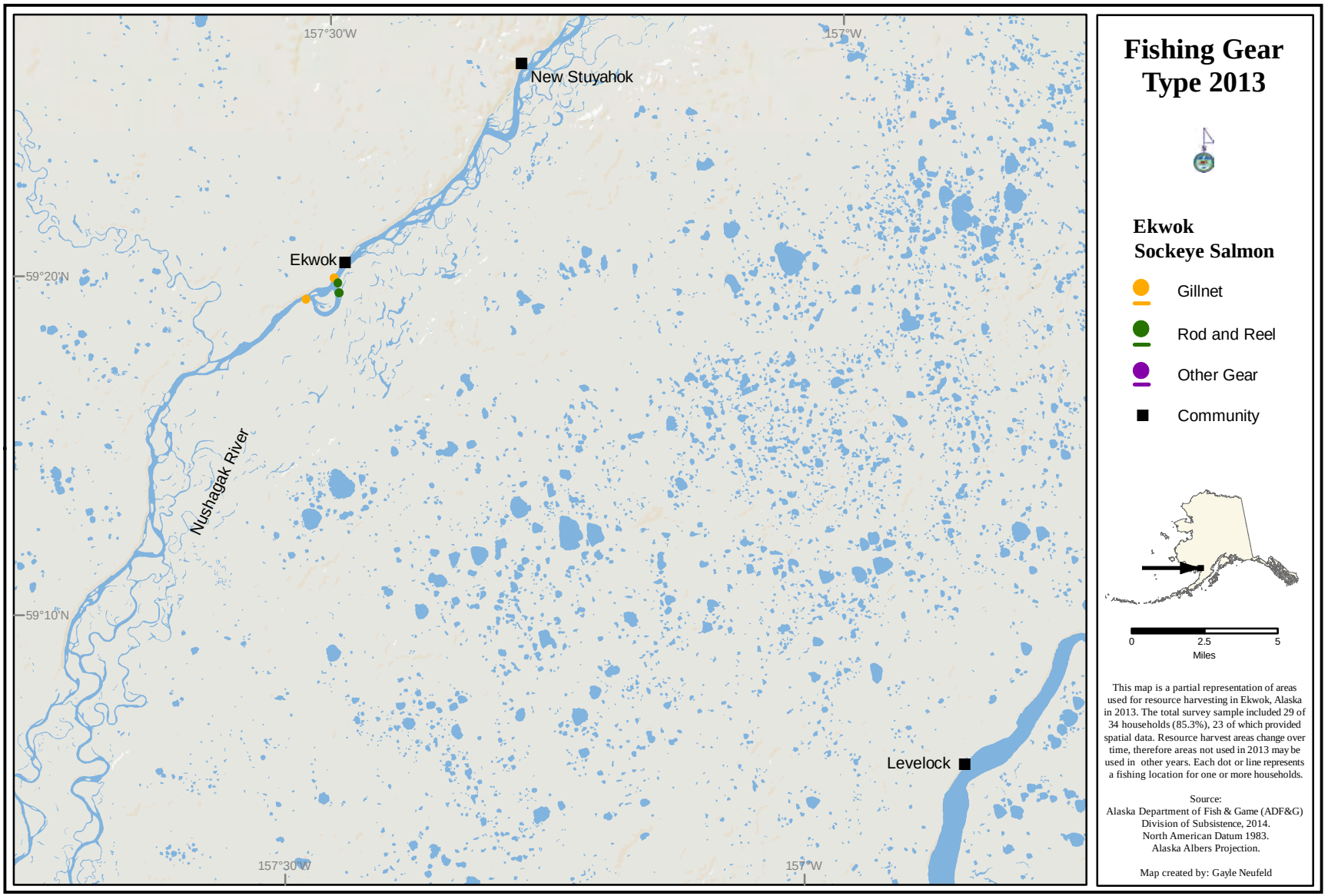


Figure 3-20.–Fishing and harvest locations by gear type, sockeye salmon, Ekwok, 2014.

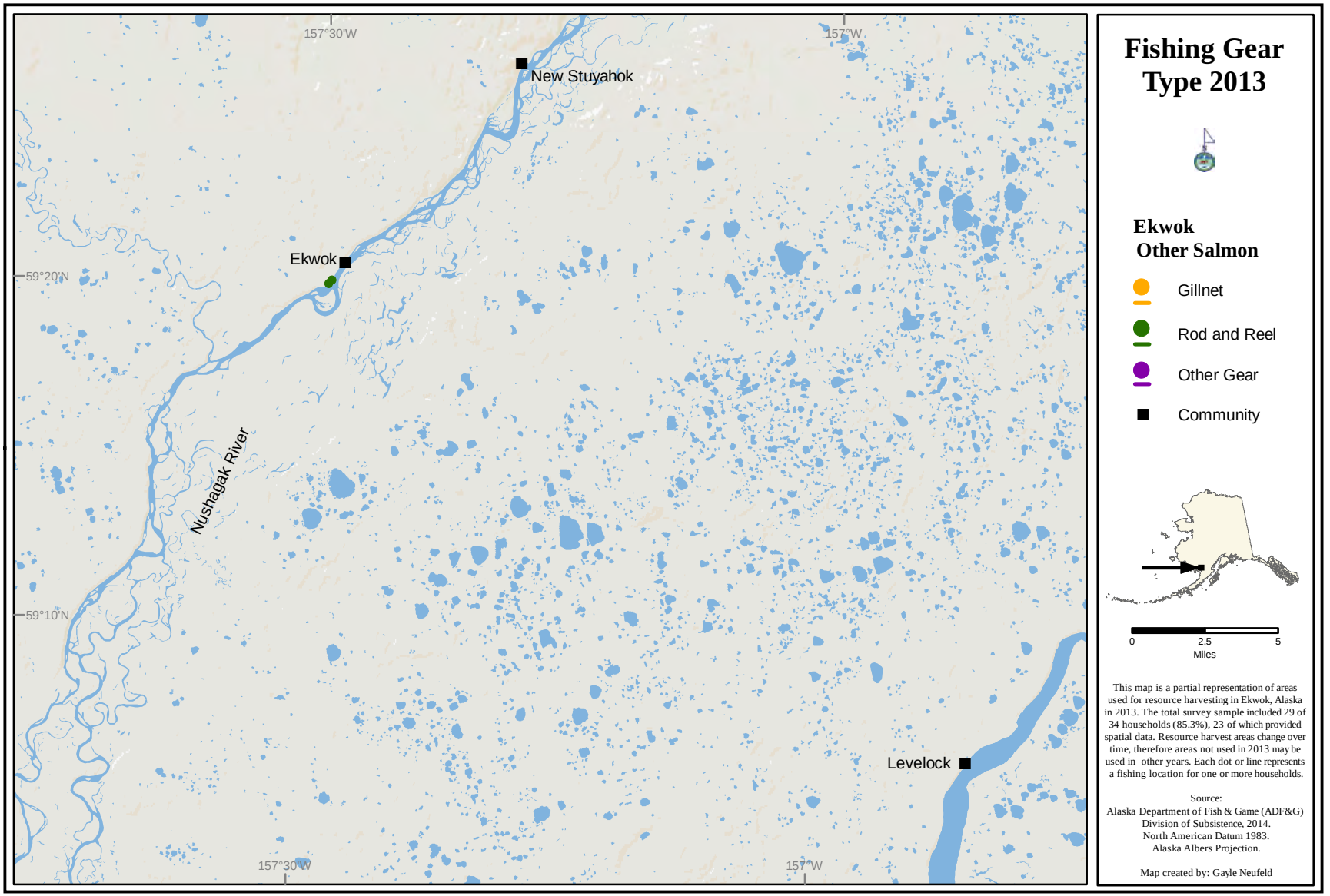


Figure 3-21.–Fishing and harvest locations by gear type, other salmon, Ekwok, 2014.

Harvest Assessments: 2013 and 2014

Researchers asked two questions regarding Chinook salmon use and harvest. The first question asked participants if they "got enough" Chinook salmon to use for their own household's needs, either through their own harvest efforts or sharing. If they did not, a numeric value was requested to determine how many fish would be the preferred amount for the household. The household was then asked why they did not get enough, either through their own efforts or sharing. This question was also asked for sockeye and coho salmon and responses for the three species are given below, under the subheading "Assessments of Use of Chinook, Sockeye, and Coho Salmon Through Harvest or Sharing." For the second assessment question, households were asked to describe their harvest of Chinook salmon in the study year, as compared to the past five years, and characterize whether the harvest was "less, same, or more." Reasons why were recorded, if the household offered anything to report. This comparison question, and reasons for less or more harvest, was also asked in relation to salmon other than Chinook (all other salmon species grouped), and is discussed under the subheading "Comparing Harvests of Chinook and Other Salmon Over Time." For both assessment questions, households could give more than one reason for not having enough salmon and changes to harvest amounts. These assessments highlight households' economic relationship to salmon and the integral role salmon availability plays in the subsistence way of life, both of which are affected in part by cash economy factors such as employment schedules, access to harvesting equipment, and fuel expense.

Assessments of Use of Chinook, Sockeye, and Coho Salmon Through Harvest or Sharing: 2013

Figure 3-22 and Table 3-12 provide a broad overview of Ekwok households' assessments of the availability of Chinook, sockeye, and coho salmon for use in 2013. Seventeen percent of households (five households) explained that they did not get enough Chinook salmon in 2013, with 83% reporting that they did get enough of the resource (through either their own efforts or sharing). Twenty-one percent of households (six) reported that they did not get enough sockeye salmon in 2013, with 79% indicating that they did get enough of the resource. Lastly, four households (14%) reported that they did not get enough coho salmon.

When asked why they did not get enough Chinook salmon, reasons included personal/family reasons (40% of responses), lack of equipment (40%), and 20% responded with a general lack of harvest success as a reason (Table 3-13). Not having enough sockeye salmon was primarily attributed to not having enough time (50%) and personal/family reasons (50%), as well as lack of equipment (17%). Two responses indicated that the household did not get enough coho salmon due to personal/family reasons (50%); other reasons cited were not having enough time (25%) and lack of equipment (25%). Three households reported that they needed more Chinook salmon to meet their food security needs, with the average amount of fish needed per household at 35 (Table 3-14). Five households indicated that they needed more sockeye salmon, with the average amount needed being 49 fish per household, and 3 households reported they would ideally like to have 30 coho salmon per household.

Comparing Harvests of Chinook and Other Salmon Over Time: 2013

About one-quarter (7) of the sampled Ekwok households indicated that they harvested fewer Chinook salmon than in the past 5 years, 15 reported the same level of harvest, and 2 reported more harvest (Figure 3-23; Table 3-15). Reasons for less harvest of Chinook salmon were largely given as personal/family reasons (two households) and working/no time (two households); other reasons cited were that the resource was less available (one household), lack of effort (one), weather/environment (one), and that Chinook salmon was not needed (one) (Table 3-16).

Eight households reported less harvest for all other salmon species (Table 3-15). Reasons for less harvest, compared to the last five years, of all other salmon species were reported as due primarily to working/no time (two households) and that the resources were not needed (two), followed by personal/family reasons (one), weather/environment (one), and overall that the household did not get enough (one) (Table 3-16).

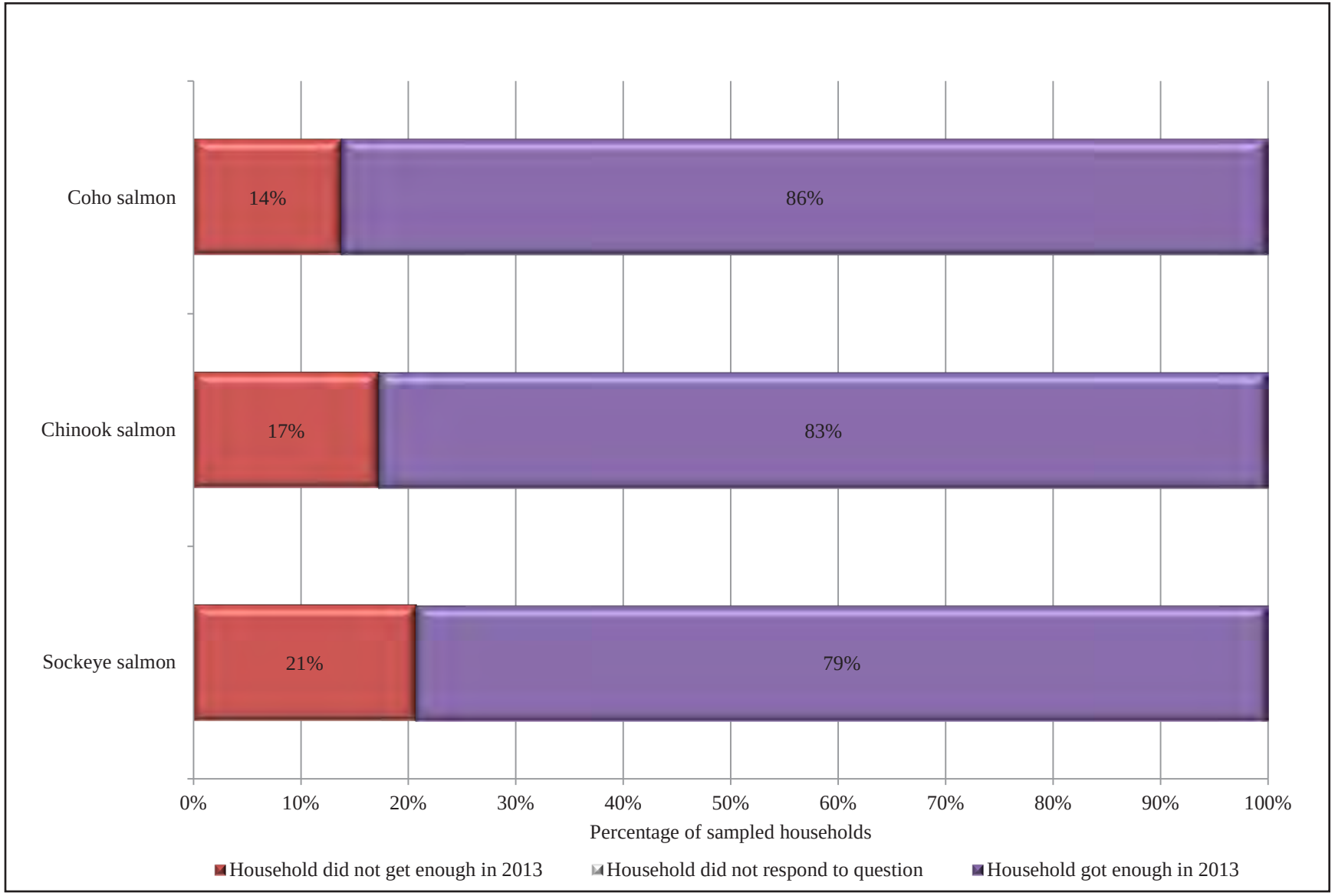


Figure 3-22.–Percentage of sampled households reporting whether they had enough salmon resources, Ekwok, 2013.

Table 3-12.–Percentage of households reporting whether they had enough salmon resources, Ekwok, 2013.

		Households not getting enough _____ .			
	Sampled	Valid responses[a]		Did not get enough	
Resource	households	Number	Percentage	Number	Percentage
Coho salmon	29	29	100.0%	4	13.8%
Chinook salmon	29	29	100.0%	5	17.2%
Sockeye salmon	29	29	100.0%	6	20.7%

Source ADF&G Division of Subsistence household surveys, 2014.
a. Does not include households that did not respond to the question or those households that never use the resource.

Table 3-13.–Reasons why households did not have enough salmon resources, Ekwok, 2013.

Resource	Valid responses[a]	Personal or family reasons		Resource availability		Too far to travel		Lack of equipment		Did not receive as much	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	4	2	50.0%	0	0.0%	0	0.0%	1	25.0%	0	0.0%
Chinook salmon	5	2	40.0%	0	0.0%	0	0.0%	2	40.0%	0	0.0%
Sockeye salmon	6	3	50.0%	0	0.0%	0	0.0%	1	16.7%	0	0.0%

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Table 3-13.–Continued.

Resource	Valid responses[a]	Less effort		Unsuccessful		Weather		Other reasons		Not enough time	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	4	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	25.0%
Chinook salmon	5	0	0.0%	1	20.0%	0	0.0%	0	0.0%	0	0.0%
Sockeye salmon	6	0	0.0%	0	0.0%	0	0.0%	0	0.0%	3	50.0%

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Table 3-13.–Continued.

Resource	Valid responses[a]	Regulations		Animals too small or diseased		Fuel too expensive	
		Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	4	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	5	0	0.0%	0	0.0%	0	0.0%
Sockeye salmon	6	0	0.0%	0	0.0%	0	0.0%

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

Note Households may provide more than one response to the question.

a. Includes those households providing a valid reason for not getting enough.

Table 3-14.–Salmon resources that sampled households reported needing, Ekwok, 2013.

Resource	Households needing	Total amount needed	Average amount needed
Coho salmon	3	90	30
Chinook salmon	3	105	35
Sockeye salmon	5	245	49

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

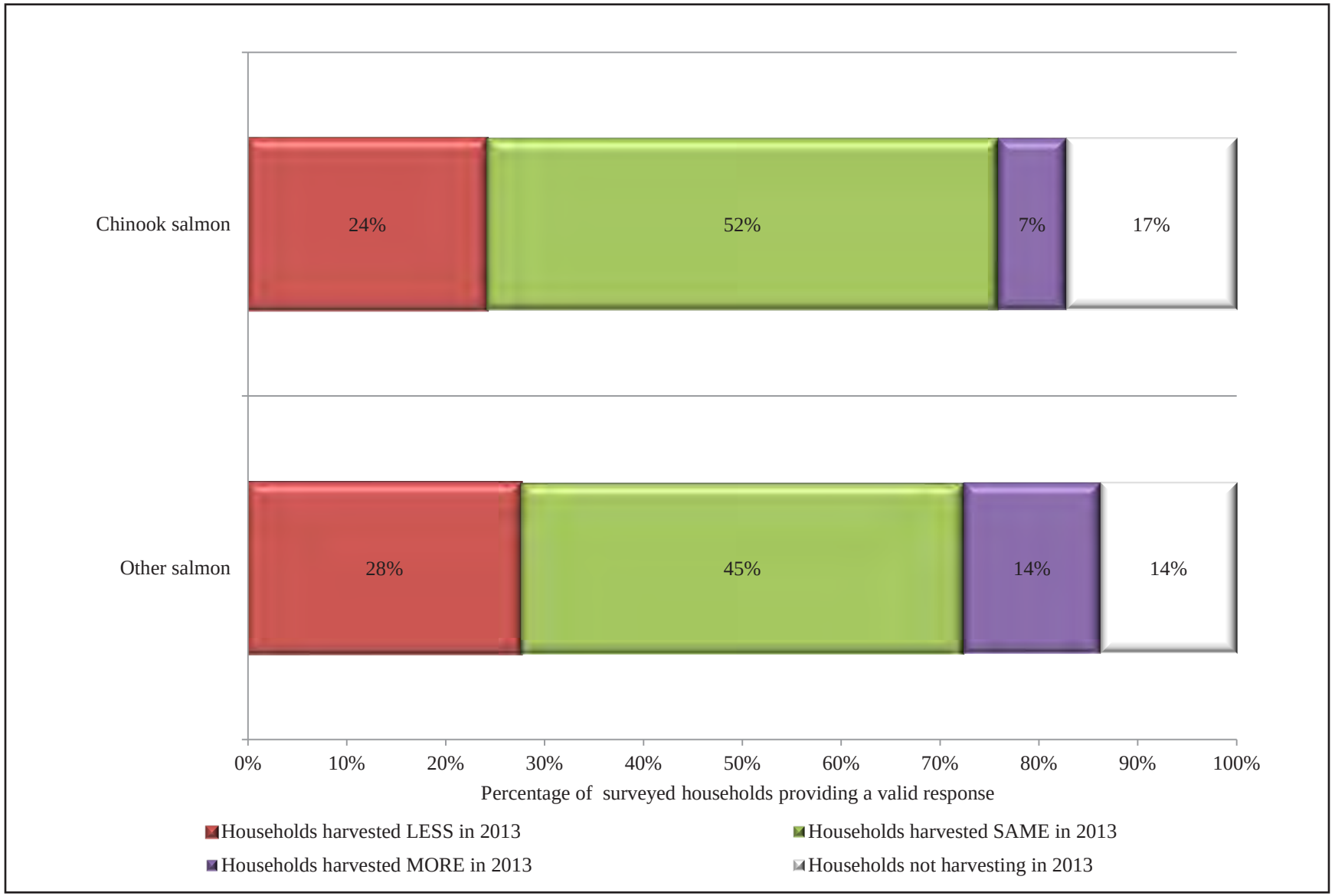


Figure 3-23.–Changes in household harvests of salmon resources compared to recent years, Ekwok, 2013.

Table 3-15.–Changes in household harvests of salmon resources compared to recent years, Ekwok, 2013.

Resource	Sampled households	Valid responses[a]	Households reporting harvest: Total households Number	Total households Percentage	Less Number	Less Percentage	Same Number	Same Percentage	More Number	More Percentage	Households not harvesting in 2013 Number	Households not harvesting in 2013 Percentage
Any resource	29	29	25	86.2%	12	41.4%	18	62.1%	4	13.8%	5	17.2%
Chinook salmon	29	29	24	82.8%	7	24.1%	15	51.7%	2	6.9%	5	17.2%
Other salmon	29	29	25	86.2%	8	27.6%	13	44.8%	4	13.8%	4	13.8%

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

a. Valid responses do not include households that did not provide any response.

Table 3-16.–Reasons for less household harvests of salmon resources compared to recent years, Ekwok, 2013.

Resource	Households reporting reasons for less harvest	Family/ personal Number	Family/ personal Percentage	Resources less available Number	Resources less available Percentage	Too far to travel Number	Too far to travel Percentage	Lack of equipment Number	Lack of equipment Percentage	Less sharing Number	Less sharing Percentage	Lack of effort Number	Lack of effort Percentage	Unsuccessful Number	Unsuccessful Percentage	Weather/ environment Number	Weather/ environment Percentage
Any resource	12	2	16.7%	1	8%	0	0.0%	0	0%	0	0%	1	8%	0	0.0%	1	8.3%
Chinook salmon	7	2	28.6%	1	14%	0	0.0%	0	0%	0	0%	1	14%	0	0.0%	1	14.3%
Other salmon	8	1	12.5%	0	0%	0	0.0%	0	0%	0	0%	0	0%	0	0.0%	1	12.5%

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Table 3-16.–Continued.

Resource	Households reporting reasons for less harvest	Other reasons Number	Other reasons Percentage	Working/ no time Number	Working/ no time Percentage	Regulations Number	Regulations Percentage	Small/ diseased animals Number	Small/ diseased animals Percentage	Did not get enough Number	Did not get enough Percentage	Did not need Number	Did not need Percentage	Equipment/ fuel expense Number	Equipment/ fuel expense Percentage	Too much competition Number	Too much competition Percentage
Any resource	12	1	8%	3	25.0%	0	0.0%	0	0.0%	1	8.3%	3	25.0%	0	0.0%	0	0.0%
Chinook salmon	7	0	0%	2	28.6%	0	0.0%	0	0.0%	0	0.0%	1	14.3%	0	0.0%	0	0.0%
Other salmon	8	1	13%	2	25.0%	0	0.0%	0	0.0%	1	12.5%	2	25.0%	0	0.0%	0	0.0%

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

Table 3-17.–Reasons for more household harvests of salmon resources compared to recent years, Ekwok, 2013.

Resource	Households reporting reasons for more harvest	Increased availability		Used other resources		Favorable weather		Received more		Needed more		Increased effort		Had more help	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	3	1	33.3%	0	0.0%	2	66.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	2	1	50.0%	0	0.0%	1	50.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Other salmon	3	0	0.0%	0	0.0%	2	66.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

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Table 3-17.–Continued.

Resource	Households reporting reasons for more harvest	Other		Regulations		Traveled farther		More success		Needed less		Store-bought expense		Got/ fixed equipment	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	3	1	33.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	2	1	50.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Other salmon	3	1	33.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

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

There were 12 households (41%) that reported less harvest of any salmon species, but in this community there was some level of increased harvests (Table 3-15). Two households indicated more harvest of Chinook salmon, as compared to the last five years, stating the reasons were increased availability (one), more favorable weather (one), and other reasons (one) (Table 3-17). Four households reported more harvest of the other species combined; two of those households credited more favorable weather for the increased harvest (Table 3-15; Table 3-17).

Assessments of Use of Chinook, Sockeye, and Coho Salmon Through Harvest or Sharing: 2014

Figure 3-24 and Table 3-18 provide a broad overview of Ekwok households' assessments of the availability of Chinook, sockeye, and coho salmon for use in 2014. For both Chinook and sockeye salmon, 23% of households (seven households) explained that they did not get enough salmon in 2014, with 77% reporting that they did get enough of these resources (through either their own efforts or sharing). Lastly, six households (20%) reported that they did not get enough coho salmon.

When asked why they did not get enough Chinook salmon, 57% of responses indicated a lack of equipment, 29% responded that they did not have enough time, and 29% cited other unspecified reasons to account for not having enough (Table 3-19). Reasons for not having enough sockeye salmon were reported as due to personal/family reasons (29%), lack of equipment (29%), not enough time (29%), less effort (14%), and other unspecified reasons (14%). Three responses indicated that households did not get enough coho salmon due to lack of equipment; other reasons cited were not having enough time (two responses), and personal/family reasons (one). Six households reported that they needed more Chinook salmon to meet their food security needs, with the average amount of fish needed per household at 43 (Table 3-20). Six households indicated that they needed more sockeye salmon, with the average amount needed being 98 fish per household, and five households reported they would ideally like to have 44 coho salmon per household.

Comparing Harvests of Chinook and Other Salmon Over Time: 2014

There were seven Ekwok households that indicated they harvested fewer Chinook salmon in 2014 than in the past five years, nine reported the same level of harvest, and six reported more harvest (Table 3-21; Figure 3-25). Reasons for less harvest of Chinook salmon were given as personal/family reasons (two households), the resource was less available (two), lack of equipment (two), working/no time (one), and another unspecified reason (one) (Table 3-22).

Six households reported less harvest for all other salmon species (Table 3-21; Figure 3-25). Reasons for less harvest of all other salmon species, compared to the last five years, were reported as primarily due to personal/family reasons (two responses) and resources were less available (two); other stated reasons were lack of equipment (one) and working/no time (one) (Table 3-22).

There were eight households that reported less harvest of any salmon species in 2014; however, nearly the same number of households (seven) reported more harvest of any salmon species (Table 3-21). Six households indicated more harvest of Chinook salmon as compared to the last five years, stating the following reasons why: increased resource availability (two responses), more favorable weather (one), increased effort (one), had more help (one), more overall success (one), and needed more (one) (Table 3-23). Four households reported more harvest of all other species combined, citing increased availability of resources (two), increased effort (one), and that the household needed more (one) as reasons why.

Assessment Comments

Some survey comments from Ekwok respondents are below, with more qualitative information provided in Chapter 8: "Local and Traditional Knowledge of Salmon and Subsistence on the Nushagak River." Survey respondents commented on a variety of reasons for their pattern of salmon use and harvest. Conditions, such as water temperature, later Chinook and earlier sockeye salmon runs, and bycatch, were mentioned as concerns from Ekwok residents in 2013. Pebble Mine, a copper/gold/molybdenum open-pit mine project proposed at Bristol Bay's headwaters, was also mentioned as a concern to residents. In 2014, sharing was mentioned as an important part of the community, yet not all residents were able to get fish from others.

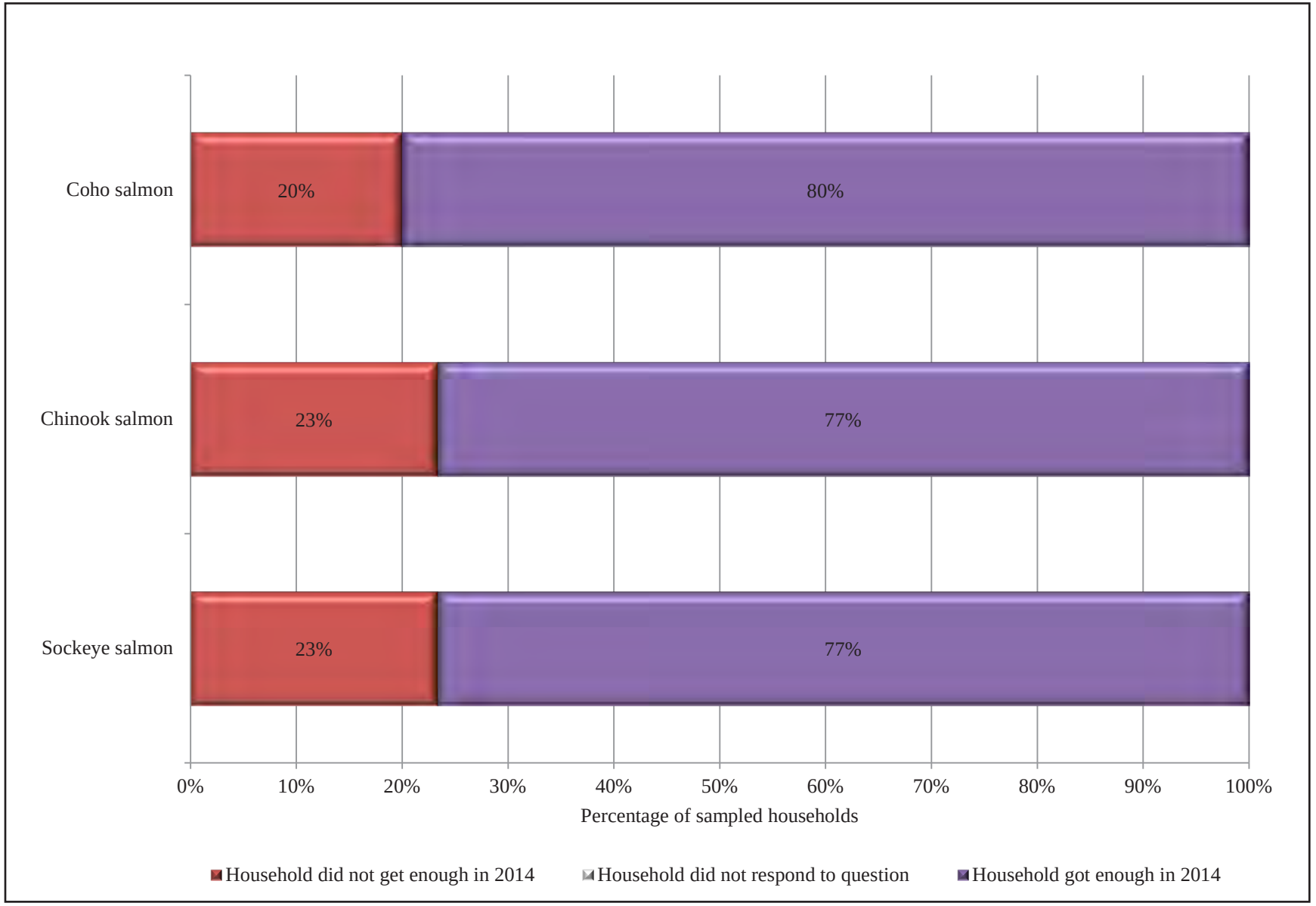


Figure 3-24.–Percentage of sampled households reporting whether they had enough salmon resources, Ekwok, 2014.

Table 3-18.–Percentage of households reporting whether they had enough salmon resources, Ekwok, 2014.

Resource	Sampled households	Households not getting enough _____ . Valid responses[a] Number	Valid responses[a] Percentage	Did not get enough Number	Did not get enough Percentage
Coho salmon	30	30	100.0%	6	20.0%
Chinook salmon	30	30	100.0%	7	23.3%
Sockeye salmon	30	30	100.0%	7	23.3%

Source ADF&G Division of Subsistence household surveys, 2015.
a. Does not include households that did not respond to the question or those households that never use the resource.

Table 3-19.–Reasons why households did not have enough salmon resources, Ekwok, 2014.

Resource	Valid responses[a]	Personal or family reasons		Resource availability		Too far to travel		Lack of equipment		Did not receive as much	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	6	1	16.7%	0	0.0%	0	0.0%	3	50.0%	0	0.0%
Chinook salmon	7	0	0.0%	0	0.0%	0	0.0%	4	57.1%	0	0.0%
Sockeye salmon	7	2	28.6%	0	0.0%	0	0.0%	2	28.6%	0	0.0%

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Table 3-19.–Continued.

Resource	Valid responses[a]	Less effort		Unsuccessful		Weather		Other reasons		Not enough time	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	6	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2	33.3%
Chinook salmon	7	0	0.0%	0	0.0%	0	0.0%	2	28.6%	2	28.6%
Sockeye salmon	7	1	14.3%	0	0.0%	0	0.0%	1	14.3%	2	28.6%

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Table 3-19.–Continued.

Resource	Valid responses[a]	Regulations		Animals too small or diseased		Fuel too expensive	
		Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	6	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	7	0	0.0%	0	0.0%	0	0.0%
Sockeye salmon	7	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2015.

Note Households may provide more than one response to the question.

a. Includes those households providing a valid reason for not getting enough.

Table 3-20.–Salmon resources that sampled households reported needing, Ekwok, 2014.

Resource	Households needing	Total amount needed	Average amount needed
Coho salmon	5	220	44
Chinook salmon	6	260	43
Sockeye salmon	6	590	98

Source ADF&G Division of Subsistence household surveys, 2015.

Table 3-21.–Changes in household harvests of salmon resources compared to recent years, Ekwok, 2014.

			Households reporting harvest								Households not harvesting in 2014	
			Total households		Less		Same		More			
Resource	Sampled households	Valid responses[a]	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	30	30	22	73.3%	8	26.7%	13	43.3%	7	23.3%	8	26.7%
Chinook salmon	30	30	22	73.3%	7	23.3%	9	30.0%	6	20.0%	8	26.7%
Other salmon	30	30	22	73.3%	6	20.0%	12	40.0%	4	13.3%	8	26.7%

Source ADF&G Division of Subsistence household surveys, 2015.

a. Valid responses do not include households that did not provide any response.

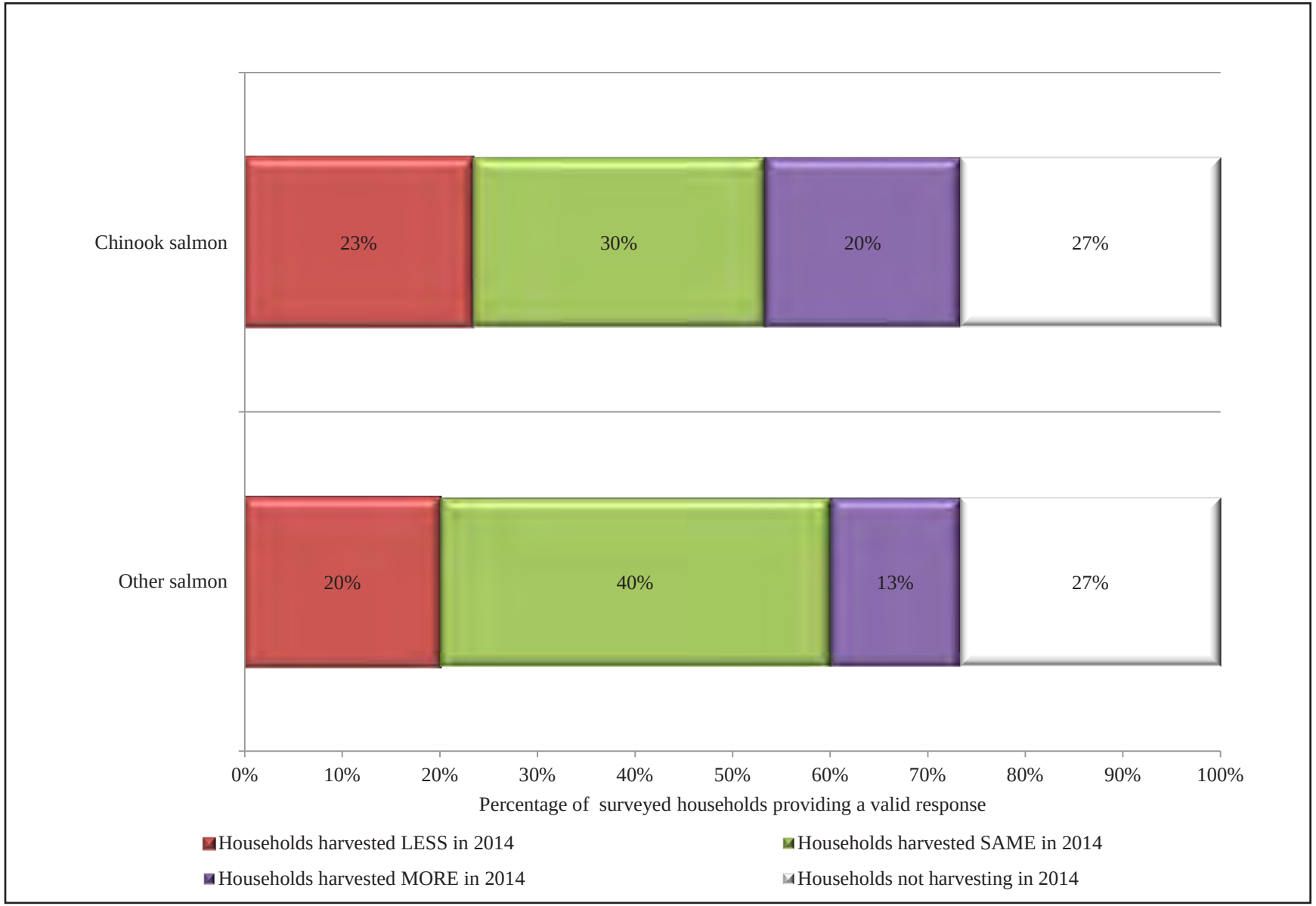


Figure 3-25.–Changes in household harvests of salmon resources compared to recent years, Ekwok, 2014.

Table 3-22.–Reasons for less household harvests of salmon resources compared to recent years, Ekwok, 2014.

Resource	Households reporting reasons for less harvest	Family/ personal		Resources less available		Too far to travel		Lack of equipment		Less sharing		Lack of effort		Unsuccessful		Weather/ environment	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	8	2	25.0%	3	38%	0	0.0%	2	25%	0	0%	0	0%	0	0.0%	0	0.0%
Chinook salmon	7	2	28.6%	2	29%	0	0.0%	2	29%	0	0%	0	0%	0	0.0%	0	0.0%
Other salmon	6	2	33.3%	2	33%	0	0.0%	1	17%	0	0%	0	0%	0	0.0%	0	0.0%

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Table 3-22.–Continued.

Resource	Households reporting reasons for less harvest	Other reasons		Working/ no time		Regulations		Small/ diseased animals		Did not get enough		Did not need		Equipment/ fuel expense		Too much competition	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	8	1	13%	1	12.5%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	7	1	14%	1	14.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Other salmon	6	0	0%	1	16.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2015.

Table 3-23.–Reasons for more household harvests of salmon resources compared to recent years, Ekwok, 2014.

Resource	Households reporting reasons for more harvest	Increased availability		Used other resources		Favorable weather		Received more		Needed more		Increased effort		Had more help	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	7	2	28.6%	0	0.0%	1	14.3%	0	0.0%	1	14.3%	2	28.6%	1	14.3%
Chinook salmon	6	2	33.3%	0	0.0%	1	16.7%	0	0.0%	1	16.7%	1	16.7%	1	16.7%
Other salmon	4	2	50.0%	0	0.0%	0	0.0%	0	0.0%	1	25.0%	1	25.0%	0	0.0%

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Table 3-23.–Continued.

Resource	Households reporting reasons for more harvest	Other		Regulations		Traveled farther		More success		Needed less		Store-bought expense		Got/ fixed equipment	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	7	0	0.0%	0	0.0%	0	0.0%	1	14.3%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	6	0	0.0%	0	0.0%	0	0.0%	1	16.7%	0	0.0%	0	0.0%	0	0.0%
Other salmon	4	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2015.

Permits and gear types were mentioned in terms of what is and is not considered subsistence by regulation. The health of salmon was also discussed.

Comments from 2013:

- Late king run could be a result of bycatch. I have noticed a late run for the last year. We usually like to get our kings before the reds come.
- Would like the state to reduce the bycatch of salmon.
- High seas interception [via] factory trawlers [is] caus[ing] the declining returns.
- I don't like Pebble Mine; we need the fish. We were raised on the fish and I think the mine will destroy the fish.

Comments from 2014:

- [We] had no way to get [our] own fish and no one shared.
- Rod and reel was not shown on the permit but it was still subsistence.
- Pus balls in the meat of the kings and silvers [coho salmon].
- The fish are getting better and better, thicker runs.

Community Data Review Meeting

A data review meeting was held in Ekwok on March 22, 2018. There were eight people in attendance. A few community members discussed the past characteristics of the Nushagak River sockeye and Chinook salmon runs, and noted that the main species prior to 1970 was sockeye salmon, until Chinook "took over." The nature of salmon runs was described as cyclical, with peak years and "crash" years. Sockeye salmon were regarded as "over-escaping" into the local rivers and lakes, and that this may predicate a "crash" of sockeye salmon. The study year 2014 was described as a peak return year, which also corresponded with survey data for the study years. One elder also indicated that if households did not harvest enough Chinook salmon that they would substitute with coho salmon. Further discussion on the changes in salmon use reported that elders in Ekwok who used to eat salmon every day had passed away and that in the 1980s the community experienced a dietary shift away from traditional food to more store-bought foods. Additionally, the use (and subsequent feeding) of sled dogs also declined in Ekwok, which may have accounted for salmon harvest declines over time. These reasons were given as possible explanations for an overall decline, in the past 30 years, of subsistence sockeye, chum, and pink salmon use and harvest (Figure 7-9). Chinook and coho salmon harvests showed a variable pattern over time, with no clear downward or upward trend of harvest. In general though, total harvests have declined. Community members commented on the Nushagak River increasing in temperature and becoming shallower. Lastly, several residents agreed that the meat of Chinook salmon had changed by losing firmness and becoming softer over time.

A Brief Comparison of Harvest Data Between Study Years

For the study years of this project, 2014 seemed to be a more overall successful year for Ekwok residents, with the total harvest increasing in 2014 by 12,617 lb compared to 2013. The largest difference in the catch was for Chinook salmon, with 1,644 fish caught in 2014 and 927 fish caught in 2013, a difference of 717 fish. The increase of the coho salmon catch in the second study year was by 641 fish. Pink salmon were not caught at all in 2013, but 200 were harvested in 2014. A general increase for the community occurred regarding salmon harvest: more households indicated harvesting more salmon compared to recent years in 2014 than in 2013 (Figure 3-23; Figure 3-25).

Overall, for the entire Nushagak District, estimated subsistence Chinook salmon harvests during the study years based on subsistence permit returns increased with a total fish harvest in 2013 of 11,602 and 16,049 Chinook salmon harvested in 2014 (Fall et al. 2015, 2017). Interestingly, the overall total run of Chinook salmon was less in 2014 (96,872) than in 2013 (133,246), indicating that despite total run size, Ekwok residents were able to harvest more of the resource than in the prior year (Salomone et al. 2017:91).

Further changes in the harvest of salmon by Ekwok residents can be understood through comparisons with findings from an earlier study year. The previous study done in Ekwok was for the study period of April 1987–March 1988 and the results were published in Schichnes and Chythlook (1991): *Contemporary Use of Fish and Wildlife in Ekwok, Koliganek, and New Stuyahok, Alaska* (Technical Paper No. 185). Both the report and data may be found online on the ADF&G website and CSIS. In Chapter 7: "The Subsistence Permit System" there is additional discussion about previous study year salmon harvest estimates, specifically under the subheading "Comparison of Household Survey and Permit Data for Study Years."

4. NEW STUYAHOK

Community Background

New Stuyahok is a small community located 52 miles up the Nushagak River from Dillingham and 12 miles upstream from Ekwok.[1] The Yup'ik name for New Stuyahok is *Cetuyaraq,* which means "to go downriver" (Schichnes and Chythlook 1991). "Old Stuyahok" was a village site at the confluence of the Stuyahok and Mulchatna rivers, where reindeer herding, done for the U.S. government, was a part of the village economy (Schichnes and Chythlook 1991). Like Koliganek and Ekwok, flooding affected Old Stuyahok, and in 1940–1942, the present location of New Stuyahok was established (Krieg et al. 2009; Schichnes and Chythlook 1991). Residents moving into New Stuyahok also arrived from an old site called Nunachuak, located about 15 miles upstream from New Stuyahok (Krieg et al. 2009). A BIA school was established in 1954, with a larger school built in 1960, and the community gained improved commercial salmon fishing access and barge service at the new location (Krieg et al. 2009; Schichnes and Chythlook 1991).

New Stuyahok is only accessed by airplane and boat, or snowmachine in winter. The airport services both small transporter aircraft and larger commercial airline companies. There are basic amenities such as a store, a post office, a State of Alaska-funded public safety officer, an electric utility, cell phone service, a landfill, a health clinic, a volunteer fire department, and a tribal administration building for the village corporation, Stuyahok Limited. The name of the federally recognized tribe is New Stuyahok Village. New Stuyahok is also the largest of the study communities, aside from the regional hub Dillingham.

The geography of New Stuyahok is considered a tundra landscape interspersed with boreal forest that is characterized by short, warm summers, and long, cold winters. The river is ice-free from roughly June to mid-November.

Population Estimates and Demographic Information: 2013 and 2014

Table 4-1 shows population information for New Stuyahok during 2013 and 2014. The estimated population for New Stuyahok in 2013 was 543 people, with the Alaska Native population estimated at 523 individuals (97%) (Table 4-1; Figure 4-1). Eligible households in the community (living in the community more than three months) were estimated at 121 with a mean household size of 4.5 (Table 4-1). Alaska Native households (where one head of the household is Alaska Native) totaled 114, composing 94% of the community. In 2014, the population in New Stuyahok decreased by 28 people, with an estimate of 515 individuals within 112 households. The Alaska Native population was estimated at 499 people in 105 households. The average age of a New Stuyahok resident during the study was 28–29, with the minimum being less than 1 year of age, and the maximum being 91.

Over time the population of New Stuyahok has increased steadily from roughly 100 individuals in 1950, to approximately 300 individuals in 1980, to the current estimate of 515 people in the last study year of the project (Figure 4-2).

Compared to Clarks Point and Ekwok, the community of New Stuyahok had a more youthful population. One-half the population was under the age of 25 in both study years (Table 4-2; Table 4-3). Also, for both years, there were more males in the community; the population ratio was 56% male and 44% female (Figure 4-3; Figure 4-4).

Sampling results in 2013 identified a final estimate of 121 dwelling units, or eligible households, 89 of which were successfully interviewed; the percentage of sampled households was 74% (Table 4-4). In 2013, 10 households failed to be contacted, 9 households declined to be surveyed, and 14 moved or were occupied by a nonresident. In 2014, 112 households were identified, with the total interviewed being 101, making

1. *Community Database Online,* s.v. "New Stuyahok" (by Alaska Department of Commerce, Community, and Economic Development), https://www.commerce.alaska.gov/dcra/DCRAExternal/community/Details/e12f5cec-01a1-48cb-97e8-a0efd9c45949 (accessed February 12, 2018).

Table 4-1.–Sample and demographic characteristics, New Stuyahok, 2013, and 2014.

Characteristics	New Stuyahok 2013	New Stuyahok 2014
Sampled households	89	101
Eligible households	121	112
Percentage sampled	73.6%	90.2%
Sampled population	399	464
Estimated community population	542.5	514.5
Range[a]	512 – 572	497 – 532
Household size		
Mean	4.5	4.6
Minimum	1	1
Maximum	10	12
Age		
Mean	28.7	27.5
Minimum[b]	0	0
Maximum	88	91
Median	24	24
Alaska Native		
Estimated households[c]		
Number	114.2	105.3
Percentage	94.4%	94.1%
Estimated population		
Number	523.4	499.0
Percentage	96.5%	97.0%
Range[a]	494 – 553	482 – 516
U.S. Census 2010[d]		
Households	114	114
Population	510	510
Alaska Native population	491	491
American Community Survey 5-year average[e]		
Households	101	107
Range[f]	82 – 120	92 – 122
Population	563	574
Range[f]	472 – 654	508 – 640
Alaska Native population	556	568
Range[f]	466 – 646	504 – 632

Source ADF&G Division of Subsistence household surveys, 2014 and 2015.

a. Estimated range is 95% confidence interval.

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

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

d. Source is U.S. Census Bureau (2011).

e. Source is U.S. Census Bureau for American Community Survey (ACS); 2009–2013 ACS estimates used for 2013, 2010–2014 ACS estimates used for 2014.

f. ACS data range is the reported margin of error.

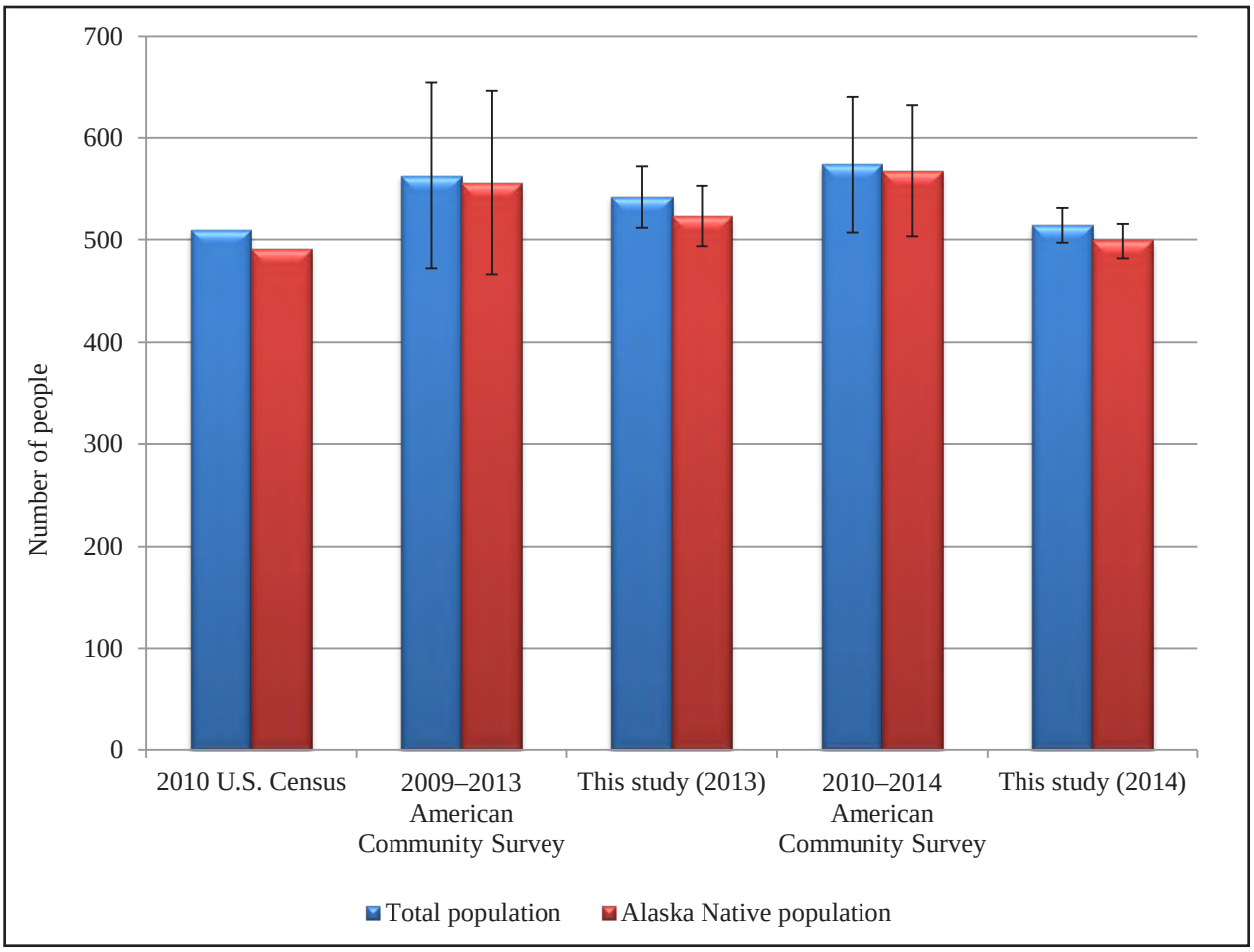


Figure 4-1.–Alaska Native and overall population estimates, New Stuyahok, 2010, 2013, and 2014.

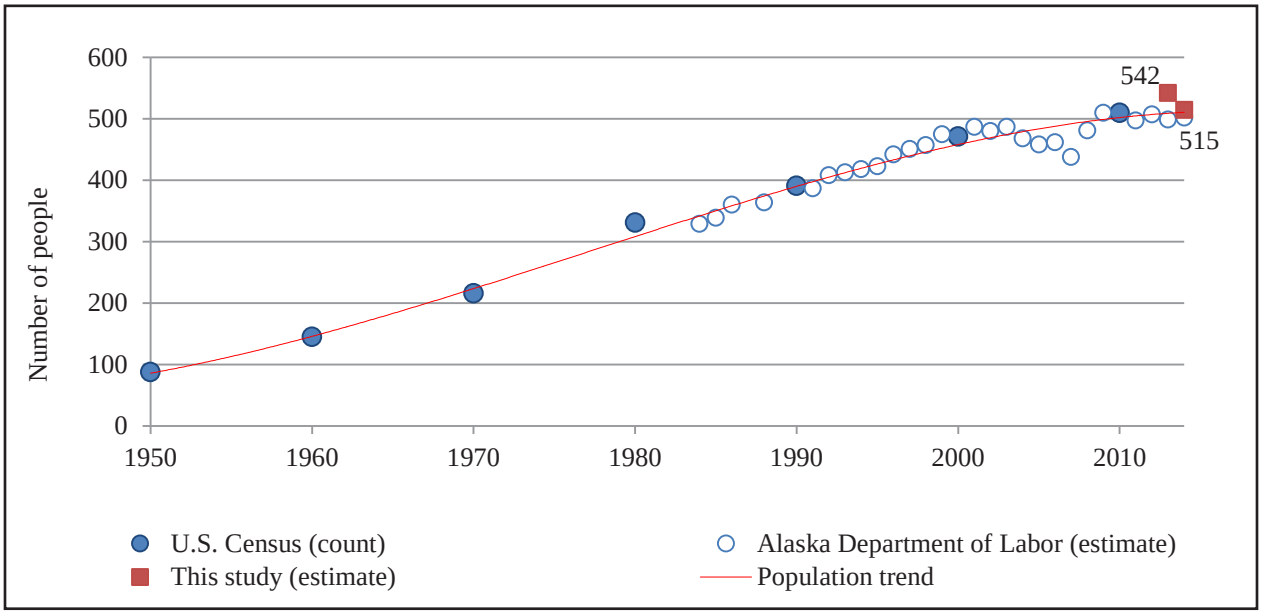


Figure 4-2.–Historical population estimates, New Stuyahok, 1950–2014.

Table 4-2.–Population profile, New Stuyahok, 2013.

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	39.4	12.9%	12.9%	16.3	6.9%	6.9%	55.7	10.3%	10.3%
5–9	23.1	7.6%	20.4%	29.9	12.6%	19.5%	53.0	9.8%	20.1%
10–14	38.1	12.4%	32.9%	24.5	10.3%	29.9%	62.5	11.5%	31.6%
15–19	34.0	11.1%	44.0%	16.3	6.9%	36.8%	50.3	9.3%	40.9%
20–24	28.6	9.3%	53.3%	17.7	7.5%	44.3%	46.2	8.5%	49.4%
25–29	23.1	7.6%	60.9%	23.1	9.8%	54.0%	46.2	8.5%	57.9%
30–34	12.2	4.0%	64.9%	10.9	4.6%	58.6%	23.1	4.3%	62.2%
35–39	8.2	2.7%	67.6%	13.6	5.7%	64.4%	21.8	4.0%	66.2%
40–44	13.6	4.4%	72.0%	12.2	5.2%	69.5%	25.8	4.8%	70.9%
45–49	20.4	6.7%	78.7%	12.2	5.2%	74.7%	32.6	6.0%	76.9%
50–54	10.9	3.6%	82.2%	9.5	4.0%	78.7%	20.4	3.8%	80.7%
55–59	9.5	3.1%	85.3%	15.0	6.3%	85.1%	24.5	4.5%	85.2%
60–64	15.0	4.9%	90.2%	13.6	5.7%	90.8%	28.6	5.3%	90.5%
65–69	8.2	2.7%	92.9%	4.1	1.7%	92.5%	12.2	2.3%	92.7%
70–74	9.5	3.1%	96.0%	6.8	2.9%	95.4%	16.3	3.0%	95.7%
75–79	2.7	0.9%	96.9%	2.7	1.1%	96.6%	5.4	1.0%	96.7%
80–84	2.7	0.9%	97.8%	1.4	0.6%	97.1%	4.1	0.8%	97.5%
85–89	0.0	0.0%	97.8%	1.4	0.6%	97.7%	1.4	0.3%	97.7%
90–94	0.0	0.0%	97.8%	0.0	0.0%	97.7%	0.0	0.0%	97.7%
95–99	0.0	0.0%	97.8%	0.0	0.0%	97.7%	0.0	0.0%	97.7%
100–104	0.0	0.0%	97.8%	0.0	0.0%	97.7%	0.0	0.0%	97.7%
Missing	6.8	2.2%	100.0%	5.4	2.3%	100.0%	12.2	2.3%	100.0%
Total	**305.9**	**100.0%**	**100.0%**	**236.6**	**100.0%**	**100.0%**	**542.5**	**100.0%**	**100.0%**

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

Table 4-3.–Population profile, New Stuyahok, 2014.

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	44.4	15.3%	15.3%	23.3	10.4%	10.4%	67.6	13.2%	13.2%
5–9	21.1	7.3%	22.6%	28.8	12.9%	23.3%	49.9	9.7%	22.9%
10–14	32.2	11.1%	33.7%	14.4	6.4%	29.7%	46.6	9.1%	32.0%
15–19	28.8	10.0%	43.7%	20.0	8.9%	38.6%	48.8	9.5%	41.5%
20–24	24.4	8.4%	52.1%	15.5	6.9%	45.5%	39.9	7.8%	49.2%
25–29	25.5	8.8%	60.9%	18.9	8.4%	54.0%	44.4	8.6%	57.9%
30–34	10.0	3.4%	64.4%	11.1	5.0%	58.9%	21.1	4.1%	62.0%
35–39	8.9	3.1%	67.4%	15.5	6.9%	65.8%	24.4	4.8%	66.7%
40–44	13.3	4.6%	72.0%	10.0	4.5%	70.3%	23.3	4.5%	71.3%
45–49	16.6	5.7%	77.8%	11.1	5.0%	75.2%	27.7	5.4%	76.7%
50–54	10.0	3.4%	81.2%	11.1	5.0%	80.2%	21.1	4.1%	80.8%
55–59	7.8	2.7%	83.9%	11.1	5.0%	85.1%	18.9	3.7%	84.4%
60–64	14.4	5.0%	88.9%	7.8	3.5%	88.6%	22.2	4.3%	88.8%
65–69	4.4	1.5%	90.4%	7.8	3.5%	92.1%	12.2	2.4%	91.1%
70–74	7.8	2.7%	93.1%	3.3	1.5%	93.6%	11.1	2.2%	93.3%
75–79	3.3	1.1%	94.3%	4.4	2.0%	95.5%	7.8	1.5%	94.8%
80–84	3.3	1.1%	95.4%	1.1	0.5%	96.0%	4.4	0.9%	95.7%
85–89	1.1	0.4%	95.8%	0.0	0.0%	96.0%	1.1	0.2%	95.9%
90–94	1.1	0.4%	96.2%	0.0	0.0%	96.0%	1.1	0.2%	96.1%
95–99	0.0	0.0%	96.2%	0.0	0.0%	96.0%	0.0	0.0%	96.1%
100–104	0.0	0.0%	96.2%	0.0	0.0%	96.0%	0.0	0.0%	96.1%
Missing	11.1	3.8%	100.0%	8.9	4.0%	100.0%	20.0	3.9%	100.0%
Total	**289.4**	**100.0%**	**100.0%**	**224.0**	**100.0%**	**100.0%**	**513.4**	**100.0%**	**100.0%**

Source ADF&G Division of Subsistence household surveys, 2015.

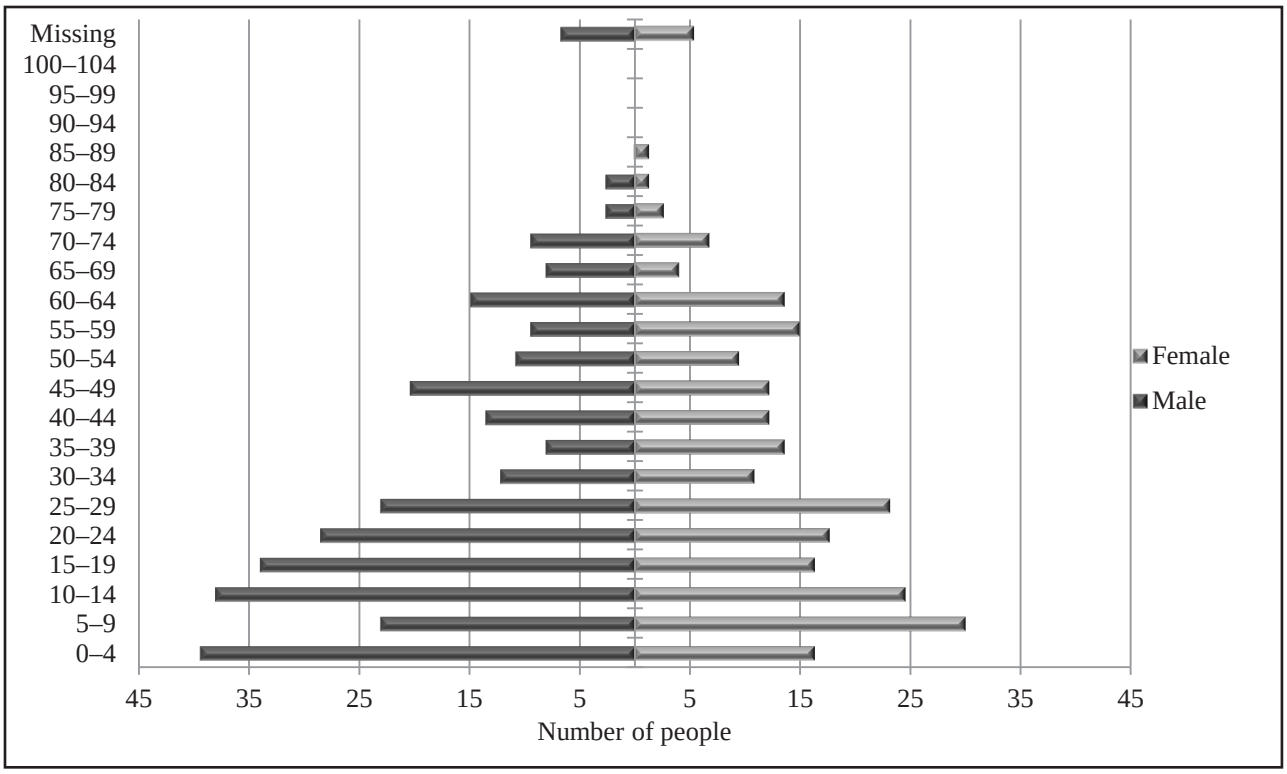


Figure 4-3.–Population profile, New Stuyahok, 2013.

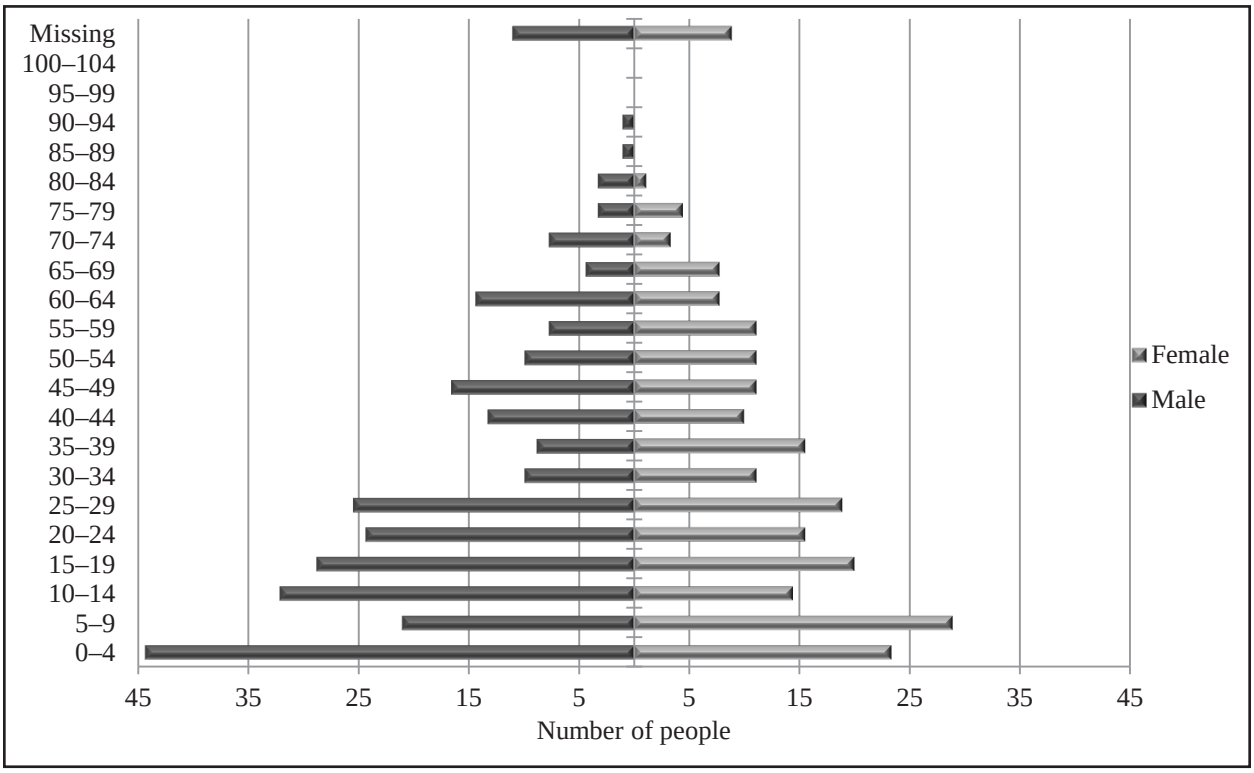


Figure 4-4.–Population profile, New Stuyahok, 2014.

Table 4-4.–Sample achievement, New Stuyahok, 2013 and 2014.

Sample information	2013	2014
Number of dwelling units	122	114
Interview goal	122	114
Households interviewed	89	101
Households failed to be contacted[a]	23	9
Households declined to be interviewed	9	2
Households moved or occupied by nonresident	1	2
Total households attempted to be interviewed	108	112
Refusal rate	9.2%	1.9%
Final estimate of permanent households	121	112
Percentage of total households interviewed	73.6%	90.2%
Interview weighting factor	1.4	1.1
Sampled population	399	464
Estimated population	542.5	514.5

Source ADF&G Division of Subsistence household surveys, 2014 and 2015.

a. In 2013, 13 households were identified as having moved but were otherwise eligible for inclusion.

the percentage sampled 90%. A total of 9 households failed to be contacted, 2 declined to be interviewed, and 2 moved or were occupied by a nonresident. Beyond basic population, age, and sex demographics, no other information, such as employment characteristics, was obtained from Division of Subsistence surveys. According to the ACS average five-year estimate for 2012–2016, which encompasses both study years for this community, the median household income in New Stuyahok was $40,417 (U.S. Census Bureau n.d.).

Summary of Harvest and Use Patterns

Survey participants were asked about their engagement with the salmon fisheries, and varying amounts of use, attempt to harvest, successful harvest, and sharing of salmon were estimated from survey results. Sharing was identified by survey respondents as fulfilling a large proportion of salmon consumed by households. Salmon were shared in one form or another, which could have included unprocessed or processed fish. The survey effort included two ways to identify gear type used in the study communities. First, respondents were asked to identify the gear type used for salmon harvests reported on the household survey. Second, when identifying fishing and harvest locations on a map, respondents were asked to identify the type of harvest gear used at each location. Note that not every surveyed household provided spatial data (see Table 1-3) and some households did not provide clarification about the gear used at specific fishing and harvest locations. Therefore, the survey results provide two different depictions of harvest patterns by gear type. Also, respondents were not asked to identify where commercial harvests retained for home use came from, but tables showing harvests by gear type do depict the estimated amount of salmon retained from commercial catches. Note that based on comments collected during survey administration, set gillnet was the gillnet gear type most commonly used for subsistence salmon fishing, but some drift gillnet use occurred. The following sections summarize results for harvest and use patterns for each study year.

Individual Participation in the Harvesting and Processing of Salmon: 2013 and 2014

All salmon species found in Alaska were harvested by New Stuyahok residents in the 2013 and 2014 study years: Chinook, sockeye, chum, coho, and pink salmon, as well as spawning salmon of varying species. Figure 4-5 is a visual representation of the level of individual participation in the subsistence harvesting and processing of salmon by members of households in New Stuyahok. An estimated 58% of individuals (313 people) subsistence fished for salmon, and 61% (329 people) processed salmon in the 2013 study year (Table 4-5). In the 2014 study year, an estimated 43% percent (221 people) subsistence fished for salmon, and 47% (243 people) processed harvested salmon.

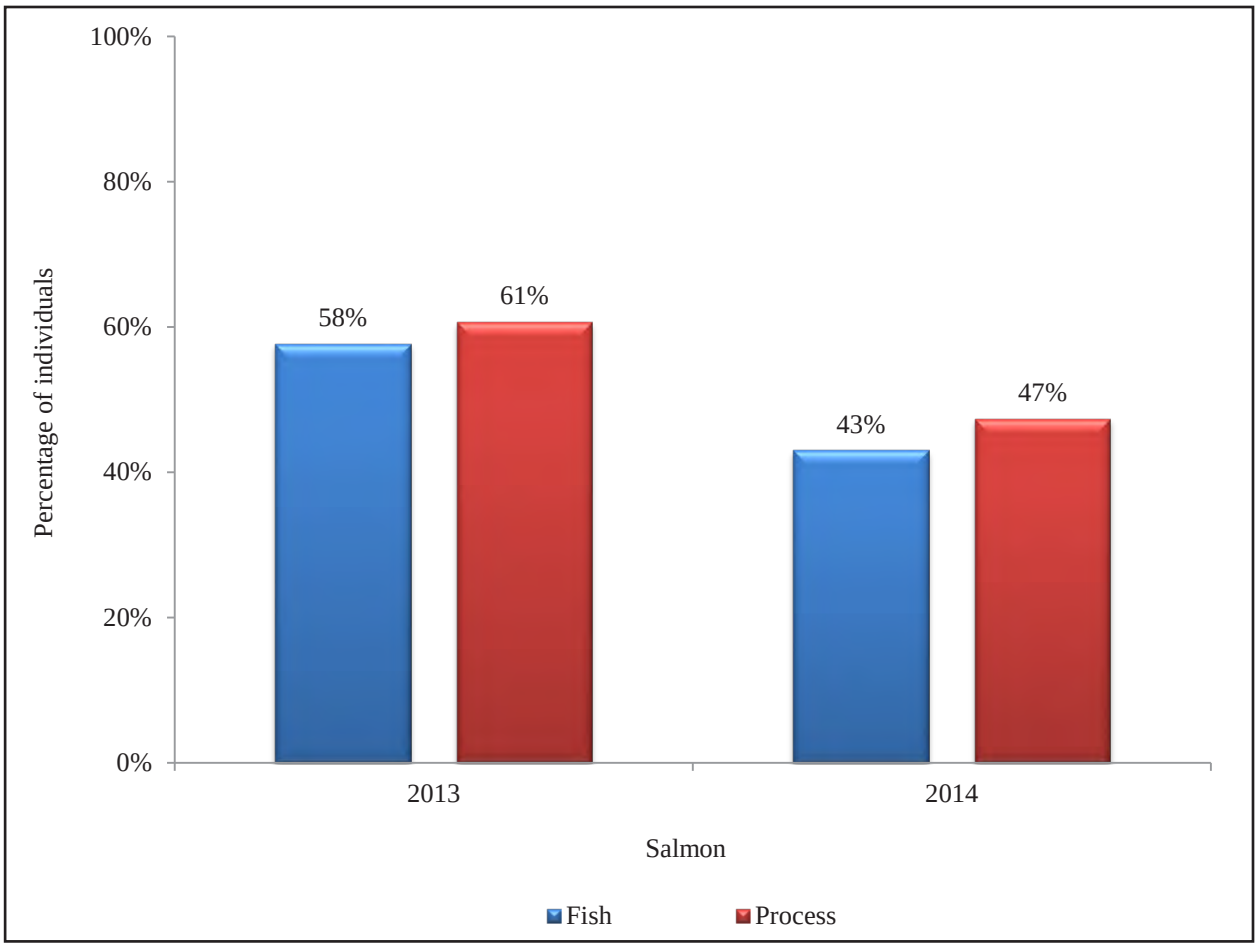


Figure 4-5.–Individual participation in subsistence salmon harvesting and processing activities, New Stuyahok, 2013 and 2014.

Table 4-5.–Individual participation in subsistence salmon harvesting and processing activities, New Stuyahok, 2013 and 2014.

	2013	2014
Total number of people	**542.5**	**514.5**
Salmon		
Fish		
Number	312.7	221.1
Percentage	57.6%	43.0%
Process		
Number	329.0	243.4
Percentage	60.7%	47.3%

Source ADF&G Division of Subsistence household surveys, 2014 and 2015.

Household Salmon Harvest and Use Characteristics in New Stuyahok: 2013

The total estimated number of all salmon species harvested in 2013 by New Stuyahok residents was 17,166 individual fish totaling 131,047 lb harvested (Table 4-6). The highest portion of harvested salmon was Chinook salmon at 81,141 lb (150 lb per capita), followed by sockeye salmon at 29,693 lb (55 lb per capita). The third highest harvested species was coho salmon at 12,248 lb, or 23 lb per capita. This community's total salmon harvest accounted for 1,083 lb per household, or 242 lb per capita. Chinook salmon made up almost two-thirds of all usable harvest weight of salmon, specifically 62% of all the harvest, followed by sockeye salmon at 23%, and coho salmon at 9% (Figure 4-6).

Overall Use by Households and Salmon Harvests by Gear Type

Ninety-one percent of all households in New Stuyahok used salmon in 2013, with 84% attempting and successfully harvesting, 64% receiving salmon, and 74% giving away salmon (Figure 4-7; Table 4-6). The highest percentages of salmon use were for Chinook and sockeye salmon, with 82% and 74% of households using these species, respectively (Table 4-6). Coho salmon was the next most used species (by 73% of households), followed by chum salmon (by 48% of households). Well more than the majority of New Stuyahok households gave away or received salmon from either other community members or from outside of the community. Chinook salmon was the most received fish: 48% of households received Chinook salmon. More households gave away Chinook salmon (62%). Sockeye and coho salmon, which were almost equally shared with New Stuyahok households, at 39% and 38%, respectively, were both given away by 48% of households.

Methods used to harvest salmon included subsistence gillnetting, rod and reel fishing, use of other subsistence gear, and removal from commercial catches (Table 4-7; Figure 4-8). Gillnetting accounted for harvesting 93% of the weight of the salmon harvest in New Stuyahok (Table 4-8). Rod and reel harvests accounted for 7% of the salmon harvest weight, followed by less than 1% harvested by other subsistence methods and removal from commercial catches. The primary species harvested by rod and reel was coho salmon (Table 4-7). Gillnetting, as the dominant method of fishing used by households in New Stuyahok, accounted for 97% or more of the harvest of each species, with the exception of coho and spawning sockeye salmon, for which rod and reel was used to harvest 49% and 37% of the species harvests, respectively (Table 4-8).

Salmon Harvests by Location and Harvest Gear Type

The salmon harvest areas used by New Stuyahok residents in 2013 are depicted by species in Figure 4-9. All species were harvested in 2013, but pink, spawning coho, and spawning chum salmon fishing and harvest locations were not mapped (Table 4-7; Figure 4-9). Salmon harvest activities spanned a large area, from north on the Mulchatna River, to south downriver of Lewis Point. The main harvest areas are concentrated around the community and Lewis Point, which is a traditional fish camp location that has been used by several New Stuyahok families since the 1960s, and probably earlier (Stariwat and Krieg 2016).

New Stuyahok residents harvested all salmon species, but use patterns reveal that Chinook salmon was the dominant species harvested at Lewis Point, which is supported in Stariwat and Krieg (2016) in *Lewis Point Fish Camp Ethnography* (Technical Paper No. 425). In correlation to the harvest amount, the harvest effort for Chinook salmon occurred in greater concentrations in more areas than for any other species.

Coho and Chinook salmon were pursued as far south as the community of Ekwok, which is roughly 10–15 miles south of New Stuyahok. Harvest locations also included both sides of the Nushagak River.

Chinook salmon harvest locations by gear type are shown in Figure 4-10. Gillnet was mainly used to harvest Chinook salmon and this gear type was used in a greater variety of locations than rod and reel; no rod and reel harvests occurred in the Lewis Point area, but there was some rod and reel fishing activity on both sides of the Nushagak River, mostly between Ekwok and New Stuyahok. Respondents indicated using several areas for Chinook fishing by rod and reel, as shown by the green line. The yellow line extending north of the community indicated use of gillnets. More locations for using other gear to harvest Chinook salmon were identified by New Stuyahok and Dillingham respondents than those from the other communities; as indicated by the purple marks, other gear (including seine and dip net) were used more frequently adjacent to the community and at Lewis Point.

Table 4-6.–Estimated use and harvest of salmon, New Stuyahok, 2013.

	Percentage of households					Harvest weight (lb)			Harvest amount			95% confidence
Resource	Use %	Attempt %	Harvest %	Receive %	Give %	Total	Mean per household	Per capita	Total	Unit	Mean per household	limit (±) harvest
Salmon	**91.0**	**84.3**	**84.3**	**64.0**	**74.2**	**131,046.5**	**1,083.0**	**241.6**	**17,166.4**	**ind**	**141.9**	**18.6**
Chum salmon	48.3	46.1	46.1	19.1	28.1	6,999.0	57.8	12.9	1,477.8	ind	12.2	22.8
Coho salmon	73.0	68.5	68.5	38.2	48.3	12,248.2	101.2	22.6	2,721.8	ind	22.5	19.5
Chinook salmon	82.0	73.0	73.0	48.3	61.8	81,140.8	670.6	149.6	6,058.9	ind	50.1	15.8
Pink salmon	2.2	2.2	2.2	0.0	0.0	18.5	0.2	0.0	8.2	ind	0.1	86.7
Sockeye salmon	74.2	66.3	66.3	39.3	48.3	29,693.1	245.4	54.7	6,687.6	ind	55.3	30.3
Spawning chum salmon	1.1	1.1	1.1	0.0	0.0	45.1	0.4	0.1	9.5	ind	0.1	102.2
Spawning coho salmon	1.1	1.1	1.1	0.0	0.0	183.5	1.5	0.3	40.8	ind	0.3	102.2
Spawning sockeye salmon	18.0	16.9	15.7	7.9	9.0	718.3	5.9	1.3	161.8	ind	1.3	33.5
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ind	0.0	0.0

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

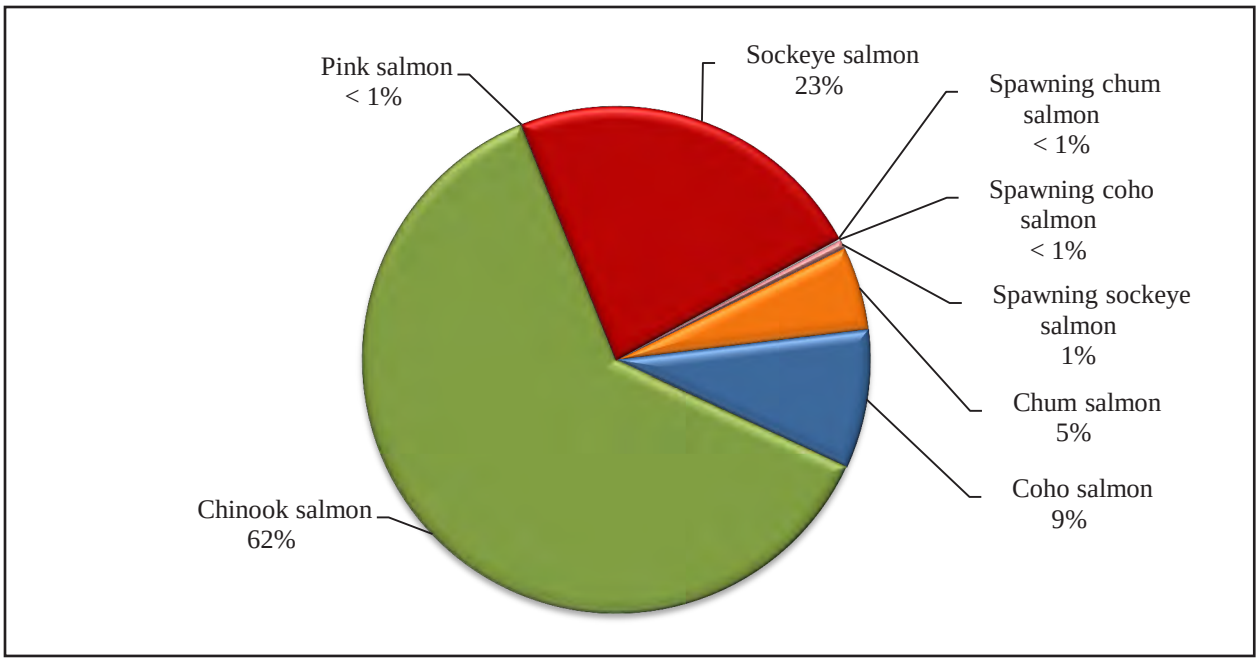


Figure 4-6.–Composition of salmon harvest in pounds usable weight, New Stuyahok, 2013.

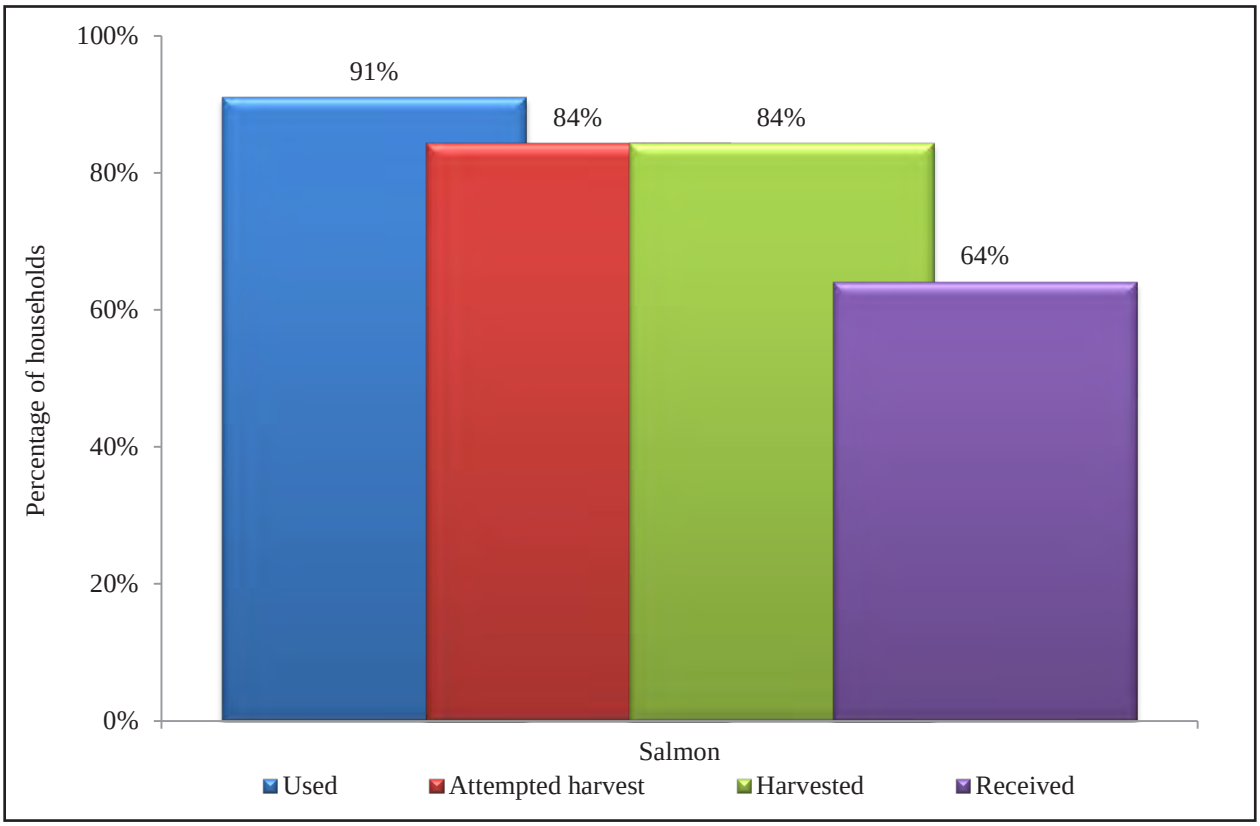


Figure 4-7.–Percentage of households using, attempting to harvest, harvesting, and receiving salmon, New Stuyahok, 2013.

Table 4-7.–Estimated harvest of salmon by gear type and resource, New Stuyahok, 2013.

	Removed from commercial catch		Subsistence methods									
			Gillnet[a]		Other method		Subsistence gear, any method		Rod and reel		Any method	
Resource	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Salmon	**1.4**	**18.2**	**15,490.7**	**121,833.7**	**17.7**	**78.6**	**15,508.4**	**121,912.2**	**1,656.7**	**9,116.0**	**17,166.4**	**131,046.5**
Chum salmon	0.0	0.0	1,456.1	6,896.0	0.0	0.0	1,456.1	6,896.0	21.8	103.0	1,477.8	6,999.0
Coho salmon	0.0	0.0	1,388.1	6,246.5	1.4	6.1	1,389.5	6,252.6	1,332.4	5,995.6	2,721.8	12,248.2
Chinook salmon	1.4	18.2	5,870.5	78,618.3	0.0	0.0	5,870.5	78,618.3	187.0	2,504.3	6,058.9	81,140.8
Pink salmon	0.0	0.0	8.2	18.5	0.0	0.0	8.2	18.5	0.0	0.0	8.2	18.5
Sockeye salmon	0.0	0.0	6,631.9	29,445.6	0.0	0.0	6,631.9	29,445.6	55.7	247.5	6,687.6	29,693.1
Spawning chum salmon	0.0	0.0	9.5	45.1	0.0	0.0	9.5	45.1	0.0	0.0	9.5	45.1
Spawning coho salmon	0.0	0.0	40.8	183.5	0.0	0.0	40.8	183.5	0.0	0.0	40.8	183.5
Spawning sockeye salmon	0.0	0.0	85.7	380.3	16.3	72.4	102.0	452.7	59.8	265.6	161.8	718.3
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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

Note The harvested number of salmon is represented as individual fish harvested.

a. Gillnet harvests include both set and drift gillnet gear types.

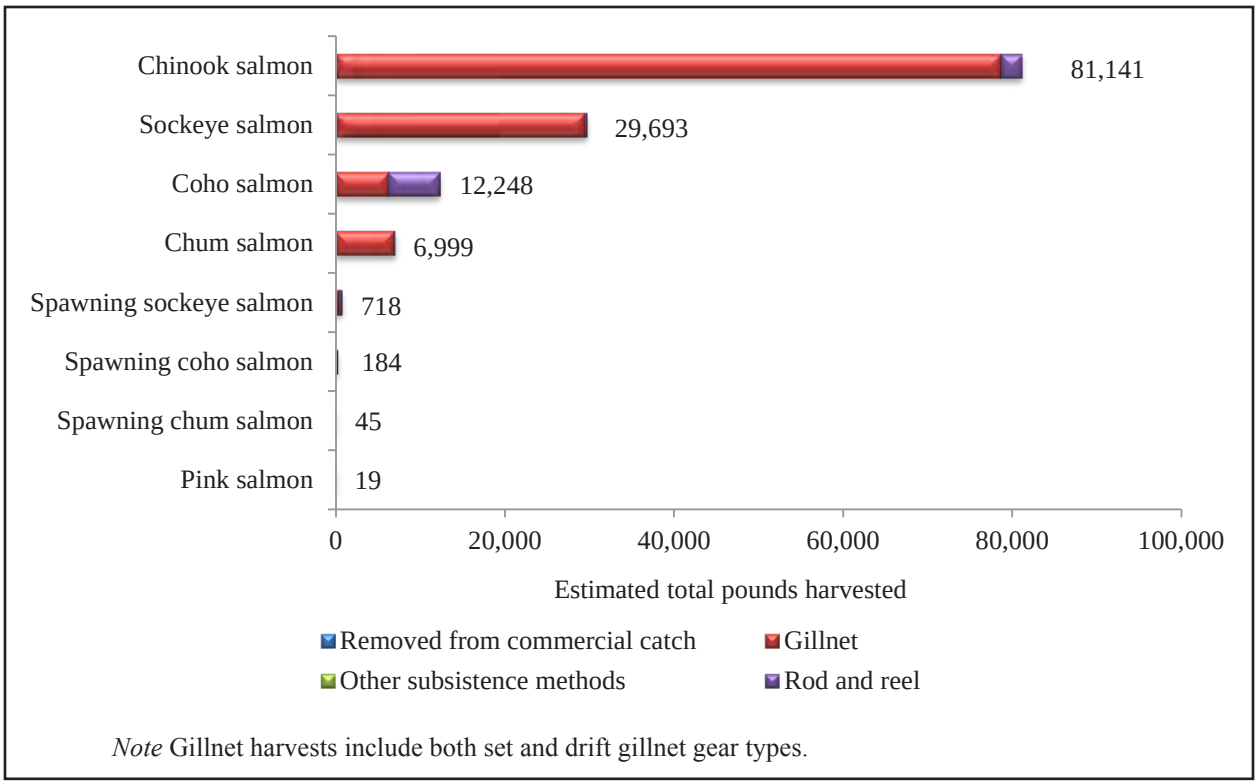


Figure 4-8.–Estimated harvest of salmon in pounds usable weight by gear type and resource, New Stuyahok, 2013.

Locations for coho harvests ranged south and north of New Stuyahok (Figure 4-11). Similar to Ekwok and Koliganek, individual coho salmon harvests by rod and reel, when compared to gillnet harvests, indicate a preference for using rod and reel gear for harvesting this resource. The rod and reel harvests in 2013 were concentrated in three places: from the Nushagak River near both Ekwok and New Stuyahok, and also from the Mulchatna River close to its confluence with the Nushagak River. Use of gillnets also spanned north and south of New Stuyahok, but by a smaller range than rod and reel use.

Sockeye salmon harvests in 2013 included a few harvest spots at Lewis Point (Figure 4-12). The remaining sockeye salmon harvest locations were close to New Stuyahok, with community members using gillnets, other gear, and rod and reel at one location. Fishing sites for other salmon, which in 2013 included chum and spawning sockeye salmon, are shown in Figure 4-13. Combined, these species were caught using subsistence gillnet, rod and reel, and other or unspecified gear; however, according to estimates based on survey responses, chum salmon were harvested primarily by subsistence gillnet, with some rod and reel gear used (Table 4-7). To obtain the other salmon species, New Stuyahok residents went south to Lewis Point, and north to the Mulchatna River (upriver of the confluence of the Nushagak and Mulchatna rivers). The predominant concentration of these harvests was clustered around New Stuyahok, with only some activity occurring at Lewis Point and on the Mulchatna River. Other gear was mostly used on the Mulchatna River, with one rod and reel location recorded there. Lewis Point was identified as a place where "other gear" was used, and harvests by gillnet, other gear, and rod and reel occurred around the community.

Table 4-8.–Estimated percentages of salmon harvest in pounds usable weight by gear type, resource, and total salmon harvest, New Stuyahok, 2013.

Resource	Percentage base	Removed from commercial catch	Subsistence methods				
			Gillnet[a]	Other method	Subsistence gear, any method	Rod and reel	Any method
Salmon	**Gear type**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
	Resource	**0.0%**	**93.0%**	**0.1%**	**93.0%**	**7.0%**	**100.0%**
	Total	**0.0%**	**93.0%**	**0.1%**	**93.0%**	**7.0%**	**100.0%**
Chum salmon	Gear type	0.0%	5.7%	0.0%	5.7%	1.1%	5.3%
	Resource	0.0%	98.5%	0.0%	98.5%	1.5%	100.0%
	Total	0.0%	5.3%	0.0%	5.3%	0.1%	5.3%
Coho salmon	Gear type	0.0%	5.1%	7.8%	5.1%	65.8%	9.3%
	Resource	0.0%	51.0%	0.0%	51.0%	49.0%	100.0%
	Total	0.0%	4.8%	0.0%	4.8%	4.6%	9.3%
Chinook salmon	Gear type	100.0%	64.5%	0.0%	64.5%	27.5%	61.9%
	Resource	0.0%	96.9%	0.0%	96.9%	3.1%	100.0%
	Total	0.0%	60.0%	0.0%	60.0%	1.9%	61.9%
Pink salmon	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Sockeye salmon	Gear type	0.0%	24.2%	0.0%	24.2%	2.7%	22.7%
	Resource	0.0%	99.2%	0.0%	99.2%	0.8%	100.0%
	Total	0.0%	22.5%	0.0%	22.5%	0.2%	22.7%
Spawning chum salmon	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Spawning coho salmon	Gear type	0.0%	0.2%	0.0%	0.2%	0.0%	0.1%
	Resource	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%
	Total	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%
Spawning sockeye salmon	Gear type	0.0%	0.3%	92.2%	0.4%	2.9%	0.5%
	Resource	0.0%	52.9%	10.1%	63.0%	37.0%	100.0%
	Total	0.0%	0.3%	0.1%	0.3%	0.2%	0.5%
Unknown salmon	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

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

a. Gillnet harvests include both set and drift gillnet gear types.

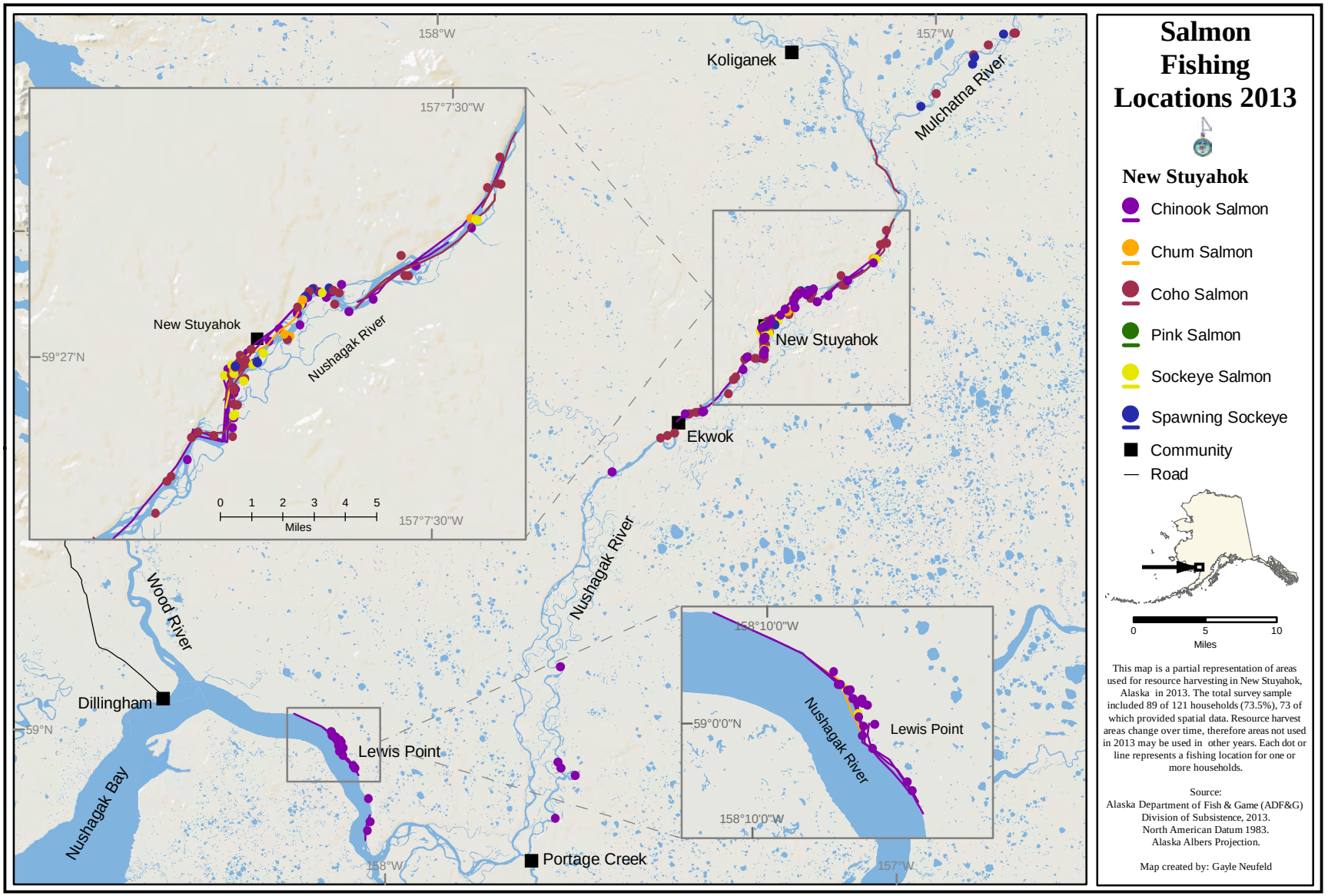


Figure 4-9.–Fishing and harvest locations of salmon, New Stuyahok, 2013.

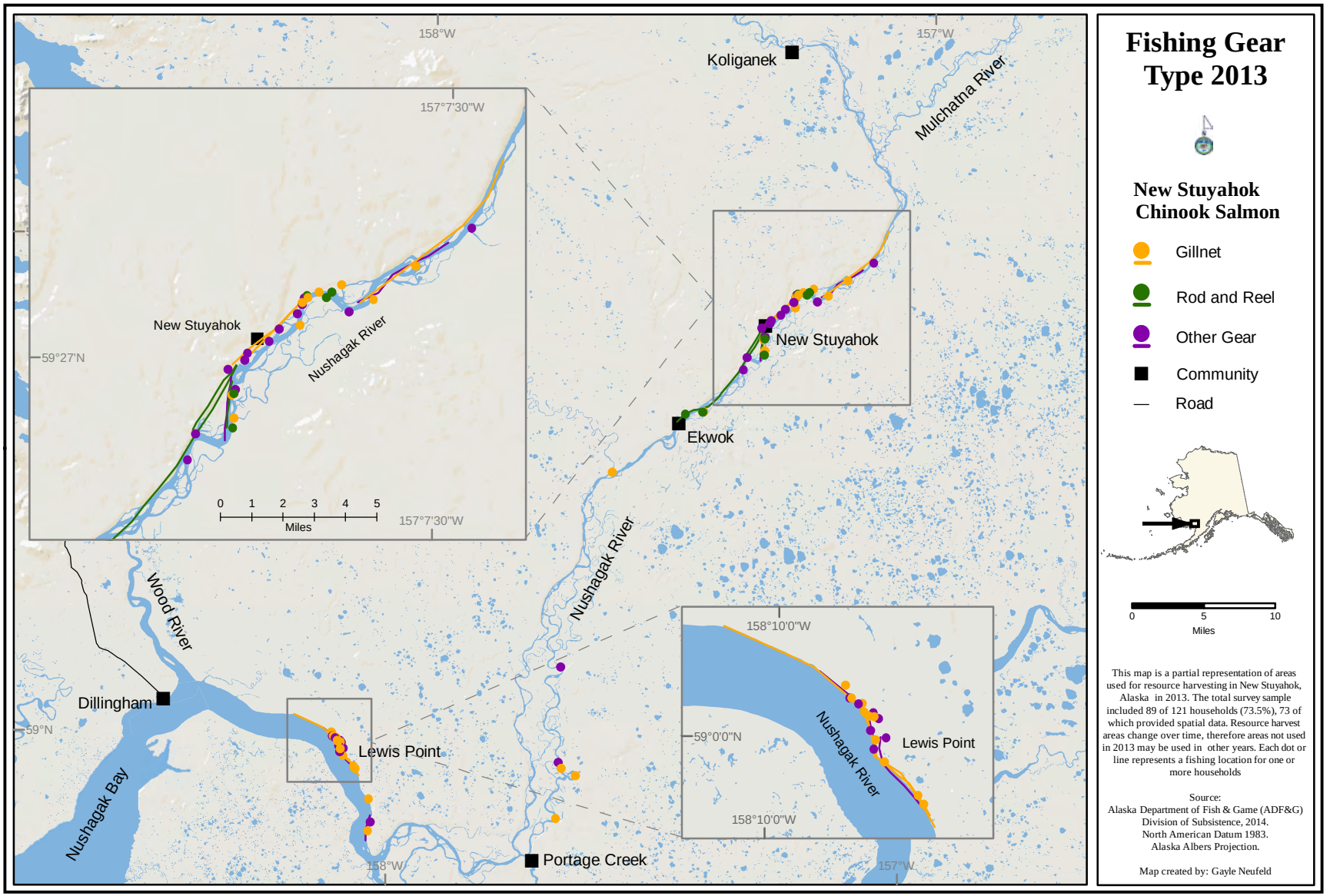


Figure 4-10.–Fishing and harvest locations by gear type, Chinook salmon, New Stuyahok, 2013.

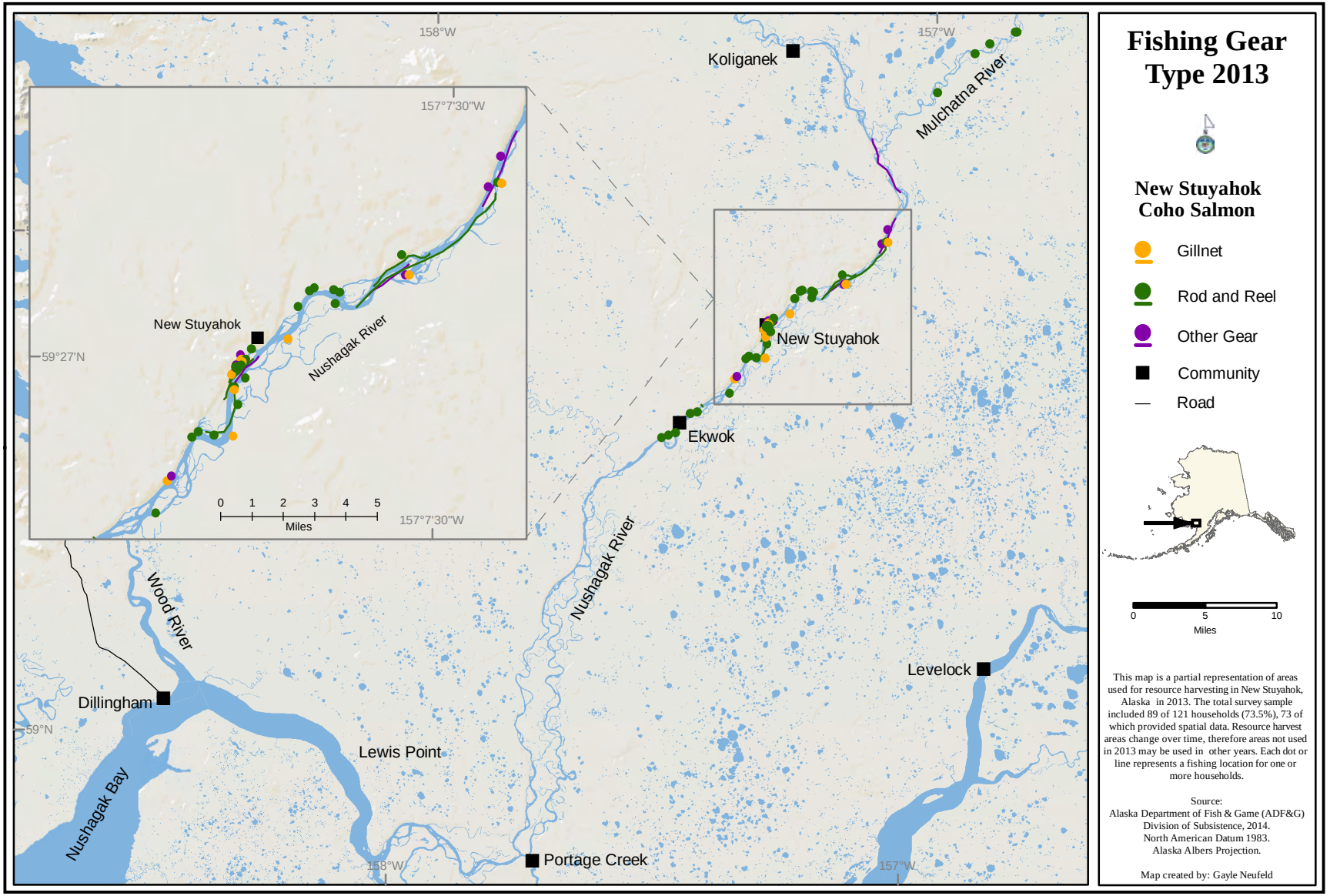


Figure 4-11.–Fishing and harvest locations by gear type, coho salmon, New Stuyahok, 2013.

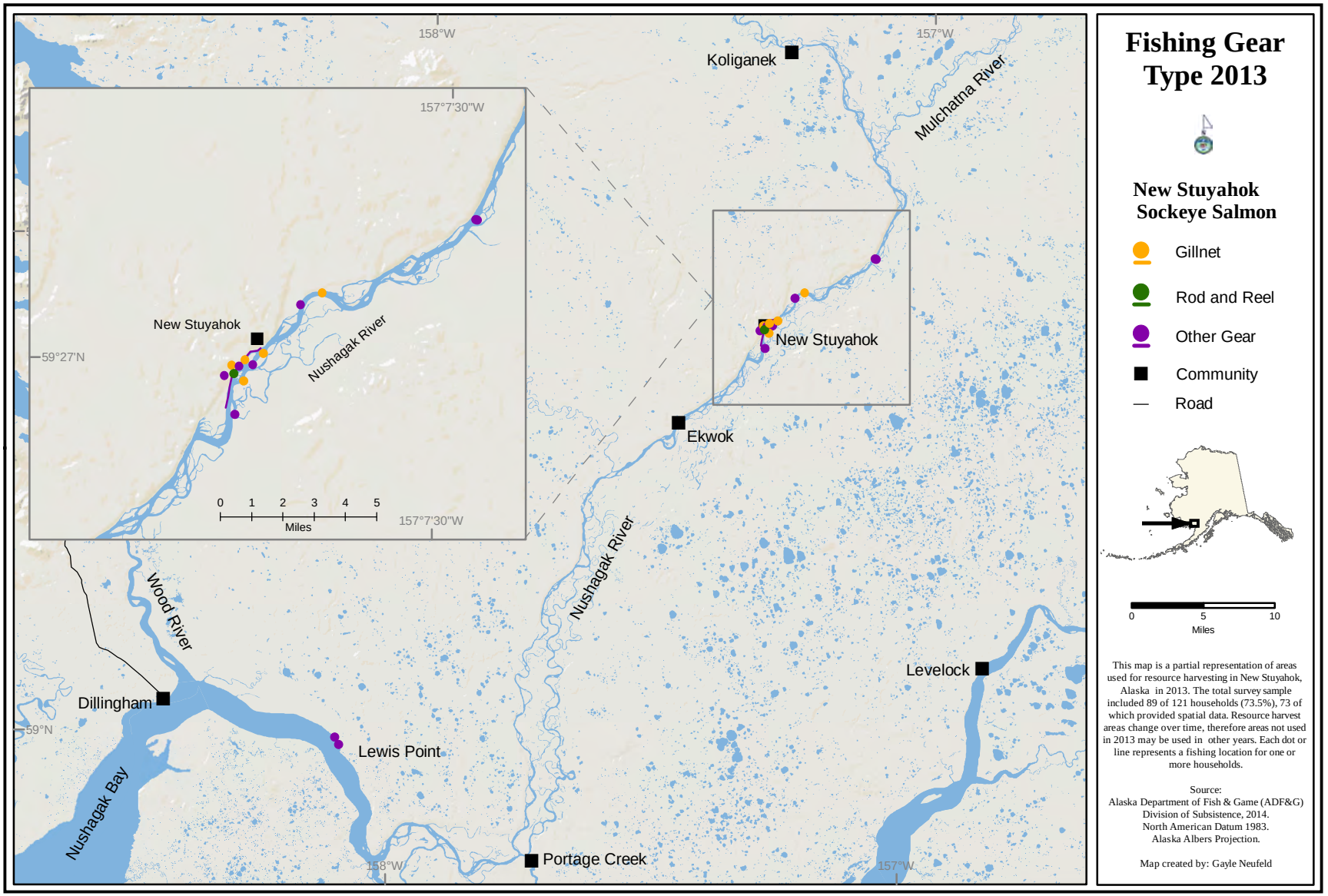


Figure 4-12.–Fishing and harvest locations by gear type, sockeye salmon, New Stuyahok, 2013.

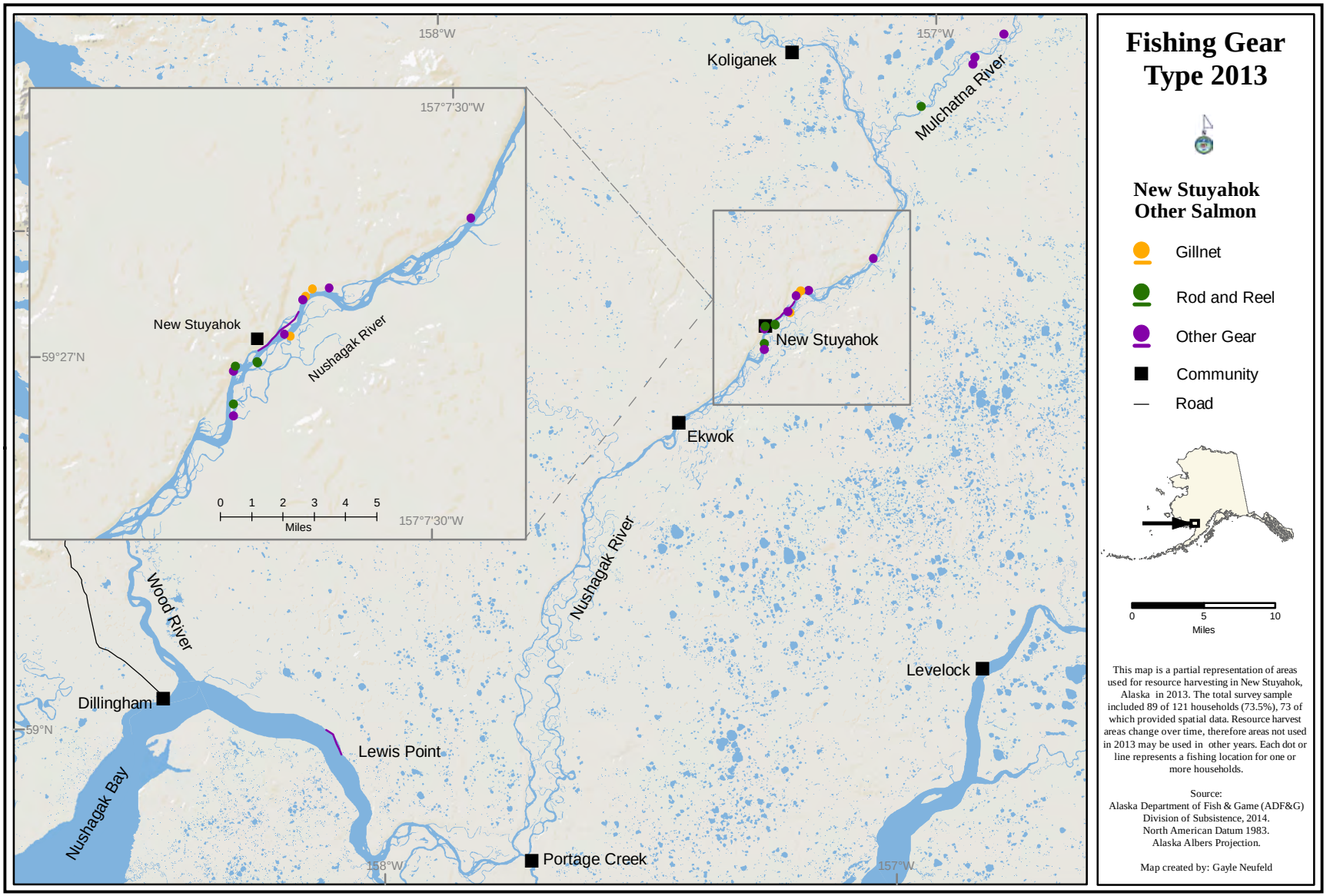


Figure 4-13.–Fishing and harvest locations by gear type, other salmon, New Stuyahok, 2013.

Household Salmon Harvest and Use Characteristics in New Stuyahok: 2014

The total number of all salmon species harvested by New Stuyahok residents in 2014 was 8,742 individual fish totaling 74,375 lb (Table 4-9); the 2014 harvest was almost one-half the amount from the previous year. The highest portion of harvested salmon was Chinook salmon at 53,091 lb (103 lb per capita), followed by coho salmon at 9,102 lb (18 lb per capita). The total salmon harvest accounted for 664 lb per household, or 145 lb per capita. Chinook salmon accounted for 71% of the harvest weight; other species that significantly contributed to the harvest were coho (12%), sockeye (9%), and chum (7%) salmon (Figure 4-14).

Overall Use by Households and Salmon Harvests by Gear Type

Ninety-four percent of households in New Stuyahok used salmon in 2014, with 84% attempting harvest, 75% successfully harvesting, and 66% receiving salmon (Figure 4-15). The highest percentages of salmon use were for Chinook (83% of households), coho (71%), and sockeye (70%) salmon (Table 4-9). In terms of successful harvest, coho salmon was the most harvested fish, by 60% of households, followed by Chinook (51%), sockeye (42%), chum (38%), and pink and spawned-out sockeye salmon (each harvested by 9% of households). Well above the majority of New Stuyahok households gave away or received salmon. Chinook salmon was the most received fish with 55% of households having received Chinook salmon. Sockeye and coho salmon were also highly shared, with 42% and 28% of households receiving these species, respectively. The most shared species were Chinook, sockeye, coho, and chum salmon; an estimated 24%–58% of households gave away those resources.

Regarding methods used to harvest salmon, subsistence gillnetting accounted for harvesting 91% of the total salmon harvest weight, followed by rod and reel fishing, which accounted for 9% of the harvest weight, and less than 1% was harvested by removal from commercial catches (Table 4-10).

In the 2014 study year, three species were removed from commercial catches: Chinook, sockeye, and coho salmon. An estimated 30 lb of Chinook (or 2 individual fish) were harvested by commercial catch removal, followed by 11 coho, and 2 sockeye salmon (Table 4-11). Rod and reel harvests also occurred in 2014 with 1,335 fish harvested by that method. Coho salmon was harvested by rod and reel more than any other species (Figure 4-16). Gillnetting accounted for the remainder of the fish harvested (7,391 fish) (Table 4-11).

Salmon Harvests by Location and Harvest Gear Type

The salmon harvest areas used by New Stuyahok residents in 2014 are depicted by species in Figure 4-17. There are harvest locations available for all species, as well as spawning sockeye salmon.

Lewis Point, the Nushagak River spanning five miles north and south of the community, and the confluence of the Nushagak and Mulchatna rivers appeared to be the main salmon harvest locations. Only coho salmon harvest locations spanned continuously as far south as the community of Ekwok in 2014. General harvest locations also included both sides of the Nushagak River.

Chinook salmon harvests by gear type are shown in Figure 4-18. High concentrations of gillnet use appeared at Lewis Point, few select points on the Nushagak River between Portage Creek and Ekwok, and in the vicinity of New Stuyahok. Rod and reel harvests for Chinook salmon were shown in two locations near New Stuyahok. Use of other gear—meaning seine, dip net, or unspecified gear—is represented by seven points along the Nushagak River.

Coho salmon harvests were predominantly centered around the community, with one line of fishing effort extending south to Ekwok, and two points at the confluence of the Mulchatna and Nushagak rivers (Figure 4-19). Line features representing rod and reel use likely indicate boat use—either opportunistic fishing while traveling to other locations, or "trolling" with rod and reel gear for select species and numbers of fish. The volume of rod and reel fishing locations correlates to the estimate that one-half of the coho harvest was caught with this gear type (Table 4-10).

Table 4-9.–Estimated use and harvest of salmon, New Stuyahok, 2014.

Resource	Percentage of households					Harvest weight (lb)			Harvest amount			95% confidence limit (±) harvest
	Use %	Attempt %	Harvest %	Receive %	Give %	Total	Mean per household	Per capita	Total	Unit	Mean per household	
Salmon	**94.1**	**84.2**	**75.2**	**66.3**	**72.3**	**74,375.3**	**664.1**	**144.5**	**8,741.5**	**ind**	**78.0**	**8.4**
Chum salmon	50.5	48.5	37.6	16.0	24.0	4,842.2	43.2	9.4	1,022.4	ind	9.1	13.3
Coho salmon	71.3	66.3	60.4	27.7	37.6	9,101.9	81.3	17.7	2,022.7	ind	18.1	9.3
Chinook salmon	83.2	69.3	50.5	54.5	58.4	53,090.7	474.0	103.2	3,964.4	ind	35.4	10.8
Pink salmon	10.9	10.9	8.9	3.0	5.0	363.9	3.2	0.7	160.8	ind	1.4	27.4
Sockeye salmon	70.3	56.4	41.6	41.6	39.6	6,489.3	57.9	12.6	1,461.5	ind	13.0	12.3
Spawning sockeye salmon	14.9	11.9	8.9	5.0	5.9	487.4	4.4	0.9	109.8	ind	1.0	23.4
Unknown salmon	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	ind	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2015.

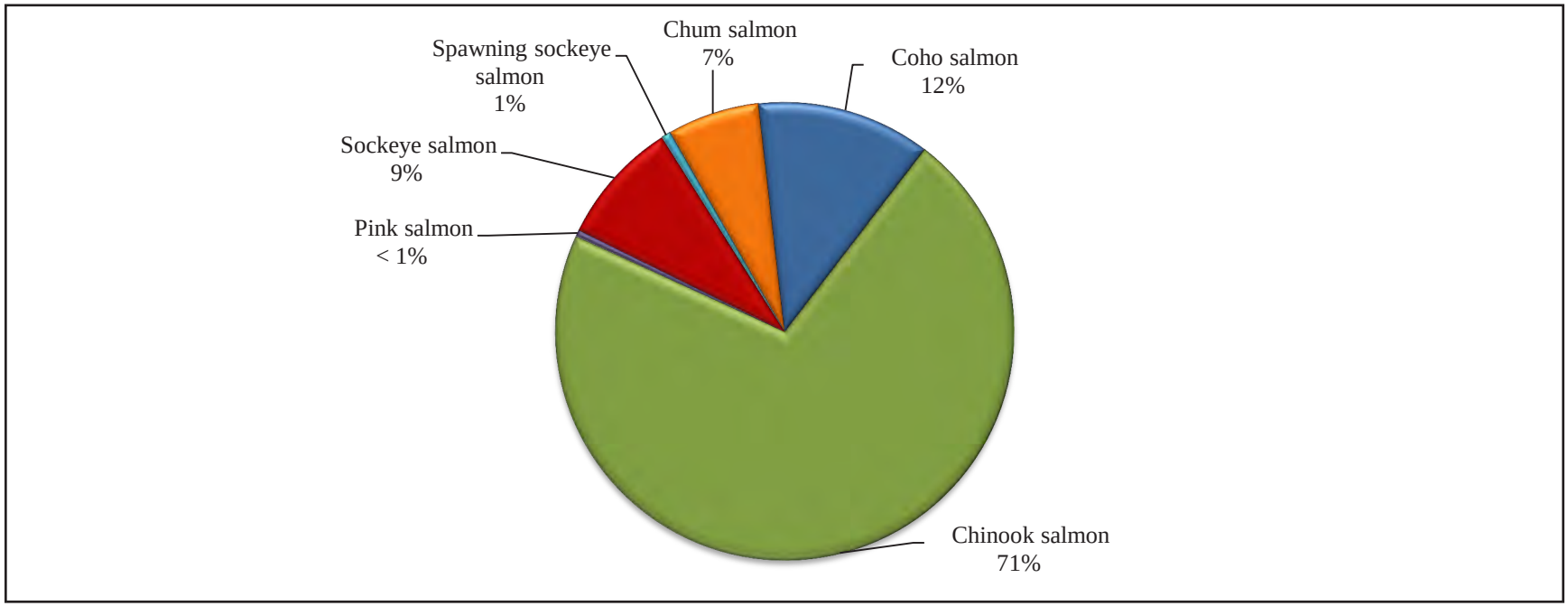


Figure 4-14.–Composition of salmon harvest in pounds usable weight, New Stuyahok, 2014.

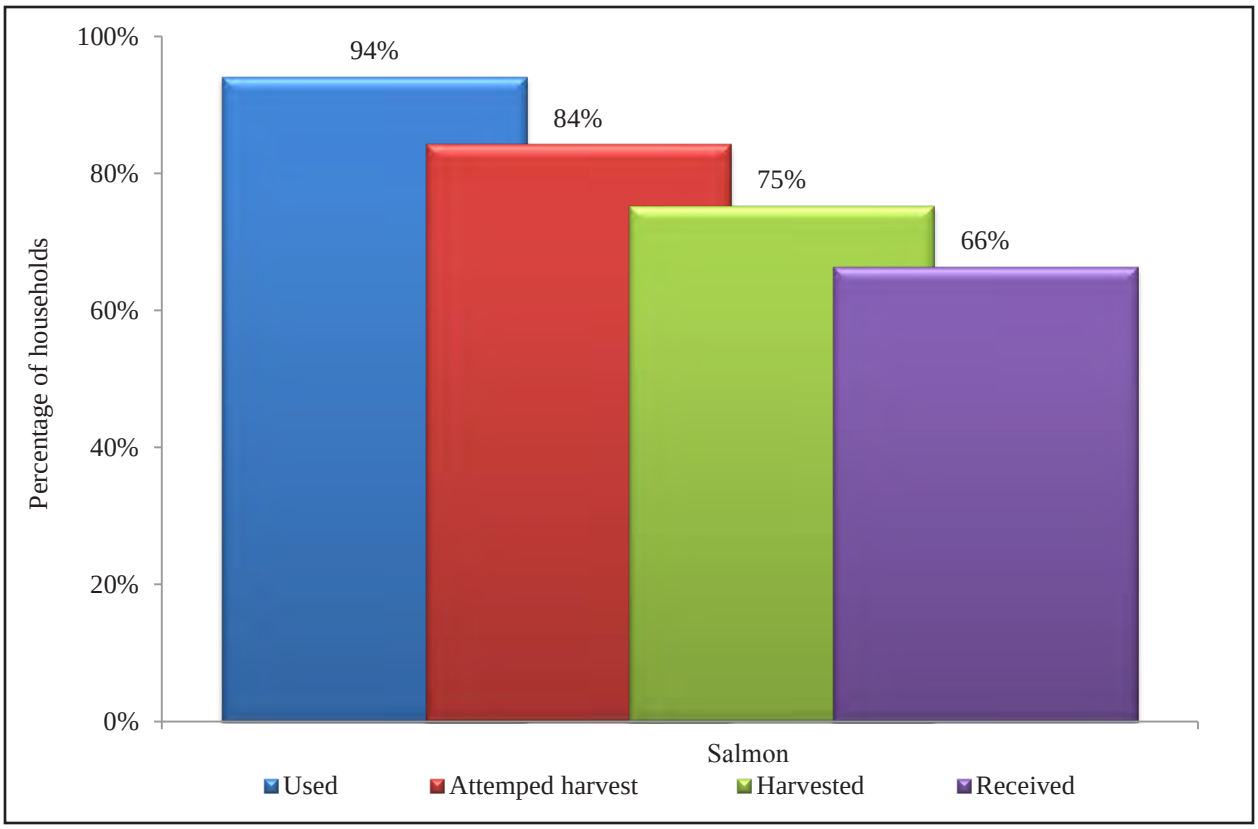


Figure 4-15.–Percentage of households using, attempting to harvest, harvesting, and receiving salmon, New Stuyahok, 2014.

Table 4-10.–Estimated percentages of salmon harvest in pounds usable weight by gear type, resource, and total salmon harvest, New Stuyahok, 2014.

Resource	Percentage base	Removed from commercial catch	Subsistence methods				
			Gillnet[a]	Other method	Subsistence gear, any method	Rod and reel	Any method
Salmon	**Gear type**	**100.0%**	**100.0%**	**0.0%**	**100.0%**	**100.0%**	**100.0%**
	Resource	**0.1%**	**91.4%**	**0.0%**	**91.4%**	**8.5%**	**100.0%**
	Total	**0.1%**	**91.4%**	**0.0%**	**91.4%**	**8.5%**	**100.0%**
Chum salmon	Gear type	0.0%	7.1%	0.0%	7.1%	0.1%	11.7%
	Resource	0.0%	99.9%	0.0%	99.9%	0.1%	100.0%
	Total	0.0%	6.5%	0.0%	6.5%	0.0%	11.7%
Coho salmon	Gear type	55.8%	5.5%	0.0%	5.5%	84.2%	23.1%
	Resource	0.5%	40.8%	0.0%	40.8%	58.6%	100.0%
	Total	0.1%	5.0%	0.0%	5.0%	7.2%	23.1%
Chinook salmon	Gear type	33.2%	77.1%	0.0%	77.1%	10.1%	45.4%
	Resource	0.1%	98.7%	0.0%	98.7%	1.2%	100.0%
	Total	0.0%	70.5%	0.0%	70.5%	0.9%	45.4%
Pink salmon	Gear type	0.0%	0.4%	0.0%	0.4%	1.5%	1.8%
	Resource	0.0%	73.8%	0.0%	73.8%	26.2%	100.0%
	Total	0.0%	0.4%	0.0%	0.4%	0.1%	1.8%
Sockeye salmon	Gear type	11.0%	9.3%	0.0%	9.3%	2.5%	16.7%
	Resource	0.2%	97.4%	0.0%	97.4%	2.4%	100.0%
	Total	0.0%	8.5%	0.0%	8.5%	0.2%	16.7%
Spawning sockeye salmon	Gear type	0.0%	0.6%	0.0%	0.6%	1.6%	1.3%
	Resource	0.0%	78.8%	0.0%	78.8%	21.2%	100.0%
	Total	0.0%	0.5%	0.0%	0.5%	0.1%	1.3%
Unknown salmon	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source ADF&G Division of Subsistence household surveys, 2015.

a. Gillnet harvests include both set and drift gillnet gear types.

Table 4-11.–Estimated harvest of salmon by gear type and resource, New Stuyahok, 2014.

	Removed from commercial catch		Subsistence methods									
			Gillnet[a]		Other method		Subsistence gear, any method		Rod and reel		Any method	
Resource	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Salmon	**15.5**	**89.4**	**7,390.9**	**67,951.3**	**0.0**	**0.0**	**7,390.9**	**67,951.3**	**1,335.1**	**6,334.5**	**8,741.5**	**74,375.3**
Chum salmon	0.0	0.0	1,021.3	4,836.9	0.0	0.0	1,021.3	4,836.9	1.1	5.3	1,022.4	4,842.2
Coho salmon	11.1	49.9	826.1	3,717.6	0.0	0.0	826.1	3,717.6	1,185.4	5,334.4	2,022.7	9,101.9
Chinook salmon	2.2	29.7	3,914.5	52,422.4	0.0	0.0	3,914.5	52,422.4	47.7	638.6	3,964.4	53,090.7
Pink salmon	0.0	0.0	118.7	268.5	0.0	0.0	118.7	268.5	42.1	95.4	160.8	363.9
Sockeye salmon	2.2	9.8	1,423.8	6,321.9	0.0	0.0	1,423.8	6,321.9	35.5	157.6	1,461.5	6,489.3
Spawning sockeye salmon	0.0	0.0	86.5	384.0	0.0	0.0	86.5	384.0	23.3	103.4	109.8	487.4
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2015.

Note The harvested number of salmon is represented as individual fish harvested.

a. Gillnet harvests include both set and drift gillnet gear types.

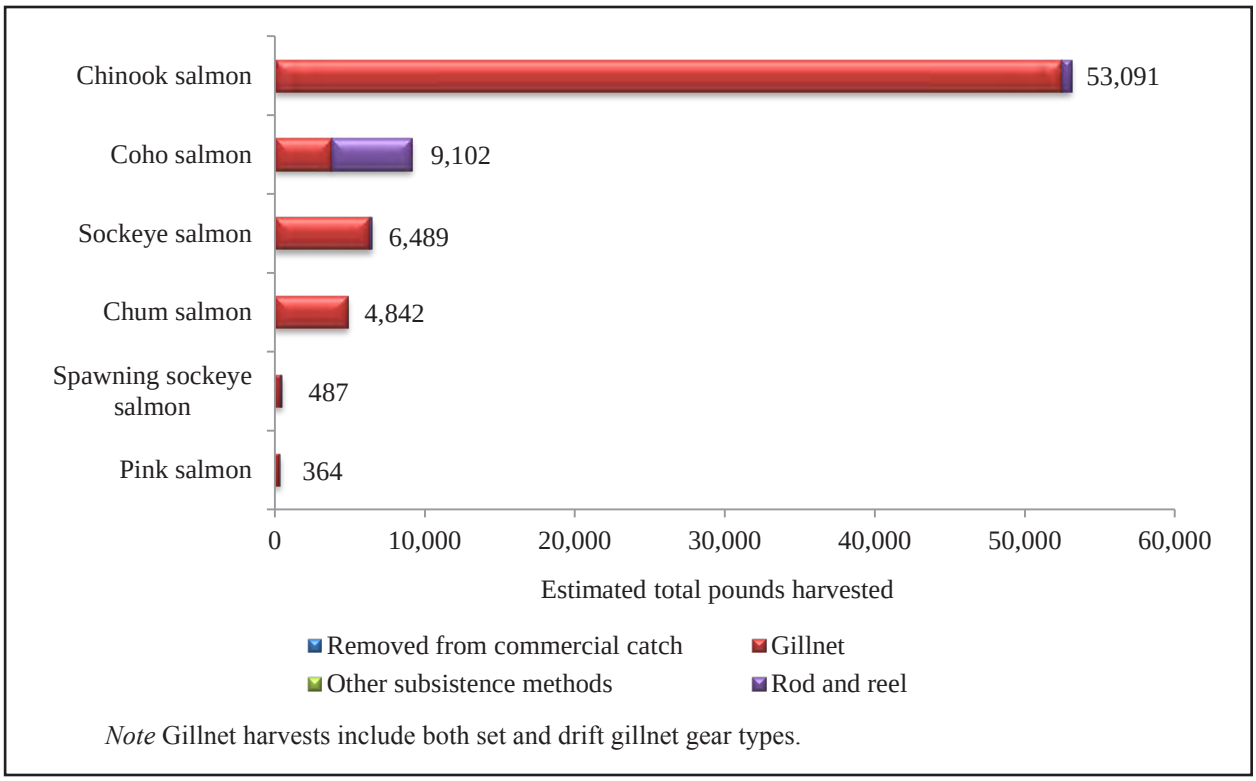


Figure 4-16.–Estimated harvest of salmon in pounds usable weight by gear type and resource, New Stuyahok, 2014.

In 2014, similar to Chinook salmon gillnet harvest locations, sockeye salmon harvests by gillnet also occurred at Lewis Point, a location between Portage Creek and Ekwok, and near the community of New Stuyahok (Figure 4-20). There were two areas of rod and reel harvests around the community, and another location just at the mouth of the Mulchatna River. Other salmon harvest gear types used were gillnet and rod and reel, and the harvest locations were centered around New Stuyahok, with two locations at Lewis Point (Figure 4-21).

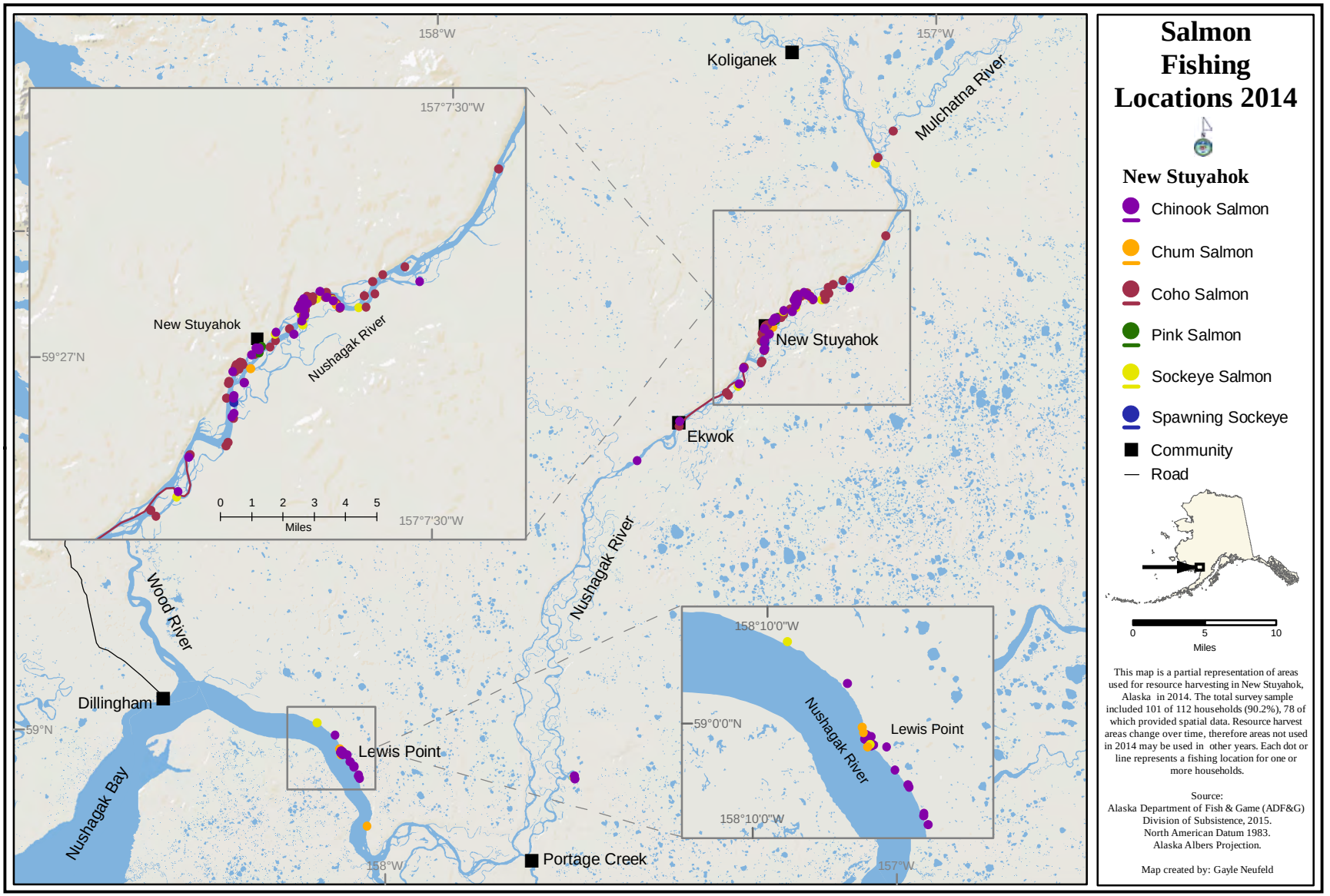


Figure 4-17.–Fishing and harvest locations of salmon, New Stuyahok, 2014.

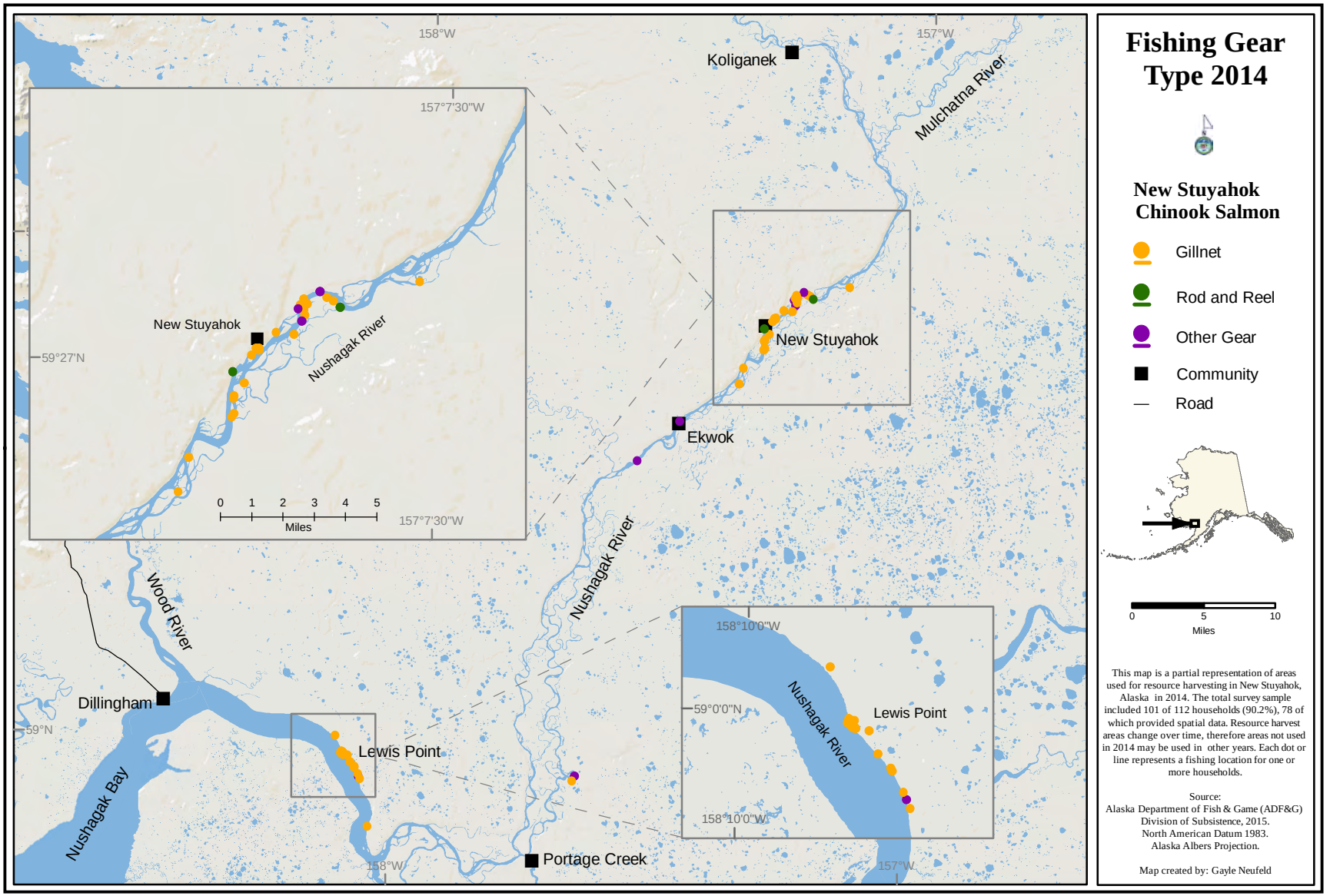


Figure 4-18.–Fishing and harvest locations by gear type, Chinook salmon, New Stuyahok, 2014.

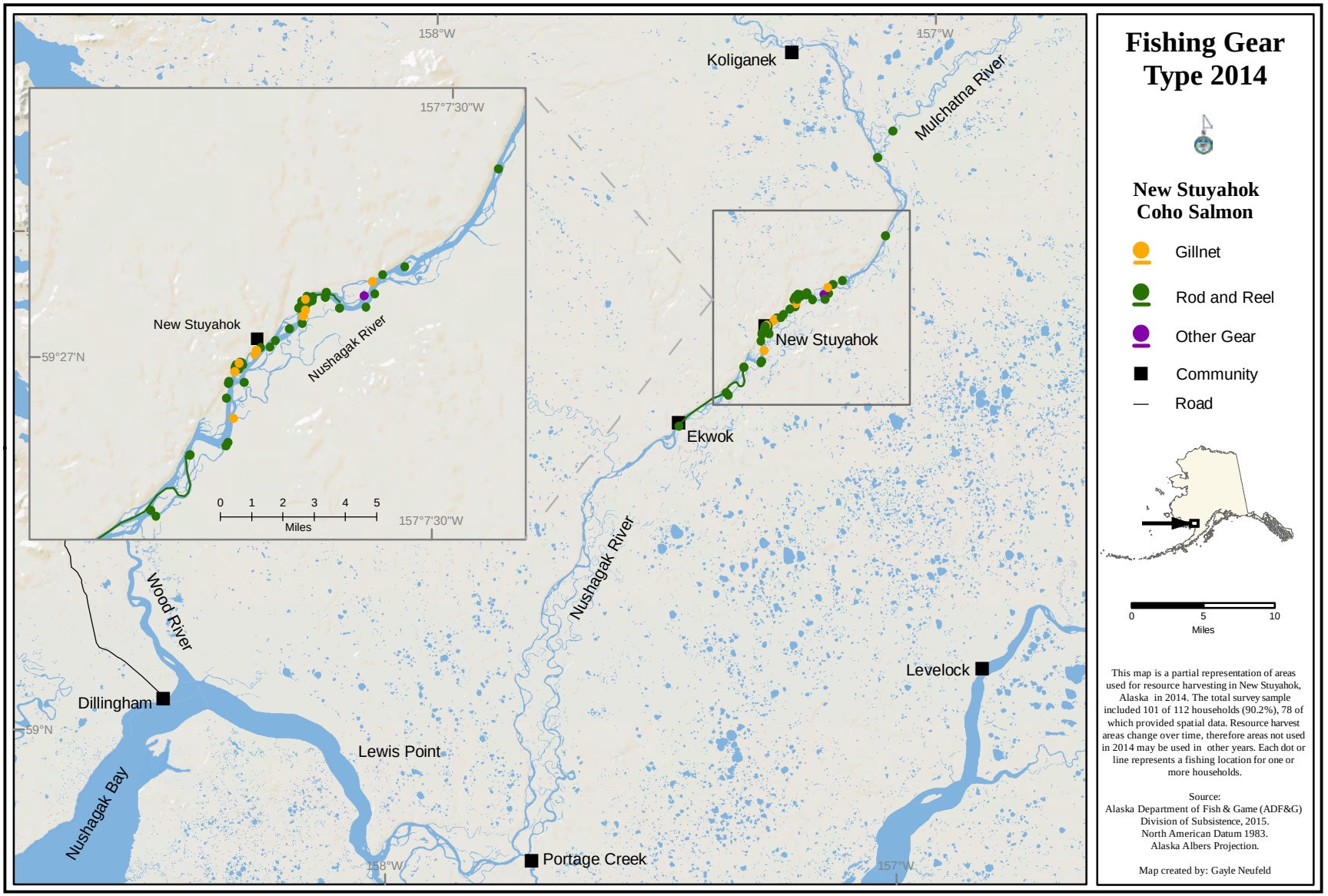


Figure 4-19.–Fishing and harvest locations by gear type, coho salmon, New Stuyahok, 2014.

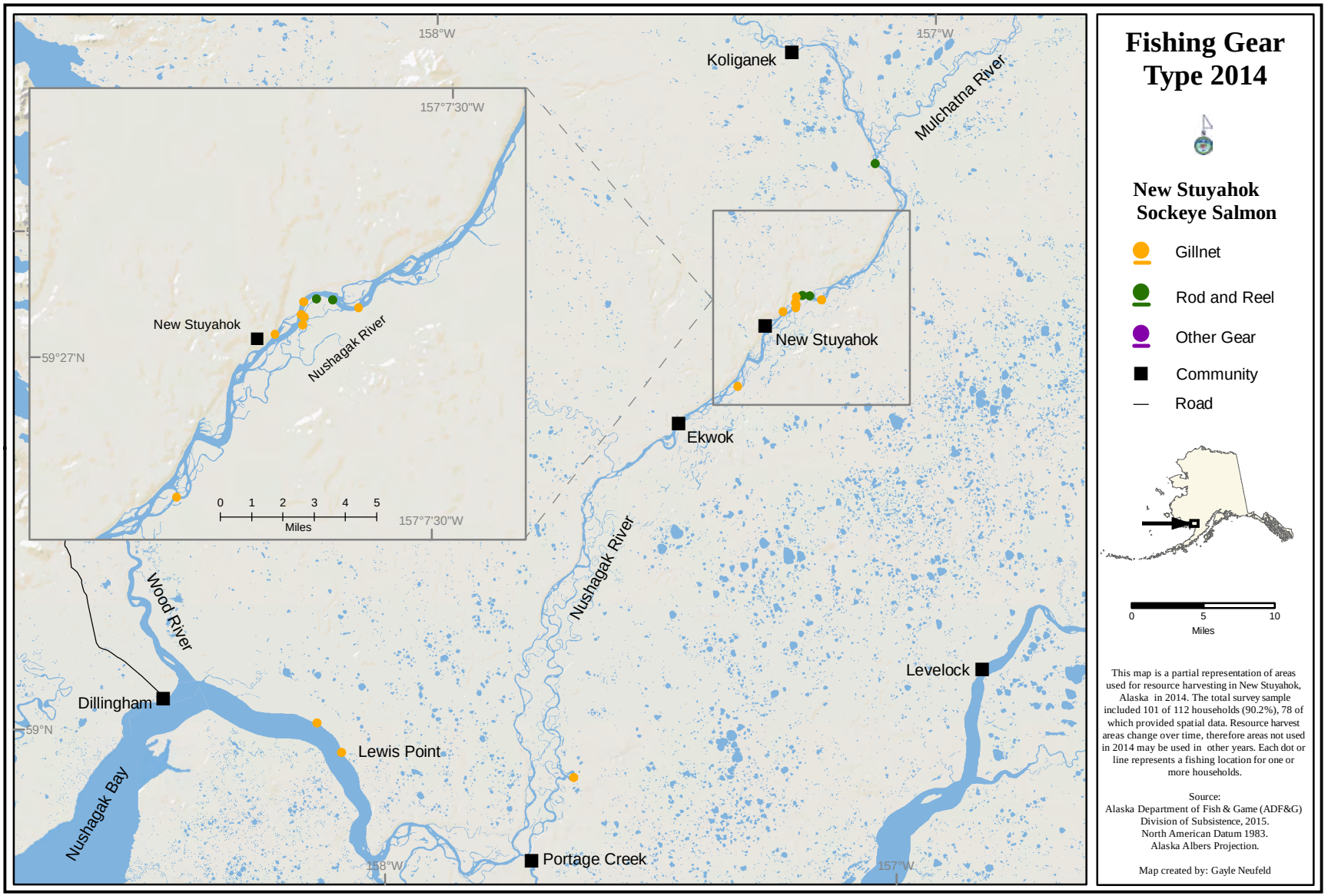


Figure 4-20.–Fishing and harvest locations by gear type, sockeye salmon, New Stuyahok, 2014.

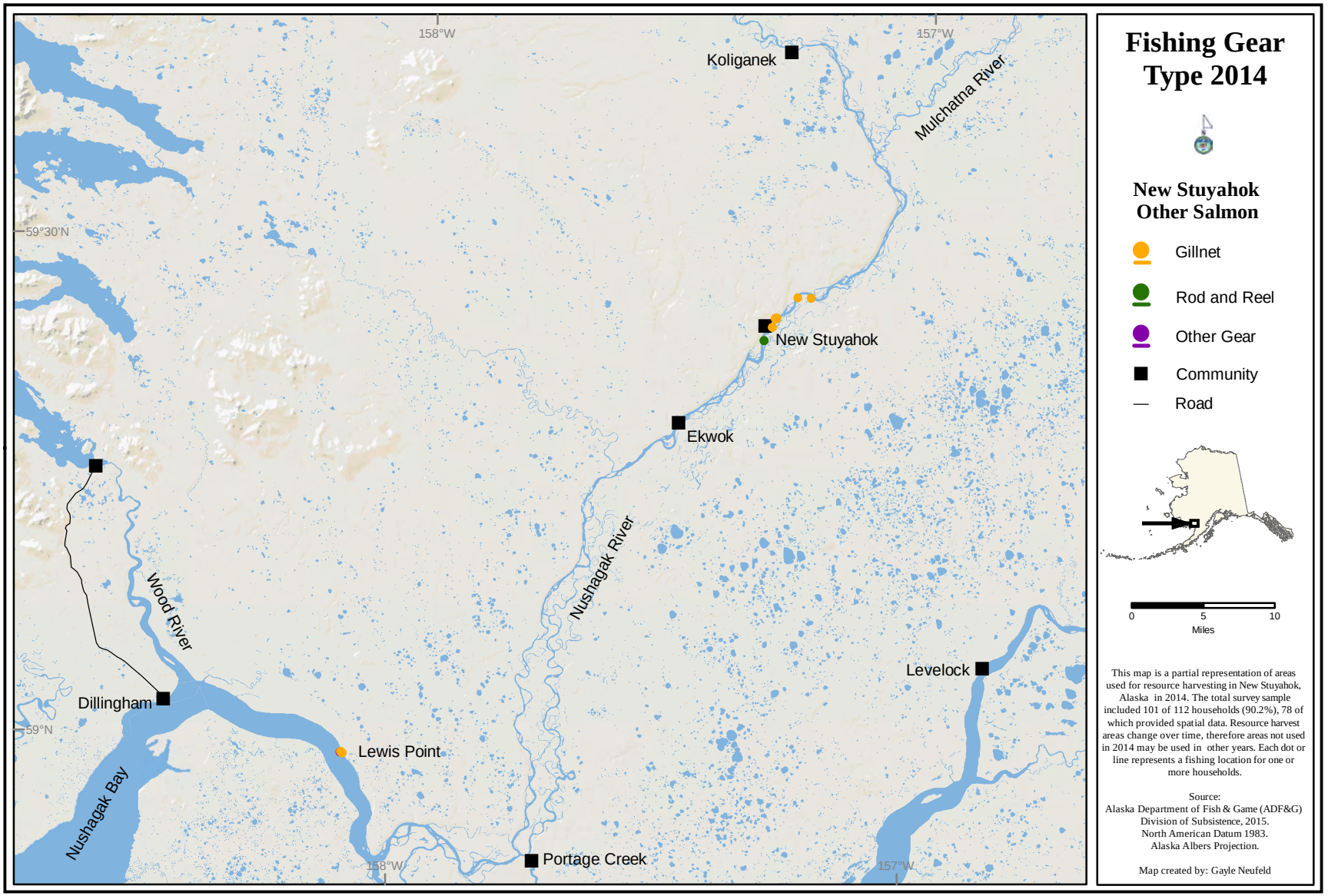


Figure 4-21.–Fishing and harvest locations by gear type, other salmon, New Stuyahok, 2014.

Harvest Assessments: 2013 and 2014

Researchers asked two questions regarding Chinook salmon use and harvest. The first question asked participants if they "got enough" Chinook salmon to use for their own household's needs, either through their own harvest efforts or sharing. If they did not, a numeric value was requested to determine how many fish would be the preferred amount for the household. The household was then asked why they did not get enough, either through their own efforts or sharing. This question was also asked for sockeye and coho salmon and responses for the three species are given below, under the subheading "Assessments of Use of Chinook, Sockeye, and Coho Salmon Through Harvest or Sharing." For the second assessment question, households were asked to describe their harvest of Chinook salmon in the study year, as compared to the past five years, and characterize whether the harvest was "less, same, or more." Reasons why were recorded, if the household offered anything to report. This comparison question, and reasons for less or more harvest, was also asked in relation to salmon other than Chinook (all other salmon species grouped), and is discussed under the subheading "Comparing Harvests of Chinook and Other Salmon Over Time." For both assessment questions, households could give more than one reason for not having enough salmon and changes to harvest amounts. These assessments highlight households' economic relationship to salmon and the integral role salmon availability plays in the subsistence way of life, both of which are affected in part by cash economy factors such as employment schedules, access to harvesting equipment, and fuel expense.

Assessments of Use of Chinook, Sockeye, and Coho Salmon Through Harvest or Sharing: 2013

Figure 4-22 and Table 4-12 provide a broad overview of New Stuyahok households' assessments of the availability of salmon in 2013. The majority (65%–79%) of sampled households indicated that they had enough Chinook, sockeye, and coho salmon through either their own efforts or sharing (Figure 4-22). Twenty-six percent of the sampled households did not get enough Chinook salmon in 2013, with significantly more (65%) reporting that they did get enough of the resource. Compared to the responses for Chinook salmon, fewer sampled households indicated that they did not have enough sockeye or coho salmon (16% and 11% of sampled households, respectively). Of the households that responded to the question asking whether they had enough salmon, there were 23, 14, and 10 households that did not have enough Chinook, sockeye, and coho salmon, respectively (Table 4-12).

When asked why they did not have enough Chinook salmon, 17% of responses indicated this was due to not enough time, and 17% attributed lack of equipment as the reason (Table 4-13). Other top reasons for not getting enough Chinook salmon included personal/family reasons (13%), resource availability (9%), and less effort (9%). Not receiving as much Chinook salmon was also cited (4%) among other reasons. Lack of sockeye salmon supply was primarily reported as due to a lack of equipment (29%), followed by not enough time (21%), personal/family reasons (14%), less harvest effort (14%), and did not receive as much (14%). A select group of reasons for lacking enough coho salmon was equally distributed among personal/family reasons, resource availability, lack of equipment, and less effort (20% of respondents for each reason), and not having enough time, regulations, and fuel expenses (10% of respondents for each reason). Twenty-one households reported that they needed more Chinook salmon to meet their food security needs, with the average amount of fish needed per household at 49 (Table 4-14). Twelve households indicated that they needed more sockeye salmon, with the average amount needed being 41 fish per household. Eight households reported that they would ideally like to have 26 coho salmon per household.

Comparing Harvests of Chinook and Other Salmon Over Time: 2013

There were 28 New Stuyahok households that indicated they harvested fewer Chinook salmon than in the past 5 years, with 24 households reporting the same level of harvest, and 15 harvesting more (Table 4-15). Of the households that answered the question, nearly one-half (49%) said harvests of salmon, excluding Chinook, were the same as in recent years, and about one-third (32%) indicated Chinook salmon harvests were the same (Figure 4-23). Reasons for less harvest of Chinook salmon were largely given as due to the

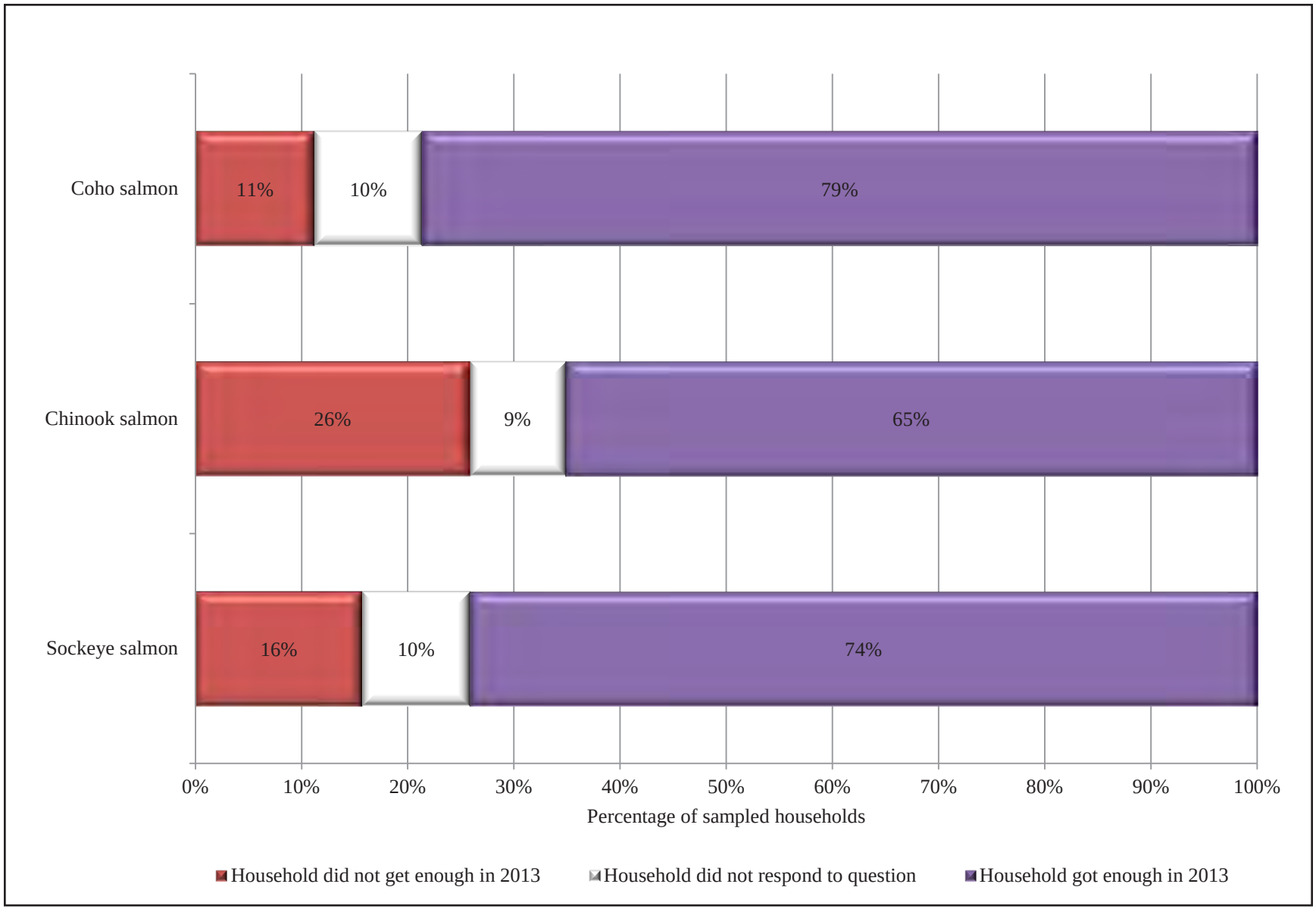


Figure 4-22.–Percentage of sampled households reporting whether they had enough salmon resources, New Stuyahok, 2013.

Table 4-12.–Percentage of households reporting whether they had enough salmon resources, New Stuyahok, 2013.

		Households not getting enough _____ .			
	Sampled	Valid responses[a]		Did not get enough	
Resource	households	Number	Percentage	Number	Percentage
Coho salmon	89	80	89.9%	10	12.5%
Chinook salmon	89	81	91.0%	23	28.4%
Sockeye salmon	89	80	89.9%	14	17.5%

Source ADF&G Division of Subsistence household surveys, 2014.
a. Does not include households that did not respond to the question or those households that never use the resource.

resource being less available (nine households), equipment or fuel expense (five), general lack of success (four), family/personal reasons (four), and other reasons as recorded in Table 4-16.

Twenty households reported less harvest for all other salmon species (Table 4-15). Less harvest of all other salmon species compared to the last five years was reported as primarily because less resources were available (five households), followed by equipment/fuel expenses (four households) (Table 4-16).

Nearly one-half (46%) of responding households reported less harvest of any salmon species, but nearly one-third (29%) reported more harvest of any salmon species (Table 4-15). Those households that reported more Chinook harvests (15 households) indicated increased effort helped their harvest (4 households), as well as increased resource availability (4 households) (Table 4-17). Households that reported more harvests of all other salmon (14 respondents) reported increased availability (8 households) and increased effort (3 households) as the main reasons.

Table 4-13.–Reasons why households did not have enough salmon resources, New Stuyahok, 2013.

Resource	Valid responses[a]	Personal or family reasons		Resource availability		Too far to travel		Lack of equipment		Did not receive as much	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	10	2	20.0%	2	20.0%	0	0.0%	2	20.0%	0	0.0%
Chinook salmon	23	3	13.0%	2	8.7%	0	0.0%	4	17.4%	1	4.3%
Sockeye salmon	14	2	14.3%	1	7.1%	0	0.0%	4	28.6%	2	14.3%

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Table 4-13.–Continued.

Resource	Valid responses[a]	Less effort		Unsuccessful		Weather		Other reasons		Not enough time	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	10	2	20.0%	0	0.0%	0	0.0%	0	0.0%	1	10.0%
Chinook salmon	23	2	8.7%	1	4.3%	1	4.3%	2	8.7%	4	17.4%
Sockeye salmon	14	2	14.3%	0	0.0%	0	0.0%	1	7.1%	3	21.4%

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Table 4-13.–Continued.

Resource	Valid responses[a]	Regulations		Animals too small or diseased		Fuel too expensive	
		Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	10	1	10.0%	0	0.0%	1	10.0%
Chinook salmon	23	1	4.3%	0	0.0%	0	0.0%
Sockeye salmon	14	0	0.0%	0	0.0%	0	0.0%

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

Note Households may provide more than one response to the question.

a. Includes those households providing a valid reason for not getting enough.

Table 4-14.–Salmon resources that sampled households reported needing, New Stuyahok, 2013.

Resource	Households needing	Total amount needed	Average amount needed
Coho salmon	8	210	26
Chinook salmon	21	1,031	49
Sockeye salmon	12	490	41

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

Table 4-15.–Changes in household harvests of salmon resources compared to recent years, New Stuyahok, 2013.

			Households reporting harvest								Households not harvesting in 2013	
			Total households		Less		Same		More			
Resource	Sampled households	Valid responses[a]	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	89	80	73	91.3%	37	46.3%	45	56.3%	23	28.8%	11	13.8%
Chinook salmon	89	76	67	75.3%	28	36.8%	24	31.6%	15	19.7%	9	11.8%
Other salmon	89	80	73	82.0%	20	25.0%	39	48.8%	14	17.5%	7	8.8%

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

a. Valid responses do not include households that did not provide any response.

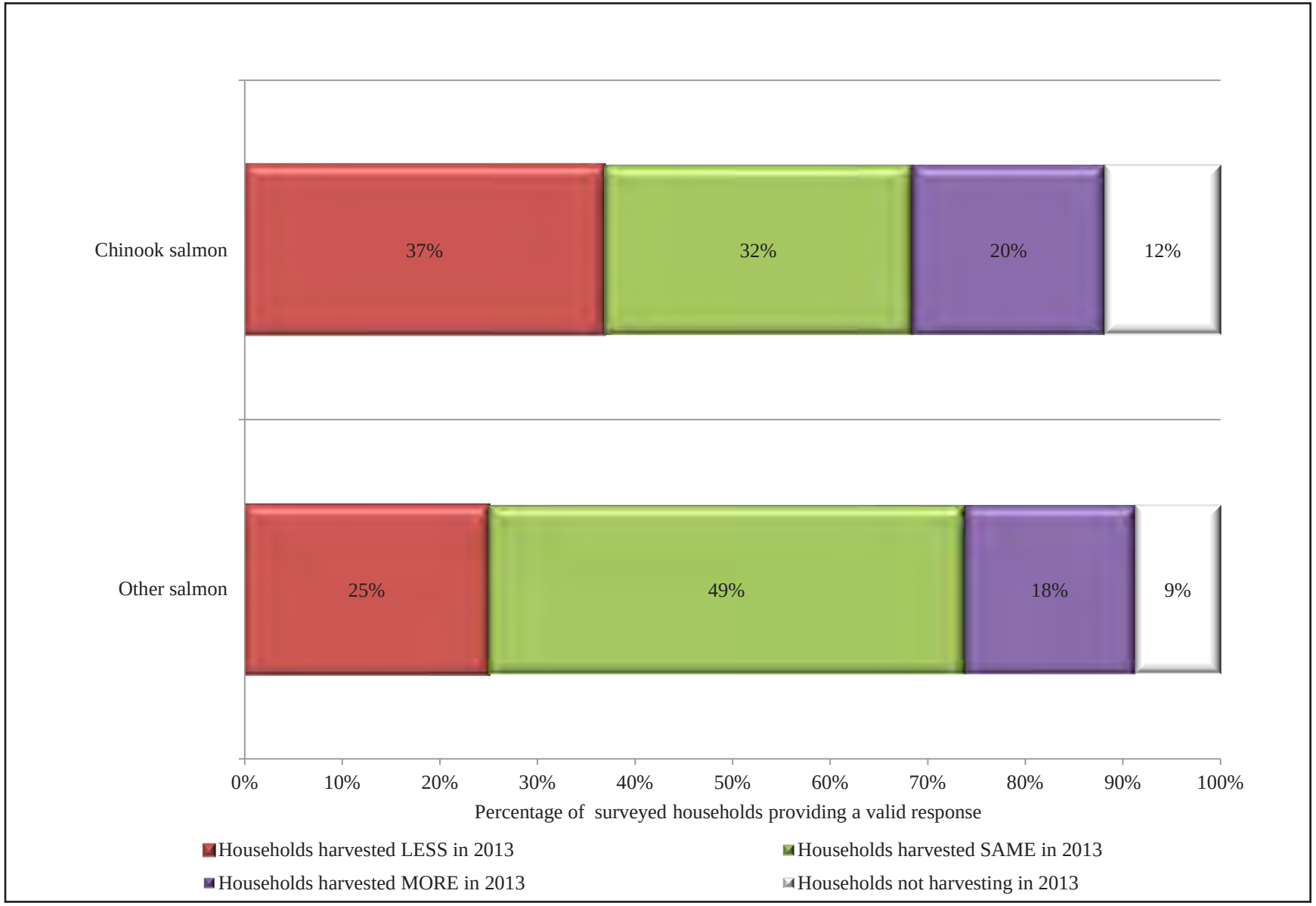


Figure 4-23.–Changes in household harvests of salmon resources compared to recent years, New Stuyahok, 2013.

Table 4-16.–Reasons for less household harvests of salmon resources compared to recent years, New Stuyahok, 2013.

Resource	Households reporting reasons for less harvest	Family/ personal		Resources less available		Too far to travel		Lack of equipment		Less sharing		Lack of effort		Unsuccessful		Weather/ environment	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	36	5	13.9%	14	39%	0	0.0%	2	6%	0	0%	2	6%	4	11.1%	2	5.6%
Chinook salmon	28	4	14.3%	9	32%	0	0.0%	2	7%	0	0%	1	4%	4	14.3%	2	7.1%
Other salmon	19	3	15.8%	5	26%	0	0.0%	1	5%	0	0%	1	5%	0	0.0%	0	0.0%

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Table 4-16.–Continued.

Resource	Households reporting reasons for less harvest	Other reasons		Working/ no time		Regulations		Small/ diseased animals		Did not get enough		Did not need		Equipment/ fuel expense		Too much competition	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	36	4	11%	2	5.6%	2	5.6%	1	2.8%	1	2.8%	1	2.8%	6	16.7%	0	0.0%
Chinook salmon	28	3	11%	2	7.1%	1	3.6%	1	3.6%	0	0.0%	0	0.0%	5	17.9%	0	0.0%
Other salmon	19	3	16%	1	5.3%	1	5.3%	0	0.0%	1	5.3%	1	5.3%	4	21.1%	0	0.0%

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

Table 4-17.–Reasons for more household harvests of salmon resources compared to recent years, New Stuyahok, 2013.

Resource	Households reporting reasons for more harvest	Increased availability		Used other resources		Favorable weather		Received more		Needed more		Increased effort		Had more help	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	22	11	50.0%	0	0.0%	3	13.6%	0	0.0%	1	4.5%	7	31.8%	1	4.5%
Chinook salmon	14	4	28.6%	0	0.0%	2	14.3%	0	0.0%	1	7.1%	4	28.6%	1	7.1%
Other salmon	14	8	57.1%	0	0.0%	1	7.1%	0	0.0%	0	0.0%	3	21.4%	1	7.1%

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Table 4-17.–Continued.

Resource	Households reporting reasons for more harvest	Other		Regulations		Traveled farther		More success		Needed less		Store-bought expense		Got/ fixed equipment	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	22	1	4.5%	3	13.6%	0	0.0%	1	4.5%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	14	0	0.0%	2	14.3%	0	0.0%	1	7.1%	0	0.0%	0	0.0%	0	0.0%
Other salmon	14	1	7.1%	2	14.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

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

Assessments of Use of Chinook, Sockeye, and Coho Salmon Through Harvest or Sharing: 2014

Figure 4-24 and Table 4-18 provide a broad overview of New Stuyahok households' assessments of the availability of salmon for use in 2014. Twenty-one households explained that they did not get enough Chinook salmon in 2014 through either their own efforts or sharing (Table 4-18). Nine households reported that they did not get enough sockeye salmon in 2014. Lastly, 14 households reported that they did not get enough coho salmon. Overall, more sampled households (58% or better) had enough Chinook, sockeye, and coho salmon available for their consumption in 2014 (Figure 4-24).

When asked why they did not have enough Chinook salmon, 35% of responses indicated that this was due to personal or family reasons (Table 4-19). Other specific reasons given for a household being unable to get enough Chinook salmon included lack of equipment (20%), not enough time (10%), equipment and fuel expenses (10%), and did not receive as much (5%). Lacking enough sockeye salmon was primarily reported as caused by several reasons, some of which included lack of equipment (22%), personal/family reasons (22%), and less effort (11%). Those households that indicated that they did not get enough coho salmon reported lack of equipment (39%) as the primary reason. Nineteen households reported that they needed more Chinook salmon to meet their food security needs, with the average amount of fish needed per household at 50 (Table 4-20). Six households indicated that they needed more sockeye salmon, with the average amount needed being 30 fish. Ten households reported they would ideally like to have 19 coho per household, a lower average number than either Chinook or sockeye salmon.

Comparing Harvests of Chinook and Other Salmon Over Time: 2014

Eighteen New Stuyahok households indicated they harvested fewer Chinook salmon than in the past 5 years, with 30 households reporting the same level of harvest, and 18 reporting an increase (Table 4-21). Of the households that answered the question, about one-half (51%) thought that their harvests of all salmon combined, excluding Chinook, was the same as in recent years, but a smaller proportion (39%) of respondents who answered the question indicated Chinook salmon harvests were the same (Figure 4-25). Reasons for less harvest of Chinook salmon were primarily personal/family reasons (33%), followed by lack of equipment (17%) and the closely related reason of equipment/fuel expense (17%), and that the species was less available (11%) and fish were too small or diseased (11%) (Table 4-22). Eleven households reported an increase in the availability of Chinook salmon in addition to increased effort (four), more overall success (two), and respondents received more help (one) or got/fixed equipment (one), thereby harvesting more in 2014 (Table 4-23).

Thirteen households reported less harvest for all other salmon species, citing several reasons such as family/personal reasons (five households), lack of equipment (two), and equipment/fuel expense (two) (Table 4-22). Seventeen households that reported more harvest of all the other species indicated resource availability as the greatest reason for an increased harvest (12 respondents) (Table 4-23).

In comparison to the previous study year, there were fewer households in 2014 reporting less harvest of any salmon species; in 2013, 37 households harvested less of any salmon resource, which declined to 24 households in 2014 (Table 4-15; Table 4-21).

Assessment Comments

Some survey comments from New Stuyahok respondents are below, with more qualitative information provided in Chapter 8: "Local and Traditional Knowledge of Salmon and Subsistence on the Nushagak River." In 2013, survey respondents commented on Chinook salmon run variability as affecting local subsistence users in terms of cost. This was reflected in survey data by respondents who cited equipment/fuel expense as a reason for a lowered harvest of salmon compared to recent years, as well as comments provided at the end of the survey. Pebble Mine, a copper/gold/molybdenum open-pit mine project proposed at Bristol Bay's headwaters, was also a concern for New Stuyahok residents in 2013 and 2014. Various gear types were discussed in both years as well, largely to reinforce their connection to subsistence: the focus was on gear such as rod and reel or drift gillnet, neither of which is considered legal subsistence gear in

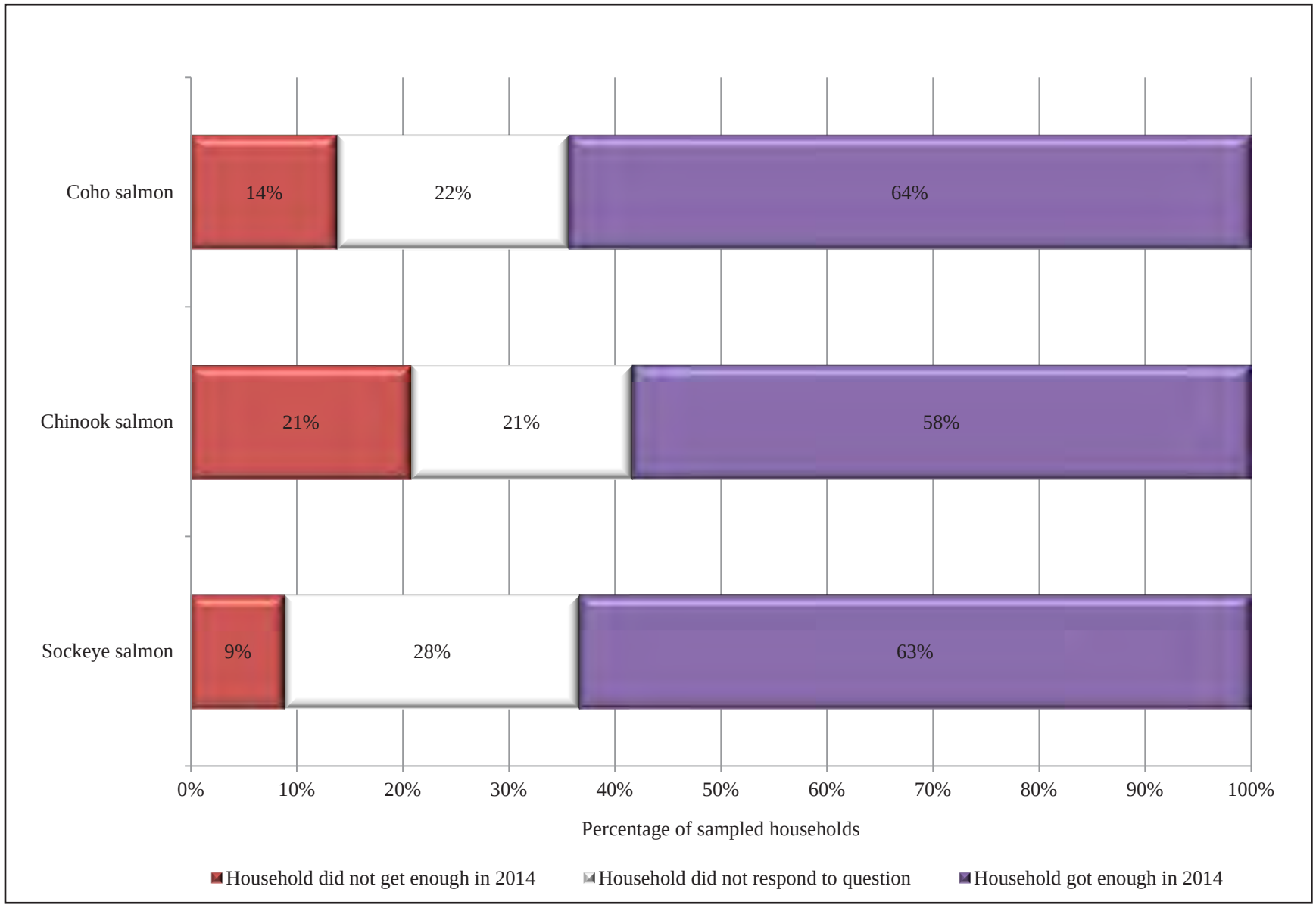


Figure 4-24.–Percentage of sampled households reporting whether they had enough salmon resources, New Stuyahok, 2014.

Table 4-18.–Percentage of households reporting whether they had enough salmon resources, New Stuyahok, 2014.

		Households not getting enough _____ .			
	Sampled	Valid responses[a]		Did not get enough	
Resource	households	Number	Percentage	Number	Percentage
Coho salmon	101	79	78.2%	14	17.7%
Chinook salmon	101	80	79.2%	21	26.3%
Sockeye salmon	101	73	72.3%	9	12.3%

Source ADF&G Division of Subsistence household surveys, 2015.
a. Does not include households that did not respond to the question or those households that never use the resource.

Table 4-19.–Reasons why households did not have enough salmon resources, New Stuyahok, 2014.

Resource	Valid responses[a]	Personal or family reasons		Resource availability		Too far to travel		Lack of equipment		Did not receive as much	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	13	4	30.8%	0	0.0%	0	0.0%	5	38.5%	1	7.7%
Chinook salmon	20	7	35.0%	0	0.0%	0	0.0%	4	20.0%	1	5.0%
Sockeye salmon	9	2	22.2%	0	0.0%	0	0.0%	2	22.2%	0	0.0%

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Table 4-19.–Continued.

Resource	Valid responses[a]	Less effort		Unsuccessful		Weather		Other reasons		Not enough time	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	13	0	0.0%	0	0.0%	1	7.7%	1	7.7%	2	15.4%
Chinook salmon	20	0	0.0%	0	0.0%	0	0.0%	2	10.0%	2	10.0%
Sockeye salmon	9	1	11.1%	0	0.0%	0	0.0%	2	22.2%	0	0.0%

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Table 4-19.–Continued.

Resource	Valid responses[a]	Regulations		Animals too small or diseased		Fuel too expensive	
		Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	13	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	20	0	0.0%	0	0.0%	2	10.0%
Sockeye salmon	9	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2015.

Note Households may provide more than one response to the question.

a. Includes those households providing a valid reason for not getting enough.

Table 4-20.–Salmon resources that sampled households reported needing, New Stuyahok, 2014.

Resource	Households needing	Total amount needed	Average amount needed
Coho salmon	10	190	19
Chinook salmon	19	943	50
Sockeye salmon	6	180	30

Source ADF&G Division of Subsistence household surveys, 2015.

Table 4-21.–Changes in household harvests of salmon resources compared to recent years, New Stuyahok, 2014.

			Households reporting harvest								Households not harvesting in 2014	
			Total households		Less		Same		More			
Resource	Sampled households	Valid responses[a]	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	101	80	73	91.3%	24	30.0%	47	58.8%	25	31.3%	12	15.0%
Chinook salmon	101	77	66	65.3%	18	23.4%	30	39.0%	18	23.4%	11	14.3%
Other salmon	101	78	70	69.3%	13	16.7%	40	51.3%	17	21.8%	8	10.3%

Source ADF&G Division of Subsistence household surveys, 2015.

a. Valid responses do not include households that did not provide any response.

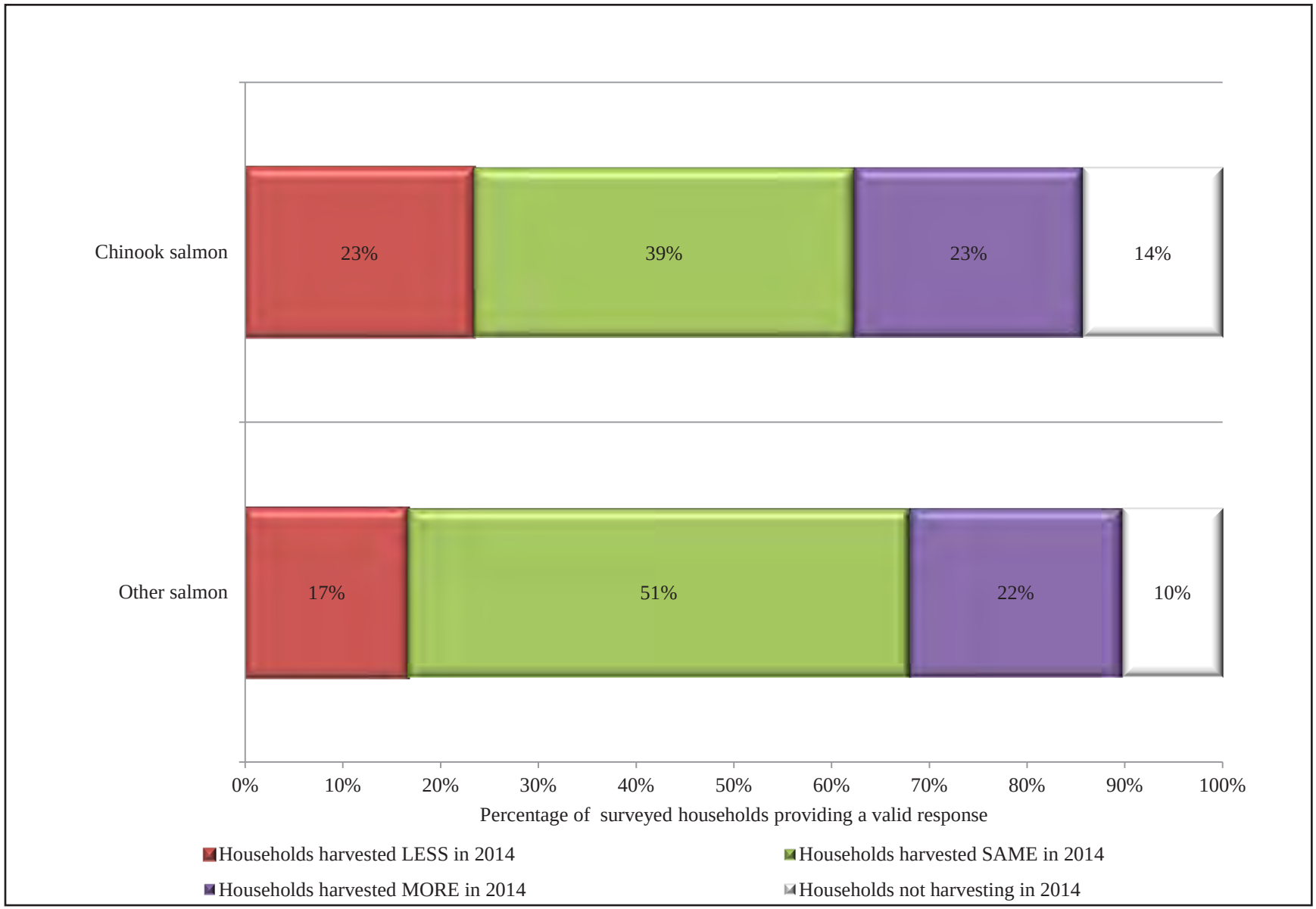


Figure 4-25.–Changes in household harvests of salmon resources compared to recent years, New Stuyahok, 2014.

Table 4-22.–Reasons for less household harvests of salmon resources compared to recent years, New Stuyahok, 2014.

Resource	Households reporting reasons for less harvest	Family/ personal		Resources less available		Too far to travel		Lack of equipment		Less sharing		Lack of effort		Unsuccessful		Weather/ environment	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	24	9	37.5%	3	13%	0	0.0%	3	13%	0	0%	0	0%	0	0.0%	1	4.2%
Chinook salmon	18	6	33.3%	2	11%	0	0.0%	3	17%	0	0%	0	0%	0	0.0%	0	0.0%
Other salmon	13	5	38.5%	1	8%	0	0.0%	2	15%	0	0%	0	0%	0	0.0%	1	7.7%

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Table 4-22.–Continued.

Resource	Households reporting reasons for less harvest	Other reasons		Working/ no time		Regulations		Small/ diseased animals		Did not get enough		Did not need		Equipment/ fuel expense		Too much competition	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	24	2	8%	1	4.2%	0	0.0%	2	8.3%	1	4.2%	0	0.0%	3	12.5%	0	0.0%
Chinook salmon	18	1	6%	1	5.6%	0	0.0%	2	11.1%	0	0.0%	0	0.0%	3	16.7%	0	0.0%
Other salmon	13	1	8%	1	7.7%	0	0.0%	0	0.0%	1	7.7%	0	0.0%	2	15.4%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2015.

Table 4-23.–Reasons for more household harvests of salmon resources compared to recent years, New Stuyahok, 2014.

Resource	Households reporting reasons for more use	Increased availability		Used other resources		Favorable weather		Received more		Needed more		Increased effort		Had more help	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	25	17	68.0%	0	0.0%	2	8.0%	0	0.0%	0	0.0%	5	20.0%	1	4.0%
Chinook salmon	18	11	61.1%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	4	22.2%	1	5.6%
Other salmon	17	12	70.6%	0	0.0%	2	11.8%	0	0.0%	0	0.0%	2	11.8%	1	5.9%

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Table 4-23.–Continued.

Resource	Households reporting reasons for more use	Other		Regulations		Traveled farther		More success		Needed less		Store-bought expense		Got/ fixed equipment	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	25	0	0.0%	0	0.0%	0	0.0%	2	8.0%	0	0.0%	0	0.0%	2	8.0%
Chinook salmon	18	0	0.0%	0	0.0%	0	0.0%	2	11.1%	0	0.0%	0	0.0%	1	5.6%
Other salmon	17	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	5.9%

Source ADF&G Division of Subsistence household surveys, 2015.

the Nushagak River. In 2014, comments were given regarding sharing of both gear and fish. Fish health and quality were mentioned by concerned community members who noticed pus and boils in sockeye and Chinook salmon meat.

Comments from 2013:

- The number of kings making [it] upriver are getting less and less. The runs either come in strong or hardly at all. They've become less predictable. Locals have to travel a far way to harvest a good amount of kings and it's very expensive.
- [I] hope to get more fish next year and gas prices go down.
- Stop the Pebble Mine—can't eat gold.
- Biggest concern is Pebble Mine, especially with all the toxic chemicals they [are] spilling into the water during exploratory drilling.
- Would love to be allowed to driftnet on the Nushagak River to make it easier to harvest.
- It would be nice to subsistence fish with rod and reel because you can be selective with what you keep. [It is] more efficient and easier on the resource; [there is] less bycatch.

Comments from 2014:

- Concerned about Pebble Mine because New Stu would be affected. The fish, kids swimming, subsistence in general: greens, moose, small land mammals, ducks, everything.
- More people don't have boats and nets so we share.
- [A] couple people gave [me] fish so [I] said it's [used] more than last year.
- Take off the regulations for subsistence fishing with rod and reel—most people like to get their subsistence with rod and reel.
- Quality of fish, [salmon] has pus, boil looking, in meat. Mostly in reds and some in kings. Maybe after the mining research.

Community Data Review Meeting

A data review meeting was held in New Stuyahok on March 26, 2018. Fourteen community members attended. One community member reported dead Chinook jack (mature, early returning males[2]) salmon at Lewis Point in the summer of 2017, near the Iowithla River, and believed they were "catch-and-release" Chinook salmon caught by sport fishers using rod and reel. Several members commented that having a salmon counting tower functioning earlier in the season would improve escapement counts and thus improve subsistence opportunities by allowing subsistence fishing to occur on the Nushagak River earlier in the season. Another member reported that 2013 was a better year in comparison to 2014, which was supported by survey data. Community feedback also included comments that sharing is high in the community; New Stuyahok subsistence fishers do not waste their catch; restrictions on subsistence fishing cannot occur since there is not enough paid employment in the community to sustain households; and drift gillnetting for subsistence should be made a viable option by ADF&G. A few residents also mentioned that subsistence harvest surveys yield valuable information and "is meaningful," and that the information may be used someday in the future by the community, so community support and participation is critical. Opposition to Pebble Mine was also a sentiment expressed by several New Stuyahok residents.

2. Alaska Department of Fish and Game, "Chinook Salmon (*Oncorhynchus tshawytscha*): Species Profile (Life History)," http://www.adfg.alaska.gov/index.cfm?adfg=chinook.main (accessed July 2018).

A Brief Comparison of Harvest Data Between Study Years

Harvest information between the years of 2013 and 2014 indicated that 2013 was a far more successful harvest year based on large differences in harvest values between the two study years (Table 4-6; Table 4-9). The total pounds harvested in 2014 (74,375 lb) was almost one-half the amount harvested in 2013 (131,047 lb). The Chinook salmon harvest, the most by weight in both years, was considerably lower in 2014 (by a difference of 28,000 lb), and the 2014 harvest totals for the remaining species were under 10,000 lb for each species. In contrast, in 2013, both sockeye and coho salmon harvests reached in excess of 10,000 lb: 29,693 lb and 12,248 lb, respectively. These are stark harvest differences for a community that was estimated to have only decreased its population between 2013 and 2014 by 28 individuals (Table 4-1). Overall, the harvest for salmon was 97 lb per capita less in 2014 than in 2013. About one-half the difference in the per capita harvests is due to a lower Chinook salmon harvest in 2014: the Chinook salmon per capita harvest was 150 lb in 2013, and reduced by 47 lb to 103 lb in 2014.

Although the 2014 total subsistence harvest of Chinook salmon, based on permit returns, increased in the entire Nushagak District to 16,049 fish from 11,602 fish in 2013, indicating a general subsistence harvest increase for the region's communities, New Stuyahok did not seem to benefit as much as the other Nushagak District communities. All three indicators used to monitor the overall Nushagak District Chinook run—inriver abundance, spawning escapement, and total run—were greater in 2013 than in 2014, but the subsistence harvest in 2014 was higher by 4,447 fish (Salomone et al. 2017:91). In comparison, the sockeye salmon subsistence harvest for the Nushagak District decreased from 2013 to 2014, coinciding with New Stuyahok's decreased overall sockeye salmon harvest in 2014. The New Stuyahok sockeye salmon harvest decreased by 23,204 lb (or 42 lb per capita) between 2013 and 2014 (Table 4-6; Table 4-9).

Several reasons may help explain the differences in harvest estimates. As highlighted previously, New Stuyahok's Chinook salmon harvest estimate was higher in 2013 than 2014, which coincides with the Nushagak District's Chinook salmon run estimate being better in 2013 than 2014. Focusing on cited reasons for changed Chinook salmon harvests, it is interesting that more households indicated that Chinook salmon was less available in 2013 (nine households) than 2014 (two households), even though the harvest of this species was estimated as greater in 2013 (Table 4-16; Table 4-22). Similarly, equipment/fuel expense and general lack of successful harvest effort were cited more frequently in 2013 than 2014 as a reason for harvesting fewer Chinook salmon.

In general, for any salmon resource, reasons for less salmon harvest indicated by respondents show that fuel and equipment expenses may have contributed to the harvest decrease. Compared to the other study communities, "equipment/fuel expense" was given far more often as a reason for smaller salmon harvests in New Stuyahok. Although reasons for general use and harvest patterns overlap and are varied in both study years, the dramatic drop in harvest numbers over a two-year period is likely the result of a combination of reasons, which were not fully explored in this project.

Further changes in the harvest of salmon by New Stuyahok residents can be understood through comparisons with findings from other study years. The most recent study done in New Stuyahok was for study year 2005, and results from the study were published in Krieg et al. (2009): *Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Levelock, and New Stuyahok, Alaska, 2005* (Technical Paper No. 322). The study prior to that was for the study period April 1987–March 1988; study results are published in Schichnes and Chythlook (1991): *Contemporary Use of Fish and Wildlife in Ekwok, Koliganek, and New Stuyahok, Alaska* (Technical Paper No.185). Both the reports and data may be found online on the ADF&G website and CSIS. In Chapter 7: "The Subsistence Permit System" there is additional discussion about previous study year salmon harvest estimates, specifically under the subheading "Comparison of Household Survey and Permit Data for Study Years."

5. KOLIGANEK

Community Background

Koliganek—known by its Yup'ik name *Qalirneq*, which means "last or upper" community on the Nushagak River—is located 65 miles northeast of Dillingham (Schichnes and Chythlook 1991). The village site of Old Koliganek was located at the mouth of the Nuyakuk River but moved in 1940. Between 1940 and 1963 another site was used, but this was abandoned due to flooding, and the present-day site of "New Koliganek" was established in 1964 (Krieg et al. 2009). In 1954, a BIA school operated in Koliganek, and then in 1965 a school was completed at the New Koliganek site (Krieg et al. 2009).

Koliganek is only accessed by airplane and boat, or snowmachine is used in winter to travel between regional villages. There are a number of facilities in Koliganek, such as a store, a school, and a tribal administration building for the village corporation, Koliganek Natives Limited. The village is also a part of the ANCSA regional corporation Bristol Bay Native Corporation. The name of the federally recognized tribe is the New Koliganek Village Council. Other amenities also exist, such as cell phone service, a landfill, a health clinic, and an airstrip that services local air transport companies, as well as larger commercial air operators.

Koliganek, like its neighboring Nushagak River communities, is surrounded by mixed spruce and deciduous forest and is situated on a flat tundra landscape. Summers are short and warm, coupled with long, cold winters. Rivers and drainages of Bristol Bay and Nushagak Bay continue to provide the largest wild salmon breeding ground worldwide.

Population Estimates and Demographic Information: 2013 and 2014

Table 5-1 shows population information for Koliganek during 2013 and 2014. The estimated population for Koliganek in 2013 was 214 people, with the Alaska Native population estimated at 201 individuals (94%) (Table 5-1; Figure 5-1). There were an estimated 60 eligible households in the community (living in the community for at least three months) with a mean household size of 3.6 members (Table 5-1). Alaska Native households (where one head of the household is Alaska Native) totaled 58, composing 96% of the community households. In 2014, the population was estimated to have decreased to 198 individuals. The Alaska Native population was 188, making up 95% of the community population (Figure 5-1; Table 5-1). The mean household size during 2014 was 3.3 individuals (Table 5-1). The average age of a Koliganek resident during the study was 30–31, with the minimum being less than 1 year of age and the maximum being 90.

The population of Koliganek has risen since 1950, when the population was just fewer than 100 individuals (Figure 5-2). The population profile of residents in Koliganek during the study years (2013–2014) was 110–105 males compared to 104–93 females; there were slightly more males each year (51% and 53%, respectively) (Table 5-2; Table 5-3). In Koliganek, there were fewer middle-age adults aged 35–44 and elders (65 and older) than all other age cohorts (Figure 5-3; Figure 5-4).

Sampling in both study years resulted in the identification of 60 eligible dwelling units, of which 48 (2013) and 51 (2014) were successfully interviewed, making the percentage sampled 80% in 2013, and 85% in 2014 (Table 5-4). Ten households in 2013 failed to be contacted, and two households declined to be surveyed. In 2014, one household failed to be contacted, and two declined to be interviewed. The refusal rate in both years was 4%. Beyond basic population, age, and sex demographics, no other information, such as employment characteristics, was obtained from Division of Subsistence surveys. According to the ACS five-year average estimate for 2012–2016, which encompasses both study years for this community, the median household income in Koliganek was $55,417 (U.S. Census Bureau n.d.).

Table 5-1.–Sample and demographic characteristics, Koliganek, 2013, and 2014.

Characteristics	Koliganek 2013	Koliganek 2014
Sampled households	48	51
Eligible households	60	60
Percentage sampled	80.0%	85.0%
Sampled population	171	168
Estimated community population	213.8	197.6
Range[a]	199 – 229	184 – 211
Household size		
Mean	3.6	3.3
Minimum	1	1
Maximum	7	8
Age		
Mean	31.0	29.8
Minimum[b]	0	0
Maximum	89	90
Median	25	25.5
Alaska Native		
Estimated households[c]		
Number	57.5	56.5
Percentage	95.8%	94.1%
Estimated population		
Number	201.3	188.2
Percentage	94.2%	95.2%
Range[a]	186 – 216	175 – 202
U.S. Census 2010[d]		
Households	55	55
Population	209	209
Alaska Native population	202	202
American Community Survey 5-year average[e]		
Households	46	45
Range[f]	28 – 64	33 – 57
Population	217	164
Range[f]	142 – 292	117 – 211
Alaska Native population	185	153
Range[f]	119 – 251	107 – 199

Source ADF&G Division of Subsistence household surveys, 2014 and 2015.

a. Estimated range is 95% confidence interval.

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

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

d. Source is U.S. Census Bureau (2011).

e. Source is U.S. Census Bureau for American Community Survey (ACS); 2009–2013 ACS estimates used for 2013, 2010–2014 ACS estimates used for 2014.

f. ACS data range is the reported margin of error.

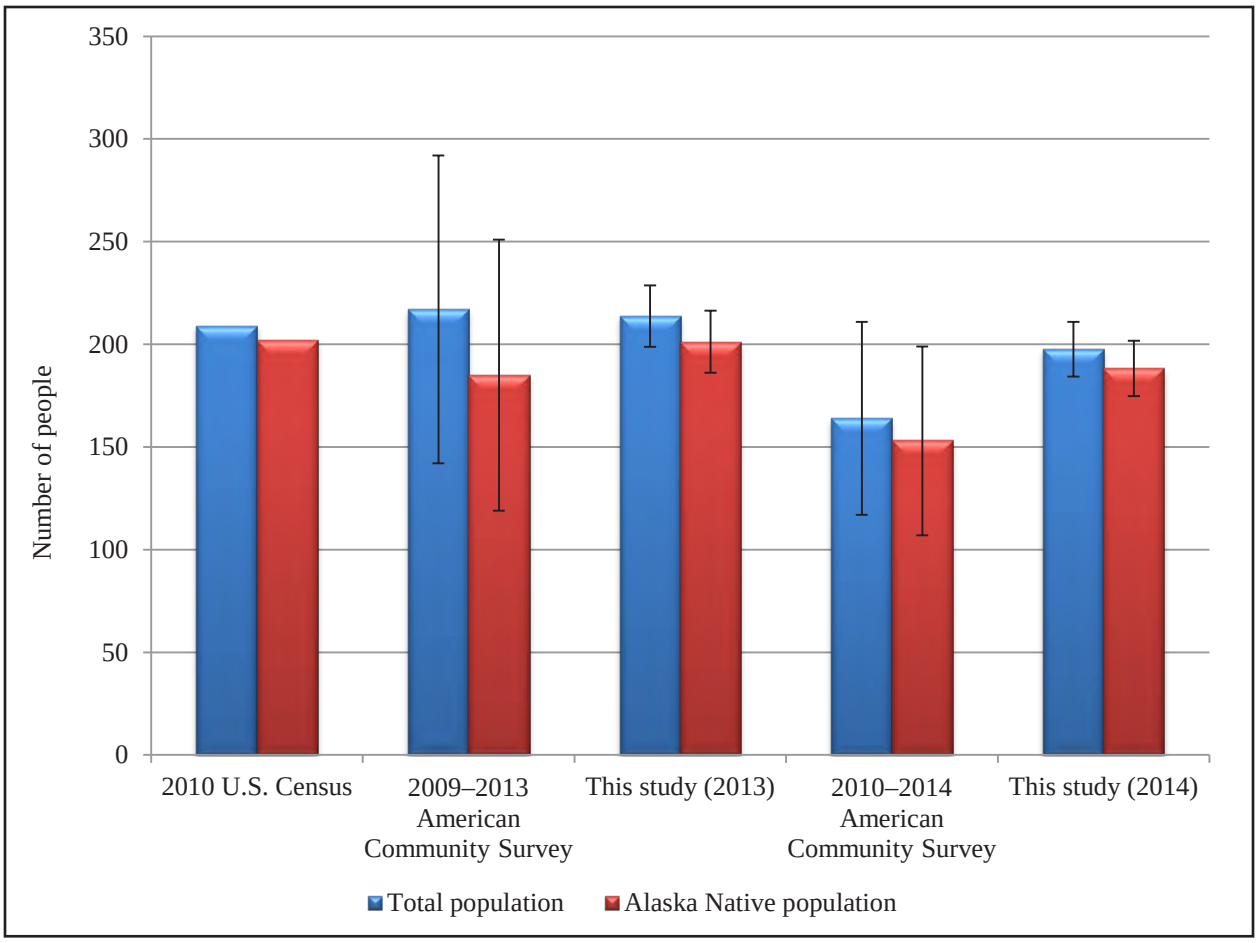


Figure 5-1.–Alaska Native and overall population estimates, Koliganek, 2010, 2013, and 2014.

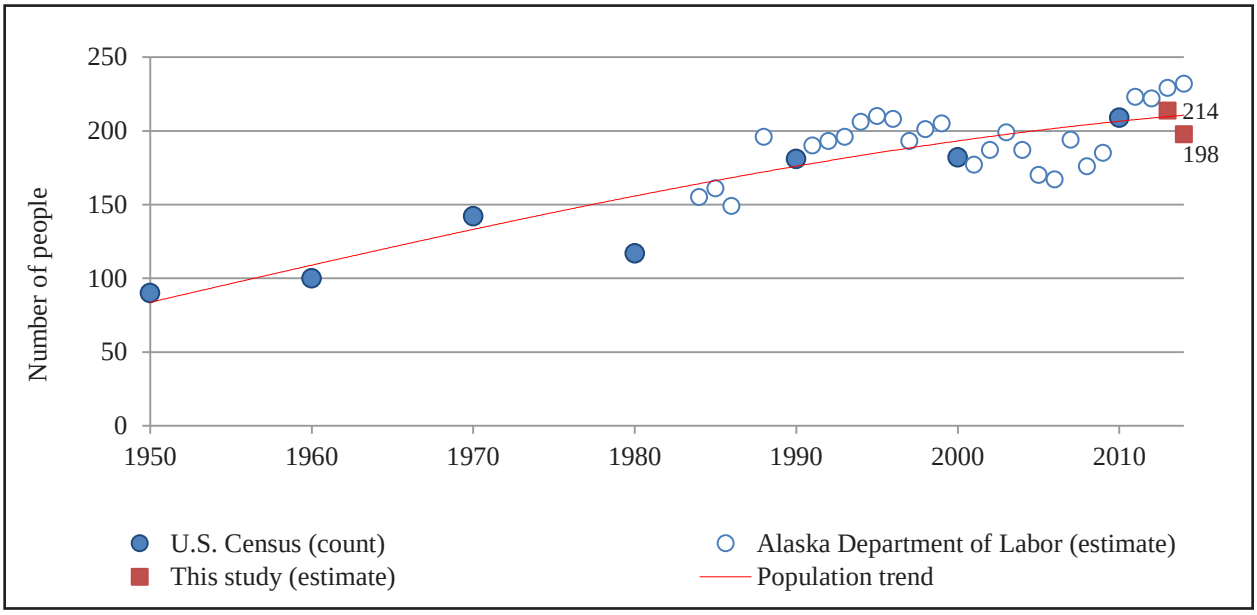


Figure 5-2.–Historical population estimates, Koliganek, 1950–2014.

Table 5-2.–Population profile, Koliganek, 2013.

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	7.5	6.8%	6.8%	12.5	12.0%	12.0%	20.0	9.4%	9.4%
5–9	15.0	13.6%	20.5%	6.3	6.0%	18.1%	21.3	9.9%	19.3%
10–14	7.5	6.8%	27.3%	11.3	10.8%	28.9%	18.8	8.8%	28.1%
15–19	6.3	5.7%	33.0%	7.5	7.2%	36.1%	13.8	6.4%	34.5%
20–24	10.0	9.1%	42.0%	12.5	12.0%	48.2%	22.5	10.5%	45.0%
25–29	11.3	10.2%	52.3%	10.0	9.6%	57.8%	21.3	9.9%	55.0%
30–34	7.5	6.8%	59.1%	3.8	3.6%	61.4%	11.3	5.3%	60.2%
35–39	1.3	1.1%	60.2%	5.0	4.8%	66.3%	6.3	2.9%	63.2%
40–44	6.3	5.7%	65.9%	0.0	0.0%	66.3%	6.3	2.9%	66.1%
45–49	3.8	3.4%	69.3%	6.3	6.0%	72.3%	10.0	4.7%	70.8%
50–54	16.3	14.8%	84.1%	10.0	9.6%	81.9%	26.3	12.3%	83.0%
55–59	5.0	4.5%	88.6%	5.0	4.8%	86.7%	10.0	4.7%	87.7%
60–64	8.8	8.0%	96.6%	5.0	4.8%	91.6%	13.8	6.4%	94.2%
65–69	0.0	0.0%	96.6%	0.0	0.0%	91.6%	0.0	0.0%	94.2%
70–74	0.0	0.0%	96.6%	3.8	3.6%	95.2%	3.8	1.8%	95.9%
75–79	1.3	1.1%	97.7%	0.0	0.0%	95.2%	1.3	0.6%	96.5%
80–84	1.3	1.1%	98.9%	1.3	1.2%	96.4%	2.5	1.2%	97.7%
85–89	0.0	0.0%	98.9%	2.5	2.4%	98.8%	2.5	1.2%	98.8%
90–94	0.0	0.0%	98.9%	0.0	0.0%	98.8%	0.0	0.0%	98.8%
95–99	0.0	0.0%	98.9%	0.0	0.0%	98.8%	0.0	0.0%	98.8%
100–104	0.0	0.0%	98.9%	0.0	0.0%	98.8%	0.0	0.0%	98.8%
Missing	1.3	1.1%	100.0%	1.3	1.2%	100.0%	2.5	1.2%	100.0%
Total	**110.0**	**100.0%**	**100.0%**	**103.8**	**100.0%**	**100.0%**	**213.8**	**100.0%**	**100.0%**

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

Table 5-3.–Population profile, Koliganek, 2014.

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	8.2	7.9%	7.9%	11.8	12.7%	12.7%	20.0	10.1%	10.1%
5–9	7.1	6.7%	14.6%	7.1	7.6%	20.3%	14.1	7.1%	17.3%
10–14	14.1	13.5%	28.1%	9.4	10.1%	30.4%	23.5	11.9%	29.2%
15–19	12.9	12.4%	40.4%	8.2	8.9%	39.2%	21.2	10.7%	39.9%
20–24	7.1	6.7%	47.2%	4.7	5.1%	44.3%	11.8	6.0%	45.8%
25–29	5.9	5.6%	52.8%	10.6	11.4%	55.7%	16.5	8.3%	54.2%
30–34	7.1	6.7%	59.6%	4.7	5.1%	60.8%	11.8	6.0%	60.1%
35–39	1.2	1.1%	60.7%	1.2	1.3%	62.0%	2.4	1.2%	61.3%
40–44	3.5	3.4%	64.0%	1.2	1.3%	63.3%	4.7	2.4%	63.7%
45–49	4.7	4.5%	68.5%	5.9	6.3%	69.6%	10.6	5.4%	69.0%
50–54	11.8	11.2%	79.8%	8.2	8.9%	78.5%	20.0	10.1%	79.2%
55–59	7.1	6.7%	86.5%	5.9	6.3%	84.8%	12.9	6.5%	85.7%
60–64	8.2	7.9%	94.4%	3.5	3.8%	88.6%	11.8	6.0%	91.7%
65–69	1.2	1.1%	95.5%	0.0	0.0%	88.6%	1.2	0.6%	92.3%
70–74	0.0	0.0%	95.5%	3.5	3.8%	92.4%	3.5	1.8%	94.0%
75–79	1.2	1.1%	96.6%	0.0	0.0%	92.4%	1.2	0.6%	94.6%
80–84	0.0	0.0%	96.6%	0.0	0.0%	92.4%	0.0	0.0%	94.6%
85–89	1.2	1.1%	97.8%	1.2	1.3%	93.7%	2.4	1.2%	95.8%
90–94	0.0	0.0%	97.8%	1.2	1.3%	94.9%	1.2	0.6%	96.4%
95–99	0.0	0.0%	97.8%	0.0	0.0%	94.9%	0.0	0.0%	96.4%
100–104	0.0	0.0%	97.8%	0.0	0.0%	94.9%	0.0	0.0%	96.4%
Missing	2.4	2.2%	100.0%	4.7	5.1%	100.0%	7.1	3.6%	100.0%
Total	**104.7**	**100.0%**	**100.0%**	**92.9**	**100.0%**	**100.0%**	**197.6**	**100.0%**	**100.0%**

Source ADF&G Division of Subsistence household surveys, 2015.

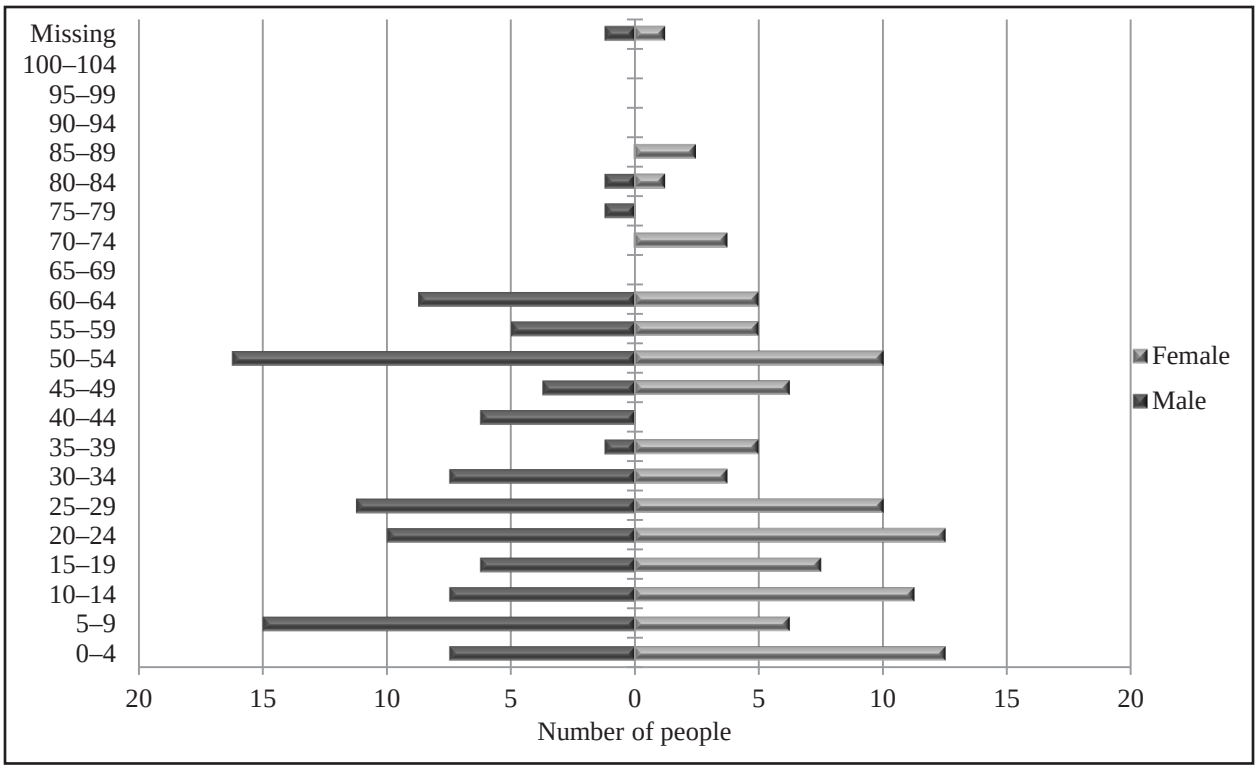


Figure 5-3.–Population profile, Koliganek, 2013.

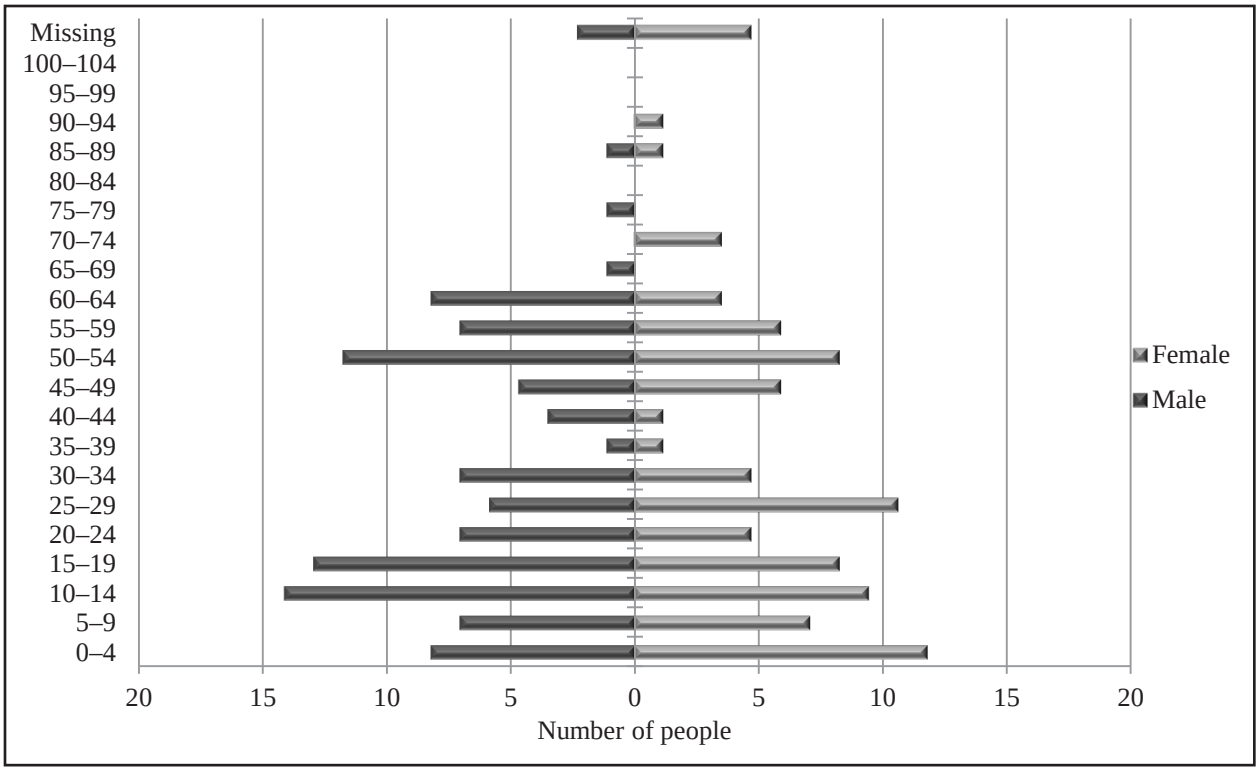


Figure 5-4.–Population profile, Koliganek, 2014.

Table 5-4.–Sample achievement, Koliganek, 2013 and 2014.

Sample information	2013	2014
Number of dwelling units	59	66
Interview goal	59	66
Households interviewed	48	51
Households failed to be contacted	10	1
Households declined to be interviewed	2	2
Households moved or occupied by nonresident	1	6
Total households attempted to be interviewed	60	54
Refusal rate	4.0%	3.8%
Final estimate of permanent households	60	60
Percentage of total households interviewed	80.0%	85.0%
Interview weighting factor	1.3	1.2
Sampled population	171	168
Estimated population	213.8	197.6

Source ADF&G Division of Subsistence household surveys, 2014 and 2015.

Summary of Harvest and Use Patterns

Survey participants were asked about their engagement with the salmon fisheries, and varying amounts of use, attempt to harvest, successful harvest, and sharing of salmon were estimated from survey results. Sharing was identified by survey respondents as fulfilling a large proportion of salmon consumed by households. Salmon were shared in one form or another, which could have included unprocessed or processed fish. The survey effort included two ways to identify gear type used in the study communities. First, respondents were asked to identify the gear type used for salmon harvests reported on the household survey. Second, when identifying fishing and harvest locations on a map, respondents were asked to identify the type of harvest gear used at each location. Note that not every surveyed household provided spatial data (see Table 1-3) and some households did not provide clarification about the gear used at specific fishing and harvest locations. Therefore, the survey results provide two different depictions of harvest patterns by gear type. Also, respondents were not asked to identify where commercial harvests retained for home use came from, but tables showing harvests by gear type do depict the estimated amount of salmon retained from commercial catches. Note that based on comments collected during survey administration, set gillnet was the gillnet gear type most commonly used for subsistence salmon fishing, but some drift gillnet use occurred. The following sections summarize results for harvest and use patterns for each study year.

Individual Participation in the Harvesting and Processing of Salmon: 2013 and 2014

All salmon species found in Alaska, except for pink salmon, were harvested by Koliganek residents in the 2013 study year. Harvested species included Chinook, sockeye, chum, and coho salmon, as well as spawned-out sockeye salmon. Figure 5-5 is a visual representation of the level of individual participation in the subsistence harvesting and processing of salmon by members of households in Koliganek. An estimated 73% percent of the community subsistence fished for salmon (155 people), and 78% processed salmon (166 people) (Table 5-5).

All salmon species, as well as spawned-out sockeye salmon, were harvested by Koliganek residents in the 2014 study year. An estimated 64% percent of the community subsistence fished for salmon (126 people), and 77% processed salmon (152 people).

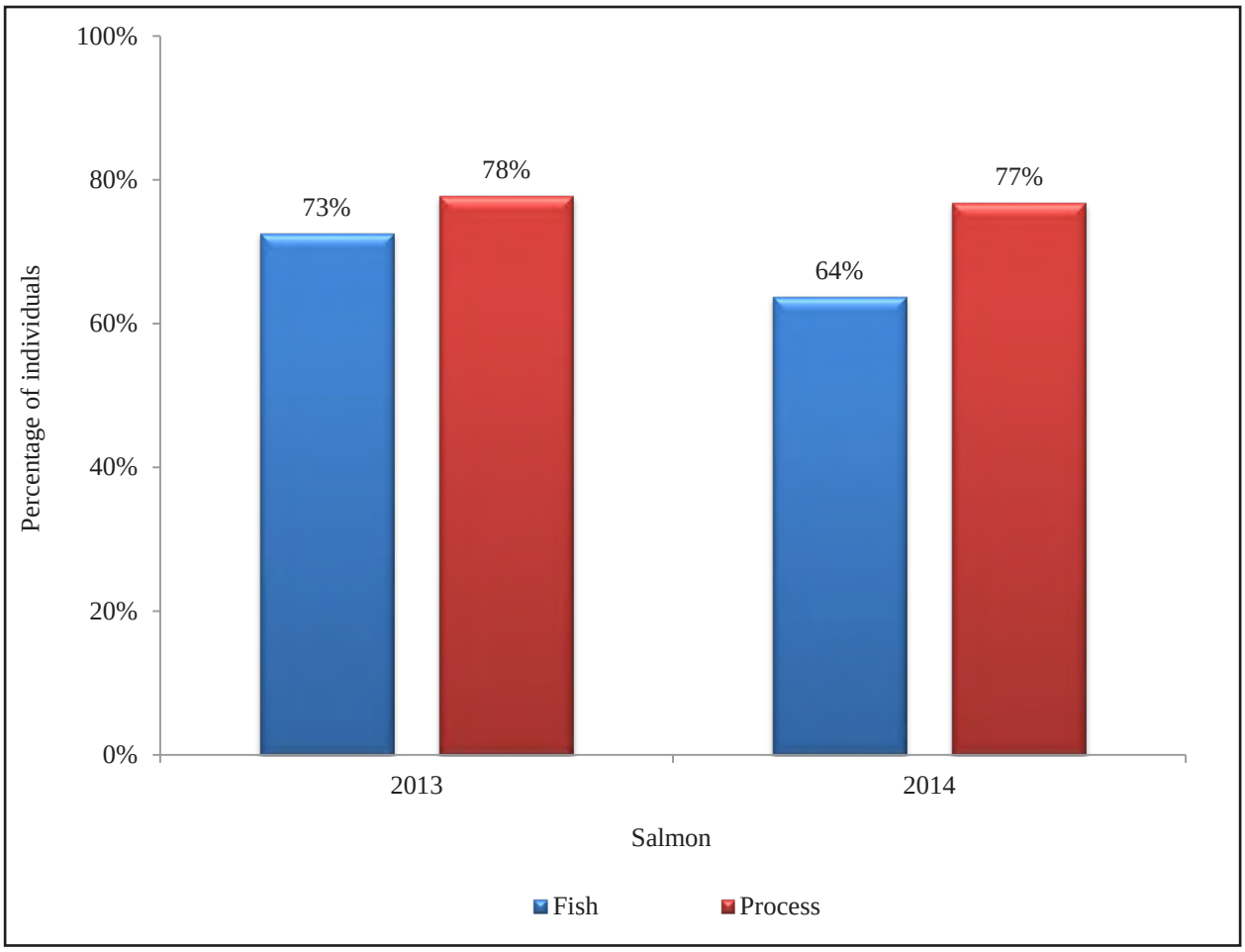


Figure 5-5.–Individual participation in subsistence salmon harvesting and processing activities, Koliganek, 2013 and 2014.

Table 5-5.–Individual participation in subsistence salmon harvesting and processing activities, Koliganek, 2013 and 2014.

	2013	2014
Total number of people	**213.8**	**197.6**
Salmon		
Fish		
Number	155.0	125.9
Percentage	72.5%	63.7%
Process		
Number	166.3	151.8
Percentage	77.8%	76.8%

Source ADF&G Division of Subsistence household surveys, 2014 and 2015.

Household Salmon Harvest and Use Characteristics in Koliganek: 2013

The total estimated number of all salmon species harvested in 2013 by Koliganek residents was 9,371 individual fish totaling 59,519 lb (Table 5-6). The highest portion of harvested salmon was Chinook salmon at 25,885 lb, followed by sockeye salmon at 15,108 lb. The total salmon harvest accounted for a mean harvest of 992 lb per household, or 279 lb per capita. Chinook salmon accounted for 43% of the total pounds harvested in 2013, or 121 lb per capita (Figure 5-6; Table 5-6). Sockeye salmon composed 25% of the salmon harvest weight, and this species accounted for the second highest per capita harvest at 71 lb.

Overall Use by Households and Salmon Harvests by Gear Type

Ninety-four percent of households in Koliganek used salmon in 2013, with 75% attempting and successfully harvesting salmon, and 54% of households received salmon (Figure 5-7). The highest percentages of salmon use were for Chinook and sockeye salmon, with 88% and 79% of households using these species, respectively (Table 5-6). In terms of successful harvest, coho salmon was the most harvested fish—by 67% of households—followed by Chinook (63%) and sockeye (60%) salmon. The majority of households gave away or received salmon. Chinook salmon was the most received fish with 44% of households having received Chinook. Giving of salmon also occurred in Koliganek, with 52% of households giving away Chinook resources, followed by 44% giving away both sockeye and coho salmon.

Methods used to harvest salmon included removal from commercial catches, subsistence gillnetting, and rod and reel fishing (Table 5-7; Figure 5-8). Home pack from commercial fishing accounted for 5% of the total salmon harvest weight (Table 5-8). Subsistence gillnetting gear accounted for 89% of the salmon harvest and 6% of the salmon harvest was from rod and reel gear. An estimated 1,759 Chinook salmon were harvested by gillnet, 158 were removed from commercial catches, and 16 were caught by rod and reel (Table 5-7). Subsistence gillnetting was the dominant method of fishing used by households in Koliganek. Coho salmon was the only species for which rod and reel gear was used to harvest a significant portion (44%) of the catch (Table 5-8).

Salmon Harvests by Location and Harvest Gear Type

The salmon harvest areas used by Koliganek residents in 2013 are depicted by species in Figure 5-9. Harvest locations are given for all species except pink salmon, which was not harvested in 2013 (Table 5-6). Salmon fishing was concentrated around the community, and on both sides of the Nushagak River (Figure 5-9). Harvest locations spanned approximately 25 miles north of the community, both on the Nushagak River and on the Nuyakuk River. South of the community, about 20–25 miles downriver, Koliganek residents harvested salmon at the confluence of the Nushagak and Mulchatna rivers, and almost to the community of New Stuyahok. Additionally, in 2013, one harvest location was indicated near Portage Creek, and two at Nushagak Point. Generally, all species were sought both close to and far from the community, but Chinook salmon was pursued at the further locations more often than any other species. Spawning sockeye salmon were harvested on the Nuyakuk River, in areas furthest from the community, and in the Nushagak River north of Koliganek.

Chinook salmon harvest locations by gear type are shown in Figure 5-10. Gillnet was the gear type primarily used to harvest Chinook salmon and in a more widespread area south of Koliganek than rod and reel gear, for which harvest locations were concentrated at locations closer to the community. Koliganek residents traveled as far as Nushagak Bay to harvest Chinook salmon, as well as up the Nuyakuk and Mulchatna rivers. Households indicated using concentrated gillnet sites between Koliganek and the Mulchatna River confluence, including areas off the main Nushagak River channel. Rod and reel gear was used upriver of Koliganek as indicated with lines spanning sections of the river.

Harvest locations for coho salmon were predominantly rod and reel fishing sites, and only two locations were south of Koliganek, with the rest clustered within approximately the first 10 miles north of the community (Figure 5-11). Individual coho salmon amounts harvested by rod and reel (678), compared to gillnet (830), indicate that rod and reel fishing is common for this species, suggesting similar importance here as at some of the other study communities for using rod and reel gear to harvest coho salmon for home

Table 5-6.–Estimated use and harvest of salmon, Koliganek, 2013.

Resource	Percentage of households: Use %	Attempt %	Harvest %	Receive %	Give %	Harvest weight (lb): Total	Mean per household	Per capita	Harvest amount: Total	Unit	Mean per household	95% confidence limit (±) harvest
Salmon	**93.8**	**75.0**	**75.0**	**54.2**	**60.4**	**59,519.2**	**992.0**	**278.5**	**9,370.8**	**ind**	**156.2**	**23.5**
Chum salmon	37.5	35.4	35.4	12.5	20.8	8,276.0	137.9	38.7	1,747.5	ind	29.1	38.8
Coho salmon	75.0	66.7	66.7	25.0	43.8	6,919.5	115.3	32.4	1,537.7	ind	25.6	21.0
Chinook salmon	87.5	62.5	62.5	43.8	52.1	25,885.4	431.4	121.1	1,932.9	ind	32.2	19.3
Pink salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ind	0.0	0.0
Sockeye salmon	79.2	60.4	60.4	37.5	43.8	15,108.4	251.8	70.7	3,402.8	ind	56.7	28.2
Spawning sockeye salmon	25.0	20.8	20.8	10.4	16.7	3,329.9	55.5	15.6	750.0	ind	12.5	51.2
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ind	0.0	0.0

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

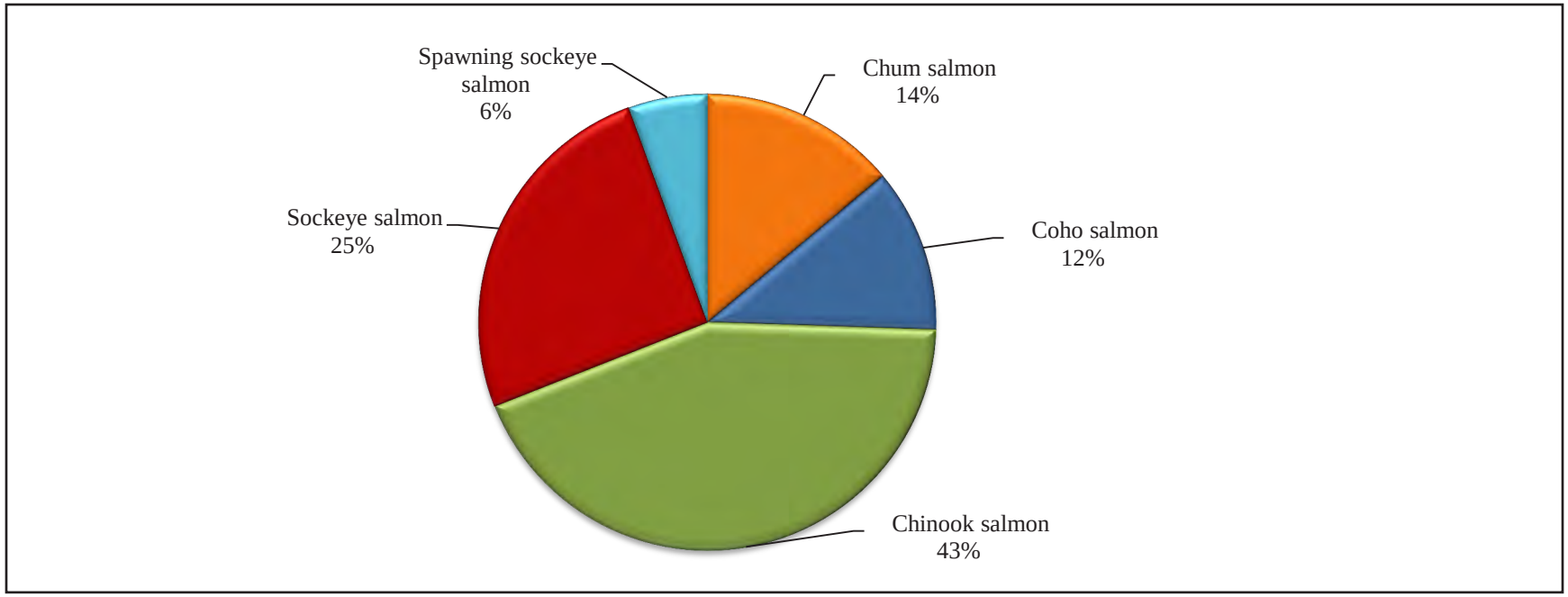


Figure 5-6.–Composition of salmon harvest in pounds usable weight, Koliganek, 2013.

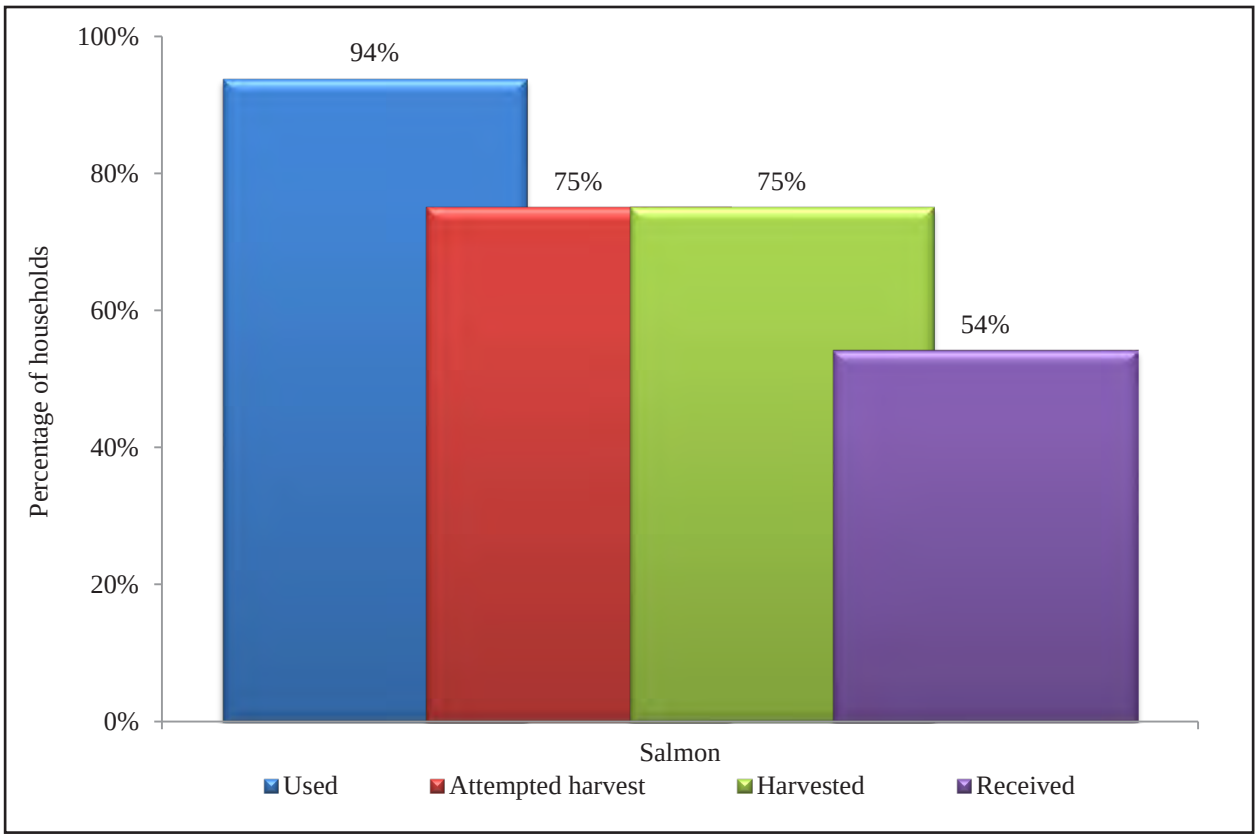


Figure 5-7.–Percentage of households using, attempting to harvest, harvesting, and receiving salmon, Koliganek, 2013.

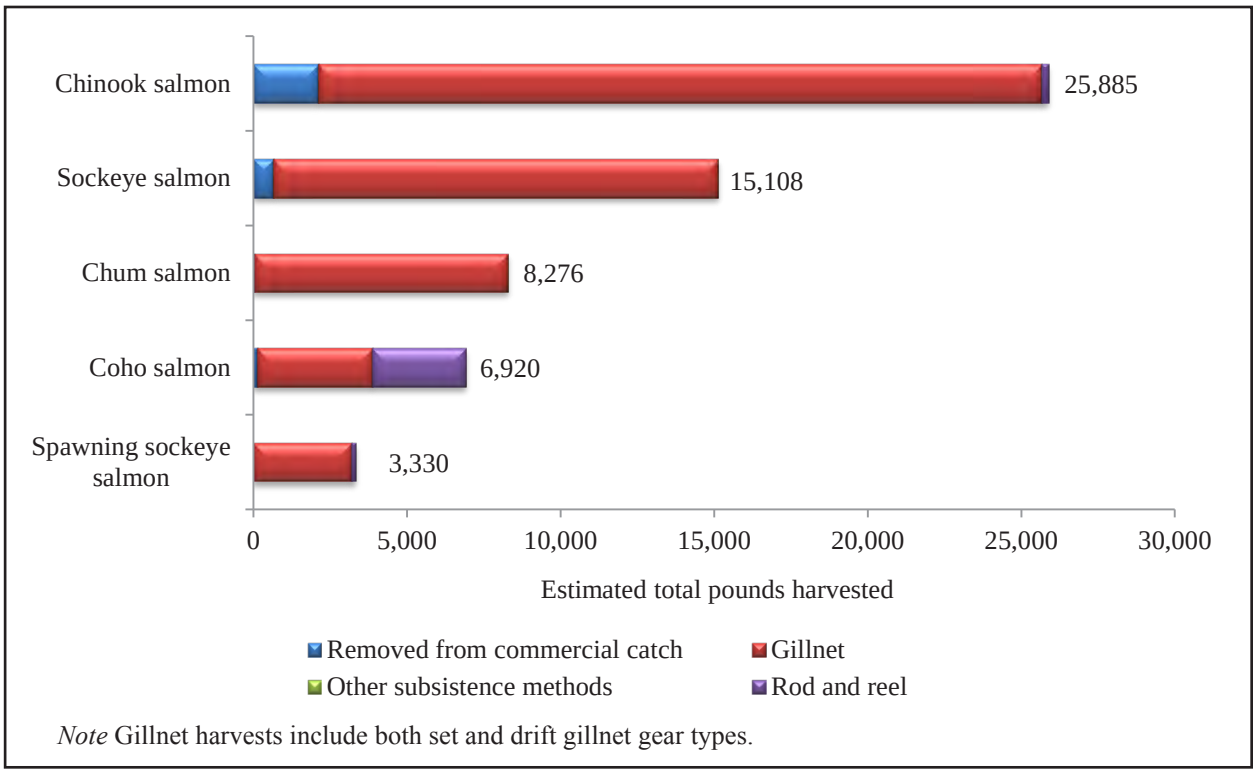
Table 5-7.–Estimated harvest of salmon by gear type and resource, Koliganek, 2013.

	Removed from commercial catch		Subsistence methods									
			Gillnet[a]		Other method		Subsistence gear, any method		Rod and reel		Any method	
Resource	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Salmon	**341.3**	**2,929.1**	**8,300.4**	**53,166.2**	**0.0**	**0.0**	**8,300.4**	**53,166.2**	**729.1**	**3,423.8**	**9,370.8**	**59,519.2**
Chum salmon	7.5	35.5	1,738.7	8,234.6	0.0	0.0	1,738.7	8,234.6	1.3	5.9	1,747.5	8,276.0
Coho salmon	30.0	135.0	829.8	3,734.0	0.0	0.0	829.8	3,734.0	677.9	3,050.4	1,537.7	6,919.5
Chinook salmon	157.5	2,109.2	1,759.1	23,558.5	0.0	0.0	1,759.1	23,558.5	16.3	217.6	1,932.9	25,885.4
Pink salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sockeye salmon	146.3	649.4	3,254.0	14,447.9	0.0	0.0	3,254.0	14,447.9	2.5	11.1	3,402.8	15,108.4
Spawning sockeye salmon	0.0	0.0	718.7	3,191.1	0.0	0.0	718.7	3,191.1	31.3	138.8	750.0	3,329.9
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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

Note The harvested number of salmon is represented as individual fish harvested.

a. Gillnet harvests include both set and drift gillnet gear types.



Note Gillnet harvests include both set and drift gillnet gear types.

Figure 5-8.–Estimated harvest of salmon in pounds usable weight by gear type and resource, Koliganek, 2013.

use (Table 5-7). In the survey comments, the use of rod and reel specifically was associated with being a type of conservation method. Qualitative comments from all communities (Table 8-2) indicated that rod and reel fishing is considered a subsistence method by community residents who use it to fish for certain species and to be able to control how many fish are harvested. The harvest locations using rod and reel may also show that this gear type is used opportunistically by harvesters when doing other subsistence activities, such as hunting or berry picking.

In 2013, sockeye salmon harvests generally spanned north up the Nuyakuk River, with a few fishing locations used toward New Stuyahok (Figure 5-12). Rod and reel gear was used continuously upriver of the community, as well as gillnets at several select locations. Fishing areas for other salmon, which in 2013 included harvest locations for chum and spawning sockeye salmon, are shown in Figure 5-13. Chum and spawning sockeye salmon were both primarily harvested by gillnet—generally upriver from Koliganek—and rod and reel harvests occurred at two locations on the Nuyakuk River.

Household Salmon Harvest and Use Characteristics in Koliganek: 2014

The total number of all salmon species harvested in 2014 by Koliganek residents was 7,848 individual fish totaling 54,441 lb (Table 5-9). The highest portion of harvested salmon was Chinook salmon at 28,745 lb, followed by chum salmon at 10,820 lb. This total salmon harvest accounted for 907 lb per household, or 275 lb per capita. Chinook salmon accounted for 53% of the total pounds harvested in 2014, or 145 lb per capita (Figure 5-14; Table 5-15). The chum salmon harvest, the second highest (20%), was 55 lb per capita.

Overall Use by Households and Salmon Harvests by Gear Type

Ninety-six percent of Koliganek households used salmon in 2014, with 82% attempting and successfully harvesting, and 67% receiving salmon (Figure 5-15). The highest percentages of salmon use were for Chinook and coho salmon, with 84% and 78% of households using these species, respectively (Table 5-9).

Table 5-8.–Estimated percentages of salmon harvest in pounds usable weight by gear type, resource, and total salmon harvest, Koliganek, 2013.

Resource	Percentage base	Removed from commercial catch	Subsistence methods				
			Gillnet[a]	Other method	Subsistence gear, any method	Rod and reel	Any method
Salmon	**Gear type**	**100.0%**	**100.0%**	**0.0%**	**100.0%**	**100.0%**	**100.0%**
	Resource	**4.9%**	**89.3%**	**0.0%**	**89.3%**	**5.8%**	**100.0%**
	Total	**4.9%**	**89.3%**	**0.0%**	**89.3%**	**5.8%**	**100.0%**
Chum salmon	Gear type	1.2%	15.5%	0.0%	15.5%	0.2%	13.9%
	Resource	0.4%	99.5%	0.0%	99.5%	0.1%	100.0%
	Total	0.1%	13.8%	0.0%	13.8%	0.0%	13.9%
Coho salmon	Gear type	4.6%	7.0%	0.0%	7.0%	89.1%	11.6%
	Resource	2.0%	54.0%	0.0%	54.0%	44.1%	100.0%
	Total	0.2%	6.3%	0.0%	6.3%	5.1%	11.6%
Chinook salmon	Gear type	72.0%	44.3%	0.0%	44.3%	6.4%	43.5%
	Resource	8.1%	91.0%	0.0%	91.0%	0.8%	100.0%
	Total	3.5%	39.6%	0.0%	39.6%	0.4%	43.5%
Pink salmon	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Sockeye salmon	Gear type	22.2%	27.2%	0.0%	27.2%	0.3%	25.4%
	Resource	4.3%	95.6%	0.0%	95.6%	0.1%	100.0%
	Total	1.1%	24.3%	0.0%	24.3%	0.0%	25.4%
Spawning sockeye salmon	Gear type	0.0%	6.0%	0.0%	6.0%	4.1%	5.6%
	Resource	0.0%	95.8%	0.0%	95.8%	4.2%	100.0%
	Total	0.0%	5.4%	0.0%	5.4%	0.2%	5.6%
Unknown salmon	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

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

a. Gillnet harvests include both set and drift gillnet gear types.

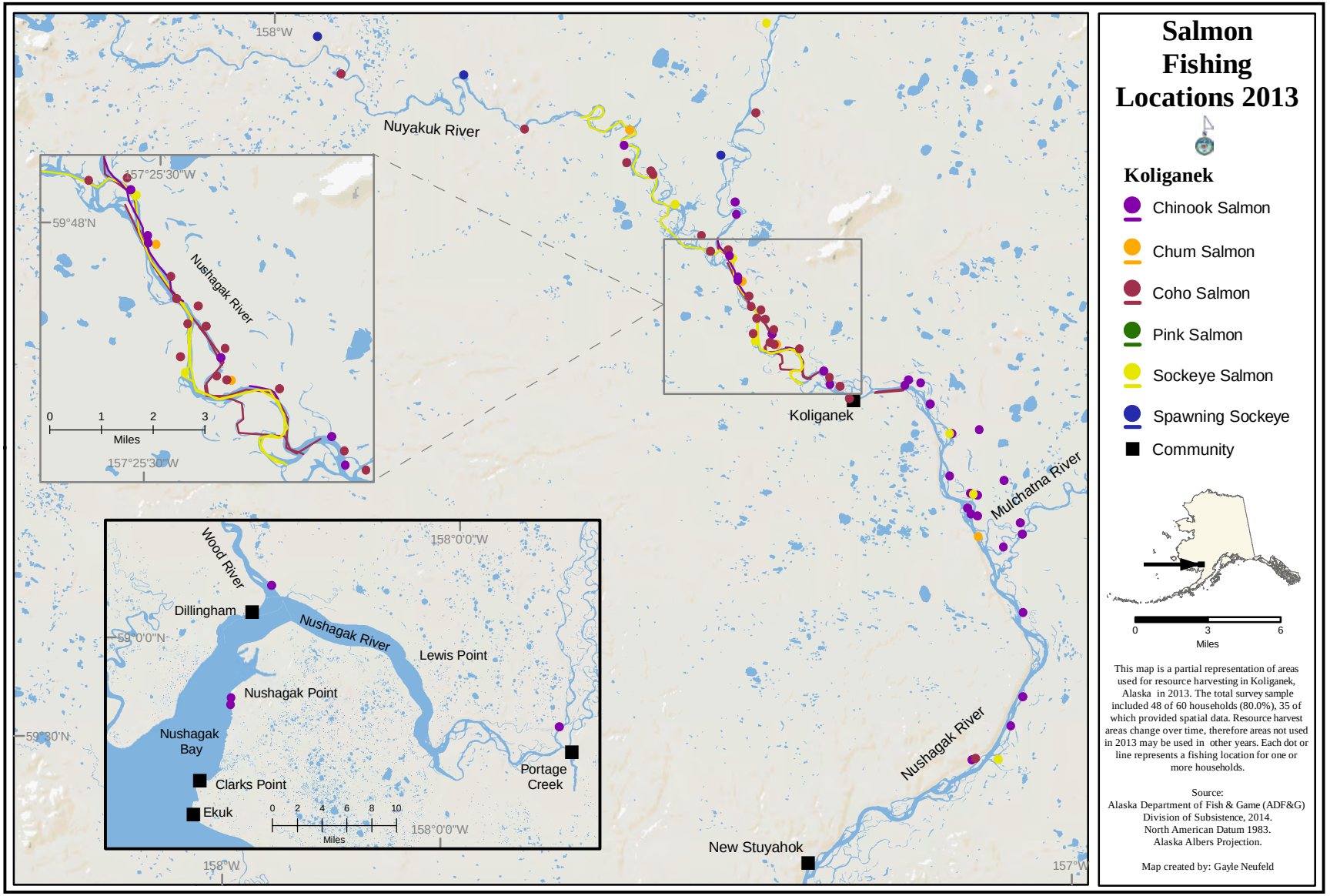


Figure 5-9.–Fishing and harvest locations of salmon, Koliganek, 2013.

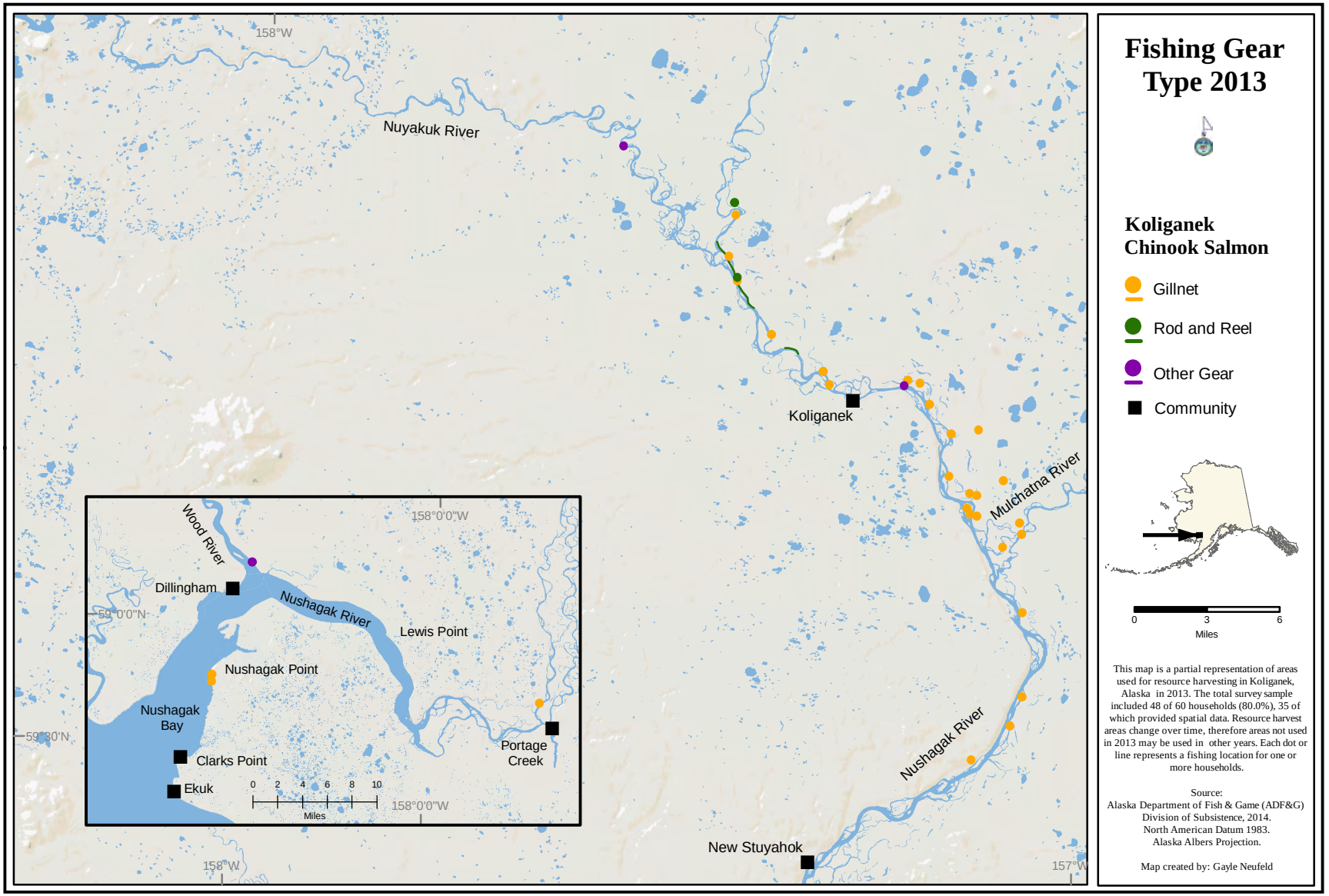


Figure 5-10.–Fishing and harvest locations by gear type, Chinook salmon, Koliganek, 2013.

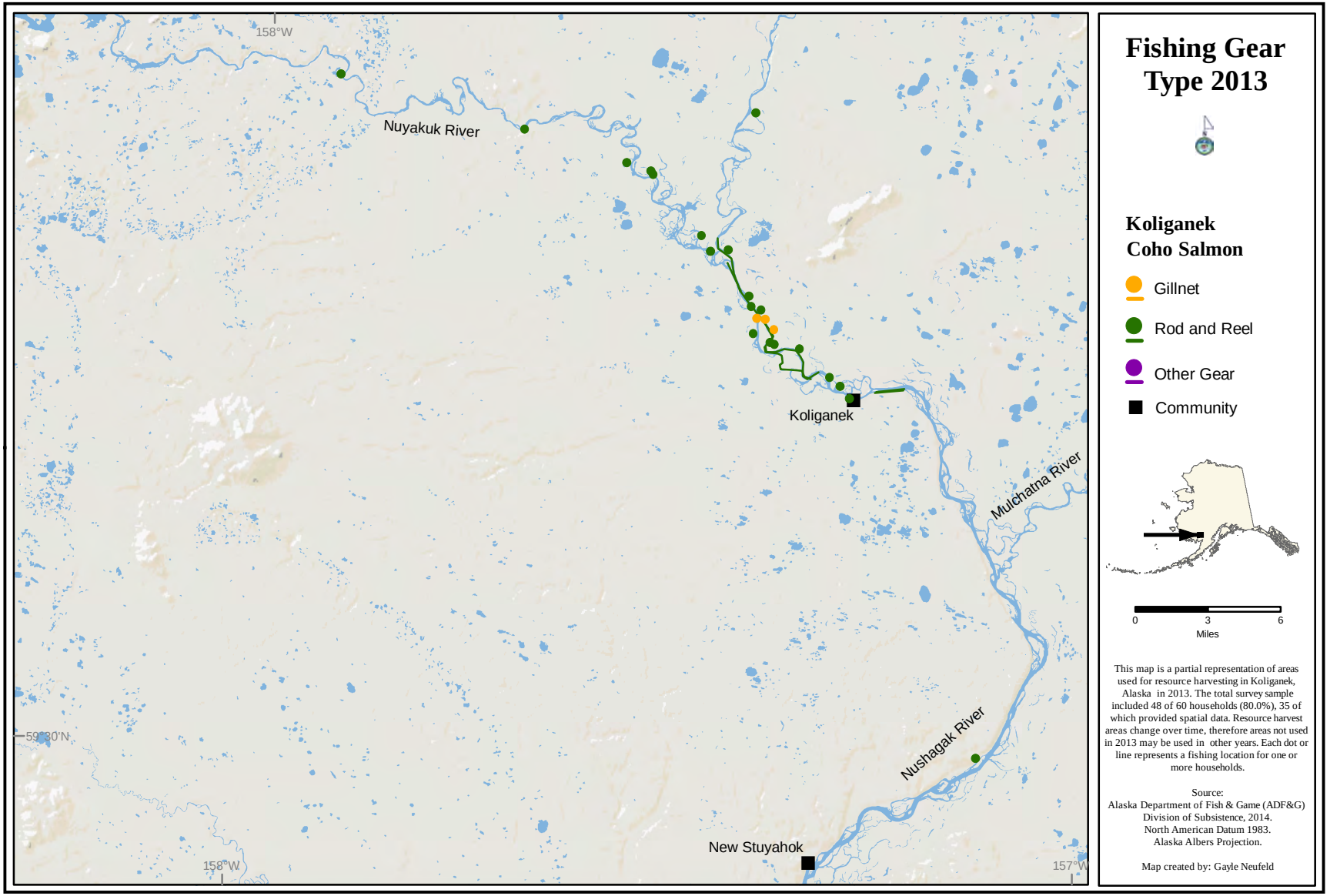


Figure 5-11.–Fishing and harvest locations by gear type, coho salmon, Koliganek, 2013.

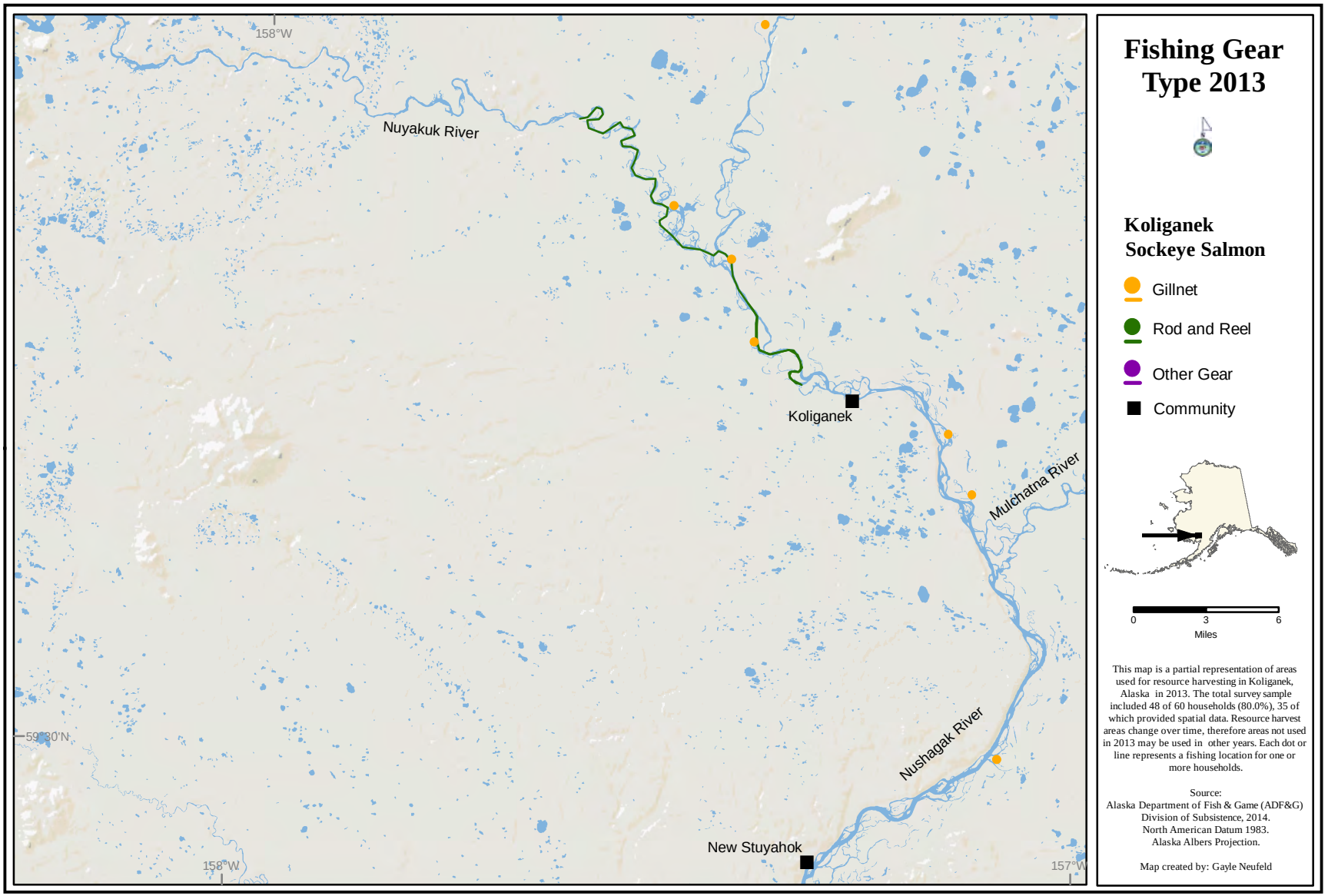


Figure 5-12.–Fishing and harvest locations by gear type, sockeye salmon, Koliganek, 2013.



Figure 5-13.–Fishing and harvest locations by gear type, other salmon, Koliganek, 2013.

In terms of successful harvest, coho salmon was the most harvested fish (by 69% of households), followed by Chinook (67%) and sockeye (55%) salmon. The majority of households gave away or received salmon. Chinook salmon was the most received fish with 55% of households having received Chinook salmon. Giving of salmon also occurred, with Chinook and coho salmon being the species most often given away by Koliganek households.

Methods used to harvest salmon included removal from commercial catches, subsistence gillnetting, and rod and reel fishing (Table 5-10; Figure 5-16). Subsistence gillnetting gear accounted for 90% of the total salmon harvest weight, followed by 10% of the harvest coming from rod and reel fishing, and less than 1% of the harvest coming from commercial home pack (Table 5-11). An estimated 2,121 Chinook salmon were harvested by subsistence gillnet, 19 by rod and reel, and 7 as commercial home pack (Table 5-10). Twelve sockeye salmon were also removed from commercial catches; no other species was harvested by this method. Coho salmon were primarily harvested by rod and reel, amounting to 1,058 fish caught by this method, or 71% of the coho harvest weight (Table 5-10; Table 5-11).

Salmon Harvests by Location and Harvest Gear Type

The salmon harvest areas used by Koliganek residents in 2014 are depicted in Figure 5-17. Harvest locations are shown for all species, as well as spawning sockeye salmon. Salmon harvests followed roughly the same pattern as in 2013, but with increased use further north on the Nushagak River, past the confluence of the Nuyakuk River. Around the community continued to be the most densely used harvest area, including harvests occurring on both sides of the Nushagak River. Salmon harvest locations continued south of the community, about 20–25 miles downriver, at the confluence of the Nushagak and Mulchatna rivers, and almost to the community of New Stuyahok. Additionally, in 2014, harvest locations were indicated at Lewis Point, one at Nushagak Point, and one at Ekuk.

Chinook salmon harvest locations by gear type are shown in Figure 5-18. Gillnet was primarily used to harvest Chinook salmon, but there were also two rod and reel harvest locations. Koliganek residents traveled as far as Nushagak Bay to harvest Chinook salmon, including close to New Stuyahok, although in 2014 locations on the Mulchtana and the Nuyakuk rivers were not used.

Coho salmon harvests were predominantly by rod and reel and occurred north of the community (Figure 5-19). Locations used south of the community for pursuing coho salmon were generally harvests by gillnet. Individual coho salmon amounts harvested by rod and reel (1,058), compared to subsistence gillnet (435), indicate a preference for using rod and reel gear to harvest coho salmon (Table 5-10). As mentioned above, survey comments indicate the use of rod and reel was associated with harvest conservation.

Sockeye salmon harvests in 2014 occurred strictly on the Nushagak River, with some harvest locations between New Stuyahok and the Mulchatna River confluence, and mapped harvest spots consisted only of gillnet sites (Figure 5-20). Other salmon, which in 2014 included harvest locations for chum, pink, and spawning sockeye salmon, are shown in Figure 5-21. Chum and pink salmon were harvested by subsistence gillnet, with no rod and reel or other gear used, primarily at stretches of the Nushagak River upriver of Koliganek and Lewis Point (Figure 5-17; Figure 5-21). Chum salmon were also harvested at a site on the Mulchatna River near the confluence with the Nushagak River, and downriver of Koliganek (Figure 5-17; Figure 5-21). Spawning sockeye salmon were harvested using rod and reel, gillnet, and other or unspecified gear (Figure 5-17; Figure 5-21). Note that the other or unspecified types of gear used to harvest spawning sockeye salmon may include drift gillnet; this is the harvest indicated by the purple line north of Koliganek. Gillnets were used to harvest one or more chum, pink, or spawning sockeye salmon in multiple locations, including two locations on the Nuyakuk River, two locations upriver from the confluence of the Nuyakuk and the Nushagak rivers, north of the community, as well as locations south about three miles. Two locations were far downriver on the Mulchatna River, including an area near Lewis Point and one location near the entrance of the Wood River.

Table 5-9.–Estimated use and harvest of salmon, Koliganek, 2014.

	Percentage of households					Harvest weight (lb)			Harvest amount			95% confidence limit (±)
Resource	Use %	Attempt %	Harvest %	Receive %	Give %	Total	Mean per household	Per capita	Total	Unit	Mean per household	harvest
Salmon	**96.1**	**82.4**	**82.4**	**66.7**	**68.6**	**54,441.4**	**907.4**	**275.4**	**7,848.0**	**ind**	**130.8**	**17.6**
Chum salmon	25.5	19.6	19.6	11.8	15.7	10,820.4	180.3	54.7	2,284.7	ind	38.1	45.6
Coho salmon	78.4	68.6	68.6	52.9	52.9	6,718.2	112.0	34.0	1,492.9	ind	24.9	13.4
Chinook salmon	84.3	66.7	66.7	54.9	60.8	28,744.7	479.1	145.4	2,146.4	ind	35.8	16.3
Pink salmon	9.8	5.9	5.9	7.8	5.9	399.4	6.7	2.0	176.5	ind	2.9	63.0
Sockeye salmon	66.7	54.9	54.9	37.3	47.1	7,283.4	121.4	36.9	1,640.4	ind	27.3	18.3
Spawning sockeye salmon	23.5	11.8	11.8	13.7	5.9	475.3	7.9	2.4	107.1	ind	1.8	33.4
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ind	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2015.

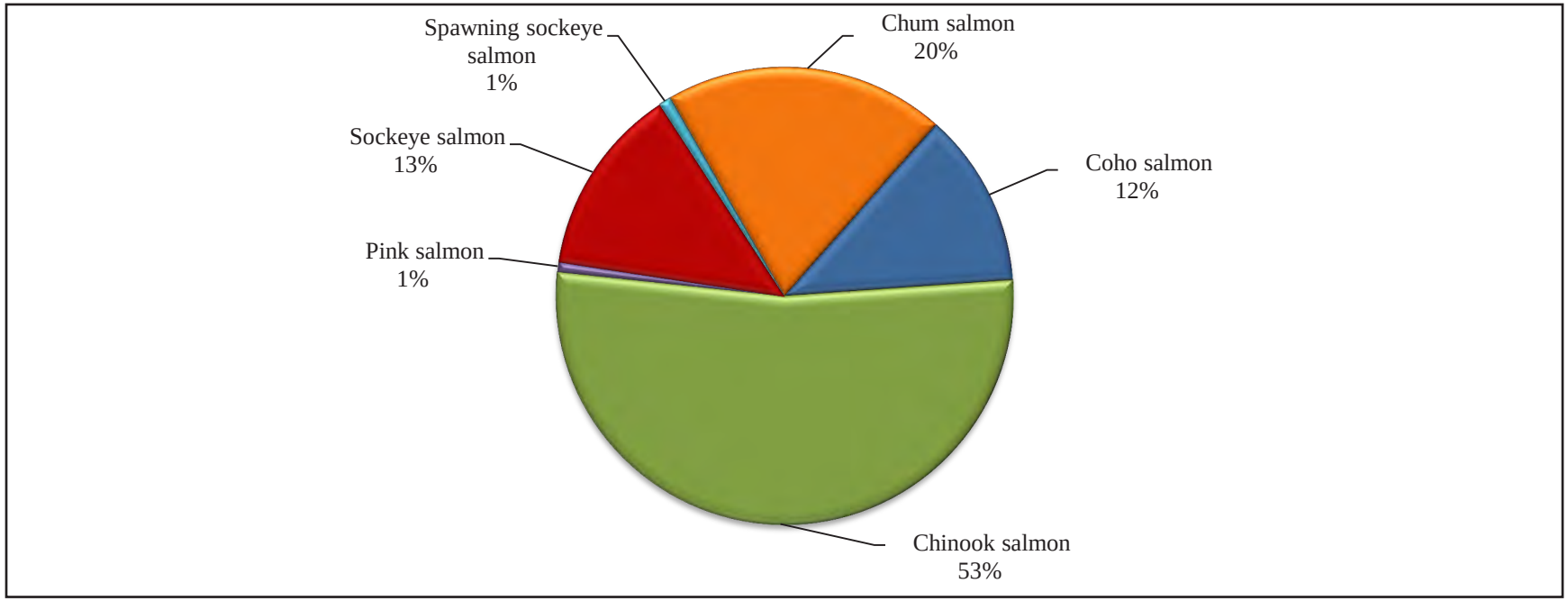


Figure 5-14.–Composition of salmon harvest in pounds usable weight, Koliganek, 2014.

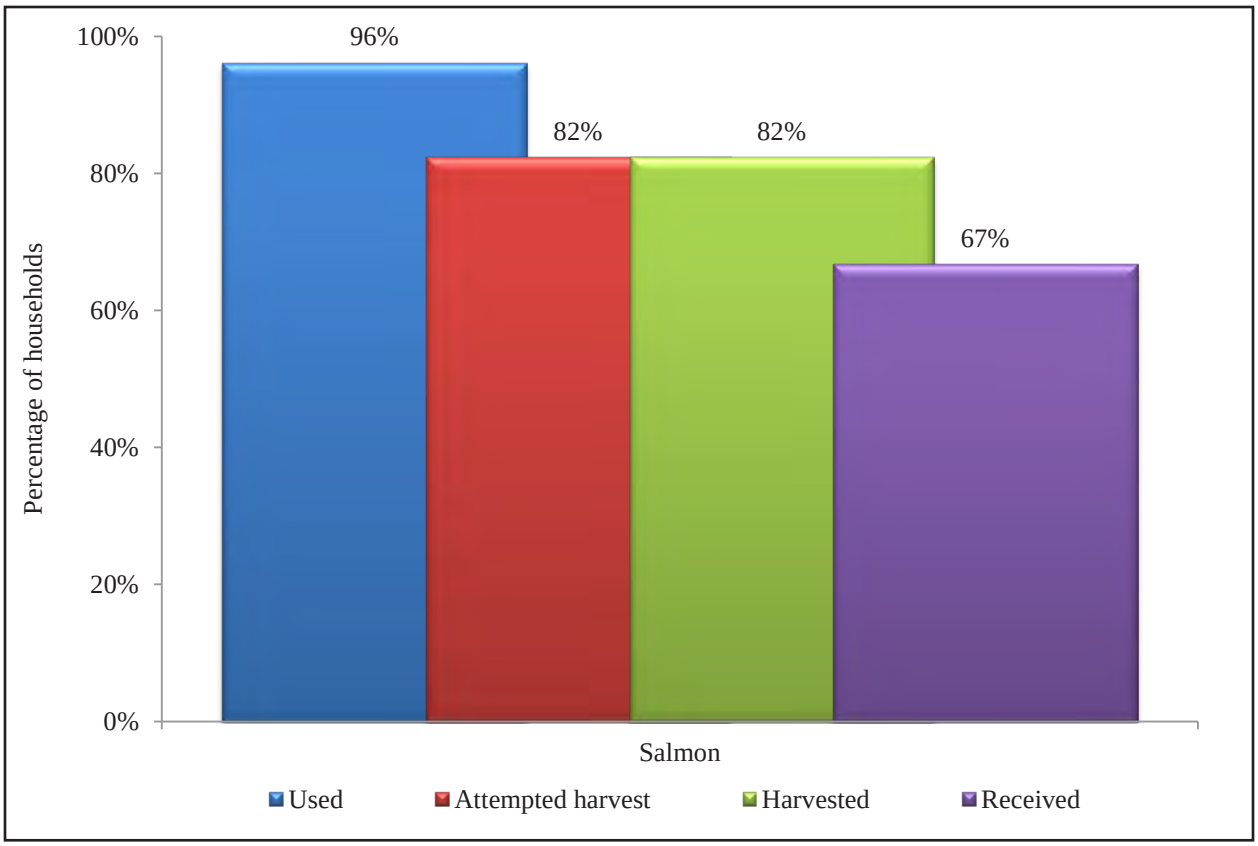


Figure 5-15.–Percentage of households using, attempting to harvest, harvesting, and receiving salmon, Koliganek, 2014.

Table 5-10.–Estimated harvest of salmon by gear type and resource, Koliganek, 2014.

	Removed from commercial catch		Subsistence methods									
			Gillnet[a]		Other method		Subsistence gear, any method		Rod and reel		Any method	
Resource	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Salmon	**18.8**	**146.8**	**6,698.6**	**49,042.9**	**0.0**	**0.0**	**6,698.6**	**49,042.9**	**1,130.6**	**5,251.8**	**7,848.0**	**54,441.4**
Chum salmon	0.0	0.0	2,284.7	10,820.4	0.0	0.0	2,284.7	10,820.4	0.0	0.0	2,284.7	10,820.4
Coho salmon	0.0	0.0	435.3	1,958.8	0.0	0.0	435.3	1,958.8	1,057.6	4,759.4	1,492.9	6,718.2
Chinook salmon	7.1	94.5	2,120.5	28,398.1	0.0	0.0	2,120.5	28,398.1	18.8	252.1	2,146.4	28,744.7
Pink salmon	0.0	0.0	176.5	399.4	0.0	0.0	176.5	399.4	0.0	0.0	176.5	399.4
Sockeye salmon	11.8	52.2	1,581.6	7,022.3	0.0	0.0	1,581.6	7,022.3	47.1	208.9	1,640.4	7,283.4
Spawning sockeye salmon	0.0	0.0	100.0	444.0	0.0	0.0	100.0	444.0	7.1	31.3	107.1	475.3
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2015.

Note The harvested number of salmon is represented as individual fish harvested.

a. Gillnet harvests include both set and drift gillnet gear types.

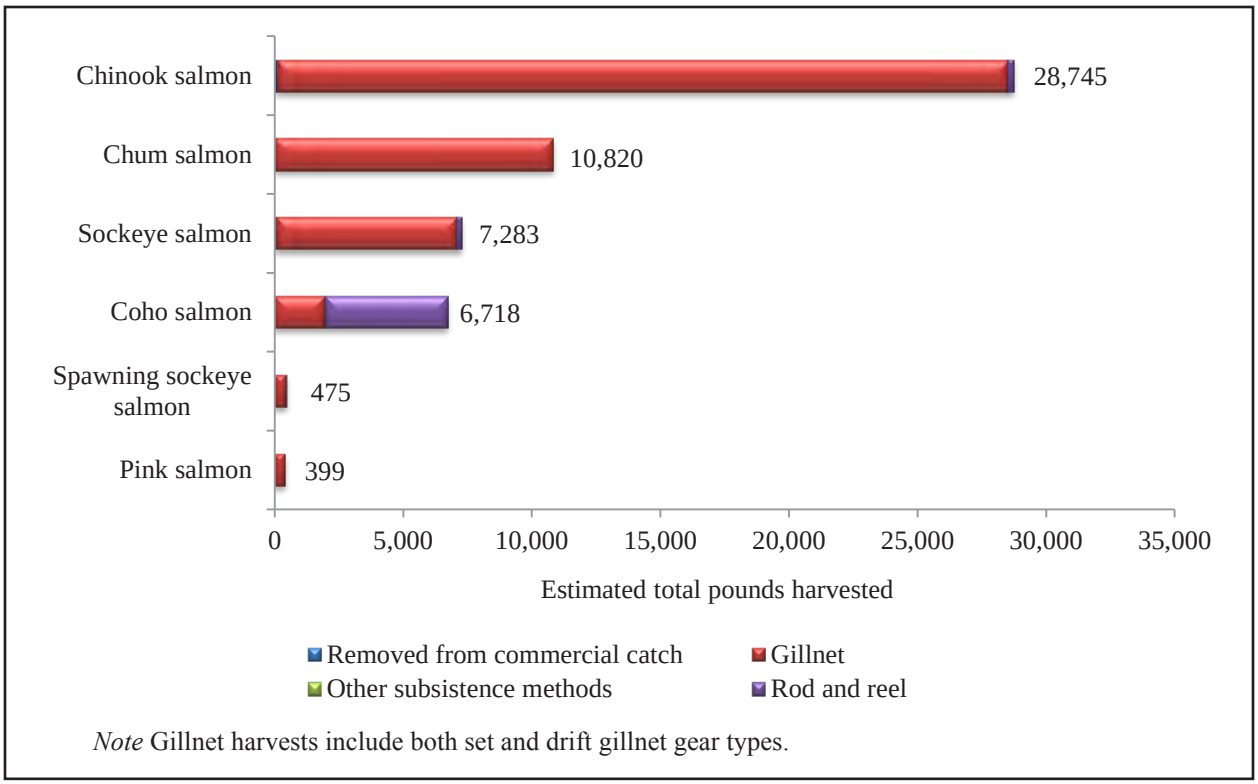


Figure 5-16.–Estimated harvest of salmon in pounds usable weight by gear type and resource, Koliganek, 2014.

Table 5-11.–Estimated percentages of salmon harvest in pounds usable weight by gear type, resource, and total salmon harvest, Koliganek, 2014.

Resource	Percentage base	Removed from commercial catch	Subsistence methods				
			Gillnet[a]	Other method	Subsistence gear, any method	Rod and reel	Any method
Salmon	**Gear type**	**100.0%**	**100.0%**	**0.0%**	**100.0%**	**100.0%**	**100.0%**
	Resource	**0.3%**	**90.1%**	**0.0%**	**90.1%**	**9.6%**	**100.0%**
	Total	**0.3%**	**90.1%**	**0.0%**	**90.1%**	**9.6%**	**100.0%**
Chum salmon	Gear type	0.0%	22.1%	0.0%	22.1%	0.0%	29.1%
	Resource	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%
	Total	0.0%	19.9%	0.0%	19.9%	0.0%	29.1%
Coho salmon	Gear type	0.0%	4.0%	0.0%	4.0%	90.6%	19.0%
	Resource	0.0%	29.2%	0.0%	29.2%	70.8%	100.0%
	Total	0.0%	3.6%	0.0%	3.6%	8.7%	19.0%
Chinook salmon	Gear type	64.4%	57.9%	0.0%	57.9%	4.8%	27.3%
	Resource	0.3%	98.8%	0.0%	98.8%	0.9%	100.0%
	Total	0.2%	52.2%	0.0%	52.2%	0.5%	27.3%
Pink salmon	Gear type	0.0%	0.8%	0.0%	0.8%	0.0%	2.2%
	Resource	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%
	Total	0.0%	0.7%	0.0%	0.7%	0.0%	2.2%
Sockeye salmon	Gear type	35.6%	14.3%	0.0%	14.3%	4.0%	20.9%
	Resource	0.7%	96.4%	0.0%	96.4%	2.9%	100.0%
	Total	0.1%	12.9%	0.0%	12.9%	0.4%	20.9%
Spawning sockeye salmon	Gear type	0.0%	0.9%	0.0%	0.9%	0.6%	1.4%
	Resource	0.0%	93.4%	0.0%	93.4%	6.6%	100.0%
	Total	0.0%	0.8%	0.0%	0.8%	0.1%	1.4%
Unknown salmon	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source ADF&G Division of Subsistence household surveys, 2015.

a. Gillnet harvests include both set and drift gillnet gear types.

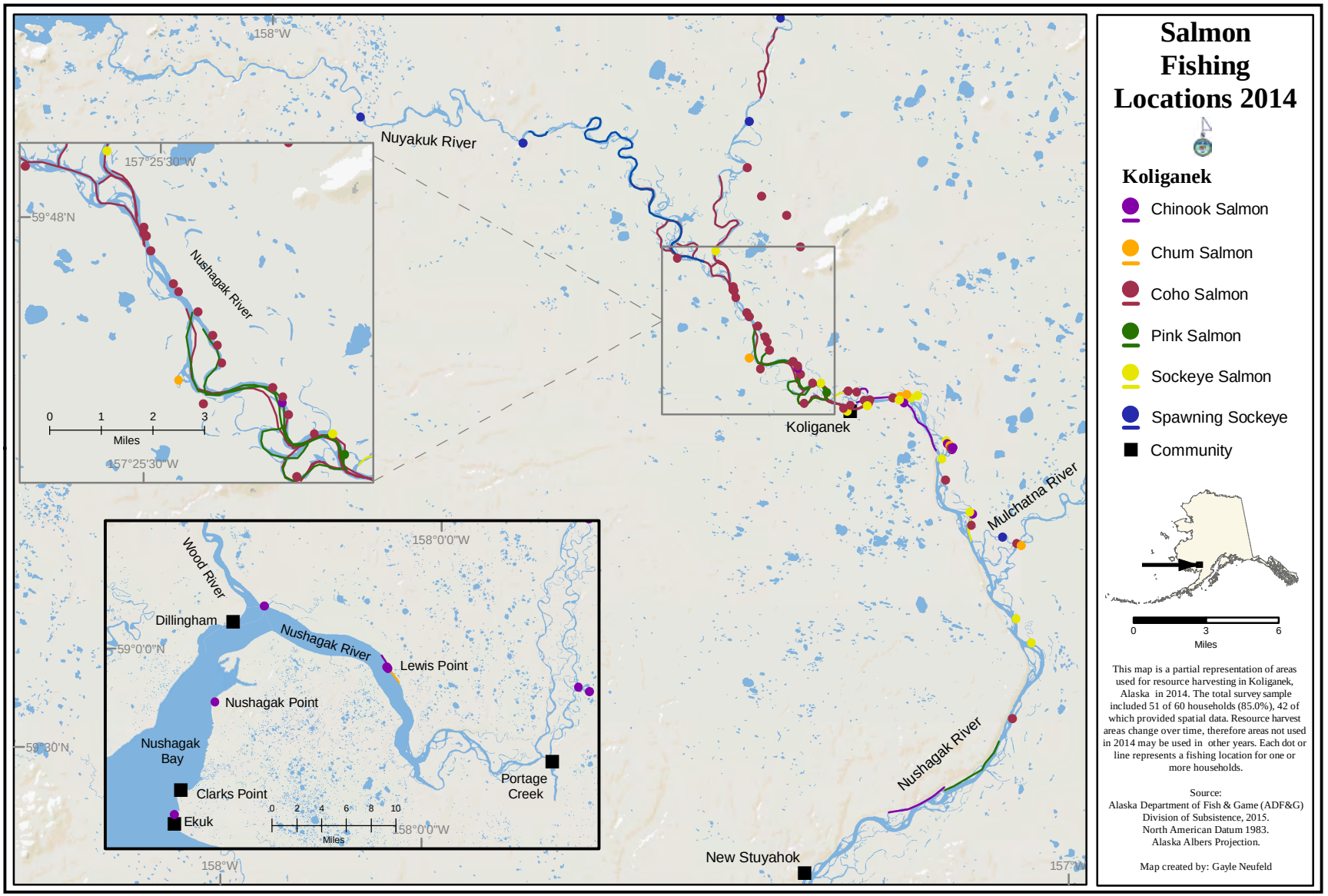


Figure 5-17.–Fishing and harvest locations of salmon, Koliganek, 2014.

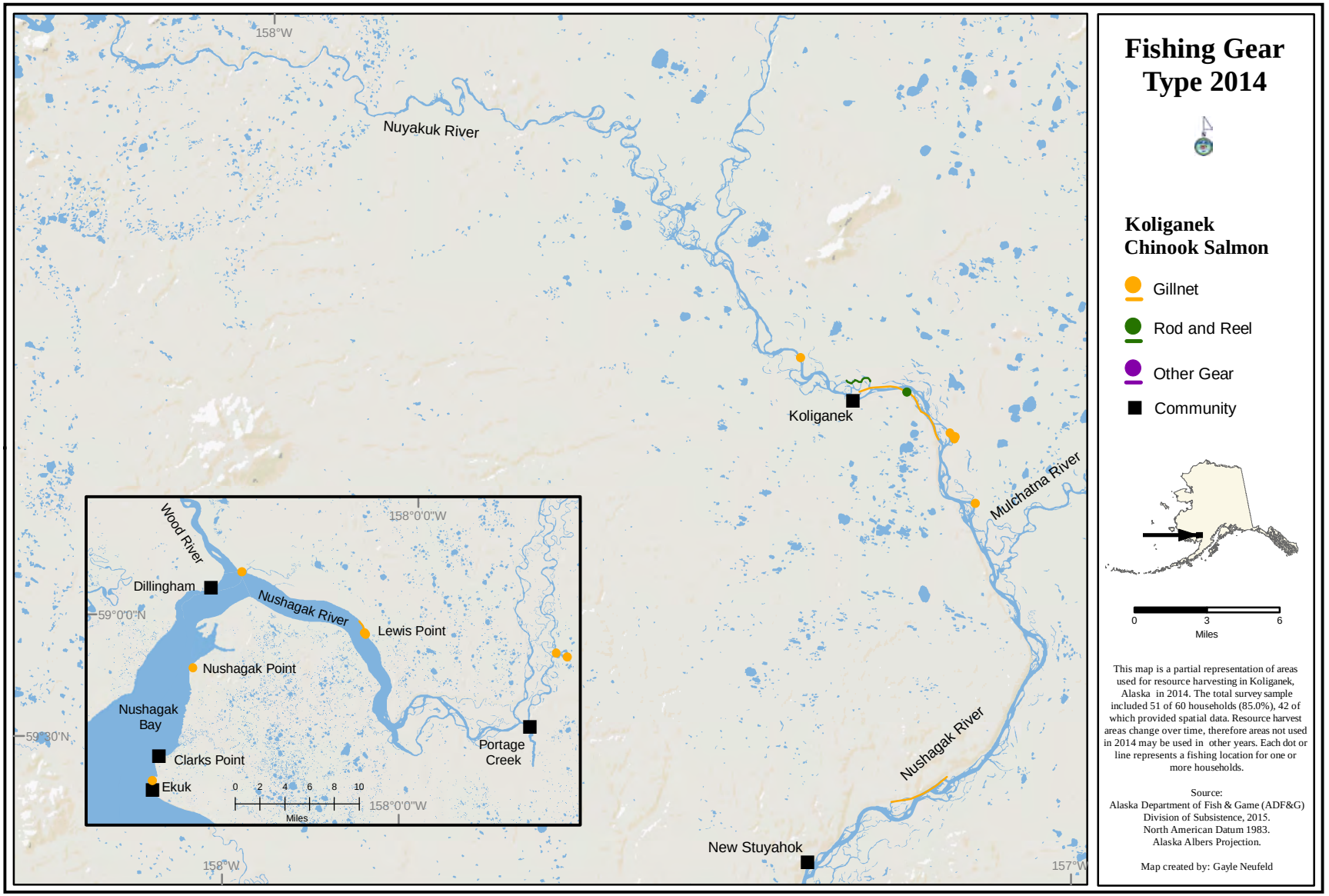


Figure 5-18.–Fishing and harvest locations by gear type, Chinook salmon, Koliganek, 2014.

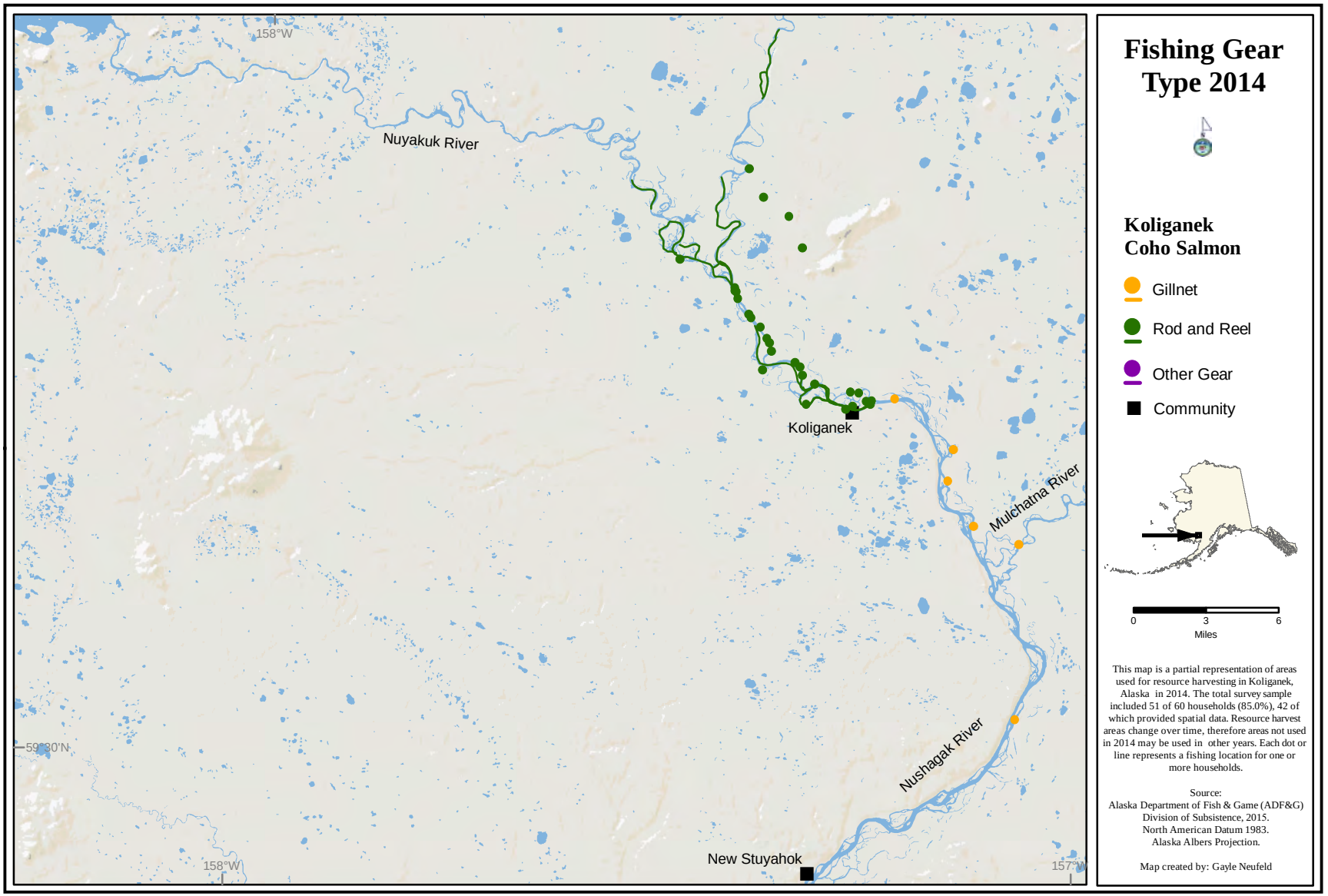


Figure 5-19.–Fishing and harvest locations by gear type, coho salmon, Koliganek, 2014.



Figure 5-20.–Fishing and harvest locations by gear type, sockeye salmon, Koliganek, 2014.

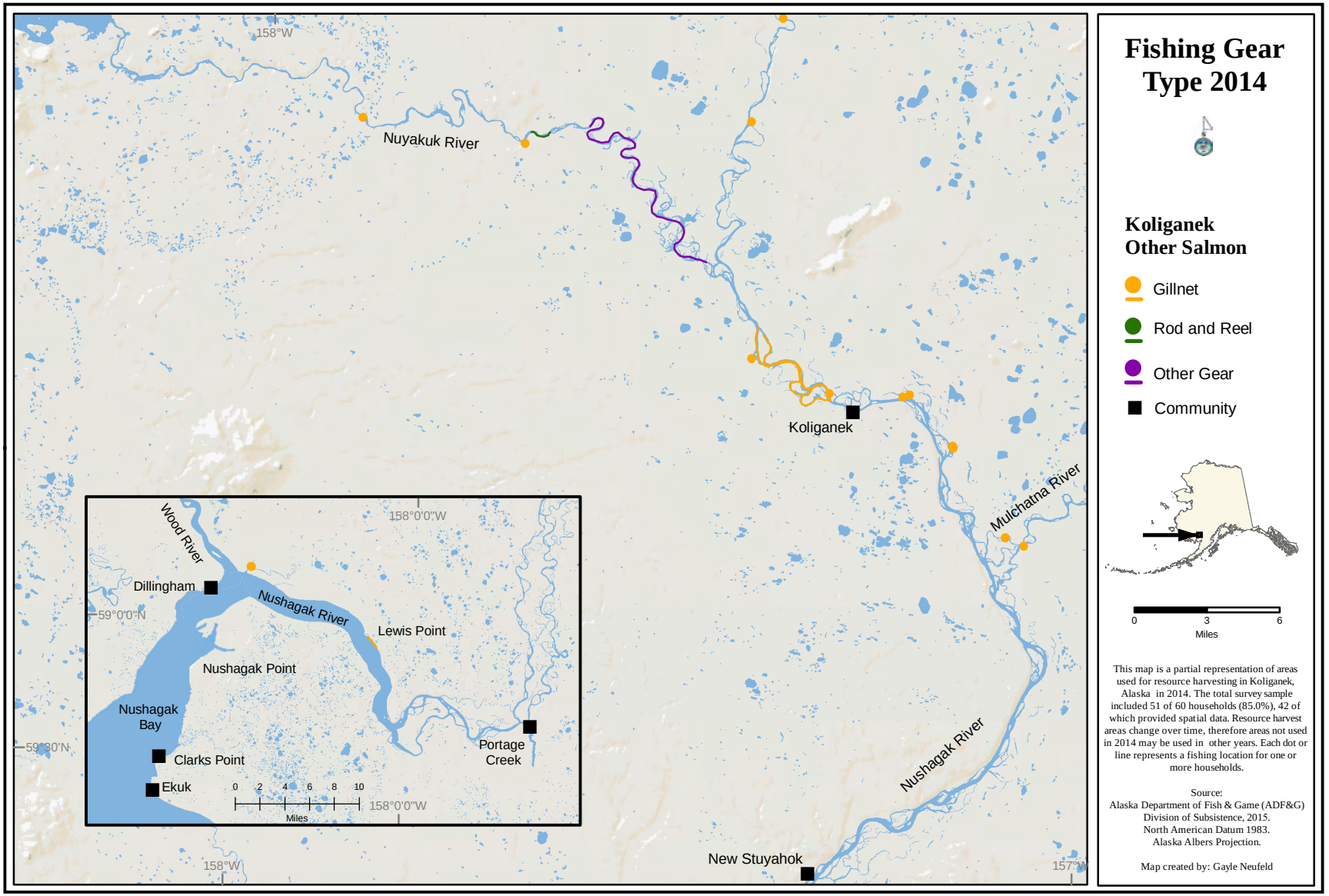


Figure 5-21.–Fishing and harvest locations by gear type, other salmon, Koliganek, 2014.

Harvest Assessments: 2013 and 2014

Researchers asked two questions regarding Chinook salmon use and harvest. The first question asked participants if they "got enough" Chinook salmon to use for their own household's needs, either through their own harvest efforts or sharing. If they did not, a numeric value was requested to determine how many fish would be the preferred amount for the household. The household was then asked why they did not get enough, either through their own efforts or sharing. This question was also asked for sockeye and coho salmon and responses for the three species are given below, under the subheading "Assessments of Use of Chinook, Sockeye, and Coho Salmon Through Harvest or Sharing." For the second assessment question, households were asked to describe their harvest of Chinook salmon in the study year, as compared to the past five years, and characterize whether the harvest was "less, same, or more." Reasons why were recorded, if the household offered anything to report. This comparison question, and reasons for less or more harvest, was also asked in relation to salmon other than Chinook (all other salmon species grouped), and is discussed under the subheading "Comparing Harvests of Chinook and Other Salmon Over Time." For both assessment questions, households could give more than one reason for not having enough salmon and changes to harvest amounts. These assessments highlight households' economic relationship to salmon and the integral role salmon availability plays in the subsistence way of life, both of which are affected in part by cash economy factors such as employment schedules, access to harvesting equipment, and fuel expense.

Assessments of Use of Chinook, Sockeye, and Coho Salmon Through Harvest or Sharing: 2013

Figure 5-22 and Table 5-12 provide a broad overview of Koliganek households' assessments of the availability of Chinook, sockeye, and coho salmon for use in 2013. Nineteen percent of sampled households (nine households) explained that they did not get enough Chinook salmon in 2013, with 65% reporting that they did get enough of the resource (through either their own efforts or sharing). Eight percent of the sample (four households) reported they did not get enough sockeye salmon in 2013, with 73% indicating they did get enough of the resource. Lastly, 17% of sampled households (eight) reported that they did not got enough coho salmon.

When asked why they did not have enough Chinook salmon, 43% of respondents answering the question indicated they did not have enough time to get enough (Table 5-13). The remaining reasons were all equally distributed, at one response each (14%), among personal/family reasons, resource availability, lack of equipment, and less effort. Lack of sockeye salmon was reported as due to not having enough time (50% of responses), lack of equipment (25%), and fuel being too expensive (25%). Reasons for not getting enough coho salmon were distributed with one response each (17%) among personal/family reasons, lack of equipment, having received less, less effort, and weather. Six households reported that they needed more Chinook salmon to meet their food security needs, with the average amount of fish needed per household at 73 (Table 5-14). Four households indicated that they needed more sockeye resources, with the average amount needed being 60 fish per household, and 5 households reported they would ideally like to have an average of 20 coho salmon per household.

Comparing Harvests of Chinook and Other Salmon Over Time: 2013

There were 11 Koliganek households that indicated they harvested fewer Chinook salmon than in the past 5 years, 11 reported the same level of harvest, and 10 reported more harvest (Table 5-15; Figure 5-23). Of the households harvesting all other salmon and answering the question, nearly one-half (45%), said their harvest was the same in 2013 as in recent previous years. Reasons for less harvest of Chinook salmon were largely due to personal/family reasons and the resource was less available (cited by two households each); the remaining reasons—cited by one household each—included working/no time, too far to travel, weather/environment, the resource was not needed, and that the fish were either too small or diseased (Table 5-16).

Nine households reported less harvest, compared to the last five years, for all other salmon species (Table 5-15). Primary reported reasons were that the resources were less available and lack of effort (two responses

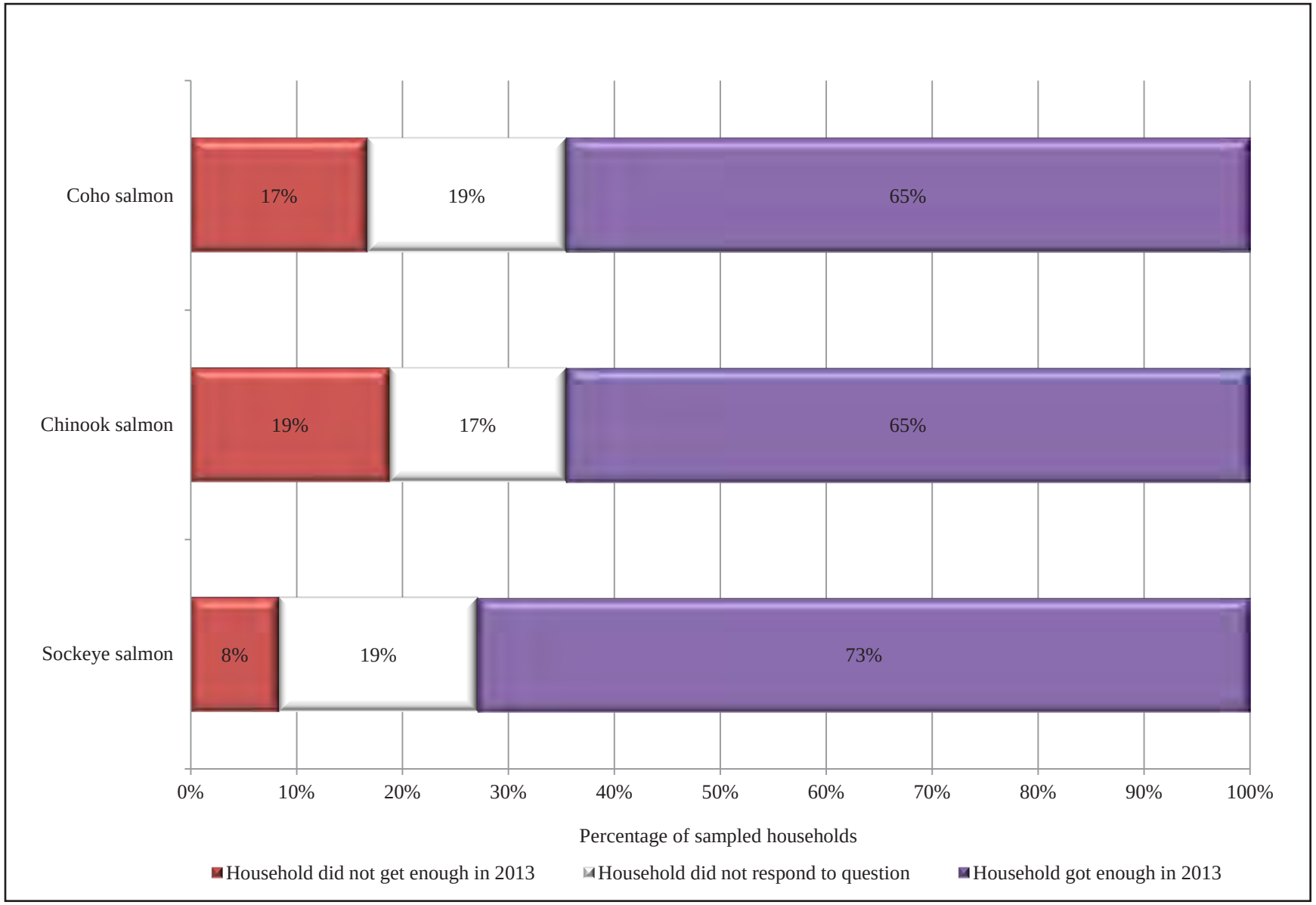


Figure 5-22.–Percentage of sampled households reporting whether they had enough salmon resources, Koliganek, 2013.

Table 5-12.–Percentage of households reporting whether they had enough salmon resources, Koliganek, 2013.

		Households not getting enough _____ .			
	Sampled	Valid responses[a]		Did not get enough	
Resource	households	Number	Percentage	Number	Percentage
Coho salmon	48	39	81.3%	8	20.5%
Chinook salmon	48	40	83.3%	9	22.5%
Sockeye salmon	48	39	81.3%	4	10.3%

Source ADF&G Division of Subsistence household surveys, 2014.
a. Does not include households that did not respond to the question or those households that never use the resource.

Table 5-13.–Reasons why households did not have enough salmon resources, Koliganek, 2013.

Resource	Valid responses[a]	Personal or family reasons		Resource availability		Too far to travel		Lack of equipment		Did not receive as much	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	6	1	16.7%	0	0.0%	0	0.0%	1	16.7%	1	16.7%
Chinook salmon	7	1	14.3%	1	14.3%	0	0.0%	1	14.3%	0	0.0%
Sockeye salmon	4	0	0.0%	0	0.0%	0	0.0%	1	25.0%	0	0.0%

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Table 5-13.–Continued.

Resource	Valid responses[a]	Less effort		Unsuccessful		Weather		Other reasons		Not enough time	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	6	1	16.7%	0	0.0%	1	16.7%	1	16.7%	0	0.0%
Chinook salmon	7	1	14.3%	0	0.0%	0	0.0%	0	0.0%	3	42.9%
Sockeye salmon	4	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2	50.0%

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Table 5-13.–Continued.

Resource	Valid responses[a]	Regulations		Animals too small or diseased		Fuel too expensive	
		Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	6	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	7	0	0.0%	0	0.0%	0	0.0%
Sockeye salmon	4	0	0.0%	0	0.0%	1	25.0%

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

Note Households may provide more than one response to the question.

a. Includes those households providing a valid reason for not getting enough.

Table 5-14.–Salmon resources that sampled households reported needing, Koliganek, 2013.

Resource	Households needing	Total amount needed	Average amount needed
Coho salmon	5	100	20
Chinook salmon	6	438	73
Sockeye salmon	4	240	60

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

Table 5-15.–Changes in household harvests of salmon resources compared to recent years, Koliganek, 2013.

			Households reporting harvest								Households not harvesting in 2013	
			Total households		Less		Same		More			
Resource	Sampled households	Valid responses[a]	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	48	45	36	80.0%	15	33.3%	23	51.1%	12	26.7%	13	28.9%
Chinook salmon	48	45	32	66.7%	11	24.4%	11	24.4%	10	22.2%	13	28.9%
Other salmon	48	44	36	75.0%	9	20.5%	20	45.5%	7	15.9%	8	18.2%

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

a. Valid responses do not include households that did not provide any response.

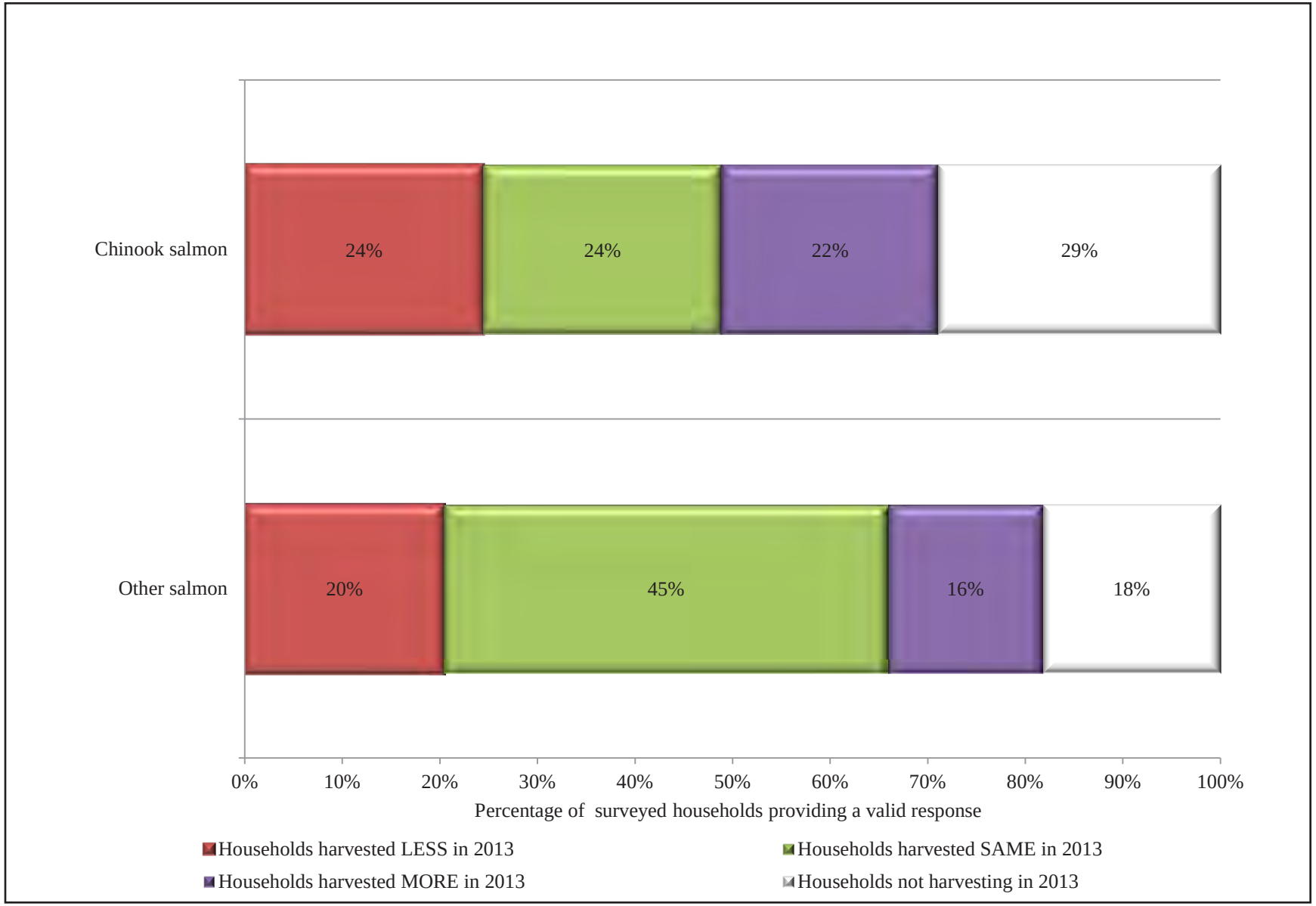


Figure 5-23.–Changes in household harvests of salmon resources compared to recent years, Koliganek, 2013.

Table 5-16.–Reasons for less household harvests of salmon resources compared to recent years, Koliganek, 2013.

Resource	Households reporting reasons for less harvest	Family/ personal		Resources less available		Too far to travel		Lack of equipment		Less sharing		Lack of effort		Unsuccessful		Weather/ environment	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	14	2	14.3%	3	21%	1	7.1%	1	7%	0	0%	2	14%	0	0.0%	2	14.3%
Chinook salmon	9	2	22.2%	2	22%	1	11.1%	0	0%	0	0%	0	0%	0	0.0%	1	11.1%
Other salmon	8	0	0.0%	2	25%	0	0.0%	1	13%	0	0%	2	25%	0	0.0%	1	12.5%

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Table 5-16.–Continued.

Resource	Households reporting reasons for less harvest	Other reasons		Working/ no time		Regulations		Small/ diseased animals		Did not get enough		Did not need		Equipment/ fuel expense		Too much competition	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	14	0	0%	1	7.1%	0	0.0%	1	7.1%	1	7.1%	1	7.1%	0	0.0%	0	0.0%
Chinook salmon	9	0	0%	1	11.1%	0	0.0%	1	11.1%	0	0.0%	1	11.1%	0	0.0%	0	0.0%
Other salmon	8	0	0%	0	0.0%	0	0.0%	0	0.0%	1	12.5%	1	12.5%	0	0.0%	0	0.0%

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

Table 5-17.–Reasons for more household harvests of salmon resources compared to recent years, Koliganek, 2013.

Resource	Households reporting reasons for more harvest	Increased availability		Used other resources		Favorable weather		Received more		Needed more		Increased effort		Had more help	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	5	2	40.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	3	60.0%	0	0.0%
Chinook salmon	4	1	25.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	3	75.0%	0	0.0%
Other salmon	4	2	50.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2	50.0%	0	0.0%

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Table 5-17.–Continued.

Resource	Households reporting reasons for more harvest	Other		Regulations		Traveled farther		More success		Needed less		Store-bought expense		Got/ fixed equipment	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	5	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	4	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Other salmon	4	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

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

each); remaining reasons cited by one respondent each were lack of equipment, weather/environment, overall lack/did not get enough, and that the resources were not needed (Table 5-16).

Overall, a similar number of responding households reported less or more harvest of any species of salmon: 15 households harvested less and 12 households harvested more of any kind of salmon (Table 5-15). Ten households indicated more harvest of Chinook salmon as compared to the last five years, and four households provided a reason for increased harvest, stating increased effort (three responses) and increased Chinook salmon availability (one response) (Table 5-17). Seven households reported more harvest of the other species combined, excluding Chinook, and four households that answered why cited increased effort and increased availability of resources (two responses each) (Table 5-15; Table 5-17).

Assessments of Use of Chinook, Sockeye, and Coho Salmon Through Harvest or Sharing: 2014

Figure 5-24 and Table 5-18 provide a broad overview of Koliganek households' assessments of the availability of Chinook, sockeye, and coho salmon (through either their own efforts or sharing) for use in 2014. Eighteen percent of sampled households (nine households) explained that they did not get enough Chinook salmon in 2014, with 61% reporting that they did get enough of the resource. Sixteen percent of sampled households (eight) reported they did not get enough sockeye salmon in 2014, with 57% indicating they did get enough of the resource. Lastly, 18% of sampled households (nine) reported that they did not get enough coho salmon.

When asked why they did not have enough Chinook salmon, 57% of households that answered the question indicated there was not enough time to get enough, with the remainder of the reasons equally distributed (14%, or one response each) among personal/family reasons, resource availability, and other reasons (Table 5-19). Having not enough sockeye salmon was due to not enough time to harvest (50% of responses), family/personal reasons (one response), lack of equipment (one), and less harvest effort (one). Three respondents answering the question about insufficient supply of coho salmon indicated that they did not get enough due to lack of time to harvest (60%); the remaining responses were for personal/family reasons (one household), and other (one household). Eight households reported that they needed more Chinook salmon to meet their food security needs, with the average amount of fish needed per household at 44 (Table 5-20). Four households indicated they needed more sockeye salmon, with the average amount needed being 118 fish per household, and 5 households reported they would ideally like to have 85 coho salmon per household on average.

Comparing Harvests of Chinook and Other Salmon Over Time: 2014

Of the households that provided an assessment, there were 12 households (28%) that indicated they harvested fewer Chinook salmon than in the past 5 years, 17 (40%) reported the same level of harvest, and 9 (21%) reported more harvest (Table 5-21; Figure 5-25). The most cited reason for less harvest of Chinook salmon was working/no time (five households, or 42% of respondents who harvested less); those households that harvested fewer Chinook salmon also cited unsuccessful harvest effort (two), personal/family reasons (one), resource was less available (one), less sharing (one), lack of effort (one), and other reasons (one) (Table 5-22).

Eleven households reported less harvest of all other salmon species, excluding Chinook (Table 5-21). Less harvest of all other salmon species combined, compared to the last five years, was due to working/no time (five responses), personal/family reasons (two), resources were less available (two), unsuccessful harvest effort (two), and lack of effort (one) (Table 5-22).

Approximately one-third of respondents (36%) harvested less or more of any salmon species, which was similar to the 2013 study year results (Table 5-21; Table 5-15). Eight of the households that indicated more harvest of Chinook salmon compared to the last five years stated it was due to increased availability (six responses), having traveled farther (two), and increased effort (one) (Table 5-23). Three households reported more harvest of all the other species combined, citing only increased effort as the reason for the increased harvest in 2014.

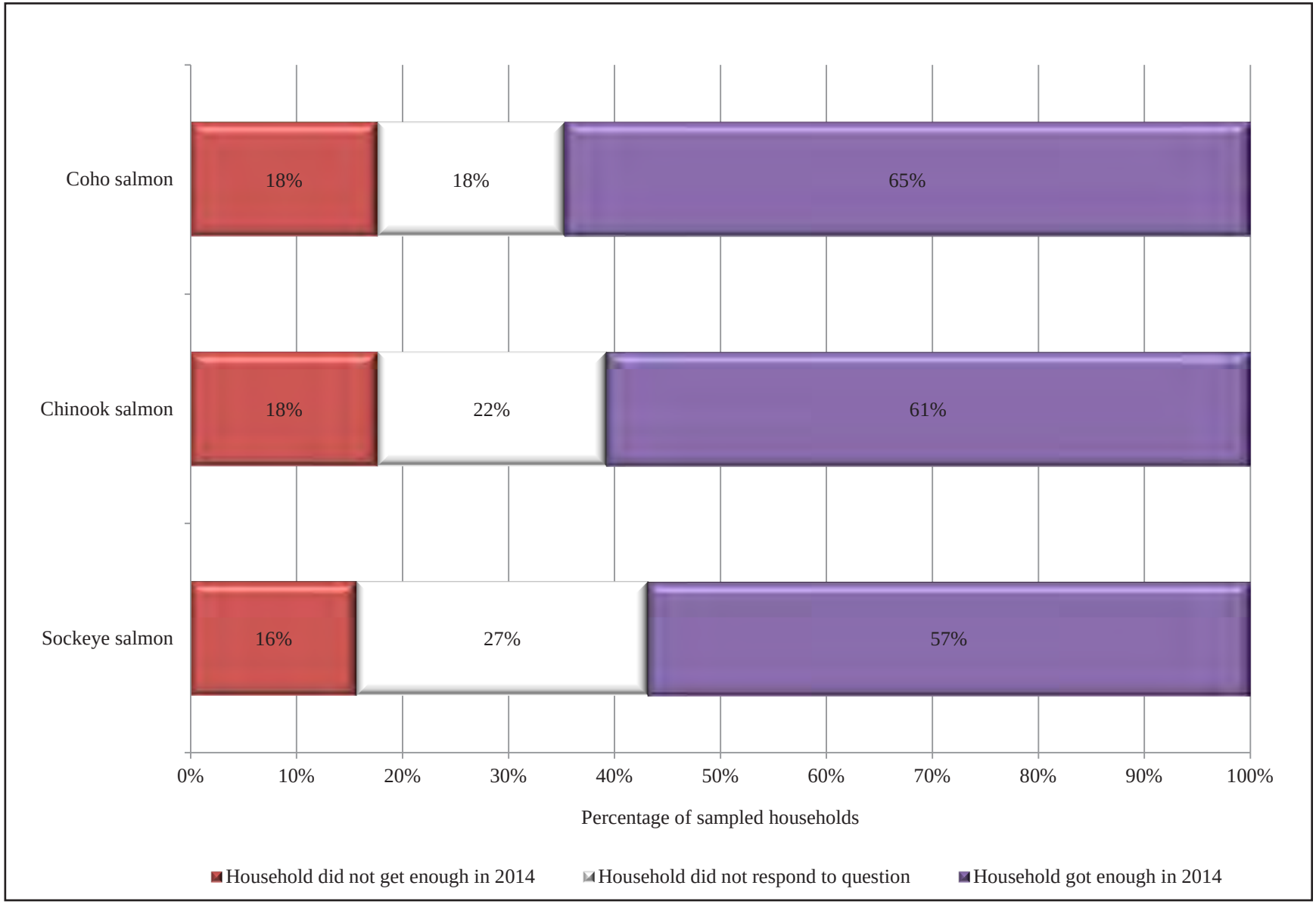


Figure 5-24.–Percentage of sampled households reporting whether they had enough salmon resources, Koliganek, 2014.

Table 5-18.–Percentage of households reporting whether they had enough salmon resources, Koliganek, 2014.

		Households not getting enough _____ .			
	Sampled	Valid responses[a]		Did not get enough	
Resource	households	Number	Percentage	Number	Percentage
Coho salmon	51	42	82.4%	9	21.4%
Chinook salmon	51	40	78.4%	9	22.5%
Sockeye salmon	51	37	72.5%	8	21.6%

Source ADF&G Division of Subsistence household surveys, 2015.
a. Does not include households that did not respond to the question or those households that never use the resource.

Table 5-19.–Reasons why households did not have enough salmon resources, Koliganek, 2014.

Resource	Valid responses[a]	Personal or family reasons		Resource availability		Too far to travel		Lack of equipment		Did not receive as much	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	5	1	20.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	7	1	14.3%	1	14.3%	0	0.0%	0	0.0%	0	0.0%
Sockeye salmon	6	1	16.7%	0	0.0%	0	0.0%	1	16.7%	0	0.0%

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Table 5-19.–Continued.

Resource	Valid responses[a]	Less effort		Unsuccessful		Weather		Other reasons		Not enough time	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	5	0	0.0%	0	0.0%	0	0.0%	1	20.0%	3	60.0%
Chinook salmon	7	0	0.0%	0	0.0%	0	0.0%	1	14.3%	4	57.1%
Sockeye salmon	6	1	16.7%	0	0.0%	0	0.0%	0	0.0%	3	50.0%

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Table 5-19.–Continued.

Resource	Valid responses[a]	Regulations		Animals too small or diseased		Fuel too expensive	
		Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	5	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	7	0	0.0%	0	0.0%	0	0.0%
Sockeye salmon	6	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2015.

Note Households may provide more than one response to the question.

a. Includes those households providing a valid reason for not getting enough.

Table 5-20.–Salmon resources that sampled households reported needing, Koliganek, 2014.

Resource	Households needing	Total amount needed	Average amount needed
Coho salmon	5	425	85
Chinook salmon	8	355	44
Sockeye salmon	4	470	118

Source ADF&G Division of Subsistence household surveys, 2015.

Table 5-21.–Changes in household harvests of salmon resources compared to recent years, Koliganek, 2014.

			Households reporting harvest								Households not harvesting in 2014	
			Total households		Less		Same		More			
Resource	Sampled households	Valid responses[a]	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	51	45	43	95.6%	16	35.6%	28	62.2%	12	26.7%	6	13.3%
Chinook salmon	51	43	38	74.5%	12	27.9%	17	39.5%	9	20.9%	5	11.6%
Other salmon	51	44	41	80.4%	11	25.0%	27	61.4%	3	6.8%	3	6.8%

Source ADF&G Division of Subsistence household surveys, 2015.

a. Valid responses do not include households that did not provide any response.

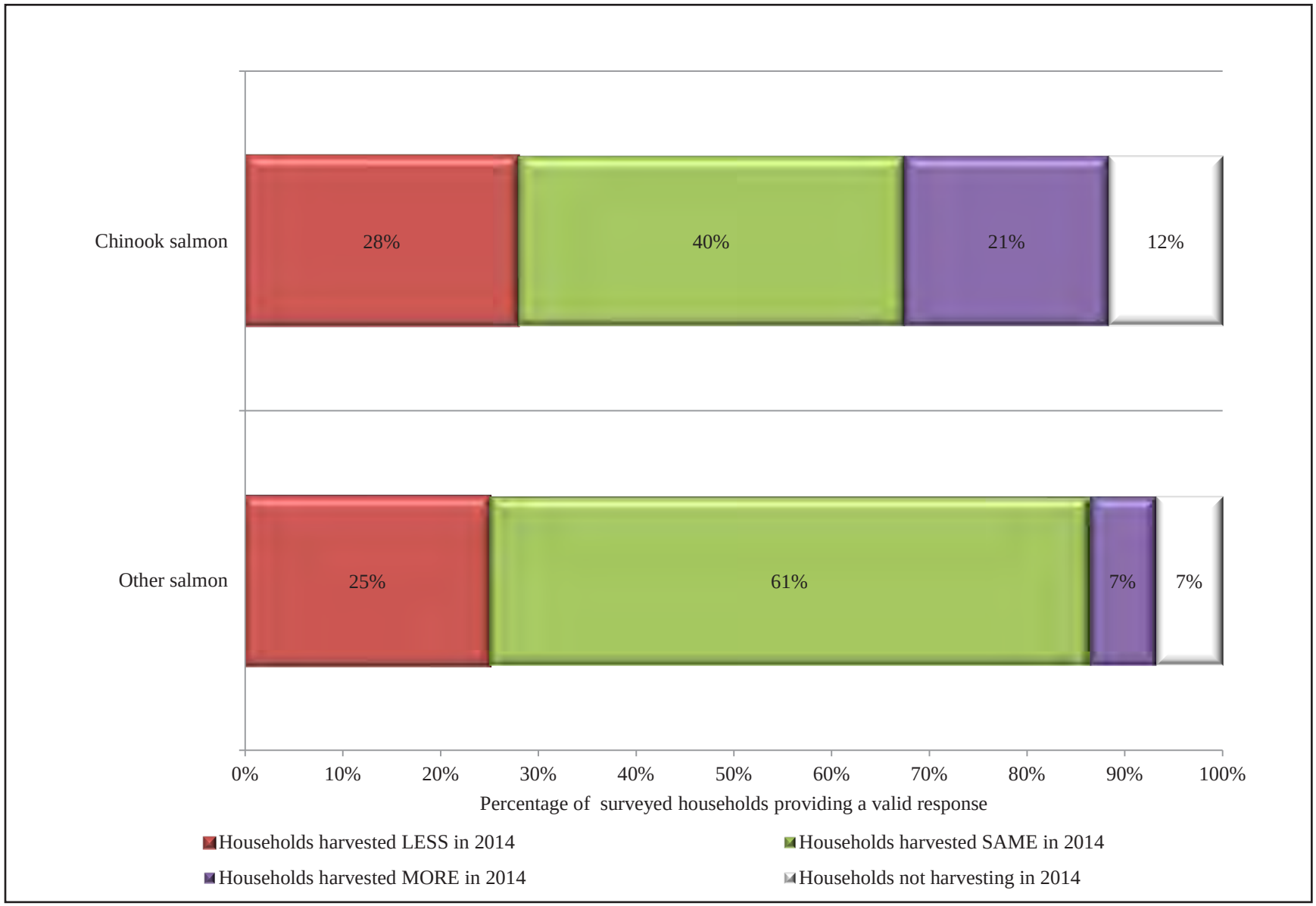


Figure 5-25.–Changes in household harvests of salmon resources compared to recent years, Koliganek, 2014.

Table 5-22.–Reasons for less household harvests of salmon resources compared to recent years, Koliganek, 2014.

Resource	Households reporting reasons for less harvest	Family/ personal		Resources less available		Too far to travel		Lack of equipment		Less sharing		Lack of effort		Unsuccessful		Weather/ environment	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	16	3	18.8%	2	13%	0	0.0%	0	0%	1	6%	2	13%	2	12.5%	0	0.0%
Chinook salmon	12	1	8.3%	1	8%	0	0.0%	0	0%	1	8%	1	8%	2	16.7%	0	0.0%
Other salmon	11	2	18.2%	2	18%	0	0.0%	0	0%	0	0%	1	9%	2	18.2%	0	0.0%

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Table 5-22.–Continued.

Resource	Households reporting reasons for less harvest	Other reasons		Working/ no time		Regulations		Small/ diseased animals		Did not get enough		Did not need		Equipment/ fuel expense		Too much competition	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	16	1	6%	6	37.5%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	12	1	8%	5	41.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Other salmon	11	0	0%	5	45.5%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2015.

Table 5-23.–Reasons for more household harvests of salmon resources compared to recent years, Koliganek, 2014.

Resource	Households reporting reasons for more harvest	Increased availability		Used other resources		Favorable weather		Received more		Needed more		Increased effort		Had more help	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	11	6	54.5%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	4	36.4%	0	0.0%
Chinook salmon	8	6	75.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	12.5%	0	0.0%
Other salmon	3	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	3	100.0%	0	0.0%

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Table 5-23.–Continued.

Resource	Households reporting reasons for more harvest	Other		Regulations		Traveled farther		More success		Needed less		Store-bought expense		Got/ fixed equipment	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	11	0	0.0%	0	0.0%	2	18.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	8	0	0.0%	0	0.0%	2	25.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Other salmon	3	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2015.

Assessment Comments

Some survey comments from Koliganek respondents are below, with more qualitative information provided in Chapter 8: "Local and Traditional Knowledge of Salmon and Subsistence on the Nushagak River." Survey respondents commented on a variety of reasons for their pattern of salmon use and harvest. In both the 2013 and 2014 survey comments, Pebble Mine, a copper/gold/molybdenum open-pit mine project proposed at Bristol Bay's headwaters, was a concern to local residents. Sharing of salmon and participation in commercial fishing—as it relates to having fish to share and affected time available to subsistence fish—were commented upon in both years, and Chinook salmon bycatch and the observation that Chinook salmon are smaller than they "used to be" were concerns for Koliganek residents in 2013. As mentioned earlier, the importance of rod and reel harvests to have enough salmon for the year was mentioned in 2013 comments.

Comments from 2013:

- I fear Pebble Mine will come to our family and friends and destroy the land.
- The Pebble Mine is trying to kill us off.
- Not as much fish in the Nushagak River as before. Lots of people from Iliamna Lake area come over to this area to harvest fish and it bugs [me] because they are all pro-Pebble Mine but want our local resources.
- [We] don't harvest any salmon but help other families cut and process them so [we] receive as much salmon as [we] need for [our] small family.
- The runs for all salmon species is lower than it used to be. Koliganek is the last community on the Nushagak so we are the last to get salmon.
- Silver run was really good. King run is smaller than it used to be, you catch a lot of jacks.
- [I] only do sport fishing [rod and reel] for subsistence. [My] in-laws fish at Lewis Point for sockeyes from a subsistence net.

Comments from 2014:

- [I] want the people of Bristol Bay to always have wild-caught fish. [I am] against mining in Bristol Bay; long-term fish are better than short-term mine.
- We, Native people of Koliganek, depend on salmon for subsistence. Harvesting and processing is a huge part of our culture, our traditional way of life, living. Help us sustain our resource, our culture, and our traditions.
- The king run was slow this year. [I] don't think the escapement numbers were correct.

Community Data Review Meeting

A data review meeting was held in Koliganek on March 27, 2018. Community members discussed the use and harvest of salmon having changed over the last several decades due to dietary changes from more traditional foods to increasingly eating store-bought foods. The lack of elders "filling fish racks all summer long" was also seen as a contributing factor in less subsistence harvest of salmon. Additionally, the decrease in dog teams for residents was also added as a reason why there was an overall reduction in harvests, particularly of sockeye salmon harvests since the early 1980s. On the other hand, the increased chum salmon harvest was attributed to possibly elders of Koliganek preferring chum salmon versus the other salmon species due to chum salmon having less fat and ease of digesting this fish. Lastly, residents of Koliganek exhibited significant interest in the subsistence salmon permit system and recognized that a lack of returns in the permit system communicated inaccurate harvest estimates. The importance of accuracy was discussed, and two ideas were identified: 1) to "tie" subsistence salmon permits with moose permits (for example, only those who return their salmon permit may then get a moose permit), and 2) encourage

increased communication from the permit vendor in Koliganek to residents to obtain their salmon permits post-season.

A Brief Comparison of Harvest Data Between Study Years

For the study years of this project, 2013 seemed to be a slightly more successful year at Koliganek, with 992 lb harvested per household, compared to 2014 when 907 lb per household was harvested (Table 5-6; Table 5-9). Chinook salmon had the highest total harvest amount in both study years and also a similar harvest value: 25,885 lb (121 lb per capita) in 2013, and 28,745 lb (145 lb per capita) in 2014. However, the sockeye salmon harvest was about double in 2013 (71 lb per capita) compared to 2014 (37 lb per capita). The same number of households indicated that they did not get enough Chinook salmon in either year (nine households), but the number of households that did not get enough sockeye salmon doubled in 2014 compared to 2013, which corresponds to the amount harvested being far less in 2014 (tables 5-12, 5-18, 5-6, and 5-9). Due to a high harvester of chum salmon in 2014, the harvest of that species rose in 2014 to 55 lb per person from 39 lb per person in 2013. This also corresponds to elevated percentages of sharing (giving and receiving) in 2014 compared to 2013. As indicated in survey comments about sharing in the community, chum salmon were given away for local use for dog teams. Overall, based on permit returns, the total subsistence harvest of Chinook salmon increased in the entire Nushagak District to 16,049 fish in 2014 from 11,602 fish in 2013 (Salomone et al. 2017:91). This indicates a general increase for the region's communities occurred in regard to salmon harvest, including for the community of Koliganek. Interestingly, the overall total run of Chinook salmon was less in 2014 (96,872) than in 2013 (133,246), which did not seem to deter the higher per capita Chinook salmon harvest for Koliganek in 2014 compared to 2013.

The most recent prior study that included Koliganek was for study year 2005, and results for that survey were published in Krieg et al. (2009): *Subsistence Harvests and Uses of Wild Resources in Igiugig, Kokhanok, Koliganek, Levelock, and New Stuyahok, Alaska, 2005* (Technical Paper No. 322). Prior to that survey, the previous study done in Koliganek was for the study period of April 1987–March 1988 and results were published in Schichnes and Chythlook (1991): *Contemporary Use of Fish and Wildlife in Ekwok, Koliganek, and New Stuyahok, Alaska* (Technical Paper No. 185). Both the reports and data may be found online on the ADF&G website and CSIS. In Chapter 7: "The Subsistence Permit System" there is additional discussion about previous study year salmon harvest estimates, specifically under the subheading "Comparison of Household Survey and Permit Data for Study Years."

6. DILLINGHAM

Community Background

Dillingham is located on Nushagak Bay, a smaller bay situated in the northwestern portion of Bristol Bay, Alaska. Nushagak Bay is about 20 miles wide, and Dillingham is situated at the mouth of the Wood River where the Nushagak River meets Nushagak Bay. Dillingham is 327 miles by air southwest of Anchorage and its boundaries encompass 37 square miles of land.[1] Dillingham is the service and transportation hub of Bristol Bay (Evans et al. 2013).

Historically, Dillingham was inhabited by Yup'ik peoples. There were three distinct Yu'pik groups, each occupying a geographic area based on their use of the land and resources. As Fall et al. (1986:14) writes, there was a "distinction … in the Dillingham area in pre-contact times between coastal and interior peoples." The distinctions blurred with the arrival of the Russians, who established Alexandrovski Redoubt Post in 1818 (Fall et al. 1986). The community was known as Nushagak by 1837, when a Russian Orthodox mission was established. In 1880, a village was reported as "Ah-lek-nug-uk in the present-day Dillingham area, and a village called Kanakanak appears on the 1890 census" (Fall et al. 1986:20). The new settlement drew people from all over southwestern Alaska, including Cook Inlet, the Kuskokwim River, and the Alaska Peninsula (Wolfe et al. 1984). In 1883 commercial fishing began in Bristol Bay, with the Arctic Packing Company opening the following year in 1884 as the first salmon cannery (Fall et al. 1986). Dillingham was named after William Paul Dillingham, a U.S. Senator from Virginia who led a tour of Alaska in 1903 (Fall et al. 1986). Dillingham soon became the regional center due to several services being located there. In 1918, Kanakanak Hospital was founded, and in 1918/19 an influenza epidemic nearly destroyed all of the Native population of the Nushagak River region, with populations on the Wood River being nearly eliminated (Fall et al. 1986). An orphanage was begun as a result of this disaster, locating children in one regional hub. A territorial school was also founded in 1920/21, though smaller schools existed on nearby sites. Shortly after, Dillingham became a transportation center, with a larger airport being established (Fall et al. 1986).

Residents, both historical and contemporary, have relied on multiple wild resources, such as land mammals, marine mammals, migratory waterfowl, whitefishes, salmon, and other seasonal foods (Evans et al. 2013; Fall et al. 1986, 1996; Wolfe et al. 1986). The community is deeply tied to fishing, both subsistence and commercial (Evans et al. 2013). According to Wright et al. (1985:3), "in many communities within the Bristol Bay region, traditional patterns of hunting, fishing, and gathering have been retained … though accommodations have been made to participate in the commercial fishery … the commercial salmon fishery is a preferred source of cash income because of its many similarities to traditional hunting and fishing, and because it is a short, intense, venture that causes little disruption in the traditional round of seasonal activities… ." The contemporary commercial fishing industry in Dillingham echoes this statement, with a high degree of both subsistence and commercial fishing centered around this community. There are several seafood processors and buyers operating in the Nushagak District, including Copper River Seafoods, Icicle Seafoods, and Peter Pan, among others. Salmon, and specifically sockeye, are the most harvested species by the commercial fleet and Bristol Bay continues to produce the world's largest returns of salmon (Evans et al. 2013). For example, in 2017 in the Nushagak District where Dillingham is located, the total inshore sockeye salmon run was 20 million fish, including a sockeye salmon commercial harvest of 12.3 million fish, 108% above the 1997–2016 average harvest of 5.9 million sockeye salmon (Elison et al. 2018:15–16). Sport fishing also plays a role in the economy and character of Dillingham and the greater Nushagak River region.

Geographically, Dillingham is characterized by tundra interspersed with boreal forest. The summers are short and warm and can often produce heavy fog in July and August. Winter is long and cold, with the

1. *Community Database Online,* s.v. "Dillingham" (by Alaska Department of Commerce, Community, and Economic Development), https://www.commerce.alaska.gov/dcra/DCRAExternal/community/Details/44c25e97-55c1-4587-b3f6-8e4e27bf5c65 (accessed May 30, 2018).

potential for high winds and heavy snowfalls. The Nushagak River is typically ice-free from June to November.

Dillingham is only accessed by airplane and boat, or snowmachine is used in winter to travel between the community and other regional communities. Dillingham is part of the ANCSA regional corporation Bristol Bay Native Corporation and has a tribal affiliation under the Curyung (Choggiung Limited) Tribal Council. Dillingham has all major facilities, including a commercial airport, school district, hospital, and electric company cooperative, an Alaska State Trooper post, a city police station, and volunteer firefighting and emergency medical services. The City of Dillingham runs several departments, including the Library, Planning Office, Port, and Public Works, among others. There is also the Sam Fox Museum documenting the historical development of Dillingham and the surrounding area. Dillingham also houses the University of Alaska–Bristol Bay campus, with full-time faculty offering both technical and master's degrees (Evans et al. 2013).

Population Estimates and Demographic Information: 2014 and 2016

Table 6-1 shows population information for Dillingham during 2014 and 2016. The estimated population for Dillingham in 2014 was 2,422, with the Alaska Native population estimated at 1,549 individuals (64%) (Table 6-1; Figure 6-1). There were an estimated 829 eligible households in the community (with a minimum of three months of residence) with a mean household size of 2.9 (Table 6-1). Alaska Native households (where one head of the household is Alaska Native) totaled 493, composing 60% of the community households. In 2016, the population was estimated to have decreased to 2,293 individuals. The Alaska Native population was 1,508, making up 66% of the community population (Figure 6-1; Table 6-1). The mean household size during 2016 was 2.8 individuals (Table 6-1). The average age of a Dillingham resident during the study was 34–35, with the minimum being less than 1 year of age and the maximum being 88.

The population of Dillingham has risen since 1950, when the population was just slightly more than 500 individuals (Figure 6-2). The population appeared to peak in 2000, and then experienced some gradual decline followed by an increase between 2000 and 2016. The population profile of residents in Dillingham during the study years (2014–2016) was 1,211–1,169 males compared to 1,211–1,124 females (Table 6-2; Table 6-3). In 2014, the smallest age cohort for males, after elders (70 and older), was the group aged 45–49. This changed two years later, with the smaller age cohort being males aged 30–34. The smallest cohort in 2014 for females, after elders (65 and older), was 60–64 and in 2016 the smallest group was aged 45–49. Although this study did not gather data on employment levels, it is interesting to note that the smallest age cohorts for both males and females fall within general ages of employability, perhaps indicating that more people are leaving Dillingham to seek employment elsewhere (Figure 6-3; Figure 6-4).

Sampling and Stratification

Sampling in Dillingham followed a stratified sample based on households that did and did not hold a subsistence salmon permit. In both years, permit and non-permit holders were randomized for the survey sample (Table 6-4). The number of dwelling units in 2014 was 279 for permit holders and 550 for non-permit holders, for a total community dwelling unit estimate of 829. The interview goal for the permit stratum was 110 households, and for the non-permit stratum it was 100 households. The number of households researchers attempted to interview for non-permit holders was higher than the interview goal for both 2014 and 2016, which may indicate an overall challenge to surveying households about subsistence salmon uses and harvest that may not intentionally harvest subsistence salmon, may fish without a permit, or use only received salmon. This corresponds to a higher refusal rate in 2014 from non-permit households compared to permitted households (10% and 4%, respectively). The percentage of total households interviewed for 2014 was 36% for permit holders and 18% for non-permit holders.

The number of dwelling units in 2016 was 357 for permit holders and 518 for non-permit holders, for a total community dwelling unit estimate of 875. The interview goal for the permit stratum was 100 households, and for the non-permit stratum was 130 households. The number of households researchers attempted to interview for non-permit holders was 193 households, and for permit holders it was 145 households. There was a higher refusal rate from non-permit households in 2016 compared to permitted households (23% and

Table 6-1.–Sample and demographic characteristics, Dillingham, 2014, and 2016.

Characteristics	Dillingham 2014	Dillingham 2016
Sampled households	200	205
Eligible households	829	815
Percentage sampled	24.1%	25.2%
Sampled population	594	607
Estimated community population	2,421.5	2,293.0
Range[a]	2,240 – 2,603	2,124 – 2,462
Household size		
Mean	2.9	2.8
Minimum	1	1
Maximum	9	10
Age		
Mean	33.9	35.1
Minimum[b]	0	0
Maximum	83	88
Median	34	34
Alaska Native		
Estimated households[c]		
Number	492.9	544.6
Percentage	59.5%	66.8%
Estimated population		
Number	1,549.1	1,507.7
Percentage	64.0%	65.8%
Range[a]	1,350 – 1,748	1,338 – 1,678
U. S. Census 2010[d]		
Households	855	855
Population	2,329	2,329
Alaska Native population	1,549	1,549
American Community Survey 5-year average[e]		
Households	770	766
Range[f]	712 – 828	710 – 822
Population	2,255	2,296
Range[f]	2,130 – 2,380	2,162 – 2,430
Alaska Native population	1,418	1,531
Range[f]	1,296 – 1,540	1,431 – 1,631

Source ADF&G Division of Subsistence household surveys, 2015 and 2017.

a. Estimated range is 95% confidence interval.

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

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

d. Source is U.S. Census Bureau (2011).

e. Source is U.S. Census Bureau for American Community Survey (ACS): 2010–2014 ACS estimates used for 2014, 2012–2016 ACS estimates used for 2016.

f. ACS data range is the reported margin of error.

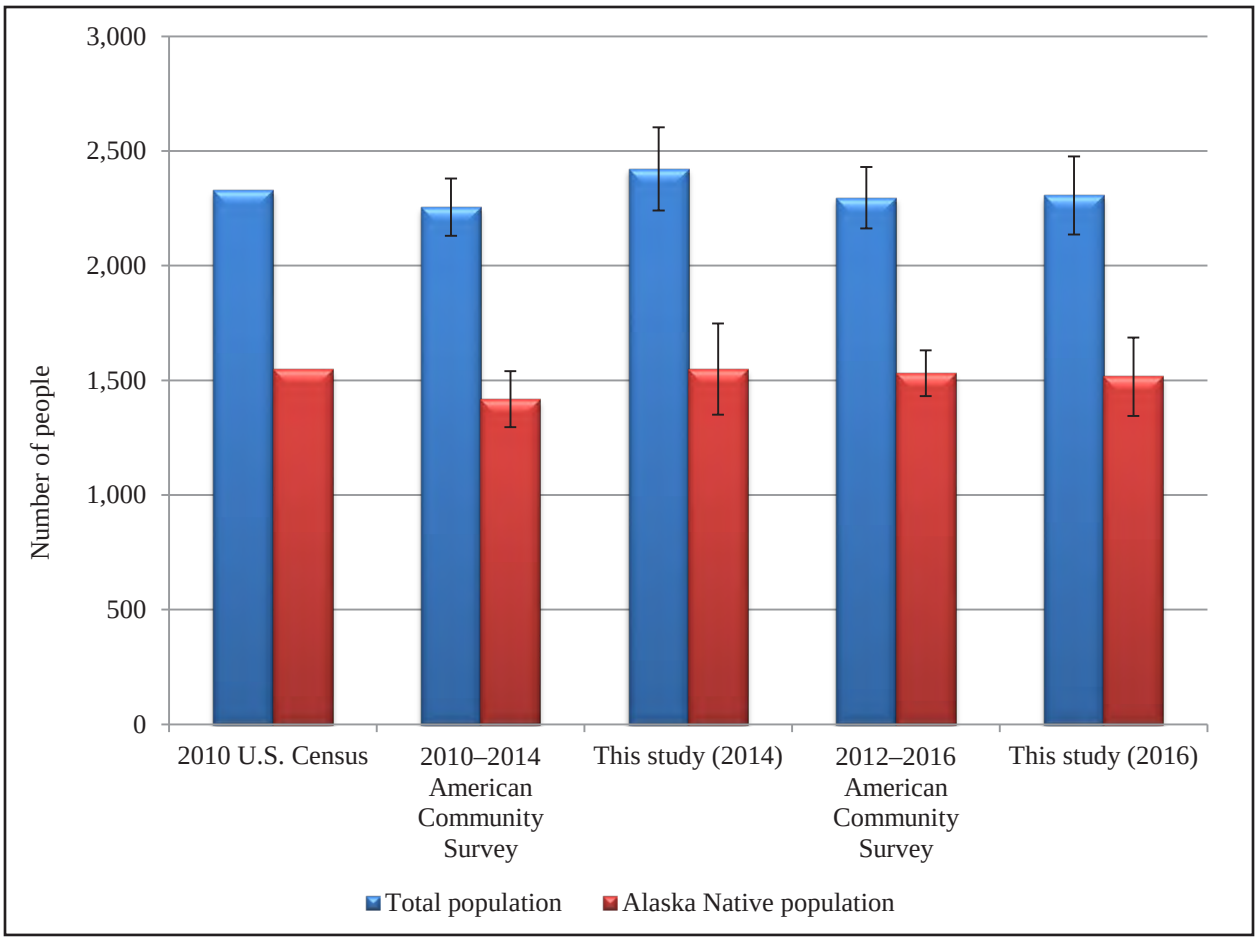


Figure 6-1.–Alaska Native and overall population estimates, Dillingham, 2010, 2014, and 2016.

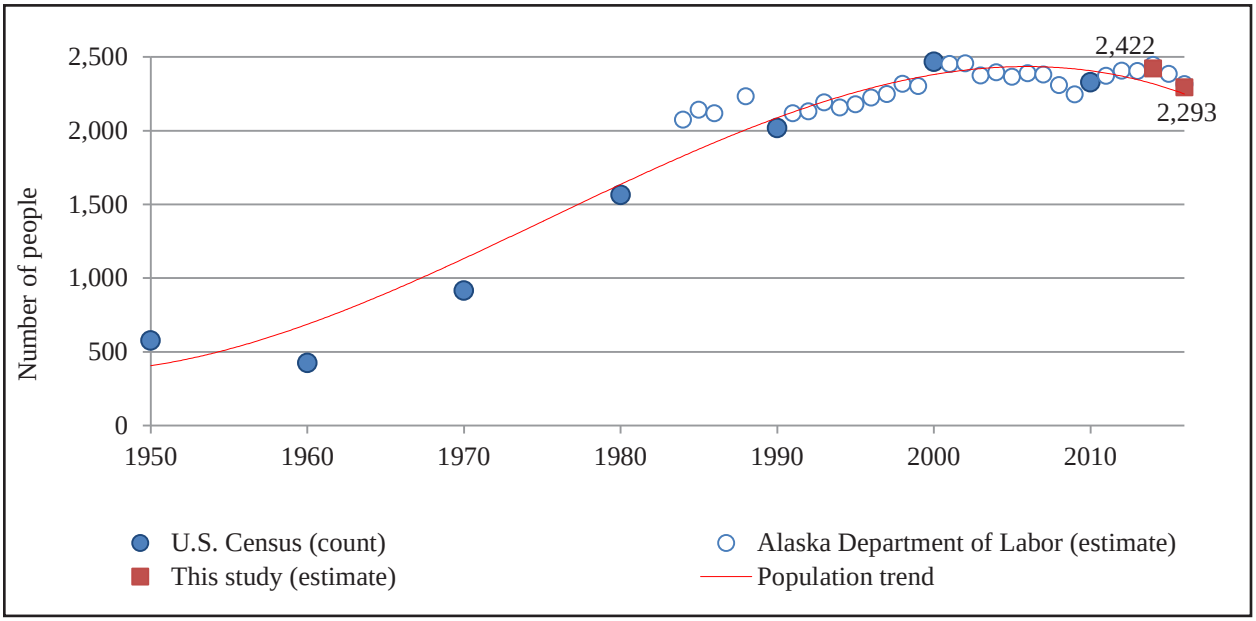


Figure 6-2.–Historical population estimates, Dillingham, 1950–2016.

Table 6-2.–Population profile, Dillingham, 2014.

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	69.1	5.7%	5.7%	107.7	8.9%	8.9%	176.8	7.3%	7.3%
5–9	121.4	10.0%	15.7%	85.6	7.1%	16.0%	207.0	8.5%	15.9%
10–14	102.2	8.4%	24.2%	105.1	8.7%	24.6%	207.3	8.6%	24.4%
15–19	91.4	7.6%	31.7%	88.4	7.3%	31.9%	179.8	7.4%	31.8%
20–24	88.5	7.3%	39.0%	63.7	5.3%	37.2%	152.2	6.3%	38.1%
25–29	60.9	5.0%	44.1%	102.0	8.4%	45.6%	162.9	6.7%	44.8%
30–34	66.1	5.5%	49.5%	82.8	6.8%	52.5%	148.9	6.1%	51.0%
35–39	47.0	3.9%	53.4%	66.4	5.5%	58.0%	113.4	4.7%	55.7%
40–44	69.0	5.7%	59.1%	66.2	5.5%	63.4%	135.2	5.6%	61.3%
45–49	41.5	3.4%	62.5%	71.9	5.9%	69.4%	113.4	4.7%	65.9%
50–54	127.1	10.5%	73.0%	77.5	6.4%	75.8%	204.5	8.4%	74.4%
55–59	102.4	8.5%	81.5%	118.9	9.8%	85.6%	221.3	9.1%	83.5%
60–64	77.5	6.4%	87.9%	52.9	4.4%	89.9%	130.3	5.4%	88.9%
65–69	49.8	4.1%	92.0%	30.5	2.5%	92.5%	80.4	3.3%	92.2%
70–74	58.0	4.8%	96.8%	41.5	3.4%	95.9%	99.5	4.1%	96.3%
75–79	11.1	0.9%	97.7%	16.5	1.4%	97.2%	27.6	1.1%	97.5%
80–84	13.8	1.1%	98.8%	0.0	0.0%	97.2%	13.8	0.6%	98.0%
85–89	0.0	0.0%	98.8%	0.0	0.0%	97.2%	0.0	0.0%	98.0%
90–94	0.0	0.0%	98.8%	0.0	0.0%	97.2%	0.0	0.0%	98.0%
95–99	0.0	0.0%	98.8%	0.0	0.0%	97.2%	0.0	0.0%	98.0%
100–104	0.0	0.0%	98.8%	0.0	0.0%	97.2%	0.0	0.0%	98.0%
Missing	14.0	1.2%	100.0%	33.3	2.8%	100.0%	47.3	2.0%	100.0%
Total	**1,210.7**	**100.0%**	**100.0%**	**1,210.8**	**100.0%**	**100.0%**	**2,421.5**	**100.0%**	**100.0%**

Source ADF&G Division of Subsistence household surveys, 2015.

Table 6-3.–Population profile, Dillingham, 2016.

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	61.7	5.3%	5.3%	90.9	8.1%	8.1%	152.6	6.7%	6.7%
5–9	97.1	8.3%	13.6%	91.4	8.1%	16.2%	188.5	8.2%	14.9%
10–14	64.5	5.5%	19.1%	89.5	8.0%	24.2%	154.1	6.7%	21.6%
15–19	91.9	7.9%	27.0%	97.5	8.7%	32.9%	189.4	8.3%	29.9%
20–24	99.9	8.5%	35.5%	57.5	5.1%	38.0%	157.4	6.9%	36.7%
25–29	74.9	6.4%	41.9%	74.4	6.6%	44.6%	149.3	6.5%	43.2%
30–34	35.8	3.1%	45.0%	73.0	6.5%	51.1%	108.8	4.7%	48.0%
35–39	61.7	5.3%	50.3%	64.5	5.7%	56.8%	126.3	5.5%	53.5%
40–44	66.9	5.7%	56.0%	63.1	5.6%	62.4%	130.0	5.7%	59.2%
45–49	50.9	4.4%	60.3%	38.2	3.4%	65.8%	89.0	3.9%	63.0%
50–54	92.4	7.9%	68.2%	88.6	7.9%	73.7%	180.9	7.9%	70.9%
55–59	89.0	7.6%	75.9%	62.2	5.5%	79.3%	151.2	6.6%	77.5%
60–64	108.8	9.3%	85.2%	94.2	8.4%	87.6%	203.0	8.9%	86.4%
65–69	67.4	5.8%	90.9%	51.4	4.6%	92.2%	118.7	5.2%	91.6%
70–74	24.5	2.1%	93.0%	39.1	3.5%	95.7%	63.6	2.8%	94.3%
75–79	18.8	1.6%	94.6%	13.2	1.2%	96.9%	32.0	1.4%	95.7%
80–84	18.4	1.6%	96.2%	8.0	0.7%	97.6%	26.4	1.2%	96.9%
85–89	0.0	0.0%	96.2%	10.4	0.9%	98.5%	10.4	0.5%	97.3%
90–94	0.0	0.0%	96.2%	0.0	0.0%	98.5%	0.0	0.0%	97.3%
95–99	0.0	0.0%	96.2%	0.0	0.0%	98.5%	0.0	0.0%	97.3%
100–104	0.0	0.0%	96.2%	0.0	0.0%	98.5%	0.0	0.0%	97.3%
Missing	44.3	3.8%	100.0%	17.0	1.5%	100.0%	61.3	2.7%	100.0%
Total	**1,168.9**	**100.0%**	**100.0%**	**1,124.1**	**100.0%**	**100.0%**	**2,293.0**	**100.0%**	**100.0%**

Source ADF&G Division of Subsistence household surveys, 2017.

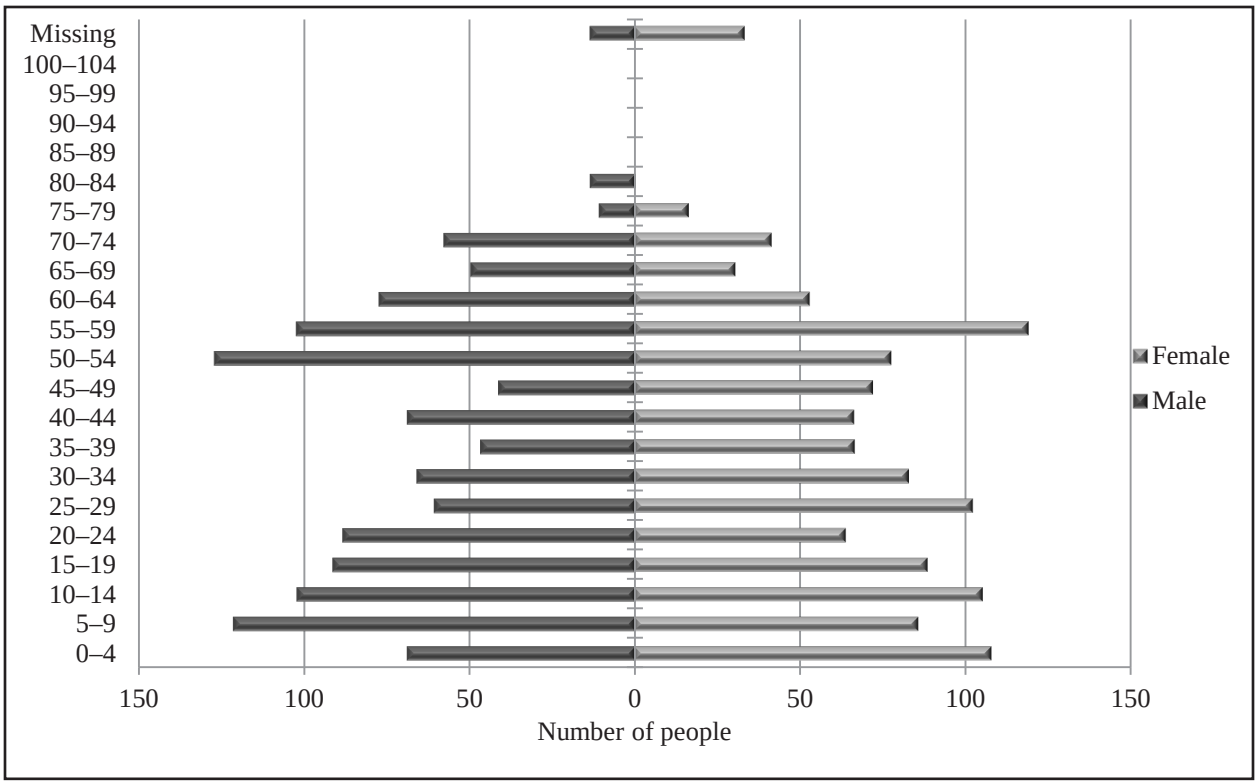


Figure 6-3.–Population profile, Dillingham, 2014.

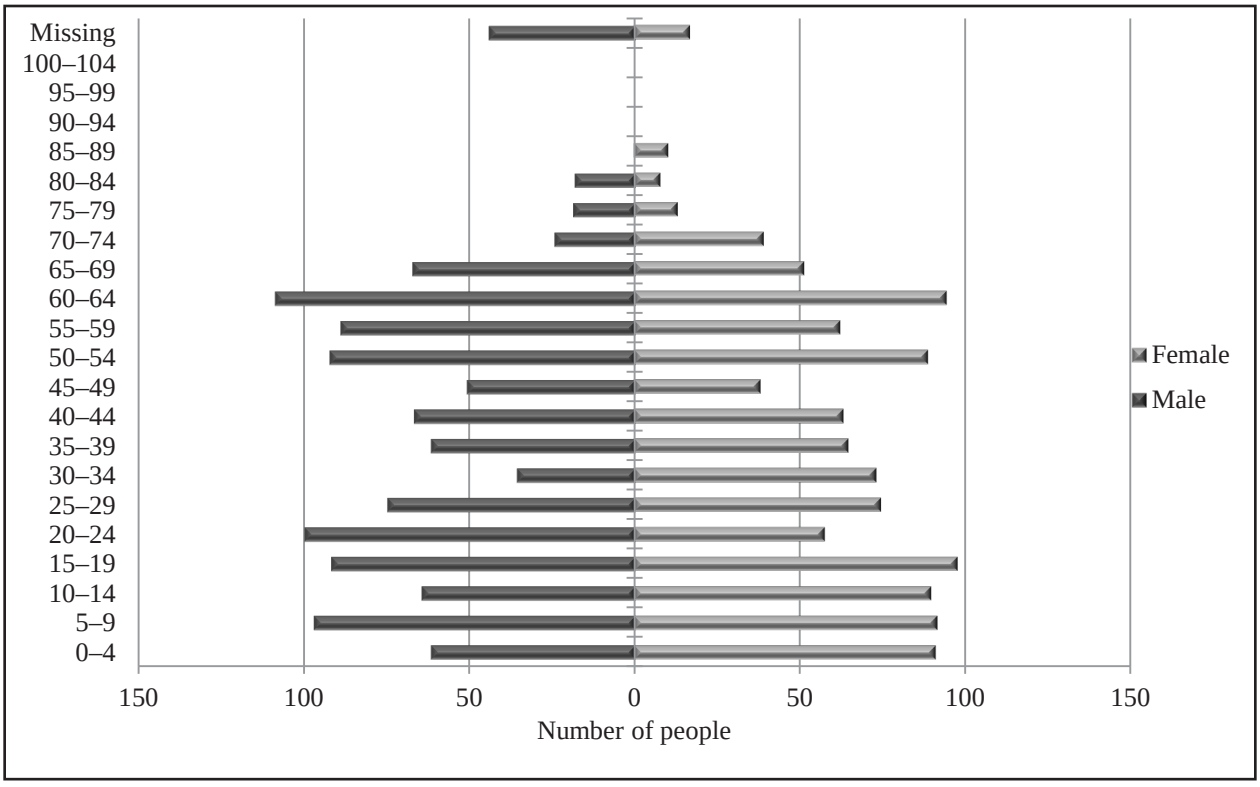


Figure 6-4.–Population profile, Dillingham, 2016.

Table 6-4.–Sample achievement, Dillingham, 2014 and 2016.

	2014			2016		
Sample information	Permit holders	Non-permit holders	Total community	Permit holders	Non-permit holders	Total community
Number of dwelling units	279	550	829	357	518	875
Interview goal	110	100	210	100	130	230
Households interviewed	100	100	200	105	100	205
Households failed to be contacted	5	26	31	31	64	95
Households declined to be interviewed	4	11	15	9	29	38
Households moved or occupied by nonresident	1	7	8	0	0	0
Total households attempted to be interviewed	109	137	246	145	193	338
Refusal rate	3.8%	9.9%	7.0%	7.9%	22.5%	15.6%
Final estimate of permanent households	279	550	829	357	518	875
Percentage of total households interviewed	35.8%	18.2%	24.1%	29.4%	19.3%	23.4%
Interview weighting factor	2.8	5.5	–	3.4	5.2	–
Sampled population	312	282	594	362	245	607
Estimated population	870.5	1,551.0	2,421.5	1,023.9	1,269.1	2,293.0

Source ADF&G Division of Subsistence household surveys, 2015 and 2017.

Note "–" indicates an interview weighting factor was applied to each stratum, therefore there is no overall total community weighting factor.

8%, respectively). The percentage of total households interviewed for 2016 was 29% for permit holders, and 19% for non-permit holders.

Overall, about one-quarter of Dillingham households were surveyed in both study years. Beyond basic population, age, and sex demographics, no other information, such as employment characteristics, was obtained from Division of Subsistence surveys. According to the ACS five-year estimate for 2012–2016, which encompasses both study years for this community, the median household income in Dillingham was $71,146 (U.S. Census Bureau n.d.).

Summary of Harvest and Use Patterns

Survey participants were asked about their engagement with the salmon fisheries, and varying amounts of use, attempt to harvest, successful harvest, and sharing of salmon were estimated from survey results. Sharing was identified by survey respondents as fulfilling a large proportion of salmon consumed by households. Salmon were shared in one form or another, which could have included unprocessed or processed fish. The survey effort included two ways to identify gear type used in the study communities. First, respondents were asked to identify the gear type used for salmon harvests reported on the household survey. Second, when identifying fishing and harvest locations on a map, respondents were asked to identify the type of harvest gear used at each location. Note that not every surveyed household provided spatial data (see Table 1-3) and some households did not provide clarification about the gear used at specific fishing and harvest locations. Therefore, the survey results provide two different depictions of harvest patterns by gear type. Also, respondents were not asked to identify where commercial harvests retained for home use came from, but tables showing harvests by gear type do depict the estimated amount of salmon retained from commercial catches. Note that based on comments collected during survey administration, set gillnet was the gillnet gear type most commonly used for subsistence salmon fishing, but some drift gillnet use occurred. The following sections summarize results for harvest and use patterns for each study year.

Individual Participation in the Harvesting and Processing of Salmon: 2014 and 2016

All salmon species in Alaska were harvested by Dillingham residents in both study years. Harvested species include Chinook, sockeye, chum, coho, and pink salmon, as well as spawned-out sockeye salmon. Figure 6-5 is a visual representation of the level of individual participation in the subsistence harvesting and processing of salmon by members of households in Dillingham. An estimated 48% percent of the community fished for salmon (1,173 people), and 61% processed salmon (1,476 people) (Table 6-5). There was a slight decrease in individual participation in the second study year. In 2016, an estimated 44% percent of the community subsistence fished for salmon (1,012 people), and 57% processed salmon (1,305 people).

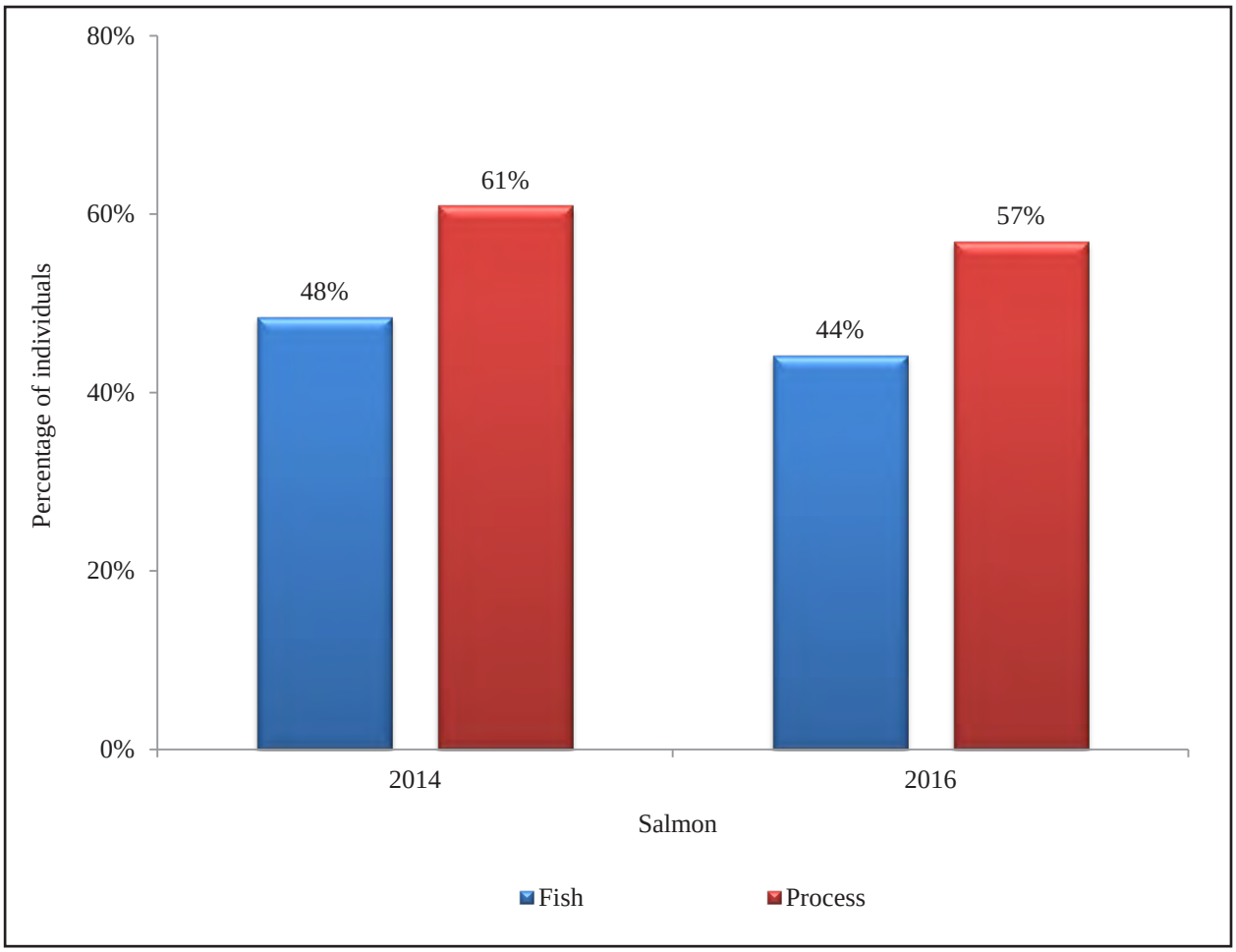


Figure 6-5.–Individual participation in subsistence salmon harvesting and processing activities, Dillingham, 2014 and 2016.

Table 6-5.–Individual participation in subsistence salmon harvesting and processing activities, Dillingham, 2014 and 2016.

	2014	2016
Total number of people	**2,421.5**	**2,293.0**
Salmon		
Fish		
Number	1,172.6	1,012.3
Percentage	48.4%	44.1%
Process		
Number	1,475.9	1,304.9
Percentage	61.0%	56.9%

Source ADF&G Division of Subsistence household surveys, 2015 and 2017.

Household Salmon Harvest and Use Characteristics in Dillingham: 2014

The total estimated number of all salmon species harvested in 2014 was 34,079 individual fish totaling 219,035 lb (Table 6-6). The highest portion of harvested salmon was Chinook salmon at 104,559 lb, followed by sockeye salmon at 61,196 lb. The total salmon harvest accounted for 264 lb per household, or 91 lb per capita. Chinook salmon accounted for 48% of the total pounds harvested in 2014, or 43 lb per capita (Figure 6-6; Table 6-6). Sockeye salmon composed 28% of the salmon harvest weight, and accounted for the second highest per capita harvest at 25 lb. The remainder of the harvest was coho (13%), chum (6%), spawning sockeye (3%), and pink (2%) salmon.

Overall Use by Households and Salmon Harvests by Gear Type

Ninety-four percent of households in Dillingham used salmon in 2014, with just more than one-half attempting (57%) and successfully (53%) harvesting salmon (Figure 6-7). The highest percentages of salmon use were for Chinook and sockeye salmon, with 88% and 85% of households using these species, respectively (Table 6-6). In terms of successful harvest, Chinook was the most harvested fish, by 41% of households, followed by sockeye (39%), coho (31%), and chum (25%) salmon; fewer than one-quarter of households harvested the other species. Most estimated households also exchanged salmon, either by giving (56%) or receiving (76%) salmon resources. Again, Chinook salmon ranked highest both for being received and given by households, suggesting perhaps two elements: overall importance of this species to Dillingham residents and ease of access to this particular salmon species. Sharing of salmon occurred in Dillingham with 44% of households giving away Chinook salmon, followed by 43% giving away sockeye and 26% giving coho salmon.

Methods used to harvest salmon included removals from commercial catches, gillnetting, rod and reel fishing, and using other subsistence gear (Table 6-7; Figure 6-8). Home pack from commercial fishing accounted for 5% of the total salmon harvest weight (Table 6-8). Subsistence gillnetting, as the dominant fishing method used by Dillingham households, accounted for 92% of the salmon harvest weight, and 3% of the harvest was from rod and reel. An estimated 7,090 Chinook salmon were harvested by gillnet, 548 were removed from commercial catches, and 169 were caught by rod and reel (Table 6-7). Coho salmon was the only species for which rod and reel gear was used to harvest a significant portion (10%) of the catch, followed by spawning sockeye salmon (7% of species harvest) (Table 6-8). Combined, these species composed 51% of the rod and reel harvest. Dillingham residents heavily favored harvesting coho salmon by gillnet, unlike other Nushagak River communities (Ekwok, Koliganek, and New Stuyahok) where one-third to one-half of the coho salmon harvests were caught by rod and reel; however, in Dillingham, rod and reel still featured as a gear type used more for harvesting coho than any other species (tables 3-8, 4-8, 5-8, and 6-8). An estimated 1,484 individual spawning sockeye salmon were harvested (Table 6-7); note that the Bristol Bay subsistence salmon permit instructs harvesters to "report spawned-out (red fish) by date and location in the 'red' column" on the log for daily subsistence salmon catch totals (Figure 6-9).

Salmon Harvests by Location and Harvest Gear Type

The salmon harvest areas used by Dillingham residents in 2014 are depicted by species in Figure 6-10. Harvest locations are given for all species, as well as spawning sockeye salmon. Harvests are clustered around three main areas: 1) Lake Aleknagik, 2) central Dillingham areas, which include the shoreline or beaches south of the town site, and 3) the confluence of the mouth of the Wood River, Nushagak Bay, and Nushagak River to Lewis Point. There are several harvest locations on the Nushagak River that are almost to the community of Ekwok, and one location on Lake Nerka for spawning sockeye salmon. Overall, Lake Aleknagik is where the majority of spawning sockeye salmon fishing occurred. Chinook salmon was the primary species pursued continuously from the mouth of the Nushagak River to Lewis Point.

Chinook salmon harvest locations by gear type are shown in Figure 6-11. Gillnet was the gear type primarily used to harvest Chinook salmon in concentrated areas at the Dillingham beaches south of the community and at the mouth of the Wood River. There was also gillnet use on the north side of the Nushagak River up to the Lewis Point area and another discrete gillnet site in Lake Aleknagik. The single harvest location for Chinook salmon in Lake Aleknagik was an island used for setnetting, as confirmed by a local Dillingham

Table 6-6.–Estimated use and harvest of salmon, Dillingham, 2014.

Resource	Percentage of households: Use %	Attempt %	Harvest %	Receive %	Give %	Harvest weight (lb): Total	Mean per household	Per capita	Harvest amount: Total	Unit	Mean per household	95% confidence limit (±) harvest
Salmon	**94.4**	**56.5**	**52.9**	**76.0**	**56.1**	**219,035.3**	**264.2**	**90.5**	**34,079.3**	**ind**	**41.1**	**17.1**
Chum salmon	39.1	28.2	24.8	18.0	21.4	13,810.2	16.7	5.7	2,916.0	ind	3.5	23.4
Coho salmon	49.0	33.8	31.1	26.6	26.4	29,323.7	35.4	12.1	6,516.4	ind	7.9	27.1
Chinook salmon	87.7	45.2	40.5	63.6	43.7	104,558.7	126.1	43.2	7,807.6	ind	9.4	16.6
Pink salmon	17.7	13.1	11.4	7.3	8.7	3,559.1	4.3	1.5	1,572.8	ind	1.9	48.3
Sockeye salmon	85.4	44.2	38.9	55.6	43.4	61,195.6	73.8	25.3	13,782.8	ind	16.6	23.5
Spawning sockeye salmon	14.4	10.4	9.0	6.3	8.3	6,588.0	7.9	2.7	1,483.8	ind	1.8	38.3
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	ind	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2015.

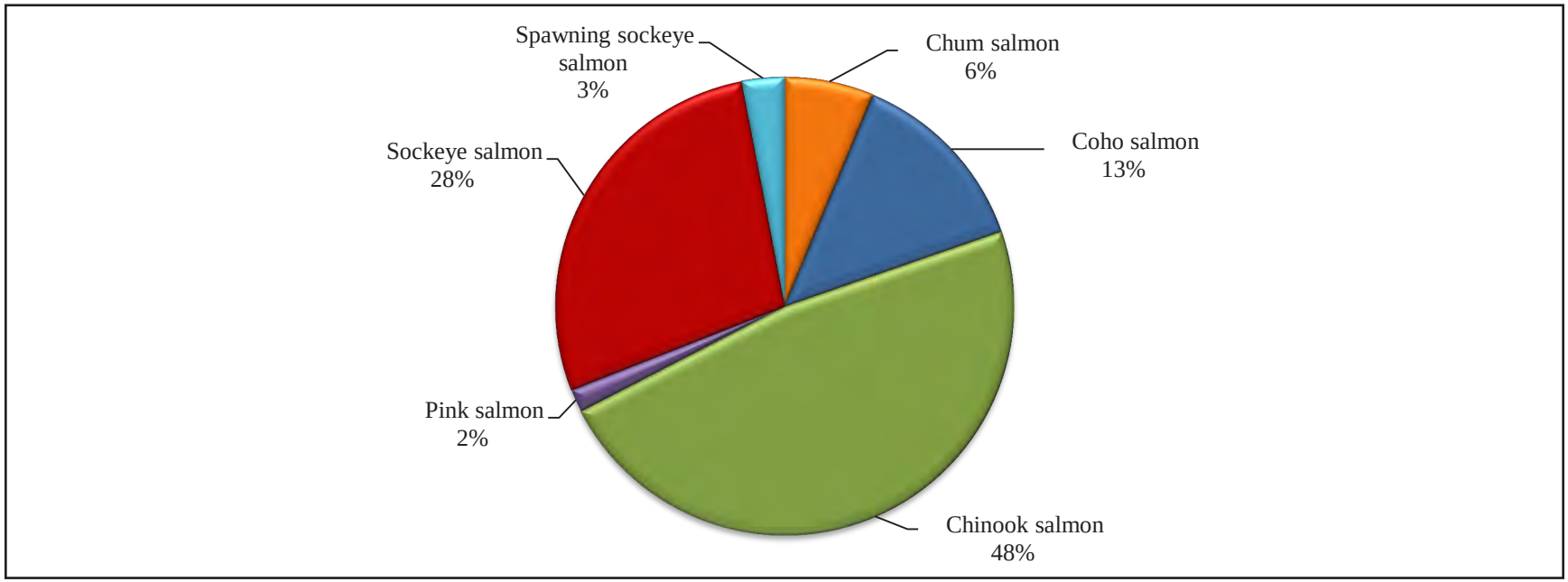


Figure 6-6.–Composition of salmon harvest in pounds usable weight, Dillingham, 2014.

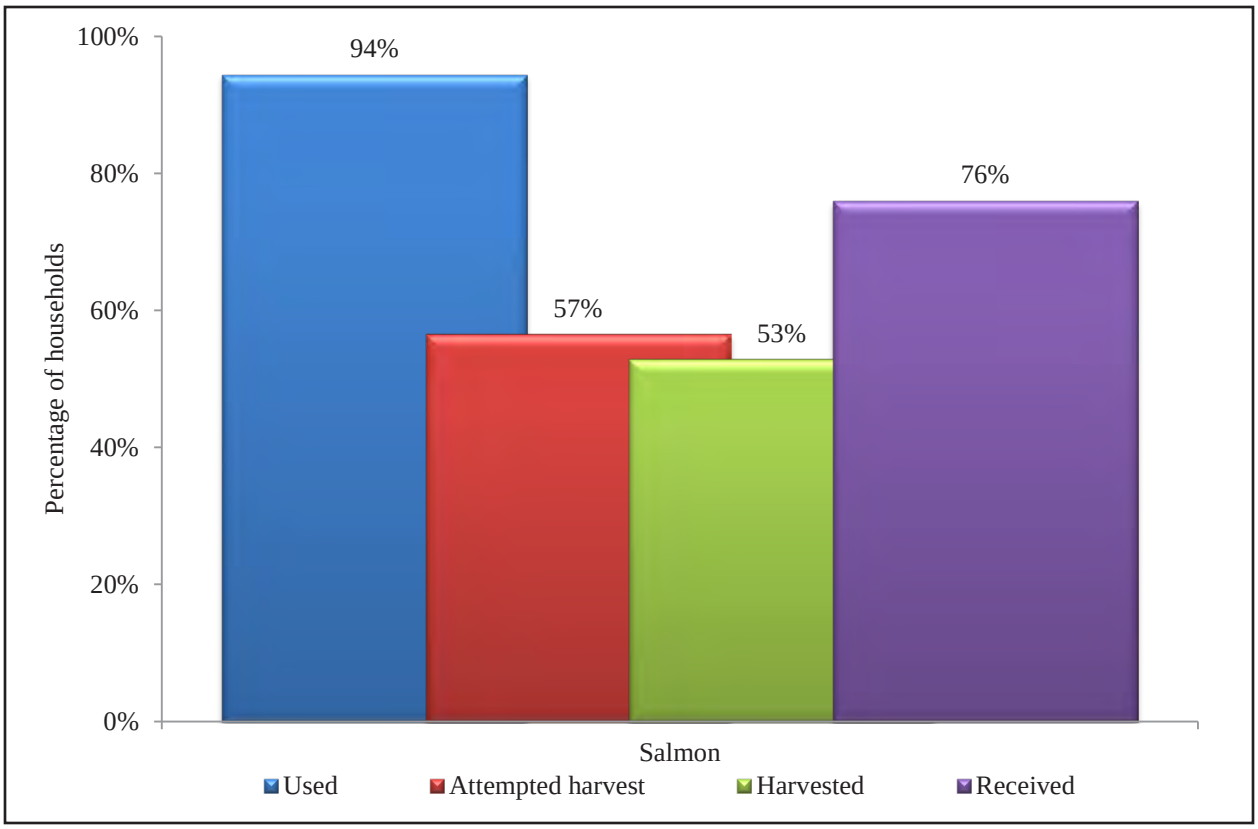


Figure 6-7.–Percentage of households using, attempting to harvest, harvesting, and receiving salmon, Dillingham, 2014.

Table 6-7.–Estimated harvest of salmon by gear type and resource, Dillingham, 2014.

	Removed from commercial catch		Subsistence methods									
			Gillnet[a]		Other method		Subsistence gear, any method		Rod and reel		Any method	
Resource	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Salmon	**1,412.6**	**11,163.4**	**31,335.3**	**200,411.9**	**214.4**	**946.2**	**31,549.8**	**201,358.1**	**1,116.9**	**6,513.9**	**34,079.3**	**219,035.3**
Chum salmon	22.3	105.7	2,888.1	13,678.1	0.0	0.0	2,888.1	13,678.1	5.6	26.4	2,916.0	13,810.2
Coho salmon	323.5	1,455.6	5,554.8	24,996.6	2.8	12.6	5,557.6	25,009.2	635.3	2,858.9	6,516.4	29,323.7
Chinook salmon	548.3	7,342.3	7,090.1	94,950.1	0.0	0.0	7,090.1	94,950.1	169.2	2,266.3	7,807.6	104,558.7
Pink salmon	19.5	44.2	1,550.4	3,508.6	2.8	6.3	1,553.2	3,514.9	0.0	0.0	1,572.8	3,559.1
Sockeye salmon	499.0	2,215.6	13,085.8	58,100.9	0.0	0.0	13,085.8	58,100.9	198.0	879.1	13,782.8	61,195.6
Spawning sockeye salmon	0.0	0.0	1,166.1	5,177.6	208.9	927.3	1,375.0	6,104.9	108.8	483.1	1,483.8	6,588.0
Unknown salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source ADF&G Division of Subsistence household surveys, 2015.

Note The harvested number of salmon is represented as individual fish harvested.

a. Gillnet harvests include both set and drift gillnet gear types.

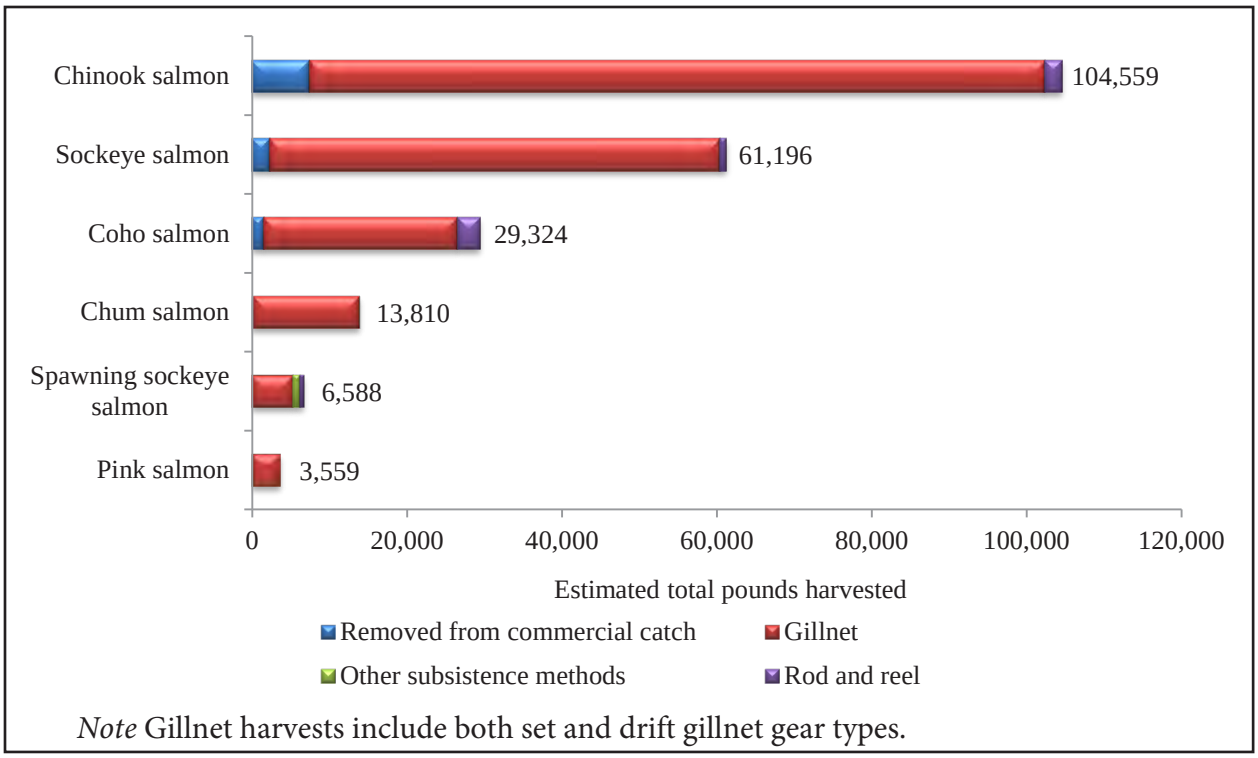


Figure 6-8.–Estimated harvest of salmon in pounds usable weight by gear type and resource, Dillingham, 2014.

resident during the community data review meeting. Additional gillnet harvest effort occurred along Nushagak Bay in the area of Ekuk. Rod and reel harvest locations were near Portage Creek, south of Ekwok, and at New Stuyahok.

Coho salmon harvests occurred predominantly by gillnet and were concentrated in similar locations as where Chinook salmon harvests occurred, with some rod and reel harvests located in the Wood River and leading into Lake Aleknagik (Figure 6-12). A few gillnet and rod and reel fishing locations were used on the Nushagak River between Lewis Point and New Stuyahok, and gillnet use occurred at several locations across Nushagak Bay from Dillingham.

Sockeye salmon gillnet harvest locations followed the previously described main clusters around the Dillingham shoreline and beaches, the Wood River, the Lewis Point area, and in Lake Aleknagik (Figure 6-13). In general, gillnets were used continuously from the mouths of the Wood and Nushagak rivers east to an area just upriver from Lewis Point. Several rod and reel fishing locations were also mapped. Seasonally, sockeye, Chinook, chum, and pink salmon are typically caught together, with Chinook coming in an earlier run, yet still overlapping with the other salmon species. This corresponds to duplicated harvest locations of the main harvested species.

Harvest locations for other salmon, which in 2014 included chum, pink, and spawning sockeye salmon, are shown in Figure 6-14. More harvest locations were identified in Lake Aleknagik, which largely represents harvests of spawning sockeye salmon, a late season fish preferred by some local residents (Figure 6-14; Figure 6-10). Overall, more gillnet sites were mapped than rod and reel fishing locations and places where other or unspecified gear was used.

Table 6-8.–Estimated percentages of salmon harvest in pounds usable weight by gear type, resource, and total salmon harvest, Dillingham, 2014.

Resource	Percentage base	Removed from commercial catch	Subsistence methods				
			Gillnet[a]	Other method	Subsistence gear, any method	Rod and reel	Any method
Salmon	**Gear type**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
	Resource	**5.1%**	**91.5%**	**0.4%**	**91.9%**	**3.0%**	**100.0%**
	Total	**5.1%**	**91.5%**	**0.4%**	**91.9%**	**3.0%**	**100.0%**
Chum salmon	Gear type	0.9%	6.8%	0.0%	6.8%	0.4%	6.3%
	Resource	0.8%	99.0%	0.0%	99.0%	0.2%	100.0%
	Total	0.0%	6.2%	0.0%	6.2%	0.0%	6.3%
Coho salmon	Gear type	13.0%	12.5%	1.3%	12.4%	43.9%	13.4%
	Resource	5.0%	85.2%	0.0%	85.3%	9.7%	100.0%
	Total	0.7%	11.4%	0.0%	11.4%	1.3%	13.4%
Chinook salmon	Gear type	65.8%	47.4%	0.0%	47.2%	34.8%	47.7%
	Resource	7.0%	90.8%	0.0%	90.8%	2.2%	100.0%
	Total	3.4%	43.3%	0.0%	43.3%	1.0%	47.7%
Pink salmon	Gear type	0.4%	1.8%	0.7%	1.7%	0.0%	1.6%
	Resource	1.2%	98.6%	0.2%	98.8%	0.0%	100.0%
	Total	0.0%	1.6%	0.0%	1.6%	0.0%	1.6%
Sockeye salmon	Gear type	19.8%	29.0%	0.0%	28.9%	13.5%	27.9%
	Resource	3.6%	94.9%	0.0%	94.9%	1.4%	100.0%
	Total	1.0%	26.5%	0.0%	26.5%	0.4%	27.9%
Spawning sockeye salmon	Gear type	0.0%	2.6%	98.0%	3.0%	7.4%	3.0%
	Resource	0.0%	78.6%	14.1%	92.7%	7.3%	100.0%
	Total	0.0%	2.4%	0.4%	2.8%	0.2%	3.0%
Unknown salmon	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source ADF&G Division of Subsistence household surveys, 2015.

a. Gillnet harvests include both set and drift gillnet gear types.

Alaska Department of Fish & Game

Bristol Bay Subsistence Salmon Fishery Permit

ALASKA RESIDENTS ONLY

Community _____

Permit No. _____

Year _____

First Name | Initial | Last Name

Permanent Mailing Address | City

State | Zip Code | Phone number

Number of year-round residents in household ▸

Names of household members who will assist in operation of subsistence net:

1. _____ 2. _____ 3. _____

4. _____ 5. _____ 6. _____

Drainage to be fished: Naknek ☐ Kvichak ☐ Egegik ☐ Ugashik ☐

Nushagak ☐ Togiak ☐ Other _____

Primary fishing location (specific): _____

Number of fathoms allowed at this site: 10 ☐ 25 ☐ Gear type: _____

Please specify set gear, drift gear, spear, or dip net.

I understand that I am applying for a subsistence fishing permit for my household in accordance with current regulations and hereby swear the information contained on this application is a true statement as witnessed by my signature below; and that I have been an Alaska resident for the last calendar year.

Applicant's signature _____ Date _____

TO BE COMPLETED BY ISSUING OFFICER ONLY

The above-named person and designated household members are authorized to fish for salmon for subsistence purposes in the Bristol Bay Area during the calendar year of _____ according to current laws and regulations of the State of Alaska.

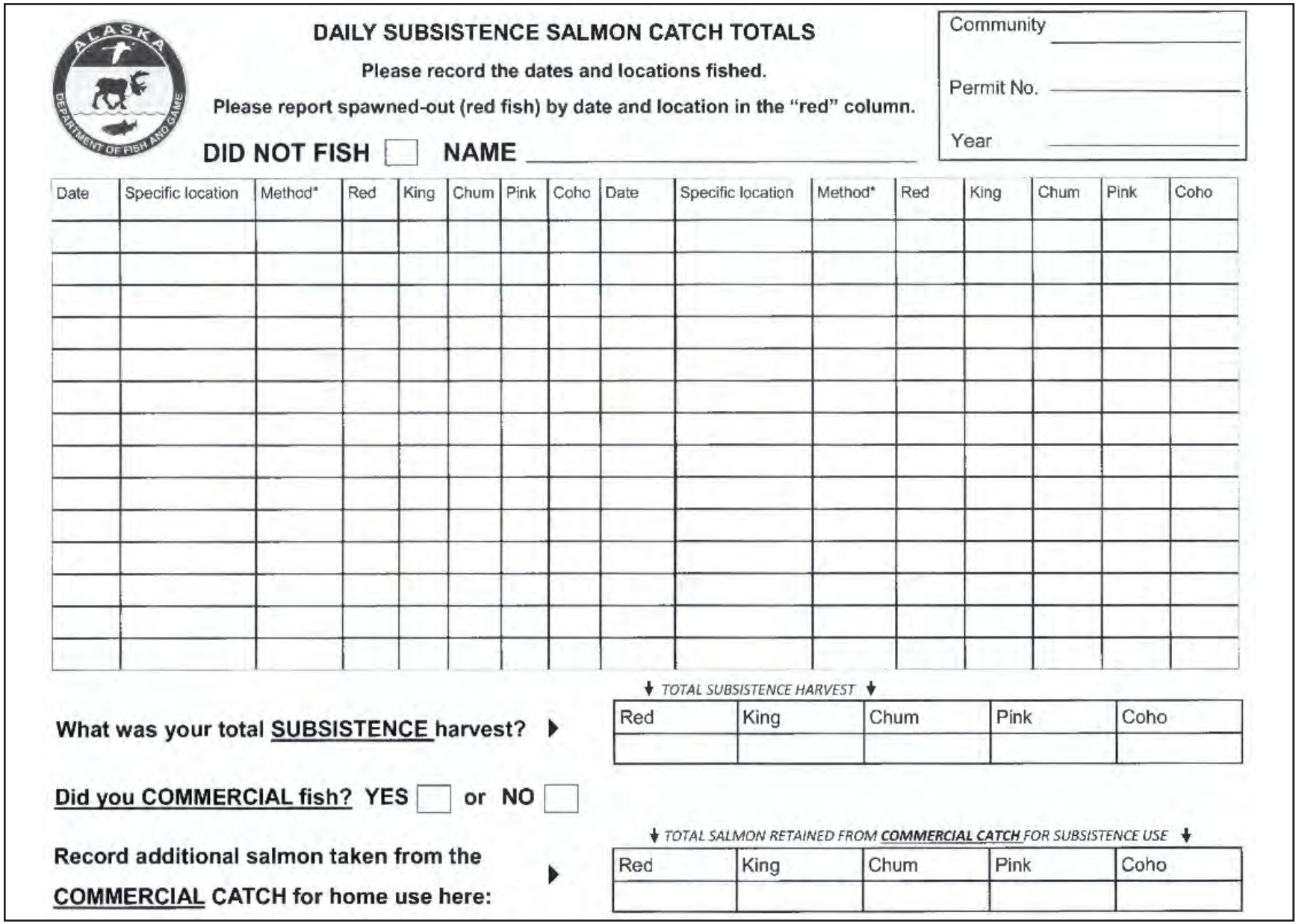
Authorizing Officer _____ Date _____

1. Only one subsistence salmon fishing permit may be issued to each household per year. People using the net/site and not of this household are required to have their own permit and file a separate report of their harvest.
2. Fish caught for subsistence uses may not be sold or allowed to enter commercial use.
3. An accurate record of fish taken under authority of this permit must be returned to the Alaska Department of Fish and Game when the permit expires. Failure to return subsistence catch records is grounds for denial of future permit privileges.

NOTE: Commercially-caught salmon may also be utilized for subsistence purposes and must be reported on the back of this form as well as a Commercial Fish ticket.

Return form to: (fax) 907-267-2450/ (email) dfg.sub.permits@alaska.gov/ or
Division of Subsistence, ADF&G, 333 Raspberry Rd, Anchorage, AK 99518

Figure 6-9.–Sample Bristol Bay subsistence salmon fishery permit, study period (pre-2019).



DAILY SUBSISTENCE SALMON CATCH TOTALS

Please record the dates and locations fished.

Please report spawned-out (red fish) by date and location in the "red" column.

Community _____

Permit No. _____

Year _____

DID NOT FISH ☐ **NAME** _____

Date	Specific location	Method*	Red	King	Chum	Pink	Coho	Date	Specific location	Method*	Red	King	Chum	Pink	Coho

TOTAL SUBSISTENCE HARVEST

What was your total SUBSISTENCE harvest? ▶

Red	King	Chum	Pink	Coho

Did you COMMERCIAL fish? YES ☐ **or NO** ☐

*TOTAL SALMON RETAINED FROM **COMMERCIAL CATCH** FOR SUBSISTENCE USE*

Record additional salmon taken from the COMMERCIAL CATCH for home use here: ▶

Red	King	Chum	Pink	Coho

Figure 6-9.–Page 2 of 2.

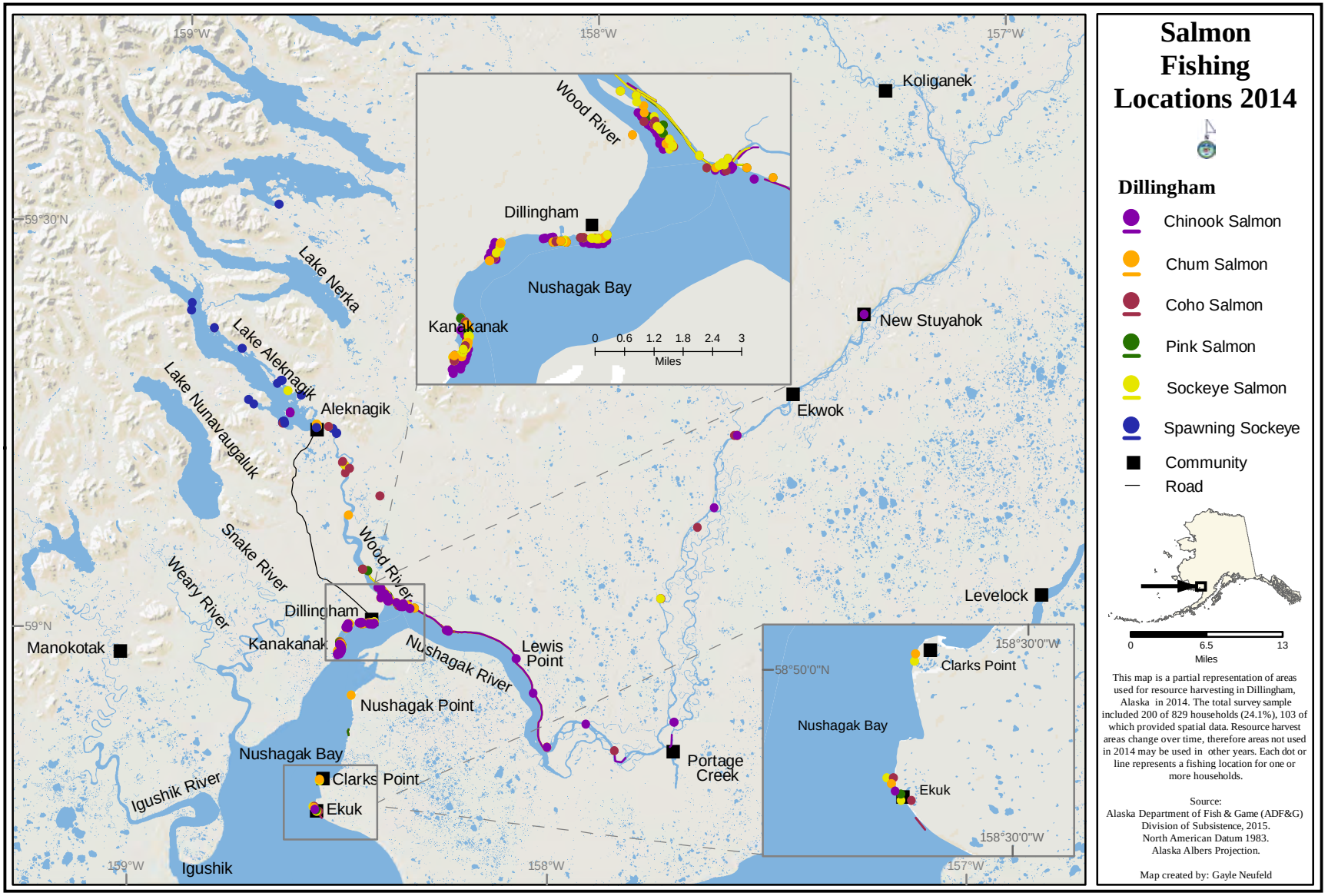


Figure 6-10.–Fishing and harvest locations of salmon, Dillingham, 2014.

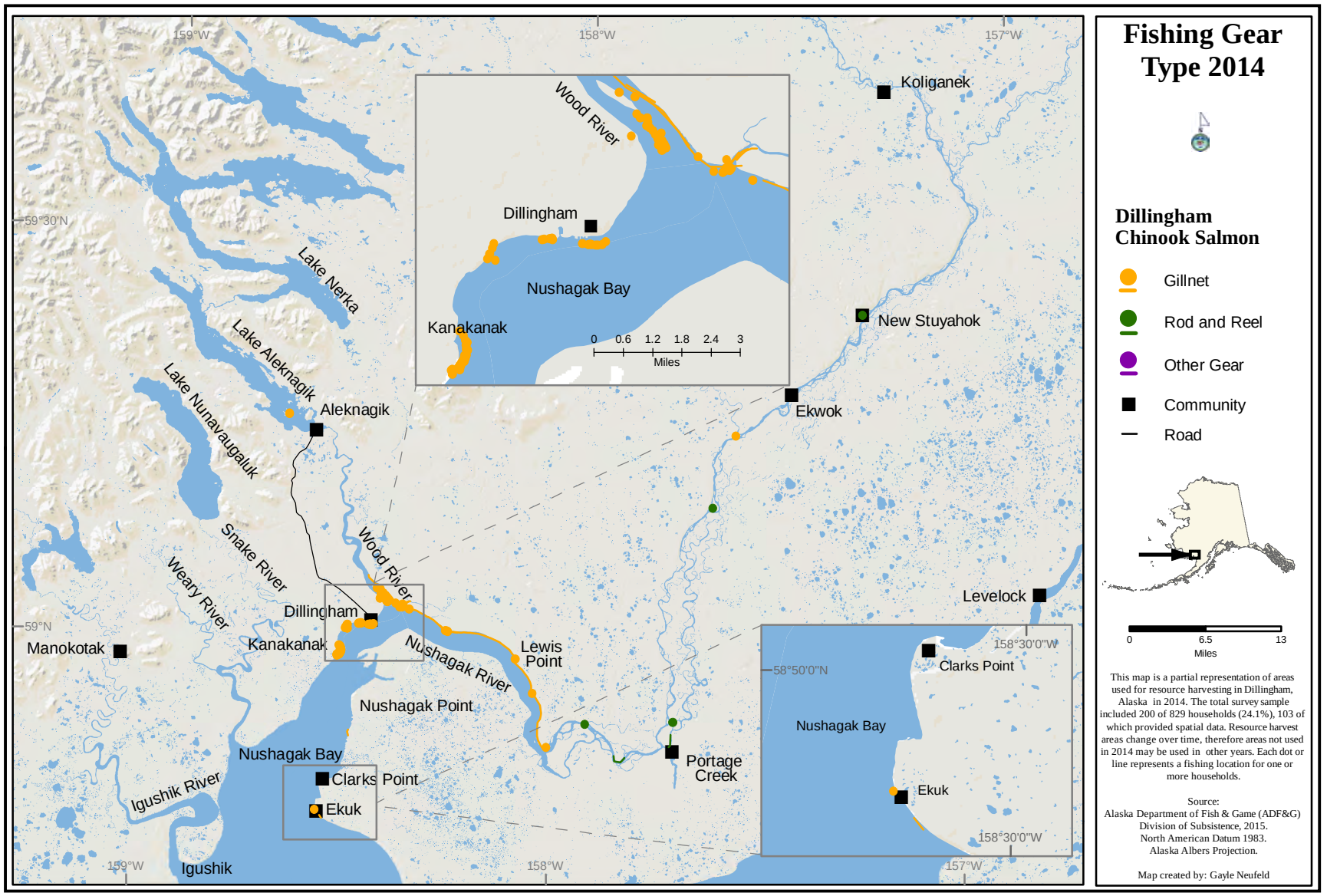


Figure 6-11.–Fishing and harvest locations by gear type, Chinook salmon, Dillingham, 2014.

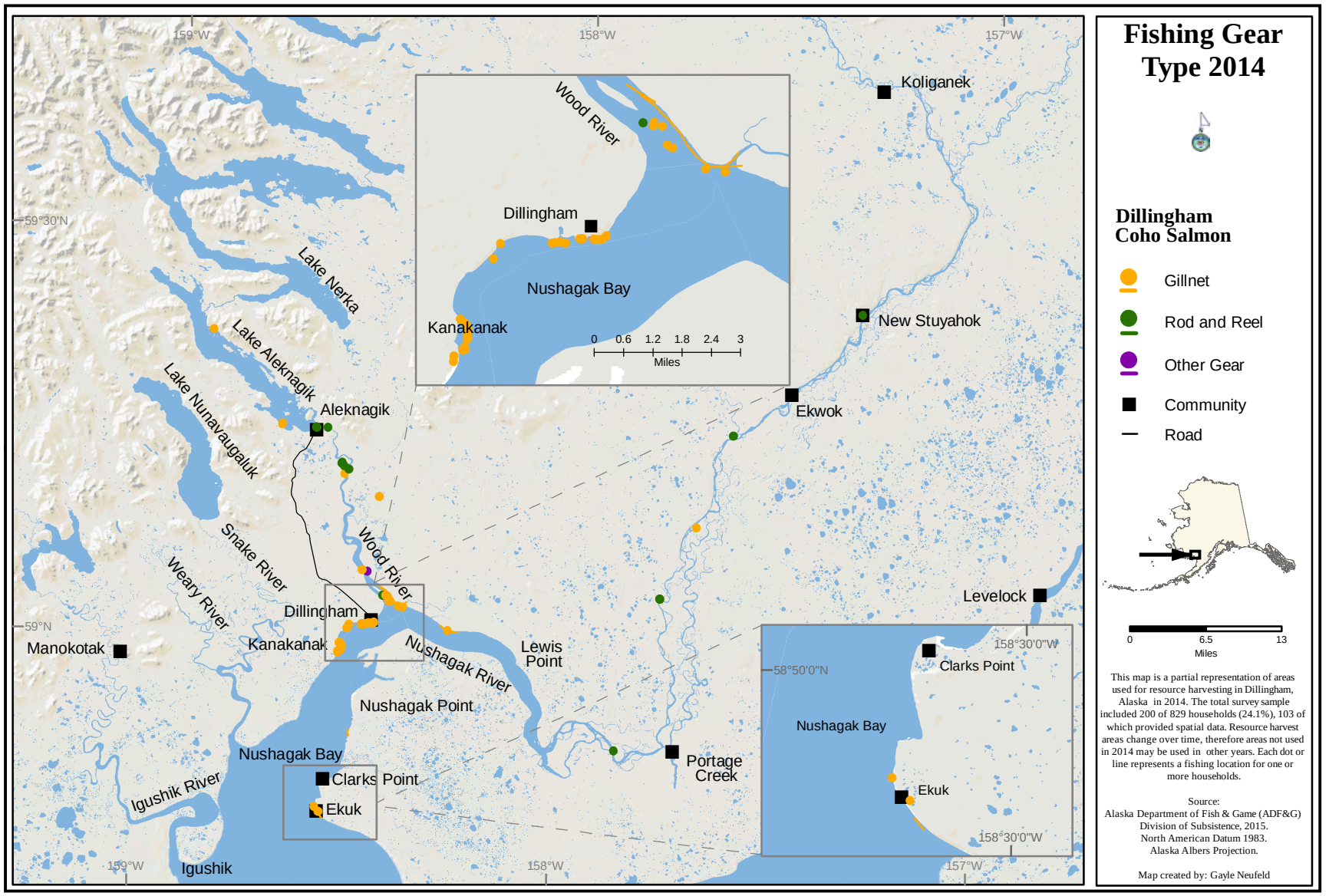


Figure 6-12.–Fishing and harvest locations by gear type, coho salmon, Dillingham, 2014.

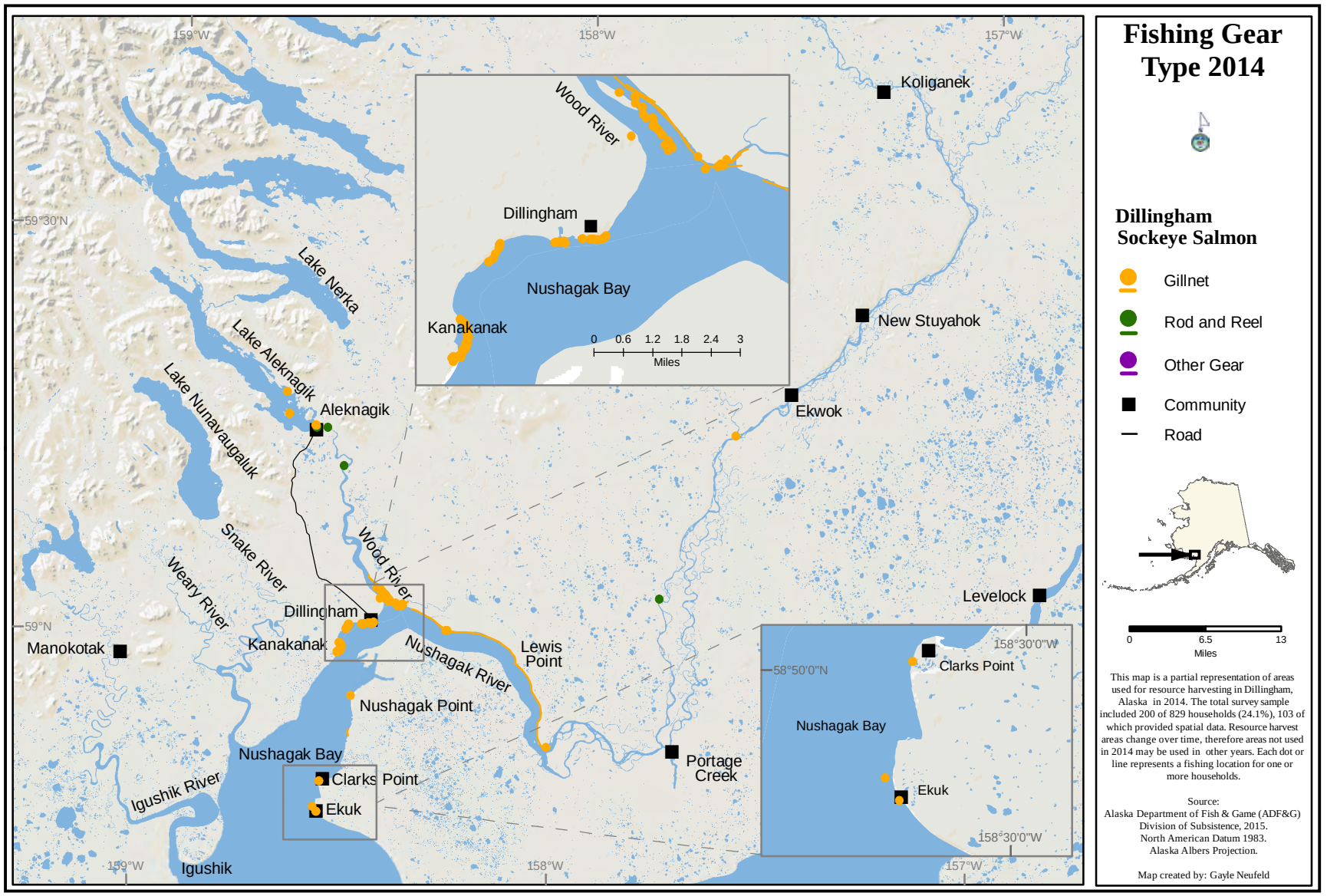


Figure 6-13.–Fishing and harvest locations by gear type, sockeye salmon, Dillingham, 2014.

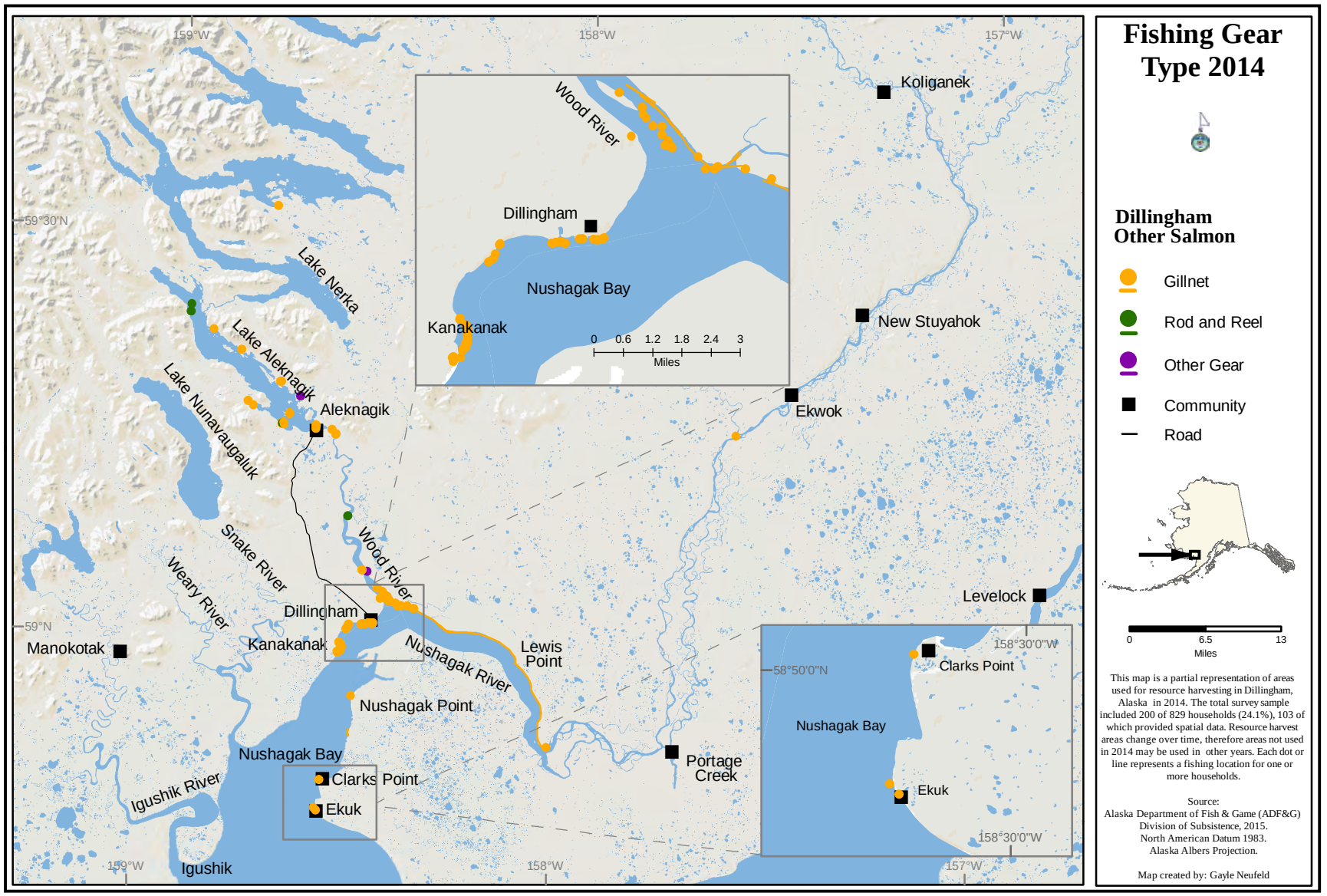


Figure 6-14.–Fishing and harvest locations by gear type, other salmon, Dillingham, 2014.

Household Salmon Harvest and Use Characteristics in Dillingham: 2016

The total number of all salmon species harvested in 2016 was 44,021 individual fish totaling 245,562 lb—roughly a 10,000 individual fish increase from 2 years prior, which increased the per capita harvest by 17 lb (Table 6-9; Table 6-6). The highest portion of harvested salmon was Chinook salmon at 121,906 lb, followed by sockeye salmon at 80,833 lb. The 2016 total salmon harvest accounted for 301 lb per household, or 107 lb per capita. Chinook salmon accounted for 49% of the total pounds harvested in 2016, or 53 lb per capita (Figure 6-15; Table 6-9. The sockeye salmon harvest, the second highest (33%), was 35 lb per capita. No other salmon species contributed more than 8% to the harvest weight.

Overall Use by Households and Salmon Harvests by Gear Type

Eighty-eight percent of Dillingham households used salmon in 2016, with 54% attempting and 50% successfully harvesting, and 61% receiving salmon (Figure 6-16). The highest percentages of salmon use were for sockeye and Chinook salmon, with 79% and 77% of households using these species, respectively (Table 6-9). About one-third of households used coho and chum salmon, and fewer households used the remaining species. In terms of successful harvest, sockeye salmon was harvested by the most households (46%), followed by Chinook (44%) and chum (24%) salmon. The majority of households gave away or received salmon. Chinook salmon was the most received fish with 46% of households having received Chinook salmon. Giving of salmon also occurred, with Chinook and sockeye being the species most often given away by Dillingham households (43% and 40%, respectively), and about one-half as many households (19%) shared coho salmon.

Methods used to harvest salmon included removals from commercial catches, subsistence gillnetting, rod and reel fishing, and using other subsistence gear (Table 6-10; Figure 6-17). Subsistence gillnetting accounted for 93% of the salmon harvest weight, followed by 5% of the harvest coming from commercial home pack, rod and reel harvests contributed 2%, and other or unspecified gear types were used to harvest less than 1% (Table 6-11). An estimated 12,025 Chinook salmon were harvested by subsistence gillnet, 144 by rod and reel, and 778 as commercial home pack (Table 6-10). Other species removed from commercial catches included sockeye (1,044), coho (104), and pink (14) salmon. Coho salmon composed more of the rod and reel harvest (73%) than any other species, and this fishing method was used to catch 19% of the coho salmon harvest weight. Spawning sockeye salmon accounted for 1,145 individual fish harvested, or 2% of the salmon harvest weight (Table 6-10; Table 6-11).

Salmon Harvests by Location and Harvest Gear Type 2016

The salmon harvest areas used by Dillingham residents in 2016 are depicted by species in Figure 6-18. Harvest locations are given for all species, as well as spawning sockeye salmon. Harvests were clustered around three main areas: 1) Lake Aleknagik, 2) central Dillingham areas, which include the shoreline or beaches south of the town site, and 3) the confluence of the mouth of the Wood River, Nushagak Bay, and the Nushagak River to Lewis Point. Other, less frequented areas include between Clarks Point and Ekuk, between points upriver of Lewis Point and south of Ekwok on the Nushagak River, across the bay from Dillingham near Nushagak Point, and several points in the lakes north of Dillingham. There were harvest locations mapped in 2016 that differed from locations in 2014, suggesting fishers traveled farther in order to obtain their salmon, especially in lakes west of Dillingham, nearby Ekwok, and between Clarks Point and Ekuk.

Chinook salmon harvest locations by gear type are shown in Figure 6-19. An abundance of gillnet sites were primarily identified in the three main harvest areas. The gillnet feature lines appearing from the mouth of the Wood River to past Lewis Point were also confirmed at the data review meeting as drift gillnet locations. Although a nominal portion (1%) of the Chinook harvest was caught using rod and reel gear, no harvest locations for this gear type are depicted (Table 6-11; Figure 6-19).

Coho salmon were harvested predominantly by gillnet and correspondingly the harvest locations depict a larger number of gillnet sites (Figure 6-20). A single rod and reel coho salmon harvest location was reported at the northern tip of Lake Aleknagik, and coho were harvested by gillnet between Clarks Point and Ekuk.

Table 6-9.–Estimated use and harvest of salmon, Dillingham, 2016.

Resource	Percentage of households: Use %	Attempt %	Harvest %	Receive %	Give %	Harvest weight (lb): Total	Mean per household	Per capita	Harvest amount: Total	Unit	Mean per household	95% confidence limit (±) harvest
Salmon	**88.2**	**53.9**	**50.3**	**61.0**	**51.9**	**245,962.4**	**301.8**	**107.3**	**44,234.6**	**ind**	**54.3**	**19.5**
Chum salmon	30.7	26.1	26.1	9.2	13.2	9,528.8	11.7	4.2	2,114.5	ind	2.6	24.6
Coho salmon	39.4	25.2	23.9	20.6	19.1	19,753.9	24.2	8.6	4,433.4	ind	5.4	32.7
Chinook salmon	76.9	47.1	44.5	45.7	43.1	121,480.2	149.1	53.0	12,909.8	ind	15.8	23.7
Pink salmon	17.3	16.0	16.0	5.0	7.3	7,350.4	9.0	3.2	2,570.6	ind	3.2	74.5
Sockeye salmon	79.2	48.7	46.4	43.9	39.6	81,280.1	99.7	35.4	20,543.1	ind	25.2	25.6
Spawning sockeye salmon	10.1	5.9	5.8	4.5	5.0	4,531.2	5.6	2.0	1,145.2	ind	1.4	60.0
Unknown salmon	2.9	0.6	0.6	2.9	0.6	2,037.7	2.5	0.9	518.0	ind	0.6	177.1

Source ADF&G Division of Subsistence household surveys, 2017.

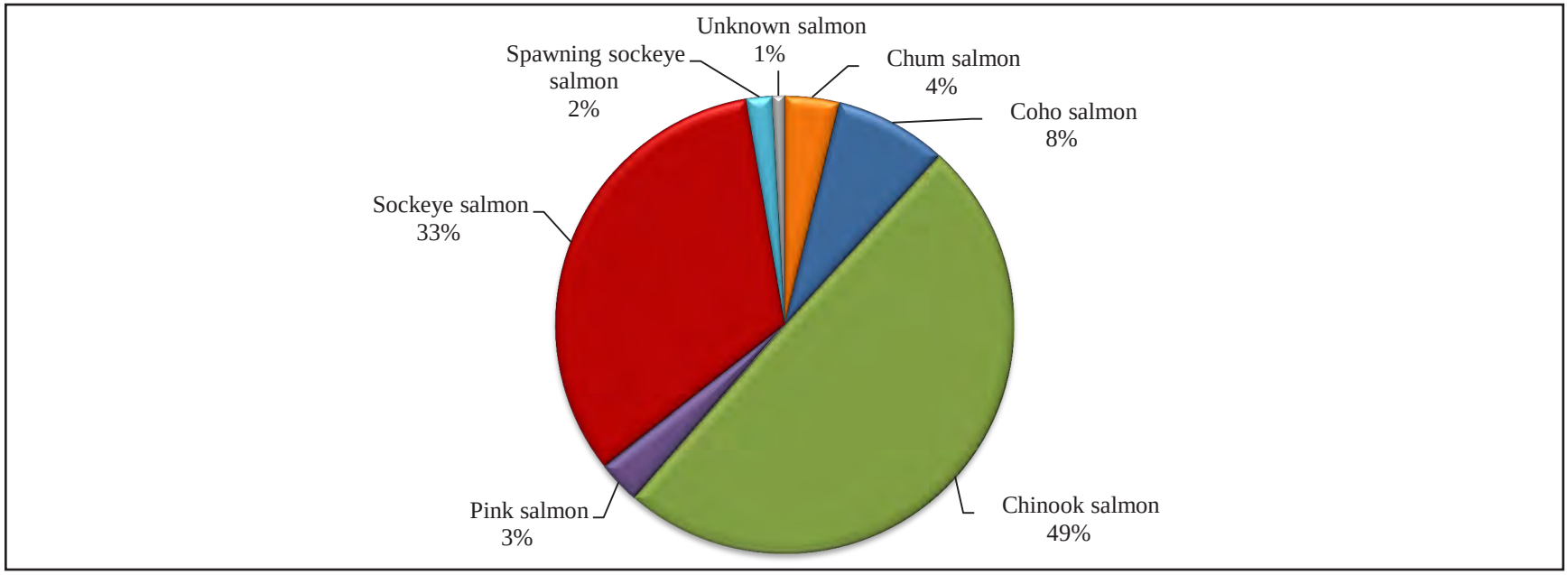


Figure 6-15.–Composition of salmon harvest in pounds usable weight, Dillingham, 2016.

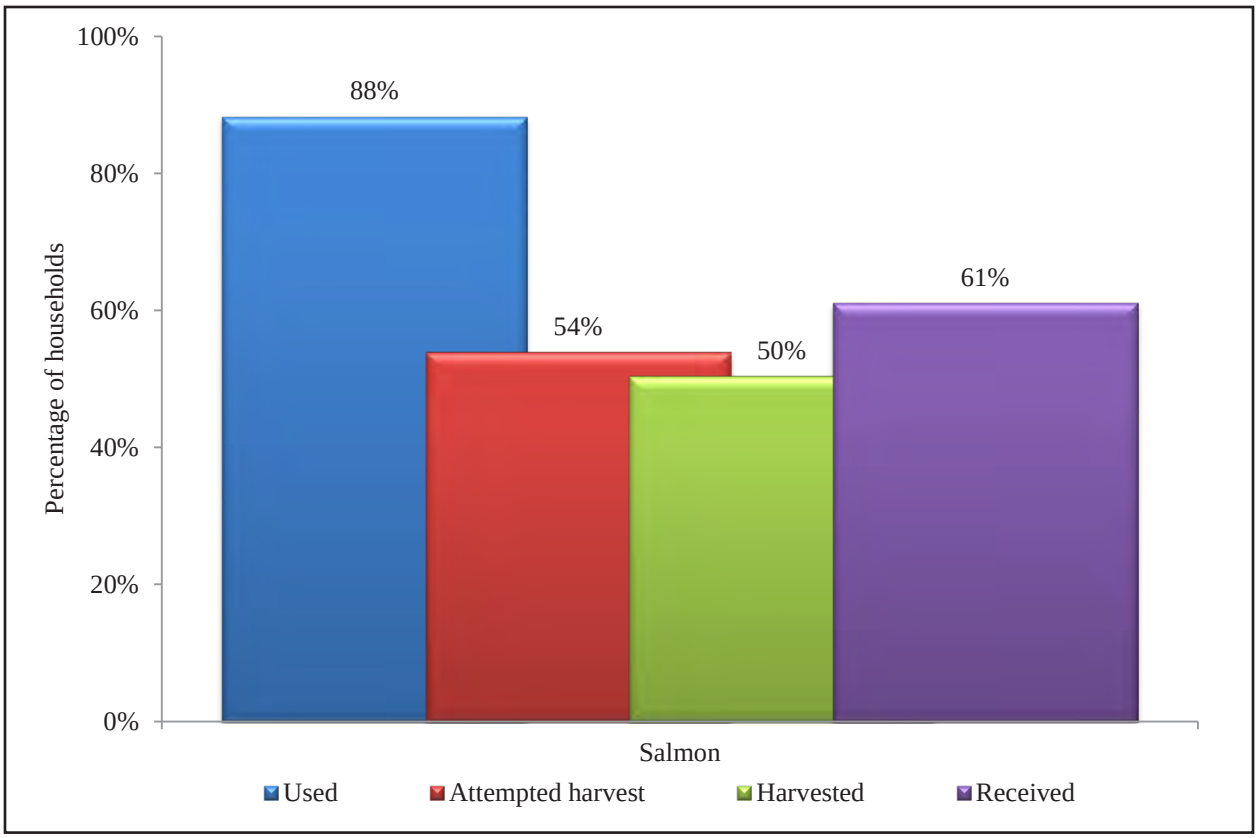


Figure 6-16.–Percentage of households using, attempting to harvest, harvesting, and receiving salmon, Dillingham, 2016.

Table 6-10.–Estimated harvest of salmon by gear type and resource, Dillingham, 2016.

	Removed from commercial catch		Subsistence methods									
			Gillnet[a]		Other method		Subsistence gear, any method		Rod and reel		Any method	
Resource	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Salmon	**1,942.8**	**11,963.1**	**41,152.7**	**228,297.6**	**160.2**	**627.5**	**41,312.8**	**228,925.1**	**979.0**	**5,074.2**	**44,234.6**	**245,962.4**
Chum salmon	0.0	0.0	2,114.5	9,528.8	0.0	0.0	2,114.5	9,528.8	0.0	0.0	2,114.5	9,528.8
Coho salmon	103.6	461.6	3,494.6	15,570.7	0.0	0.0	3,494.6	15,570.7	835.2	3,721.6	4,433.4	19,753.9
Chinook salmon	778.1	7,321.7	11,988.0	112,806.0	0.0	0.0	11,988.0	112,806.0	143.7	1,352.6	12,909.8	121,480.2
Pink salmon	17.0	48.5	2,548.0	7,285.7	5.7	16.2	2,553.6	7,301.9	0.0	0.0	2,570.6	7,350.4
Sockeye salmon	1,044.2	4,131.3	19,395.3	76,738.9	103.6	409.9	19,498.9	77,148.8	0.0	0.0	20,543.1	81,280.1
Spawning sockeye salmon	0.0	0.0	1,094.3	4,329.7	50.9	201.4	1,145.2	4,531.2	0.0	0.0	1,145.2	4,531.2
Unknown salmon	0.0	0.0	518.0	2,037.7	0.0	0.0	518.0	2,037.7	0.0	0.0	518.0	2,037.7

Source ADF&G Division of Subsistence household surveys, 2017.

Note The harvested number of salmon is represented as individual fish harvested.

a. Gillnet harvests include both set and drift gillnet gear types.

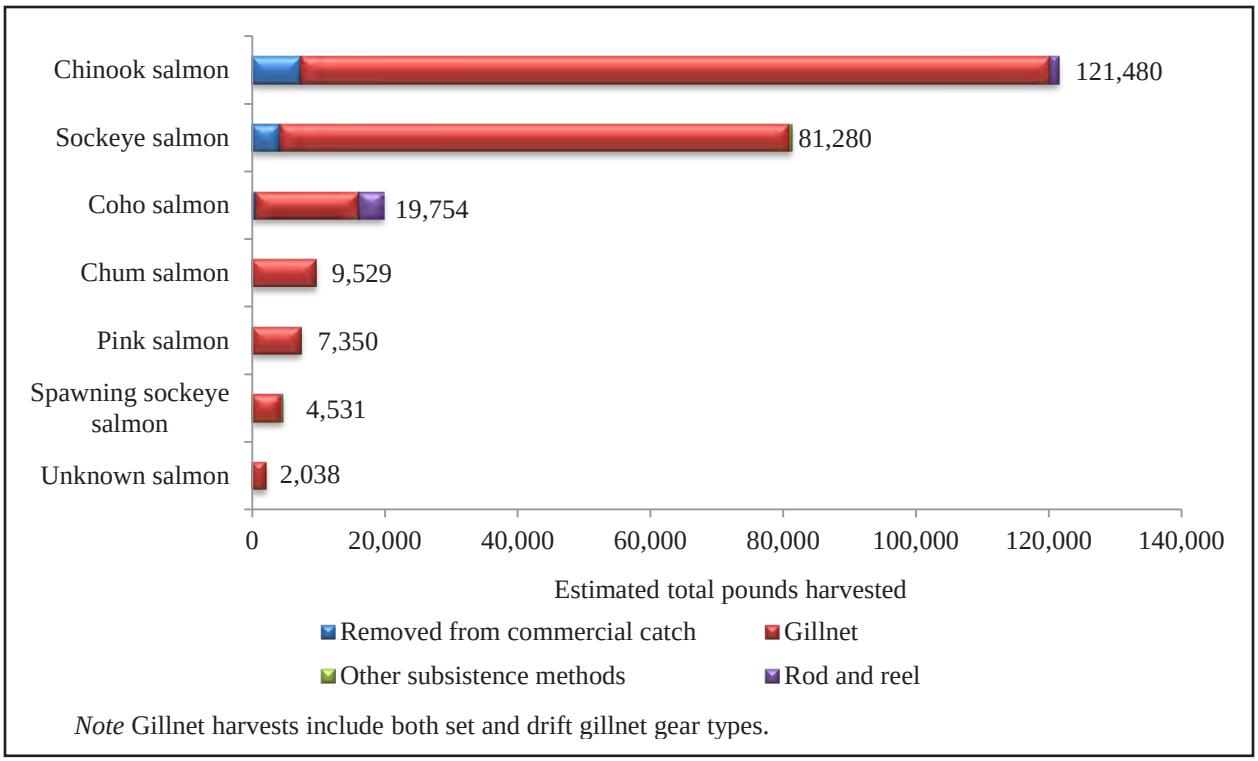


Figure 6-17.–Estimated harvest of salmon in pounds usable weight by gear type and resource, Dillingham, 2016.

Only rod and reel harvests of coho salmon occurred in a section of the Nushagak River close to Ekwok and New Stuyahok.

Gillnet harvest locations for sockeye salmon were clustered around the Dillingham shoreline and beaches, the Wood River confluence, some locations past Lewis Point, and at the northern lead of the Wood River into Lake Aleknagik (Figure 6-21). One location for harvesting sockeye salmon was also identified on a tributary of the Weary River (Figure 6-18).

Other salmon harvest locations, which in 2016 included fishing areas for chum, pink, and spawning sockeye salmon, are shown in the Figure 6-22. Harvest locations using gillnets for spawning sockeye salmon were identified in Lake Aleknagik, with one location in Lake Nunavaugaluk (Figure 6-18; Figure 6-22). These other salmon were not harvested in the Lewis Point area as much in comparison to the other main harvested species, but gillnet harvests did occur between Clarks Point and Ekuk and the confluence of Nushagak Bay and the Nushagak and Wood rivers (Figure 6-22).

Table 6-11.–Estimated percentages of salmon harvest in pounds usable weight by gear type, resource, and total salmon harvest, Dillingham, 2016.

Resource	Percentage base	Removed from commercial catch	Subsistence methods				
			Gillnet[a]	Other method	Subsistence gear, any method	Rod and reel	Any method
Salmon	**Gear type**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
	Resource	**4.9%**	**92.8%**	**0.3%**	**93.1%**	**2.1%**	**100.0%**
	Total	**4.9%**	**92.8%**	**0.3%**	**93.1%**	**2.1%**	**100.0%**
Chum salmon	Gear type	0.0%	4.2%	0.0%	4.2%	0.0%	3.9%
	Resource	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%
	Total	0.0%	3.9%	0.0%	3.9%	0.0%	3.9%
Coho salmon	Gear type	3.9%	6.8%	0.0%	6.8%	73.3%	8.0%
	Resource	2.3%	78.8%	0.0%	78.8%	18.8%	100.0%
	Total	0.2%	6.3%	0.0%	6.3%	1.5%	8.0%
Chinook salmon	Gear type	61.2%	49.4%	0.0%	49.3%	26.7%	49.4%
	Resource	6.0%	92.9%	0.0%	92.9%	1.1%	100.0%
	Total	3.0%	45.9%	0.0%	45.9%	0.5%	49.4%
Pink salmon	Gear type	0.4%	3.2%	2.6%	3.2%	0.0%	3.0%
	Resource	0.7%	99.1%	0.2%	99.3%	0.0%	100.0%
	Total	0.0%	3.0%	0.0%	3.0%	0.0%	3.0%
Sockeye salmon	Gear type	34.5%	33.6%	65.3%	33.7%	0.0%	33.0%
	Resource	5.1%	94.4%	0.5%	94.9%	0.0%	100.0%
	Total	1.7%	31.2%	0.2%	31.4%	0.0%	33.0%
Spawning sockeye salmon	Gear type	0.0%	1.9%	32.1%	2.0%	0.0%	1.8%
	Resource	0.0%	95.6%	4.4%	100.0%	0.0%	100.0%
	Total	0.0%	1.8%	0.1%	1.8%	0.0%	1.8%
Unknown salmon	Gear type	0.0%	0.9%	0.0%	0.9%	0.0%	0.8%
	Resource	0.0%	100.0%	0.0%	100.0%	0.0%	100.0%
	Total	0.0%	0.8%	0.0%	0.8%	0.0%	0.8%

Source ADF&G Division of Subsistence household surveys, 2017.

a. Gillnet harvests include both set and drift gillnet gear types.

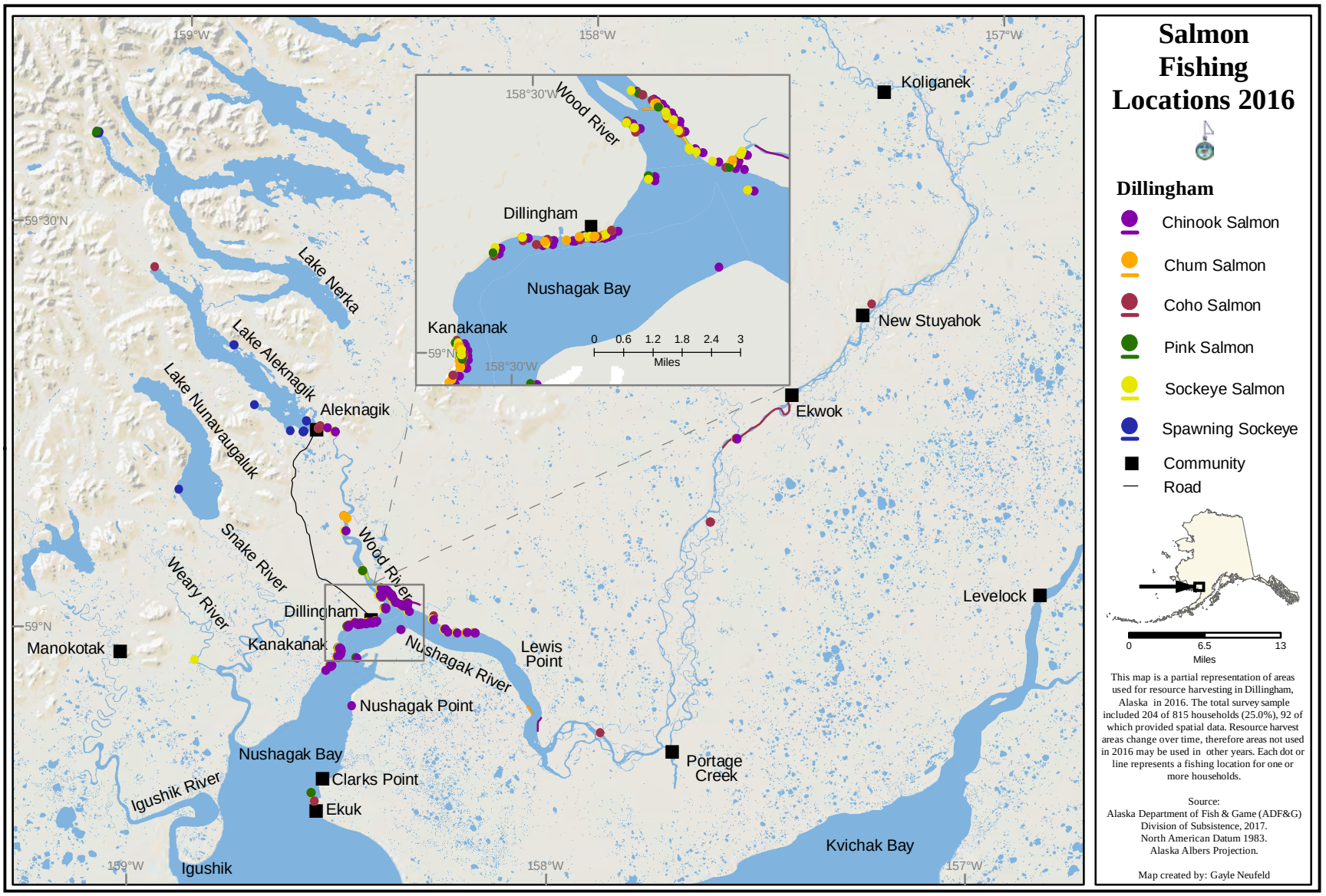


Figure 6-18.–Fishing and harvest locations of salmon, Dillingham, 2016.

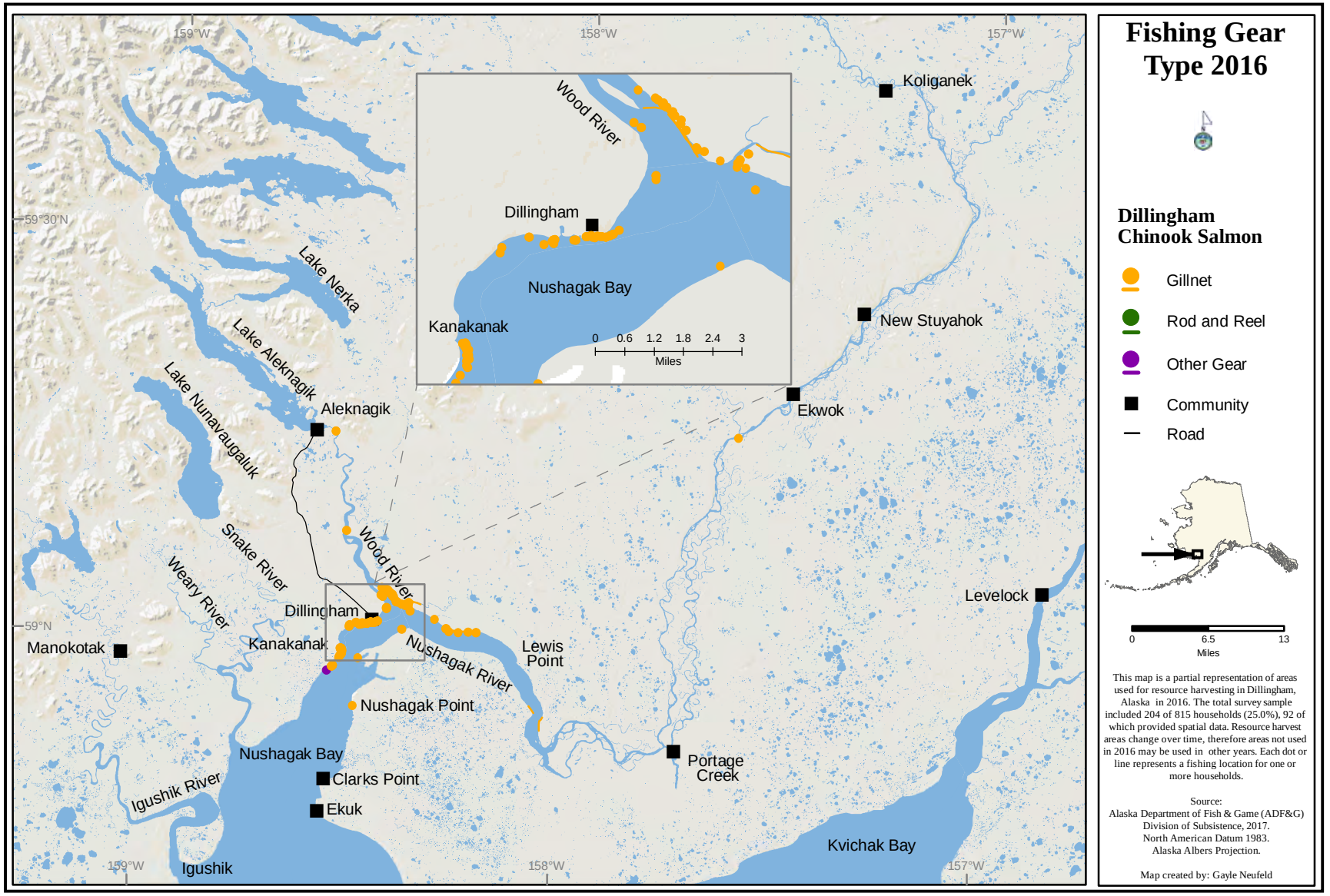


Figure 6-19.–Fishing and harvest locations by gear type, Chinook salmon, Dillingham, 2016.

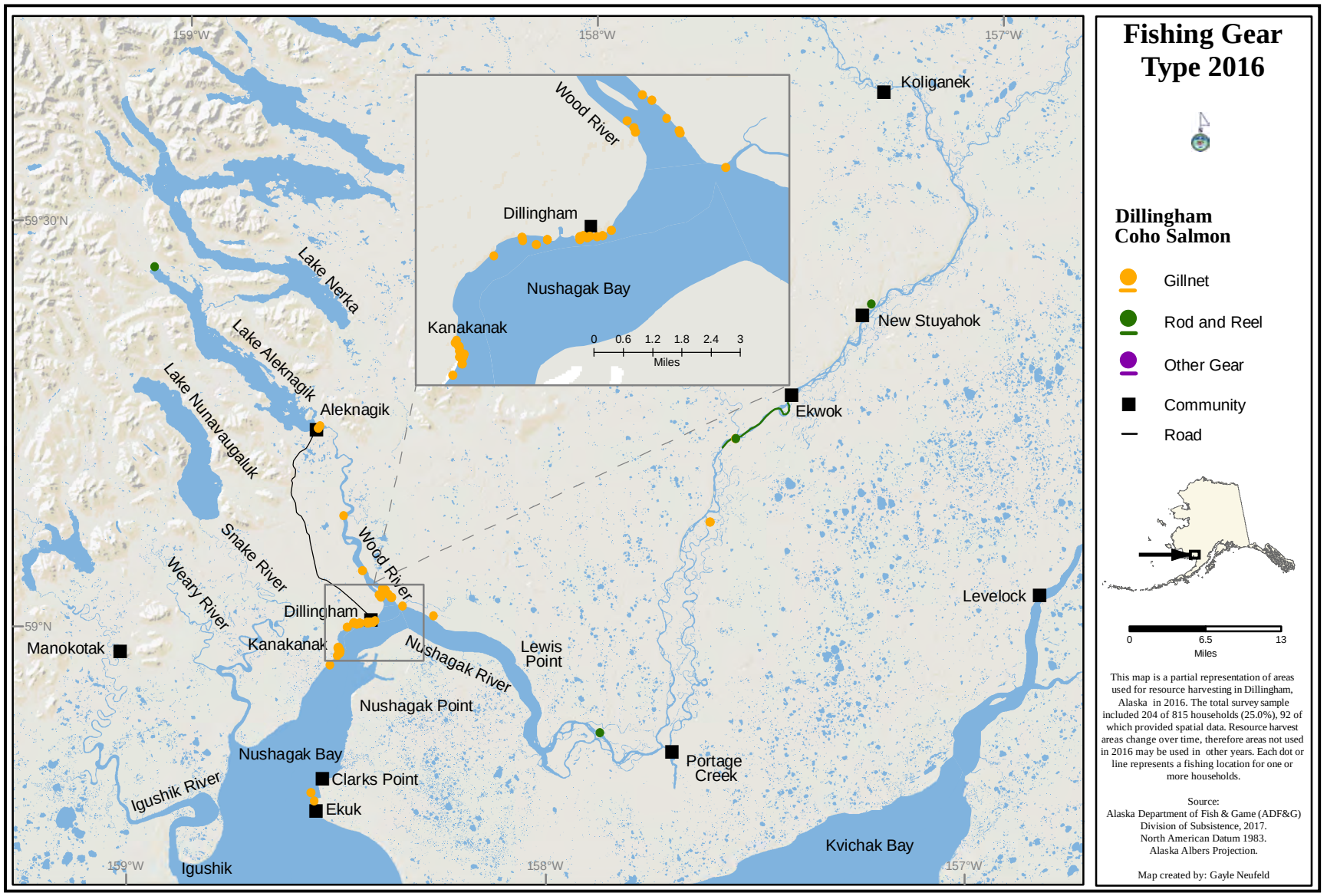


Figure 6-20.–Fishing and harvest locations by gear type, coho salmon, Dillingham, 2016.

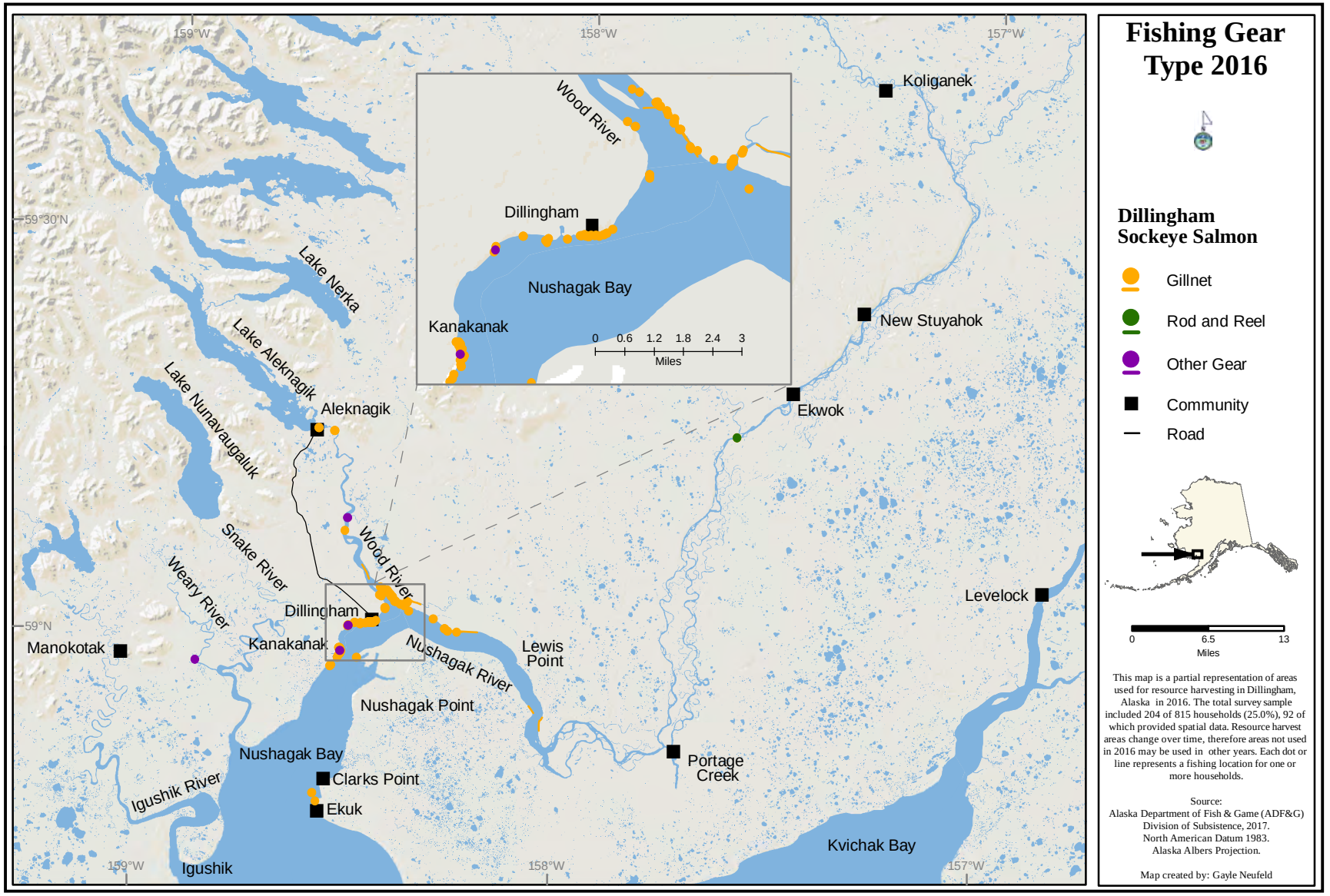


Figure 6-21.–Fishing and harvest locations by gear type, sockeye salmon, Dillingham, 2016.

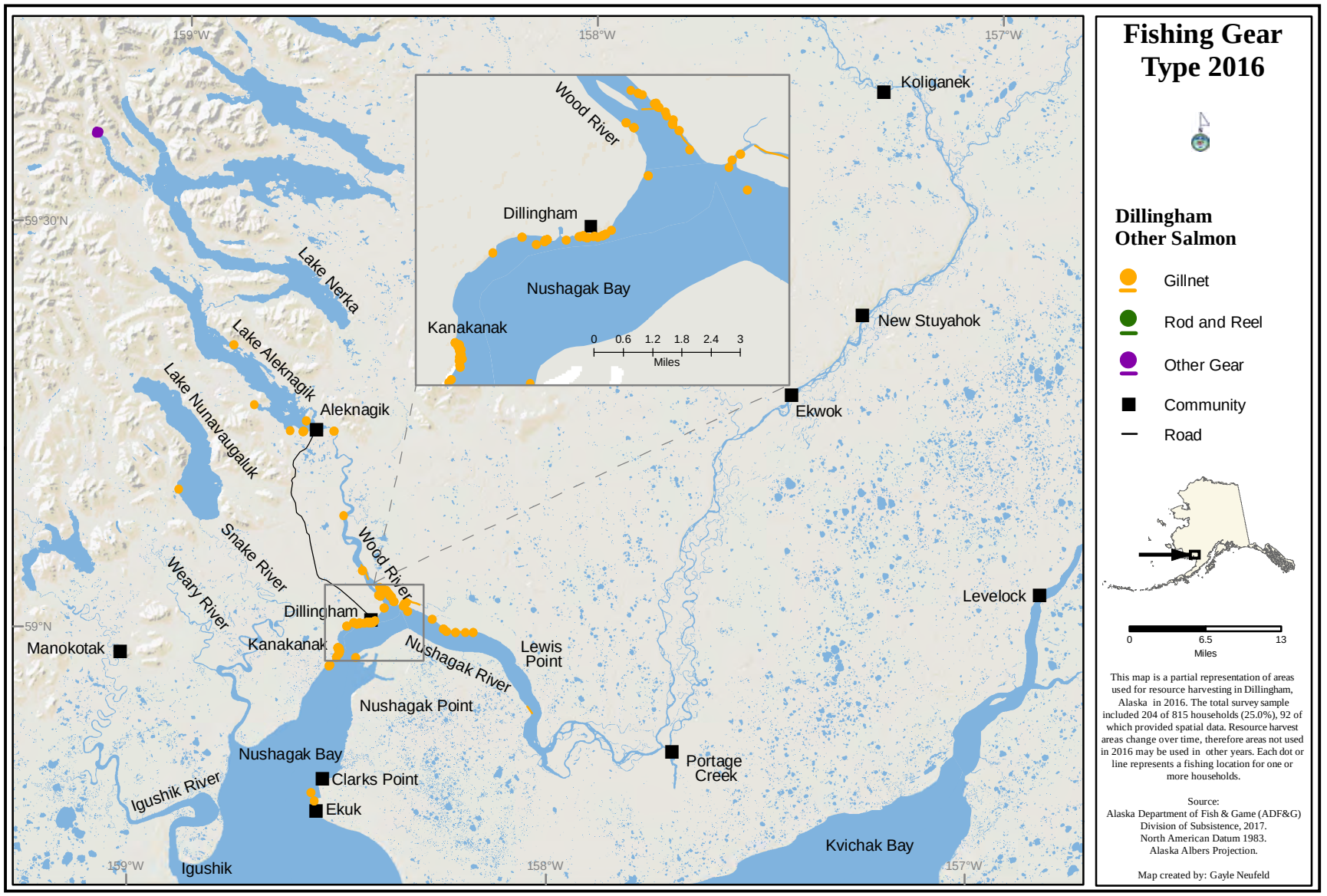


Figure 6-22.–Fishing and harvest locations by gear type, other salmon, Dillingham, 2016.

Harvest Assessments: 2014 and 2016

Researchers asked two questions regarding Chinook salmon use and harvest. The first question asked participants if they "got enough" Chinook salmon to use for their own household's needs, either through their own harvest efforts or sharing. If they did not, a numeric value was requested to determine how many fish would be the preferred amount for the household. The household was then asked why they did not get enough, either through their own efforts or sharing. This question was also asked for sockeye and coho salmon and responses for the three species are given below, under the subheading "Assessments of Use of Chinook, Sockeye, and Coho Salmon Through Harvest or Sharing." For the second assessment question, households were asked to describe their harvest of Chinook salmon in the study year, as compared to the past five years, and characterize whether the harvest was "less, same, or more." Reasons why were recorded, if the household offered anything to report. This comparison question, and reasons for less or more harvest, was also asked in relation to salmon other than Chinook (all other salmon species grouped), and is discussed under the subheading "Comparing Harvests of Chinook and Other Salmon Over Time." For both assessment questions, households could give more than one reason for not having enough salmon and changes to harvest amounts. These assessments highlight households' economic relationship to salmon and the integral role salmon availability plays in the subsistence way of life, both of which are affected in part by cash economy factors such as employment schedules, access to harvesting equipment, and fuel expense. Responses to the harvest assessment questions are shown in the tables as the number of reporting households from both strata in the sample and are not expanded to an estimate for the community.

Assessments of Use of Chinook, Sockeye, and Coho Salmon Through Harvest or Sharing: 2014

Figure 6-23 and Table 6-12 provide a broad overview of Dillingham households' assessments of the availability of Chinook, sockeye, and coho salmon for use in 2014. Overall, the majority of sampled households had enough salmon (through their own efforts or sharing); Figure 6-23 illustrates that 69%, 63%, and 77% of sampled households had enough coho, Chinook, and sockeye salmon, respectively. Of the households that responded to the question asking whether they had enough salmon, 34% reported not having enough Chinook, 26% reported they did not have enough coho, and 19% indicated not having enough sockeye salmon (Table 6-12). When asked why they did not have enough Chinook salmon, 35% of 65 households answering the question indicated that they did not have time to get enough (Table 6-13). The other top reasons ranked from less effort to harvest (12% of responses), resource availability (9%), and the household did not receive as much (8%), to the rest of the reasons being cited by 6% or fewer responding households that did not have enough. Lack of sockeye salmon was reported by 37 households as being due more so to not having enough time to harvest (38% of responses), not receiving as much (19%), and expending less effort (16%). The top reason for not getting enough coho was the same as for Chinook and sockeye salmon, with 35% of 48 households that provided a reason why reporting there was not enough time to get enough. Less effort was ranked second at 25% of responses, and did not receive as much was ranked third, at 15% of respondents. Sixty-four households reported that they needed more Chinook salmon to meet their food security needs, with the average amount of fish needed per household at 29 (Table 6-14). Thirty-seven households indicated that they needed more sockeye salmon, with the average amount needed being 38 fish per household, and 46 households reported they would ideally like to have 20 coho salmon on average per household.

Comparing Harvest of Chinook and Other Salmon Over Time: 2014

Nearly equal proportions (one-quarter) of households that answered the question about Chinook salmon harvests assessed that harvests were less than or equal to harvests in the past five years (Table 6-15; Figure 6-24). One-quarter of responding households indicated that they harvested fewer Chinook salmon than in the past five years, 26% reported the same level of harvest, and 11% reported more harvest (Table 6-15). Of the households harvesting all other salmon and answering the question, 38% said their harvest was the same in 2014 as in recent previous years (Figure 6-24). The top three reasons given for less harvest of Chinook salmon cited by 45 households were working/no time (33%), the resource was less available (24%), and

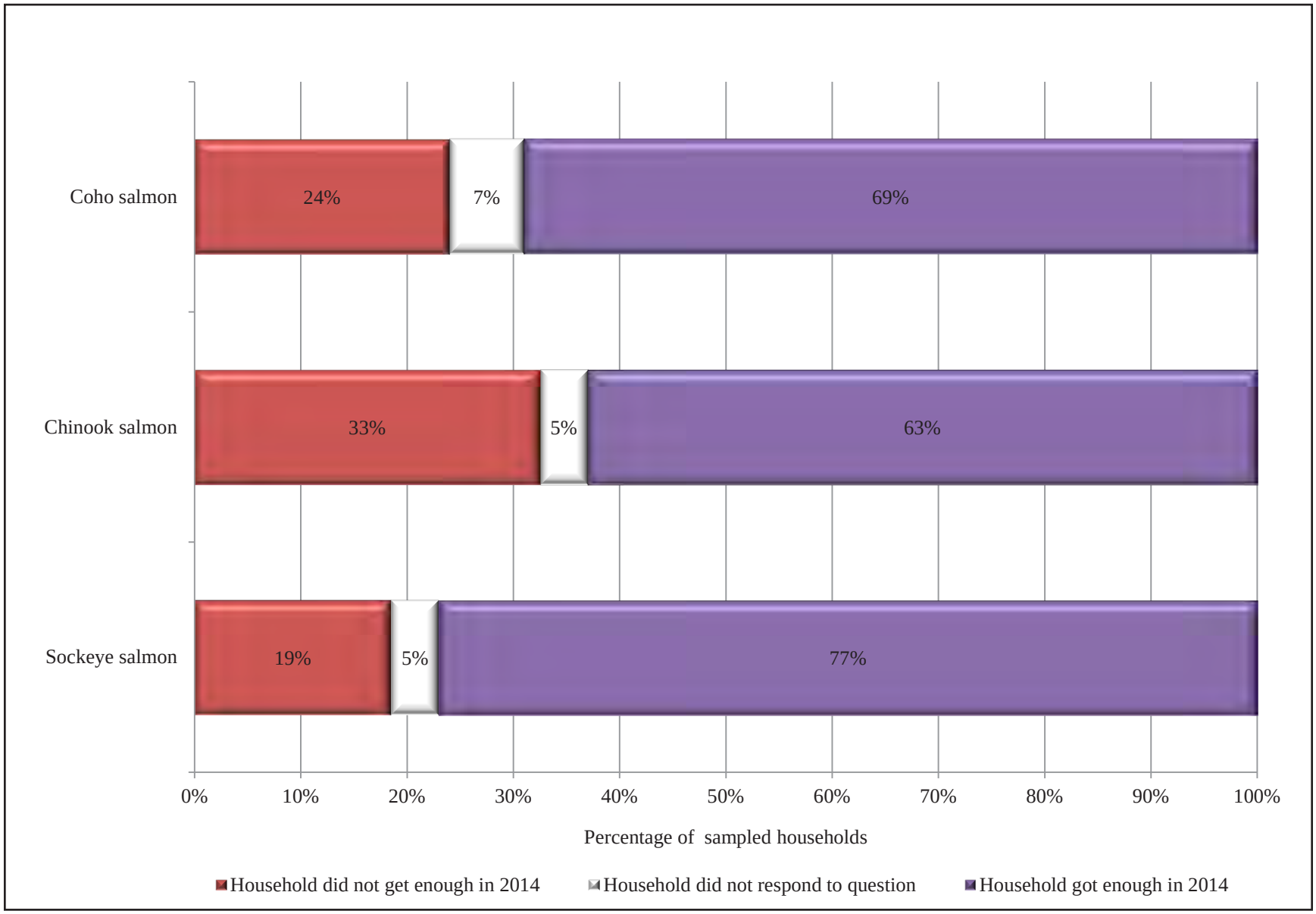


Figure 6-23.–Percentage of sampled households reporting whether they had enough salmon resources, Dillingham, 2014.

Table 6-12.–Percentage of households reporting whether they had enough salmon resources, Dillingham, 2014.

		Households not getting enough _____ .			
	Sampled	Valid responses[a]		Did not get enough	
Resource	households	Number	Percentage	Number	Percentage
Coho salmon	200	186	93.0%	48	25.8%
Chinook salmon	200	191	95.5%	65	34.0%
Sockeye salmon	200	191	95.5%	37	19.4%

Source ADF&G Division of Subsistence household surveys, 2015.
a. Does not include households that did not respond to the question or those households that never use the resource.

lack of effort (13%) (Table 6-16). Less harvest of all other salmon species compared to the last 5 years was reported by 33 households as primarily due to lack of effort (30%), working/no time (21%), and that the resources were not needed (18%).

Overall, fewer households reported reasons for more harvest compared to recent years. Twenty-one households indicated more harvest of Chinook salmon as compared to the last 5 years but only 17 of those provided a reason why; 5 responses each were provided for 2 main reasons: increased availability (29%) and more overall success (29%) (Table 6-15; Table 6-17). Seventeen households reported more harvest of the other species combined, excluding Chinook. Only 12 of those households that harvested more other salmon provided a reason why and those households most often cited increased availability (50%) and increased effort (33%).

There were 64 households that reported less harvest of any salmon species, but more households (87) indicated harvests were the same as in recent previous years (Table 6-15). As such, approximately one-half (46%) of the responding households indicated the same level of harvest of either Chinook salmon, all other salmon, or both. Working or not having time was the main reason attributed to causing less harvest of any salmon (Table 6-16). A smaller proportion of responding households (16%) indicated increased harvests of any salmon in 2014 (Table 6-15).

Table 6-13.–Reasons why households did not have enough salmon resources, Dillingham, 2014.

Resource	Valid responses[a]	Personal or family reasons		Resource availability		Too far to travel		Lack of equipment		Did not receive as much	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	48	3	6.3%	2	4.2%	0	0.0%	1	2.1%	7	14.6%
Chinook salmon	65	4	6.2%	6	9.2%	0	0.0%	4	6.2%	5	7.7%
Sockeye salmon	37	5	13.5%	1	2.7%	0	0.0%	1	2.7%	7	18.9%

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Table 6-13.–Continued.

Resource	Valid responses[a]	Less effort		Unsuccessful		Weather		Other reasons		Not enough time	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	48	12	25.0%	2	4.2%	0	0.0%	3	6.3%	17	35.4%
Chinook salmon	65	8	12.3%	3	4.6%	2	3.1%	3	4.6%	23	35.4%
Sockeye salmon	37	6	16.2%	2	5.4%	0	0.0%	1	2.7%	14	37.8%

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Table 6-13.–Continued.

Resource	Valid responses[a]	Regulations		Animals too small or diseased		Fuel too expensive		Competition	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	48	0	0.0%	0	0.0%	0	0.0%	1	2.1%
Chinook salmon	65	0	0.0%	0	0.0%	0	0.0%	4	6.2%
Sockeye salmon	37	0	0.0%	0	0.0%	0	0.0%	1	2.7%

Source ADF&G Division of Subsistence household surveys, 2015.

Note Households may provide more than one response to the question.

a. Includes those households providing a valid reason for not getting enough.

Table 6-14.–Salmon resources that sampled households reported needing, Dillingham, 2014.

Resource	Households needing	Total amount needed	Average amount needed
Coho salmon	46	909	20
Chinook salmon	64	1,844	29
Sockeye salmon	37	1,403	38

Source ADF&G Division of Subsistence household surveys, 2015.

Table 6-15.–Changes in household harvests of salmon resources compared to recent years, Dillingham, 2014.

			Households reporting harvest								Households not harvesting in 2014	
			Total households		Less		Same		More			
Resource	Sampled households	Valid responses[a]	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	200	191	127	66.5%	64	33.5%	87	45.5%	30	15.7%	74	38.7%
Chinook salmon	200	189	117	61.9%	47	24.9%	49	25.9%	21	11.1%	72	38.1%
Other salmon	200	190	124	65.3%	35	18.4%	72	37.9%	17	8.9%	66	34.7%

Source ADF&G Division of Subsistence household surveys, 2015.

a. Valid responses do not include households that did not provide any response.

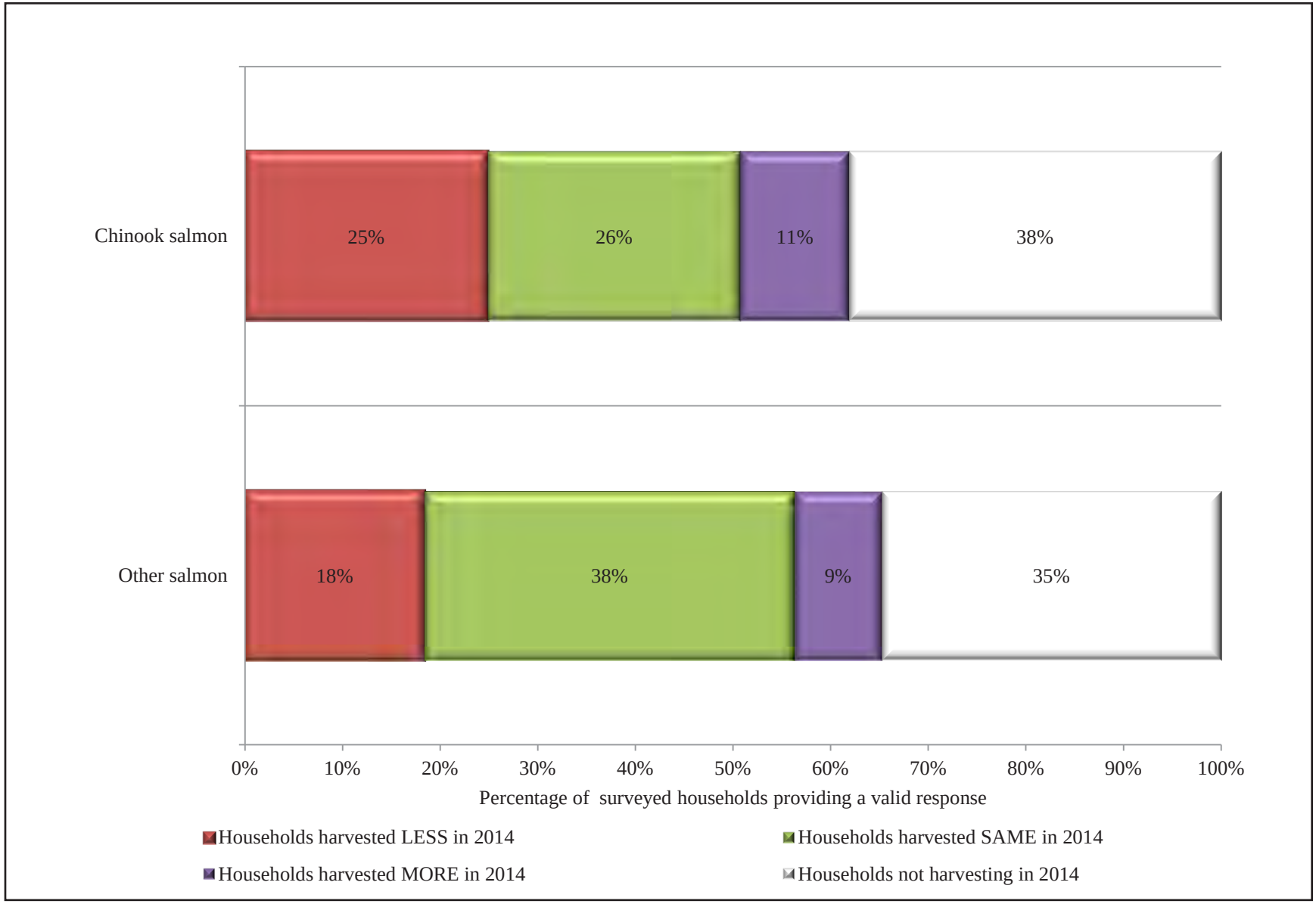


Figure 6-24.–Changes in household harvests of salmon resources compared to recent years, Dillingham, 2014.

Table 6-16.–Reasons for less household harvests of salmon resources compared to recent years, Dillingham, 2014.

Resource	Households reporting reasons for less harvest	Family/ personal		Resources less available		Too far to travel		Lack of equipment		Less sharing		Lack of effort		Unsuccessful		Weather/ environment		Used other resources	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	62	3	4.8%	13	21%	0	0.0%	0	0%	2	3%	14	23%	5	8.1%	3	4.8%	0	0.0%
Chinook salmon	45	2	4.4%	11	24%	0	0.0%	0	0%	1	2%	6	13%	4	8.9%	3	6.7%	0	0.0%
Other salmon	33	3	9.1%	3	9%	0	0.0%	0	0%	1	3%	10	30%	2	6.1%	0	0.0%	0	0.0%

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Table 6-16.–Continued.

Resource	Households reporting reasons for less harvest	Other reasons		Working/ no time		Regulations		Small/ diseased animals		Did not get enough		Did not need		Equipment/ fuel expense		Too much competition	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	62	6	10%	18	29.0%	1	1.6%	2	3.2%	3	4.8%	8	12.9%	0	0.0%	1	1.6%
Chinook salmon	45	4	9%	15	33.3%	1	2.2%	1	2.2%	1	2.2%	3	6.7%	0	0.0%	1	2.2%
Other salmon	33	2	6%	7	21.2%	0	0.0%	1	3.0%	2	6.1%	6	18.2%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2015.

Table 6-17.–Reasons for more household harvests of salmon resources compared to recent years, Dillingham, 2014.

Resource	Households reporting reasons for more harvest	Increased availability		Used other resources		Favorable weather		Received more		Needed more		Increased effort		Had more help	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	23	10	43.5%	0	0.0%	0	0.0%	2	8.7%	1	4.3%	5	21.7%	1	4.3%
Chinook salmon	17	5	29.4%	0	0.0%	0	0.0%	2	11.8%	1	5.9%	4	23.5%	0	0.0%
Other salmon	12	6	50.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	4	33.3%	1	8.3%

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Table 6-17.–Continued.

Resource	Households reporting reasons for more harvest	Other		Regulations		Traveled farther		More success		Needed less		Store-bought expense		Got/ fixed equipment	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	23	1	4.3%	0	0.0%	1	4.3%	5	21.7%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	17	1	5.9%	0	0.0%	0	0.0%	5	29.4%	0	0.0%	0	0.0%	0	0.0%
Other salmon	12	1	8.3%	0	0.0%	1	8.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2015.

Assessments of Use of Chinook, Sockeye, and Coho Salmon Through Harvest or Sharing: 2016

Figure 6-25 and Table 6-18 provide a broad overview of Dillingham households' assessments of the availability of Chinook, sockeye, and coho salmon (through either their own efforts or sharing) for use in 2016. Overall, the majority of sampled households continued to assess that they had enough salmon; Figure 6-25 illustrates that 60%, 68%, and 74% of sampled households had enough coho, Chinook, and sockeye salmon, respectively. Of the households that responded to the question asking whether they had enough salmon, 30% reported not having enough coho salmon, 22% did not have enough Chinook salmon, and 16% indicated not having enough sockeye salmon (Table 6-18).

When asked why they did not have enough Chinook salmon, 46% of 35 households that answered the question indicated regulations prevented harvesters from obtaining enough (Table 6-19). The regulations often mentioned in this context was the limitation of the subsistence fishery to three days per week in July; however, as footnoted in the overview of regulations in Chapter 1: "Introduction," this subsistence fishery schedule restriction was removed after an Alaska Board of Fisheries meeting that concluded in December 2018. The other top two reasons were resource availability (23%) and not enough time (17%). The most frequently cited reasons 26 households reported for not having enough sockeye salmon were regulations (50% of responses), and not enough time (19%). Not getting enough coho salmon was also primarily due to regulations, with 42% of 50 responding households reporting this answer; resource availability was the other top reason (22% of responses). Thirty-nine households reported that they needed more Chinook salmon to meet their food security needs, with the average amount of fish needed per household at 33 (Table 6-20). Twenty-eight households indicated they needed more sockeye salmon, with the average amount needed being 41 fish per household, and 52 household reported that they would ideally like to have 27 coho on average per household.

Comparing Harvest of Chinook and Other Salmon Over Time: 2016

Of the households that provided an assessment, there were 47 households (27%) that indicated they harvested fewer Chinook salmon than in the past 5 years, 47 (27%) reported the same level of harvest, and 39 (22%) reported more harvest (Table 6-21; Figure 6-26). The most cited reason for less harvest of Chinook was working/no time (nine households, or 19% of respondents); those households that harvested less also more frequently cited personal/family reasons (17%), and other uncategorized reasons (13%) (Table 6-22).

Forty-one households reported less harvest of all other salmon species, excluding Chinook (Table 6-21). The top two reasons for less harvest of all other salmon species combined, compared to the last five years, were working/no time (27%), and did not need the resources (20%) (Table 6-22).

Thirty-seven households that both indicated more harvest of Chinook salmon recently and provided a reason why primarily stated it was due to increased availability (35%), more success overall (32%), and increased effort (11%) (Table 6-23). Twenty-two households provided reasons for more harvest of all the other species combined, citing increased availability (41%) as the top reason for the increased harvest in 2016.

The proportion of households that harvested less or the same amount of any salmon—either Chinook, all other salmon, or both—remained very similar to the previous study year, and lower harvests were again attributed more often to working or having no time to harvest (tables 6-15, 6-21, and 6-22). However, in 2016, a slightly higher proportion of responding households (27%) indicated an increase in harvests of any salmon compared to the last five years, which was most frequently attributed to increased availability of salmon (Table 6-21; Table 6-23).

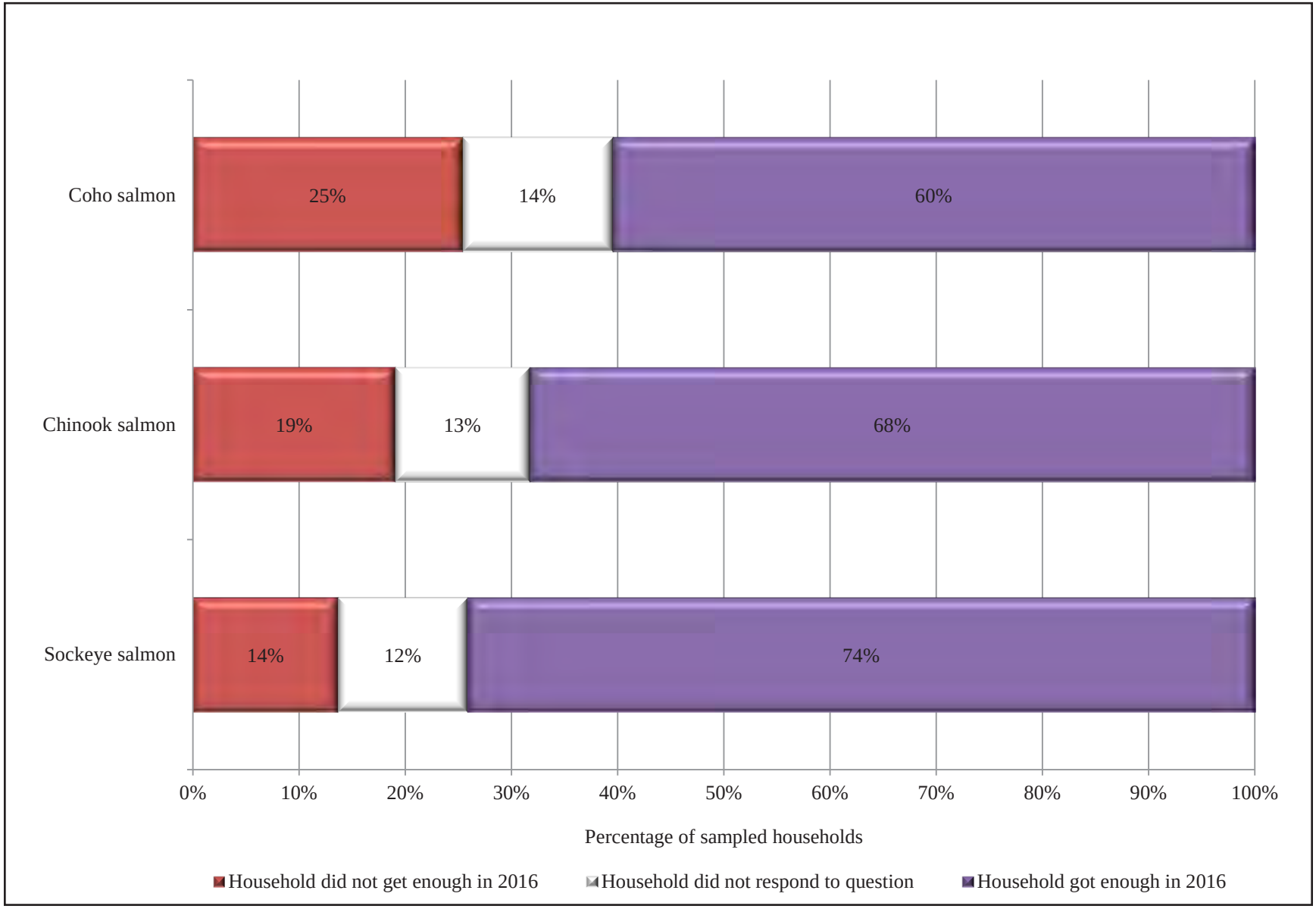


Figure 6-25.–Percentage of sampled households reporting whether they had enough salmon resources, Dillingham, 2016.

Table 6-18.–Percentage of households reporting whether they had enough salmon resources, Dillingham, 2016.

		Households not getting enough _____ .			
	Sampled	Valid responses[a]		Did not get enough	
Resource	households	Number	Percentage	Number	Percentage
Coho salmon	205	176	85.9%	52	29.5%
Chinook salmon	205	179	87.3%	39	21.8%
Sockeye salmon	205	180	87.8%	28	15.6%

Source ADF&G Division of Subsistence household surveys, 2017.
a. Does not include households that did not respond to the question or those households that never use the resource.

Table 6-19.–Reasons why households did not have enough salmon resources, Dillingham, 2016.

Resource	Valid responses[a]	Personal or family reasons		Resource availability		Too far to travel		Lack of equipment		Did not receive as much	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	50	0	0.0%	11	22.0%	3	6.0%	0	0.0%	3	6.0%
Chinook salmon	35	4	11.4%	8	22.9%	1	2.9%	0	0.0%	4	11.4%
Sockeye salmon	26	0	0.0%	3	11.5%	3	11.5%	1	3.8%	3	11.5%

-continued-

Table 6-19.–Continued.

Resource	Valid responses[a]	Less effort		Unsuccessful		Weather		Other reasons		Not enough time	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	50	4	8.0%	8	16.0%	1	2.0%	3	6.0%	6	12.0%
Chinook salmon	35	0	0.0%	5	14.3%	1	2.9%	0	0.0%	6	17.1%
Sockeye salmon	26	3	11.5%	1	3.8%	0	0.0%	2	7.7%	5	19.2%

-continued-

Table 6-19.–Continued.

Resource	Valid responses[a]	Regulations		Animals too small or diseased		Fuel too expensive		Competition	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Coho salmon	50	21	42.0%	0	0.0%	0	0.0%	0	0.0%
Chinook salmon	35	16	45.7%	0	0.0%	0	0.0%	0	0.0%
Sockeye salmon	26	13	50.0%	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2017.

Note Households may provide more than one response to the question.

a. Includes those households providing a valid reason for not getting enough.

Table 6-20.–Salmon resources that sampled households reported needing, Dillingham, 2016.

Resource	Households needing	Total amount needed	Average amount needed
Coho salmon	52	1,391	27
Chinook salmon	39	1,279	33
Sockeye salmon	28	1,158	41

Source ADF&G Division of Subsistence household surveys, 2017.

Table 6-21.–Changes in household harvests of salmon resources compared to recent years, Dillingham, 2016.

			Households reporting harvest								Households not harvesting in 2016	
			Total households		Less		Same		More			
Resource	Sampled households	Valid responses[a]	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	205	183	139	76.0%	63	34.4%	79	43.2%	49	26.8%	54	29.5%
Chinook salmon	205	177	133	64.9%	47	26.6%	47	26.6%	39	22.0%	44	24.9%
Other salmon	205	183	134	65.4%	41	22.4%	69	37.7%	24	13.1%	49	26.8%

Source ADF&G Division of Subsistence household surveys, 2017.

a. Valid responses do not include households that did not provide any response.

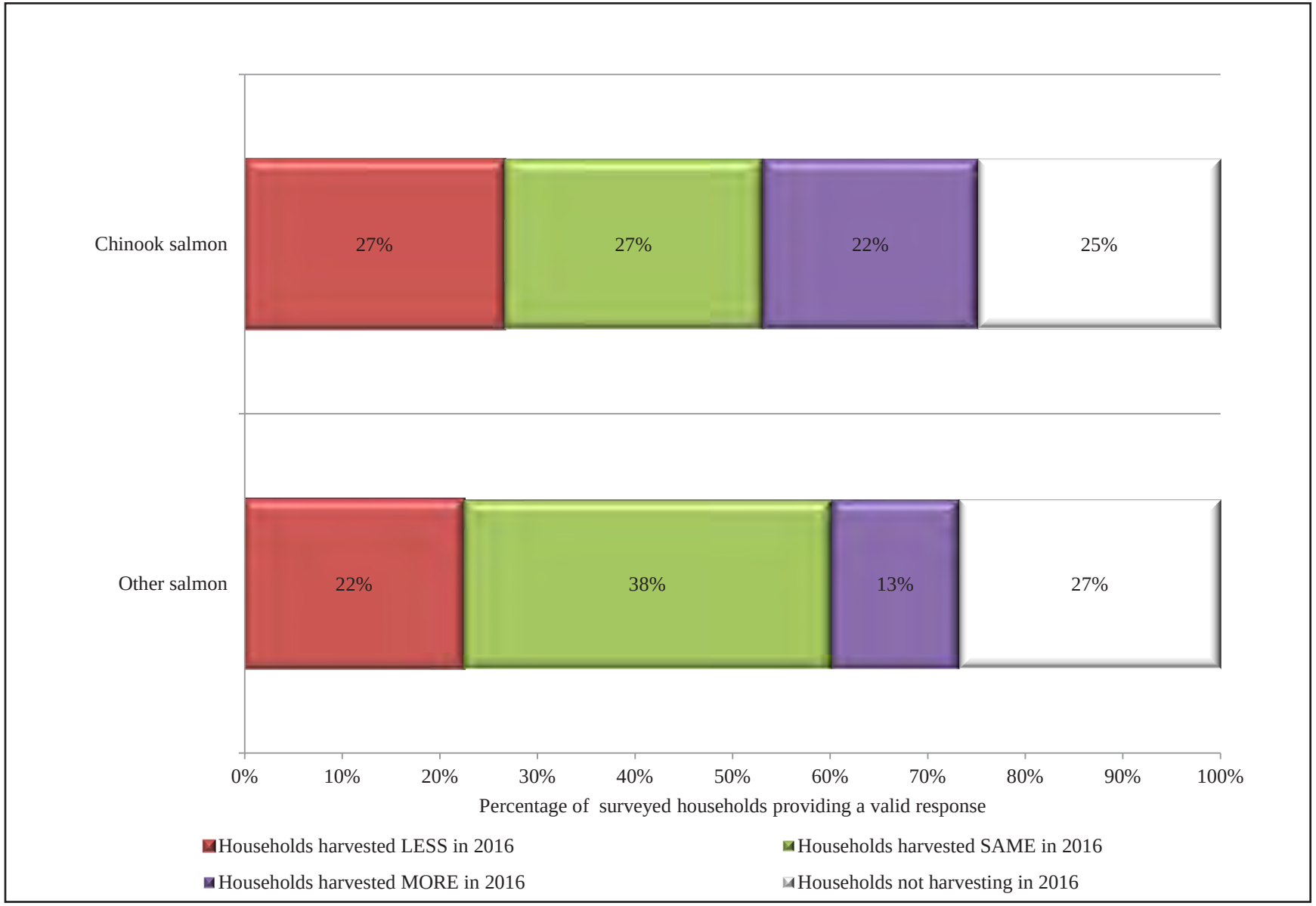


Figure 6-26.–Changes in household harvests of salmon resources compared to recent years, Dillingham, 2016.

Table 6-22.–Reasons for less household harvests of salmon resources compared to recent years, Dillingham, 2016.

Resource	Households reporting reasons for less harvest	Family/ personal		Resources less available		Too far to travel		Lack of equipment		Less sharing		Lack of effort		Unsuccessful		Weather/ environment	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	63	10	15.9%	6	10%	0	0.0%	5	8%	3	5%	8	13%	6	9.5%	3	4.8%
Chinook salmon	47	8	17.0%	4	9%	0	0.0%	4	9%	1	2%	5	11%	5	10.6%	2	4.3%
Other salmon	41	4	9.8%	2	5%	0	0.0%	4	10%	3	7%	4	10%	1	2.4%	2	4.9%

-continued-

Table 6-22.–Continued.

Resource	Households reporting reasons for less harvest	Other reasons		Working/ no time		Regulations		Small/ diseased animals		Did not need		Equipment/ fuel expense		Used other resources		Too much competition	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	63	8	13%	14	22.2%	0	0.0%	1	1.6%	10	15.9%	0	0.0%	6	9.5%	0	0.0%
Chinook salmon	47	6	13%	9	19.1%	0	0.0%	1	2.1%	4	8.5%	0	0.0%	2	4.3%	0	0.0%
Other salmon	41	3	7%	11	26.8%	0	0.0%	1	2.4%	8	19.5%	0	0.0%	4	9.8%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2017.

Table 6-23.–Reasons for more household harvests of salmon resources compared to recent years, Dillingham, 2016.

Resource	Households reporting reasons for more harvest	Increased availability		Used other resources		Favorable weather		Received more		Needed more		Increased effort		Other	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	46	17	37.0%	3	6.5%	2	4.3%	2	4.3%	3	6.5%	6	13.0%	3	6.5%
Chinook salmon	37	13	35.1%	1	2.7%	2	5.4%	2	5.4%	1	2.7%	4	10.8%	2	5.4%
Other salmon	22	9	40.9%	3	13.6%	1	4.5%	1	4.5%	2	9.1%	3	13.6%	2	9.1%

-continued-

Table 6-23.–Continued.

Resource	Households reporting reasons for more harvest	Regulations		Traveled farther		More success		More time		Store-bought expense		Got/ fixed equipment		Substitute for unavailable resource	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Any resource	46	0	0.0%	1	2.2%	12	26.1%	1	2.2%	0	0.0%	1	2.2%	0	0.0%
Chinook salmon	37	0	0.0%	1	2.7%	12	32.4%	1	2.7%	0	0.0%	1	2.7%	0	0.0%
Other salmon	22	0	0.0%	1	4.5%	2	9.1%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2017.

Assessment Comments

Some survey comments from Dillingham respondents are below, with more qualitative information provided in Chapter 8: "Local and Traditional Knowledge of Salmon and Subsistence on the Nushagak River." Survey respondents commented on a variety of reasons for their pattern of salmon use and harvest. Regulations topics were brought up by several surveyed households, including comments about confusion over closed areas, timing inhibiting the ability to fish or get enough fish, counting towers, and questions regarding whether regulations imposed on fishers would allow more Chinook salmon to escape. Some comments indicated that the Dillingham beach areas used for subsistence setnetting were increasingly occupied and remarked upon harvest site competition. Sharing and the permit system were other topics in survey comments, with households indicating that they often fish for more than one household and then share the catch.

Comments from 2014:

- There doesn't seem to be enough kings coming up, especially at Kanakanak beach. I did better at Scandinavian [beach] for kings. Kings come in the deep channels and bypass Kanakanak beach. [There] don't seem to be quite the numbers as some years back.
- I do the fishing for about four households.
- Subsistence is just a label. It's just life.
- Are there restrictions going to be placed on kings, so they continue to return?
- People have shared with us for the last two years, but we get a permit in case we need to put out a net and catch our own fish.
- Why is the other side across from Wood River closed? [Regulations for] both sides of [the] Wood and Nushagak [rivers] need to be explained for a day a week schedule because it is confusing when we can fish.
- We weren't able to can kings this year because I didn't catch enough. Everybody is coming to the mouth of the Wood River to fish for kings. A lot of people used to get their fish there, now others have found out they can get their fish there.
- When we go and check [our] net, we see a net that hasn't been picked through [for] a couple tides. Check when the tide goes out! Kings [were] lying in the sun! [It is] up the State Troopers to tell those people about it [regulations]! Be responsible to fish.
- I noticed some round sore; white polyp things on the fillets, maybe three or four kings had that.
- I used to catch them good but not anymore. Better fishing [is] from a skiff at Black Slough.
- Things are managed as good as they can be. Mother Nature will do what she is going to do. Have to adapt yourself to Mother Nature.
- Get the tower up earlier this year. Two weeks earlier this year, everything is early. The whole world is shifting.

Comments from 2016:

- The permit system is seamless and easy to deal with.
- There are plenty of fish. Just have to get out there and get them and have time to process.
- There is a lot of competition for beach setnet sites. Some beaches are inaccessible due to private land or have no established road so [one] either needs an ATV or a boat. It would [also] be nice to driftnet.

- Listen to elders more, they have knowledge in fishing subsistence and commercial fishing.
- Change the three-day schedule to include a Saturday [since] we need better improvement to accommodate people's schedules.
- Regulations should allow drift subsistence. This would reduce waste from leaving nets out too long. Drift requires folks to tend net. [This] would reduce fish left out to gulls and baking in the sun. We need strict boundaries and not allow [fishers] to leave the net unattended.

Community Data Review Meeting

A data review meeting was held in Dillingham on May 7, 2018. Although only three residents were at the meeting, information and feedback were shared regarding the representation of harvest locations.

A Brief Comparison of Harvest Data Between Study Years

For the study years of this project, 2016 was a more successful year than 2014 for Dillingham residents, with an overall salmon harvest that increased by 26,527 lb (Table 6-6; Table 6-9). Chinook salmon was the most harvested species by weight in both years, and in 2016 the harvest was more than in 2014 by 17,374 lb. The per capita harvest of Chinook salmon increased from 43 lb in 2014 to 53 lb in 2016. The sockeye salmon harvest followed a similar trend, with the per capita harvest increasing by 10 lb. Interestingly, overall use of salmon decreased in 2016, despite the higher harvest that year: 88% of households used salmon in 2016, compared with 94% in 2014. The percentages of households that attempted to harvest and actually harvested salmon were close in both study years, but a decline in sharing may account for the overall use difference. In 2016, even with more salmon harvested, fewer households received salmon (61%) than in 2014 (76%), and fewer households gave salmon away (52%) in 2016 than in 2014 (56%). Subsistence fishing participation and fish processing activity for individuals remained about the same for both study years but were slightly decreased in 2016 compared to 2014 (Figure 6-5). Similarly, gear types used in both study years did not change in any notable way, indicating a strong continued preference for using gillnets, some commercial retention for home use, and some use of rod and reel (Table 6-8; Table 6-11).

For both study years, reasons for households not having enough of the three main salmon species (Chinook, sockeye, and coho) did not overlap: 2014 responses indicated "not enough time" as the main issue for a lack of enough salmon (Table 6-13). This may have been due to the three-day-per-week schedule for subsistence fishing, which only included Monday to Friday. At the December 2015 Board of Fisheries meeting, this regulation changed to include a subsistence opener from 9 a.m. Saturday to 9 a.m. Sunday, between July 2 and July 17 (in effect for 2016). Interestingly, in 2016, "regulations" was the top reason given for needs not being met for the three main species (Table 6-19).

Comparing overall harvest and run trends in the Nushagak District, the total subsistence Chinook salmon harvest in 2016 was 15,735 fish, which was lower than in 2014 (16,049 fish), yet the total run in the district was far greater for Chinook salmon in 2016 (166,006) than in 2014 (96,872) (Elison et al. 2018:86). However, despite these run and harvest characteristics, the second highest reason for needs not being met for Chinook salmon in 2016 was "resource availability." On the other hand, "less effort" was the next most frequently attributed reason for why not enough Chinook, sockeye, and coho salmon were available for use in 2014 (Table 6-13).

In terms of assessing harvests in comparison to recent previous years, for both study years, the main reason for reduced harvests was the same, which was characterized as "working/no time" (Table 6-16; Table 6-22) The nature of setnetting involves planning and fishing specific tides, using locations suitable for setnetting, and often borrowing gear and sites. This may indicate that due to work schedules held by household members, in communities where more people may be working in cash-economy employment, that time and work can inhibit subsistence activities. On the other hand, for both study years, the top reason for more Chinook harvests was increased resource availability (Table 6-17; Table 6-23). For 2014 and 2016, about the same percentage of households indicated that they harvested the same amount of Chinook salmon

(26% and 27%, respectively, for 2014 and 2016), indicating that even with a two-year gap in harvest data, Dillingham households appear to be in a stable position regarding their overall harvest of Chinook salmon.

Further changes in the harvest of salmon by Dillingham residents can be understood through comparisons with findings from earlier study years. The most recent study prior to this survey effort was for the study year 2010 and the results were published in Evans et al. (2013): *Harvests and Uses of Wild Resources in Dillingham, Alaska, 2010* (Technical Paper No. 375). Prior to that, results for other Dillingham studies were published, among other regional reports, in Seitz (1990): *Subsistence Salmon Fishing in Nushagak Bay, Southwest Alaska* (Technical Paper No. 195); Wolfe et al. (1986): *The Role of Fish and Wildlife in the Economies of Barrow, Bethel, Dillingham, Kotzebue, and Nome* (Technical Paper No. 154); and Fall et al. (1986): *Patterns of Wild Resource Use in Dillingham: Hunting and Fishing in an Alaskan Regional Center* (Technical Paper No. 135). All reports and data may be found online on the ADF&G website and CSIS. In Chapter 7: "The Subsistence Permit System" there is additional discussion about previous study year salmon harvest estimates, specifically under the subheading "Comparison of Household Survey and Permit Data for Study Years."

7. THE SUBSISTENCE PERMIT SYSTEM

Historical Context of Subsistence Permit Program Administration

In the 1960s, "Bristol Bay fishery managers became concerned about low salmon returns in some river systems" (Schichnes and Chythlook 1991:129), which prompted the introduction of a permit system to track local subsistence harvests. From 1960 through 1963, proper cause by a user was required to be shown to ADF&G when a subsistence permit was requested. Although some changes have occurred regarding permit use (Holen et al. 2012; Krieg et al. 2015; Schichnes and Chythlook 1991; Stariwat and Krieg 2016), since 1980, one permit issued per household has been the norm. Subsistence gear has been restricted over time, with 50 fathoms of setnet being the regulatory length prior to 1974; since then, net length restrictions have changed to 10 fathoms and 50 fathoms depending on the area fished. No salmon harvest limits (quotas) have ever been placed on subsistence fishers in the Nushagak District (Krieg et al. 2015; Schichnes and Chythlook 1991), although various other restrictions have been put in place (see Chapter 1: "Introduction" for subsistence fishing regulatory description and map). In 1986, only rural residents "from communities with customary and traditional uses of salmon were allowed to obtain salmon for subsistence purposes in the Nushagak District" (Schichnes and Chythlook 1991:125,127). In 1988, only Alaska residents domiciled in the Nushagak River drainage were able to obtain a subsistence permit. Those living in the communities of the Nushagak District were required to obtain a subsistence permit from the Dillingham ADF&G office, or a local community vendor. A vendor was tasked with issuing, collecting, and returning to ADF&G the issued and returned subsistence permits. One permit was issued per household and those in the household assisting with subsistence fishing were required to be named on the permit. Salmon harvests were required to be recorded by date of harvest with specific harvest locations identified. This system of required permit information has remained unchanged; although, beginning again in 1990, all Alaska residents were qualified as subsistence users and could fish in the Nushagak District under subsistence regulations (Krieg et al. 2015:3).

Currently, the Nushagak District subsistence fishery permit system is administered by the Division of Subsistence (permit systems for other districts in the Bristol Bay Area are administered by the Division of Commercial Fisheries). Subsistence salmon fishing permits for the Nushagak District are issued in the Dillingham ADF&G office, the Anchorage ADF&G office, and by community vendors. Vendors are contacted by staff from the ADF&G Anchorage office and material is sent to each community vendor prior to the subsistence salmon season. A vendor then issues household permits to community members and forwards to ADF&G the collected completed permits at the end of the season, which typically occurs in early fall. According to Krieg et al. (2015:4), "To ensure high permit return rates, staff mail three reminder letters to permit holders, visit area communities, and contact permit recipients by telephone, as time and funding permit. These measures have been very successful, with permit returns averaging better than 85% annually. Thus, most subsistence fishing households in the BBA [Bristol Bay Area] that do obtain permits do return their salmon permits and harvest calendars." Figure 7-1 is the Bristol Bay subsistence salmon permit issued through 2018, which includes the calendar upon which fishers are required to record species harvested, and date and location of harvests. Figure 7-2 is the reminder letter, which is sent to each permit holder who has not returned a permit on time.

Alaska Department of Fish & Game

Bristol Bay Subsistence Salmon Fishery Permit

ALASKA RESIDENTS ONLY

Community _____

Permit No. _____

Year _____

First Name | Initial | Last Name

Permanent Mailing Address | City

State | Zip Code | Phone number

Number of year-round residents in household ▸

Names of household members who will assist in operation of subsistence net:

1. _____ 2. _____ 3. _____

4. _____ 5. _____ 6. _____

Drainage to be fished: Naknek ☐ Kvichak ☐ Egegik ☐ Ugashik ☐

Nushagak ☐ Togiak ☐ Other _____

Primary fishing location (specific): _____

Number of fathoms allowed at this site: 10 ☐ 25 ☐ Gear type: _____

Please specify set gear, drift gear, spear, or dip net.

I understand that I am applying for a subsistence fishing permit for my household in accordance with current regulations and hereby swear the information contained on this application is a true statement as witnessed by my signature below; and that I have been an Alaska resident for the last calendar year.

Applicant's signature _____ Date _____

TO BE COMPLETED BY ISSUING OFFICER ONLY

The above-named person and designated household members are authorized to fish for salmon for subsistence purposes in the Bristol Bay Area during the calendar year of _____ according to current laws and regulations of the State of Alaska.

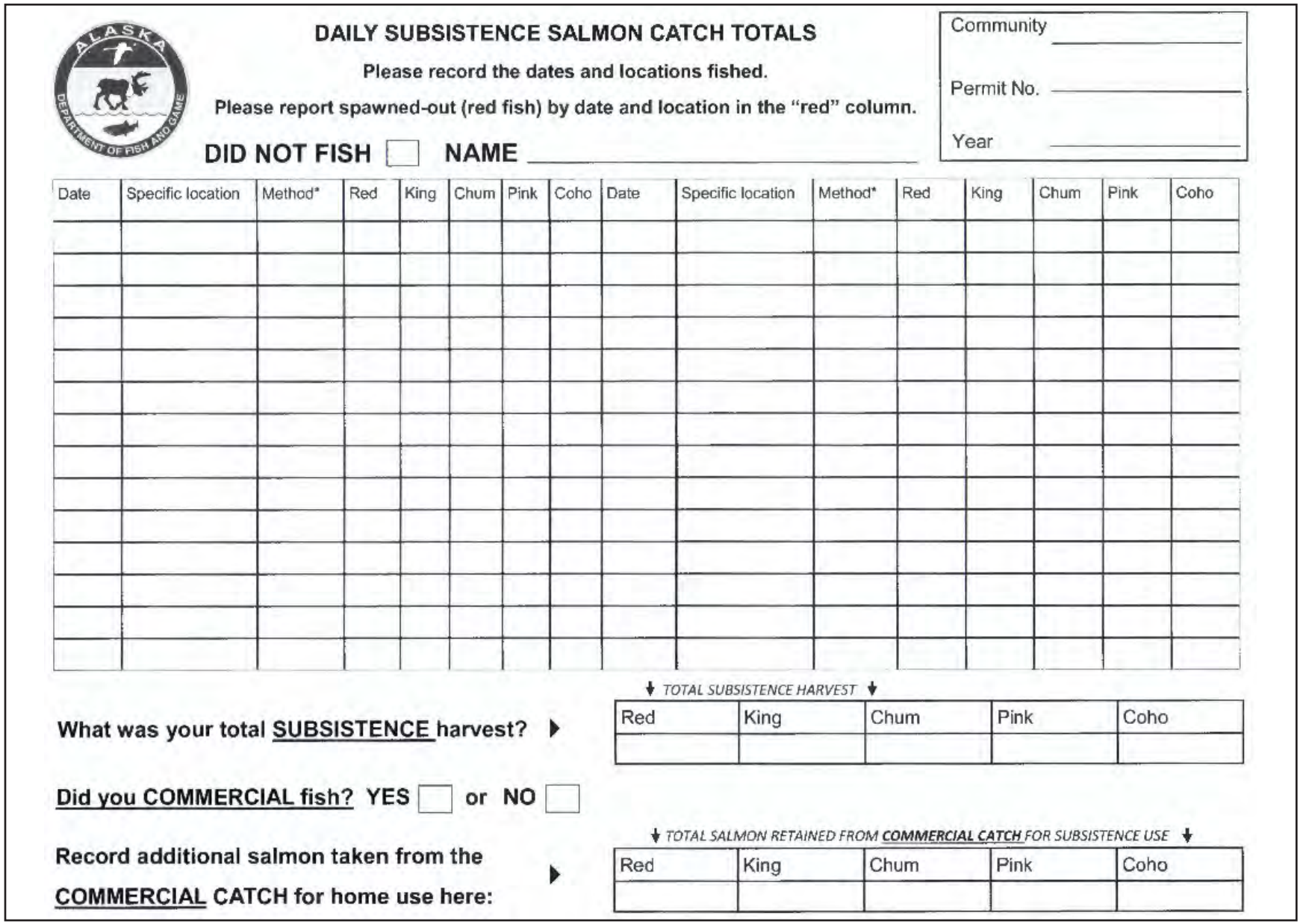
Authorizing Officer _____ Date _____

1. Only one subsistence salmon fishing permit may be issued to each household per year. People using the net/site and not of this household are required to have their own permit and file a separate report of their harvest.
2. Fish caught for subsistence uses may not be sold or allowed to enter commercial use.
3. An accurate record of fish taken under authority of this permit must be returned to the Alaska Department of Fish and Game when the permit expires. Failure to return subsistence catch records is grounds for denial of future permit privileges.

NOTE: Commercially-caught salmon may also be utilized for subsistence purposes and must be reported on the back of this form as well as a Commercial Fish ticket.

Return form to: (fax) 907-267-2450/ (email) dfg.sub.permits@alaska.gov/ or
Division of Subsistence, ADF&G, 333 Raspberry Rd, Anchorage, AK 99518

Figure 7-1.–Sample Bristol Bay subsistence salmon fishery permit, study period (pre-2019).



DAILY SUBSISTENCE SALMON CATCH TOTALS

Please record the dates and locations fished.

Please report spawned-out (red fish) by date and location in the "red" column.

Community _____

Permit No. _____

Year _____

DID NOT FISH ☐ **NAME** _____

Date	Specific location	Method*	Red	King	Chum	Pink	Coho	Date	Specific location	Method*	Red	King	Chum	Pink	Coho

TOTAL SUBSISTENCE HARVEST

What was your total SUBSISTENCE harvest? ▶

Red	King	Chum	Pink	Coho

Did you COMMERCIAL fish? YES ☐ **or NO** ☐

*TOTAL SALMON RETAINED FROM **COMMERCIAL CATCH** FOR SUBSISTENCE USE*

Record additional salmon taken from the COMMERCIAL CATCH for home use here: ▶

Red	King	Chum	Pink	Coho

Figure 7-1.–Sample Bristol Bay subsistence salmon fishery permit, Page 2 of 2.

State of Alaska
Department of Fish and Game
Division of Subsistence
333 Raspberry Road
Anchorage, Alaska 99518-1565

First Reminder 11/26/2018

NAME
ADDRESS
CITY

Dear Permit Holder,

At this time, the Department of Fish And Game is in the final stages of data entry of the subsistence salmon permit harvest reports. To date, we have not received your catch reports for the current season. Please take a moment to return your permit with the catch record information on the back at your earliest convenience.

The information taken from your subsistence salmon harvest reports is used to ensure that adequate fish for subsistence are calculated into escapement goals by ADF&G. It is also used by the Board of Fisheries and other planning groups to help implement the subsistence priority which is required by law.

If you have sent in your permit, please disregard this notice. In case you have lost your permit, please use the space provided at the bottom of this letter to record your harvest information. However, we much prefer to receive the actual permit back, since it contains daily harvest information. Please take a few minutes to locate the permit if possible. Failure to report subsistence catches may prohibit you from obtaining subsistence permits in the future.

If you have any questions or would like to report over the phone, please feel free to call us at 907-267-2353. You may also report your daily catches by e-mail at **dfg.sub.permits@alaska.gov.**

Thank you for your immediate attention.

Sincerely,

Halia Janssen
Program Technician

PERMIT ID: DLG XXX Did Not Fish_____

Your Subsistence Catch:	Red Salmon	King Salmon	Chum Salmon	Pink Salmon	Coho Salmon
Fishing Location and date: _____	_____	_____	_____	_____	_____
Fishing Location and date: _____	_____	_____	_____	_____	_____
Your Spawn out Catch:					
Fishing Location and date: _____	_____	_____	_____	_____	_____
Fishing Location and date: _____	_____	_____	_____	_____	_____
Subsistence taken from Commercial Catch:					
	_____	_____	_____	_____	_____

NOTE: If your Subsistence permit numbers do not match, please **DO NOT BE ALARMED**. Numbers are sometimes changed because of duplication or for in-house bookkeeping purposes.

Figure 7-2.–Example of reminder letter for returning Bristol Bay subsistence salmon permit.

Subsistence Salmon Permit Participation

Participation in the subsistence salmon fishery in the Nushagak District has increased somewhat over time since 1997, with the 20-year average for issued permits in the district at 540 subsistence salmon permits (Elison et al. 2018:95). Growth in the number of permits issued has occurred—particularly in more recent years; for example, in the first study year of this project, there were 584 subsistence salmon permits issued, and in the final year of the study, 2016, there were 613 permits issued (Elison et al. 2018:95). According to the Division of Subsistence:

> Much of the increase in the number of permits issued during these years [since the 1960s] reflects: 1) a greater compliance with the permitting and reporting requirements, 2) an increased level of effort expended by ADF&G in making permits available (including issuance by area vendors), 3) contacting individuals to remind them to return the harvest forms, and 4) a growing regional population. Most fishers are obtaining permits and reporting their harvests, and overall permit returns have averaged between 85% and 90%. (Fall et al. 2018:108)

A series of figures (figures 7-3, 7-4, 7-5, 7-6, and 7-7), which are based on permit data in the ADF&G Division of Subsistence Alaska Subsistence Fisheries Database (ASFDB), show the number of permits issued by community of residence, from 1983 to 2016, and depict that for most of the study communities the number of issued permits has generally increased since the early 1980s in spite of periods of fluctuation. The blue line in the figures depicts the number of permits issued in each community, and is contrasted with the red line, which shows the number of permits returned. The gap between the lines shows how many issued permits were returned, indicating a general trend of compliance by households that participate in the subsistence permit system. The black line is the overall trend line, where increases and decreases in the number of issued permits is generally seen. Households that fish without a permit are not represented in the permit system except when post-season household surveys identified harvests that occurred without a permit. A comparison between harvests by permit holders and non-permit holders is discussed for each community below under the subheading "Subsistence Harvest Estimates Based on Returned Permits and Surveys."

Clarks Point in the early 1980s through roughly the mid-1990s experienced a relatively disparate number of returned permits compared to issued permits, as seen by some larger gaps between the lines depicting permits issued and returned (Figure 7-3). Once the late 1990s began, Clarks Point households were returning permits with a high compliance rate: generally from 90%–100%, and the lowest return rates occurred in 2000–2002 but did not drop below 77% (Table 7-1). Overall, the trend line marks an increase over time of permit use in Clarks Point; however, a decline starting in the late-1990s is likely due to a decrease in population size (Figure 7-3; Figure 2-2).

Ekwok has experienced an overall increase in both permits issued and returned since 1983, with a steady rate of permits issued since about 2010 as depicted by the trend line (Figure 7-4). Of those households that have participated in the subsistence salmon permit system, there has been high permit return compliance in Ekwok since 1983, beginning with a 100% return rate in 1983, and the majority of the time (25 out of 34 years) the return rate has been 90% or better (Table 7-2). For the first year of this project, 2013, a spike in permits issued (23) and returned (22) occurred, which is due to permits being issued by Division of Subsistence staff in the field. It is common practice for Division of Subsistence staff to issue a permit to a household that fished without a permit and record that permit as returned. Select years (2002, 2005, 2008, 2013, and 2015) were all years when the number of issued permits was 21 permits or higher; but, only one of those years, 2013, was a study year. Ekwok households that participate in the subsistence salmon permit system show a fairly stable compliance rate for on-time permit returns, which indicates that those who use the permit system are likely comfortable with its function.

In New Stuyahok, the number of issued subsistence salmon permits has remained relatively stable from 1983–2016, with slight increases and decreases over the 34-year period (Figure 7-5). Fifteen out of the 34 years showed a return rate of 90% or higher, followed by eight years of 80%–89% of permits returned

(Table 7-3). This indicates that out of the households in the community that obtained a permit, a high percentage also returned their permits. High return rates indicate that those households that obtain permits are likely to return them at the end of the season. The year 2013 shows a high increase in permits issued (73) and returned (72), which was the first year of research for this project. Again, since Division of Subsistence staff issued permits to households that originally fished without a permit, this higher permit use is more a product of issuing ex post facto permits to households that did not use a permit while subsistence fishing. This contrasts with the number of households that have used permits consistently over time as depicted by the trend line on Figure 7-5.

Koliganek households that obtained subsistence permits also show a high permit return compliance rate, as well as the same sharp increase in permits issued (31) in 2013, which is when division staff issued ex post facto permits during household surveys (Figure 7-6). In general, Koliganek showed a slight decrease in permits obtained in the late 1980s and early 1990s, which then increased until about 2005 when a high of 22 permits were issued. After that, the number of permits decreased but has remained generally stable since 2006. In 24 years, there has been a 90% and higher return rate, which is the majority out of the 34 years for which data are available (Table 7-4). Since 1983, on average (excluding 2013), 14 permits were issued, with 13 permits returned.

Dillingham shows an overall increase over time of permits issued, and a high compliance rate of returned permits: out of 34 years, 15 years of 90% or greater return rate, and 19 years of 80%–89% return rate (Figure 7-7; Table 7-5). Although there was a very slight decline overall in the mid-2000s in the number of issued permits, Dillingham has achieved a high success rate with permit return compliance. Permits issued by division staff during household surveys done in 2014 and 2016 are indistinguishable in Figure 7-7, unlike in a couple of the other study communities. This is due to scale: the number of Dillingham permits issued has been roughly between 300–350 permits since the early 1990s; adding permits (for example, 22 in 2016) does not make a difference in the trend line.

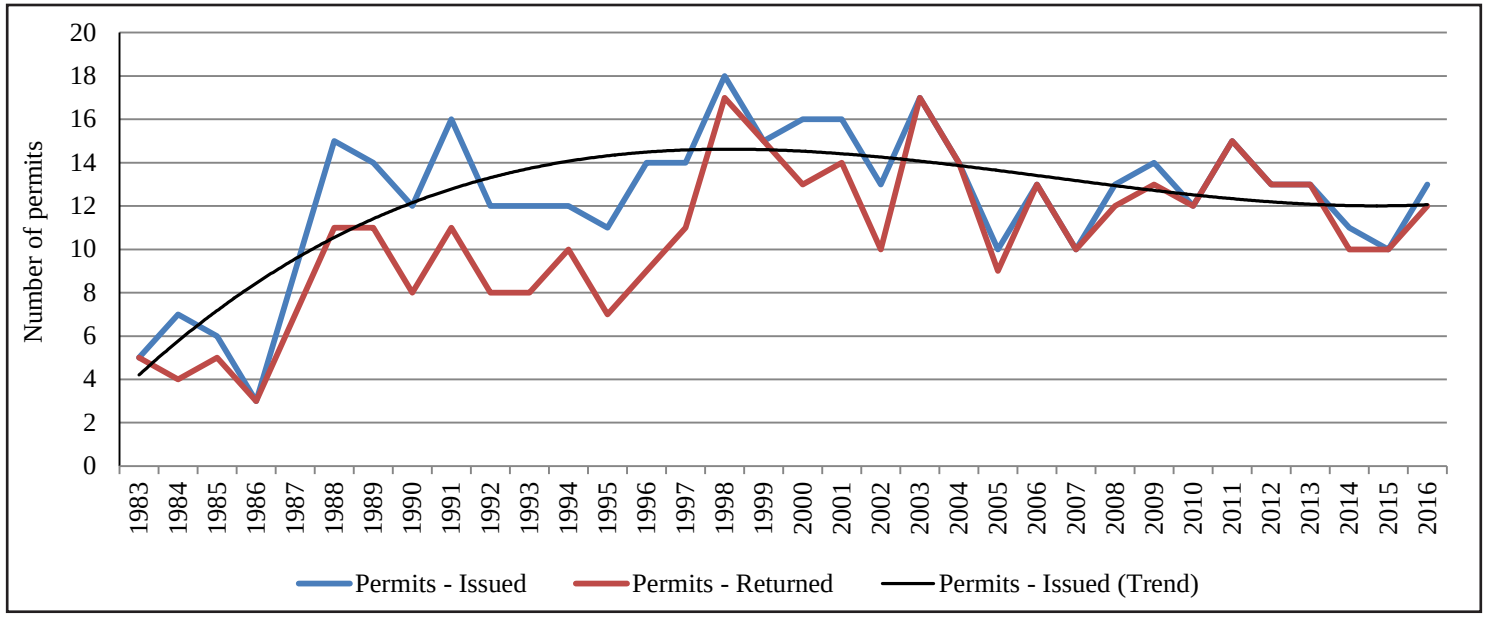


Figure 7-3.–Number of permits issued and returned by Clarks Point residents, 1983–2016.

Table 7-1.–Historical harvest of salmon, based on returned permits, Clarks Point, 1983–2016.

Year	Permits		Percentage of returned permits	Chinook		Sockeye		Coho		Chum		Pink		**Total**	
	Issued	Returned		Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	**Number**	**Pounds**
1983	5	5	100%	55	827	487	2,042	131	634	44	204	15	49	**732**	**3,757**
1984	7	4	57%	26	377	146	611	141	803	39	179	103	239	**455**	**2,209**
1985	6	5	83%	19	249	61	260	0	0	10	47	0	0	**90**	**556**
1986	3	3	100%	100	1,341	208	935	261	1,316	111	534	81	208	**761**	**4,334**
1987	9	7	78%	317	4,581	57	253	11	56	533	2,552	0	0	**918**	**7,441**
1988	15	11	73%	75	1,009	105	489	51	286	18	92	50	131	**300**	**2,007**
1989	14	11	79%	136	1,884	475	2,004	382	2,129	84	389	9	25	**1,086**	**6,430**
1990	12	8	67%	134	1,633	231	983	117	657	66	303	75	211	**623**	**3,787**
1991	16	11	69%	288	3,214	757	3,246	741	3,853	129	586	29	73	**1,945**	**10,974**
1992	12	8	67%	201	2,413	415	1,758	168	883	18	82	88	231	**889**	**5,368**
1993	12	8	67%	338	4,220	409	1,821	145	751	157	747	71	176	**1,120**	**7,715**
1994	12	10	83%	84	1,091	102	419	32	199	28	128	143	394	**389**	**2,231**
1995	11	7	64%	185	2,639	396	1,612	134	668	24	111	9	24	**748**	**5,055**
1996	14	9	64%	165	2,035	232	1,079	199	1,285	90	458	98	248	**783**	**5,105**
1997	14	11	79%	266	3,151	489	2,165	153	832	152	711	4	9	**1,064**	**6,867**
1998	18	17	94%	213	2,559	246	1,045	311	1,944	2	10	128	309	**900**	**5,867**
1999	15	15	100%	207	2,166	502	1,965	402	2,080	84	363	23	56	**1,218**	**6,631**
2000	16	13	81%	336	3,787	539	2,450	142	795	33	164	97	252	**1,147**	**7,448**
2001	16	14	88%	257	3,227	435	2,173	549	2,939	96	510	70	140	**1,407**	**8,988**
2002	13	10	77%	176	2,302	553	2,488	165	866	20	97	51	143	**963**	**5,896**
2003	17	17	100%	159	1,832	316	1,479	319	1,605	75	359	65	232	**934**	**5,508**
2004	14	14	100%	193	2,100	283	1,210	365	1,897	52	245	186	560	**1,079**	**6,012**
2005	10	9	90%	264	3,138	436	2,037	277	1,455	94	456	46	115	**1,117**	**7,201**
2006	13	13	100%	231	2,816	313	1,337	51	246	31	141	58	158	**684**	**4,698**
2007	10	10	100%	120	1,166	264	1,138	79	382	74	332	10	25	**547**	**3,043**
2008	13	12	92%	172	1,930	789	3,371	535	2,590	99	454	421	1,092	**2,016**	**9,436**
2009	14	13	93%	169	1,849	541	2,373	480	2,342	80	369	39	92	**1,308**	**7,026**
2010	12	12	100%	131	1,331	334	1,445	332	1,671	88	396	270	650	**1,155**	**5,494**
2011	15	15	100%	142	1,329	615	2,774	604	2,808	96	455	33	73	**1,490**	**7,440**
2012	13	13	100%	99	1,024	365	1,539	189	772	80	373	149	339	**882**	**4,047**
2013	13	13	100%	177	1,945	911	4,040	597	2,685	105	496	104	235	**1,894**	**9,401**
2014	11	10	91%	77	856	2,530	10,402	1,660	8,007	72	322	36	97	**4,375**	**19,684**
2015	10	10	100%	59	450	598	2,354	214	1,100	57	254	13	34	**941**	**4,192**
2016	13	12	92%	203	1,906	602	2,383	549	2,447	90	405	34	96	**1,478**	**7,237**

Source ADF&G Division of Subsistence Alaska Subsistence Fisheries Datbase (ASFDB), accessed January 2019.

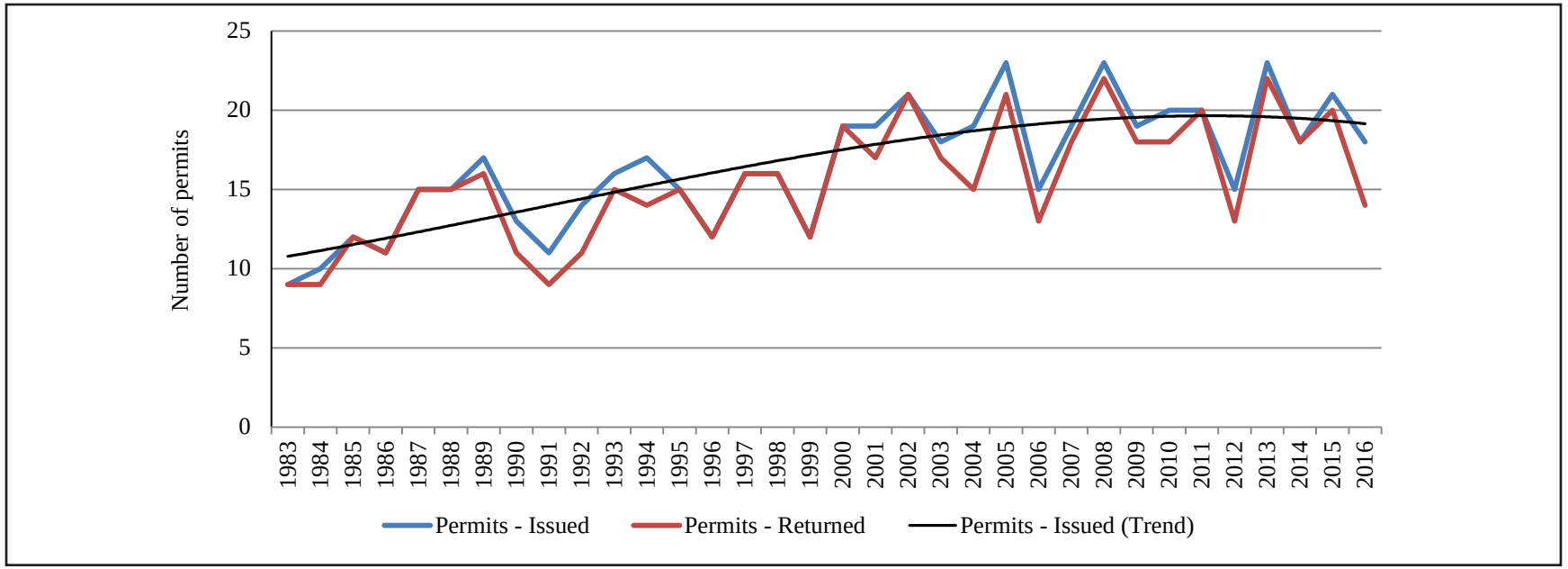


Figure 7-4.–Number of permits issued and returned by Ekwok residents, 1983–2016.

Table 7-2.–Historical harvest of salmon, based on returned permits, Ekwok, 1983–2016.

	Permits		Percentage of returned	Chinook		Sockeye		Coho		Chum		Pink		**Total**	
Year	Issued	Returned	permits	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
1983	9	9	100%	1,214	18,263	2,655	11,134	209	1,011	1,191	5,525	0	0	**5,269**	**35,934**
1984	10	9	90%	877	12,608	4,266	17,815	575	3,267	1,256	5,790	410	957	**7,383**	**40,437**
1985	12	12	100%	1,113	14,585	4,562	19,409	569	3,471	468	2,216	284	816	**6,996**	**40,497**
1986	11	11	100%	891	11,951	4,959	22,288	618	3,115	1,057	5,085	259	665	**7,784**	**43,106**
1987	15	15	100%	1,213	17,546	3,385	14,931	893	4,672	914	4,373	38	107	**6,443**	**41,628**
1988	15	15	100%	1,106	14,833	2,525	11,714	602	3,366	1,281	6,578	620	1,619	**6,134**	**38,110**
1989	17	16	94%	662	9,159	2,314	9,766	439	2,446	1,185	5,481	112	310	**4,711**	**27,163**
1990	13	11	85%	793	9,700	2,558	10,884	343	1,928	964	4,419	273	768	**4,931**	**27,698**
1991	11	9	82%	902	10,051	1,927	8,258	702	3,653	1,280	5,825	3	7	**4,813**	**27,794**
1992	14	11	79%	764	9,190	1,939	8,214	1,156	6,079	1,508	7,074	146	387	**5,512**	**30,944**
1993	16	15	94%	850	10,622	1,695	7,548	206	1,066	182	867	3	7	**2,936**	**20,111**
1994	17	14	82%	1,092	14,191	2,473	10,159	119	733	586	2,706	6	17	**4,276**	**27,805**
1995	15	15	100%	881	12,540	836	3,403	105	525	223	1,047	1	3	**2,046**	**17,518**
1996	12	12	100%	608	7,483	1,453	6,756	200	1,294	519	2,642	86	219	**2,866**	**18,394**
1997	16	16	100%	468	5,536	1,139	5,039	60	327	129	604	1	2	**1,797**	**11,509**
1998	16	16	100%	837	10,063	2,227	9,470	114	712	359	1,652	18	43	**3,555**	**21,941**
1999	12	12	100%	446	4,667	1,094	4,283	93	481	218	943	19	46	**1,870**	**10,421**
2000	19	19	100%	669	7,540	1,601	7,276	731	4,106	780	3,841	165	428	**3,946**	**23,191**
2001	19	17	89%	733	9,198	1,045	5,214	128	687	312	1,655	0	0	**2,218**	**16,754**
2002	21	21	100%	1,049	13,759	1,044	4,701	111	582	522	2,598	9	25	**2,735**	**21,666**
2003	18	17	94%	935	10,774	1,064	4,979	164	823	271	1,295	0	0	**2,433**	**17,872**
2004	19	15	79%	960	10,447	730	3,120	77	402	77	364	47	141	**1,891**	**14,474**
2005	23	21	91%	778	9,233	428	2,001	111	581	72	347	0	0	**1,388**	**12,162**
2006	15	13	87%	616	7,512	552	2,357	249	1,201	68	310	14	38	**1,499**	**11,417**
2007	19	18	95%	647	6,288	322	1,387	226	1,091	72	322	0	0	**1,267**	**9,089**
2008	23	22	96%	781	8,748	661	2,824	247	1,194	165	760	48	125	**1,902**	**13,651**
2009	19	18	95%	757	8,278	706	3,100	687	3,351	195	903	0	0	**2,345**	**15,632**
2010	20	18	90%	668	6,787	414	1,793	94	475	198	891	6	13	**1,380**	**9,959**
2011	20	20	100%	899	8,413	664	2,995	93	432	232	1,100	5	11	**1,893**	**12,953**
2012	15	13	87%	681	7,044	167	706	59	240	234	1,092	112	254	**1,253**	**9,337**
2013	23	22	96%	939	10,335	587	2,602	449	2,018	326	1,538	0	0	**2,300**	**16,493**
2014	18	18	100%	1,356	15,069	294	1,209	817	3,941	302	1,358	71	190	**2,840**	**21,767**
2015	21	20	95%	749	5,708	379	1,492	327	1,679	164	729	0	0	**1,619**	**9,608**
2016	18	14	78%	675	6,352	378	1,496	64	286	262	1,182	39	110	**1,418**	**9,426**

Source ADF&G Division of Subsistence Alaska Subsistence Fisheries Datbase (ASFDB), accessed May 2019.

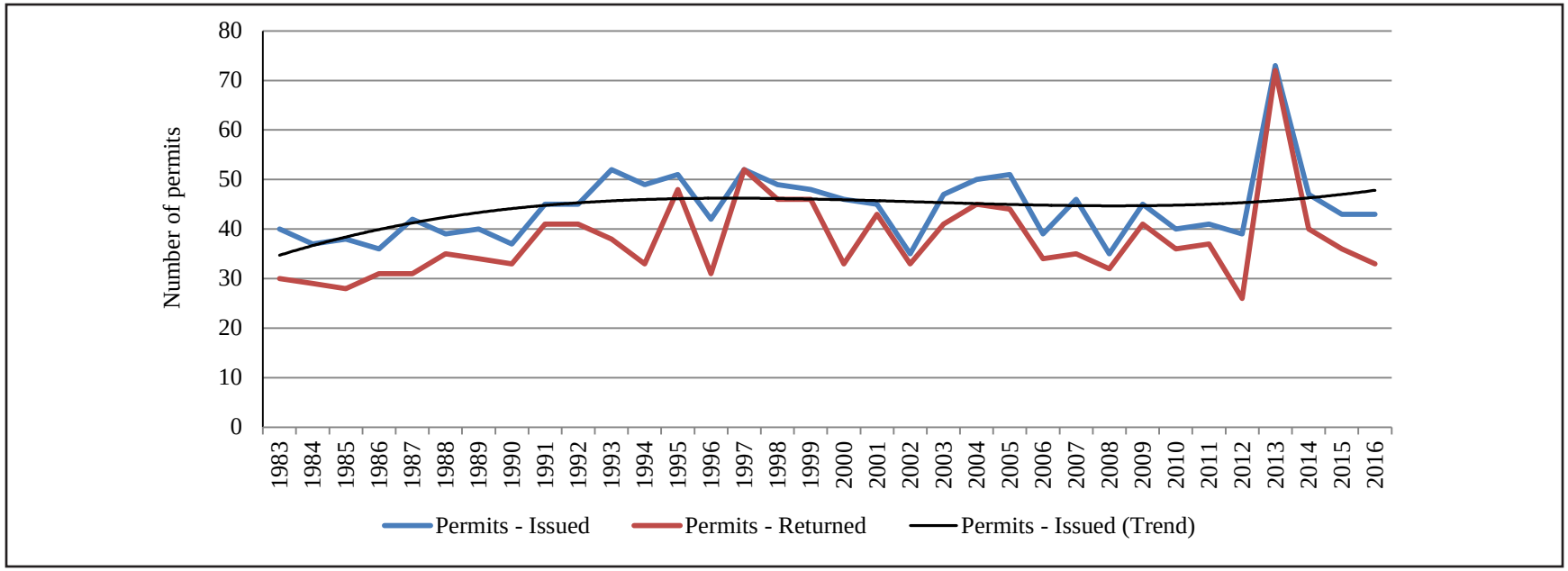


Figure 7-5.–Number of permits issued and returned by New Stuyahok residents, 1983–2016.

Table 7-3.–Historical harvest of salmon, based on returned permits, New Stuyahok, 1983–2016.

	Permits		Percentage of returned	Chinook		Sockeye		Coho		Chum		Pink		**Total**	
Year	Issued	Returned	permits	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	**Number**	**Pounds**
1983	40	30	75%	3,172	47,715	10,900	45,710	536	2,593	3,743	17,363	364	1,195	**18,714**	**114,577**
1984	37	29	78%	2,177	31,298	9,835	41,072	790	4,490	2,336	10,771	1,065	2,487	**16,203**	**90,118**
1985	38	28	74%	3,075	40,294	9,869	41,986	1,132	6,908	2,145	10,157	61	176	**16,282**	**99,520**
1986	36	31	86%	3,343	44,844	10,363	46,579	1,658	8,359	2,406	11,575	2,384	6,123	**20,155**	**117,479**
1987	42	31	74%	3,478	50,305	6,836	30,151	17	88	1,722	8,241	45	125	**12,097**	**88,909**
1988	39	35	90%	3,458	46,374	4,333	20,104	504	2,820	2,816	14,463	713	1,862	**11,825**	**85,623**
1989	40	34	85%	1,867	25,831	6,104	25,760	500	2,787	1,123	5,195	12	32	**9,605**	**59,604**
1990	37	33	89%	3,036	37,140	4,151	17,660	292	1,640	1,674	7,676	287	806	**9,439**	**64,923**
1991	45	41	91%	3,244	36,158	3,298	14,134	351	1,828	1,077	4,900	115	287	**8,085**	**57,306**
1992	45	41	91%	3,134	37,719	5,602	23,738	188	987	1,889	8,864	288	763	**11,101**	**72,070**
1993	52	38	73%	6,812	85,130	4,703	20,946	92	477	1,281	6,101	8	20	**12,897**	**112,673**
1994	49	33	67%	4,341	56,401	2,437	10,008	73	446	1,361	6,288	13	35	**8,224**	**73,179**
1995	51	48	94%	3,227	45,933	2,783	11,328	195	976	584	2,740	1	3	**6,790**	**60,981**
1996	42	31	74%	5,137	63,222	3,081	14,325	458	2,962	516	2,625	75	190	**9,266**	**83,325**
1997	52	52	100%	3,751	44,373	1,903	8,419	378	2,059	345	1,617	50	124	**6,427**	**56,591**
1998	49	46	94%	3,323	39,951	1,374	5,843	314	1,961	278	1,280	26	62	**5,315**	**49,097**
1999	48	46	96%	3,021	31,610	1,640	6,420	117	605	345	1,491	51	124	**5,173**	**40,249**
2000	46	33	72%	1,954	22,025	1,091	4,960	369	2,075	397	1,956	71	185	**3,882**	**31,201**
2001	45	43	96%	3,444	43,220	2,595	12,953	504	2,702	636	3,379	114	229	**7,293**	**62,483**
2002	35	33	94%	2,571	33,721	2,265	10,202	344	1,802	1,074	5,347	11	30	**6,265**	**51,102**
2003	47	41	87%	4,002	46,113	4,115	19,267	978	4,923	1,485	7,101	236	842	**10,816**	**78,246**
2004	50	45	90%	3,710	40,363	1,321	5,652	709	3,686	651	3,071	340	1,022	**6,731**	**53,794**
2005	51	44	86%	3,345	39,697	4,316	20,177	890	4,684	967	4,668	183	462	**9,701**	**69,688**
2006	39	34	87%	2,356	28,724	2,108	9,002	679	3,271	1,007	4,586	19	53	**6,169**	**45,636**
2007	46	35	76%	3,098	30,105	3,597	15,499	612	2,959	781	3,500	197	502	**8,285**	**52,565**
2008	35	32	91%	1,822	20,411	2,634	11,261	196	950	1,089	5,013	13	34	**5,754**	**37,669**
2009	45	41	91%	2,554	27,934	2,443	10,726	879	4,287	904	4,183	75	178	**6,855**	**47,308**
2010	40	36	90%	2,090	21,241	2,020	8,739	251	1,264	1,081	4,869	166	399	**5,608**	**36,512**
2011	41	37	90%	2,279	21,331	4,739	21,380	410	1,906	533	2,528	18	39	**7,979**	**47,184**
2012	39	26	67%	2,439	25,236	1,778	7,497	345	1,409	677	3,155	137	310	**5,376**	**37,607**
2013	73	72	99%	4,558	50,208	5,232	23,196	1,168	5,253	926	4,366	6	17	**11,890**	**83,041**
2014	47	40	85%	4,733	52,595	1,162	4,778	597	2,879	1,012	4,549	109	293	**7,613**	**65,094**
2015	43	36	84%	2,914	22,221	1,639	6,451	603	3,101	676	3,007	27	73	**5,859**	**34,853**
2016	43	33	77%	2,874	27,049	1,591	6,295	437	1,945	496	2,237	318	909	**5,716**	**38,435**

Source ADF&G Division of Subsistence Alaska Subsistence Fisheries Datbase (ASFDB), accessed May 2019.

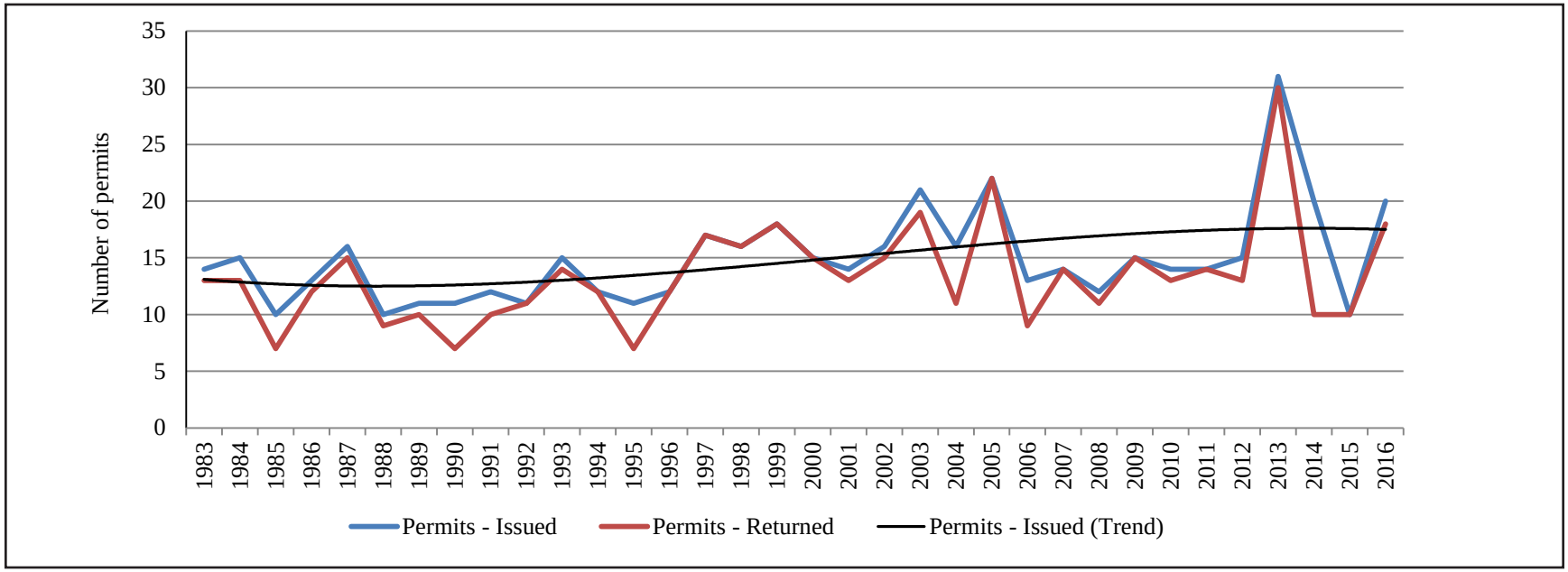


Figure 7-6.–Number of permits issued and returned by Koliganek residents, 1983–2016.

Table 7-4.–Historical harvest of salmon, based on returned permits, Koliganek, 1983–2016.

Year	Permits		Percentage of returned permits	Chinook		Sockeye		Coho		Chum		Pink		**Total**	
	Issued	Returned		Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	**Number**	**Pounds**
1983	14	13	93%	1,582	23,799	6,432	26,974	37	179	2,525	11,714	0	0	**10,576**	**62,666**
1984	15	13	87%	1,864	26,804	11,150	46,564	168	957	4,882	22,506	172	402	**18,236**	**97,233**
1985	10	7	70%	596	7,810	5,883	25,027	20	122	629	2,980	0	0	**7,128**	**35,939**
1986	13	12	92%	873	11,710	8,139	36,581	213	1,074	1,894	9,112	392	1,007	**11,511**	**59,484**
1987	16	15	94%	624	9,026	5,010	22,098	343	1,794	1,397	6,684	0	0	**7,374**	**39,603**
1988	10	9	90%	1,007	13,505	4,096	19,003	0	0	1,619	8,314	0	0	**6,722**	**40,822**
1989	11	10	91%	586	8,108	2,347	9,905	76	424	1,347	6,232	0	0	**4,356**	**24,669**
1990	11	7	64%	1,873	22,920	4,322	18,390	120	674	2,566	11,763	50	141	**8,931**	**53,886**
1991	12	10	83%	1,037	11,558	2,542	10,895	225	1,171	574	2,612	0	0	**4,378**	**26,236**
1992	11	11	100%	719	8,653	1,888	8,000	100	526	951	4,462	50	132	**3,708**	**21,773**
1993	15	14	93%	1,105	13,808	2,360	10,510	110	569	335	1,595	0	0	**3,910**	**26,483**
1994	12	12	100%	1,225	15,916	1,943	7,981	208	1,280	1,137	5,253	0	0	**4,513**	**30,430**
1995	11	7	64%	708	10,083	1,211	4,931	130	652	620	2,911	0	0	**2,670**	**18,577**
1996	12	12	100%	496	6,105	1,350	6,277	388	2,510	780	3,971	305	777	**3,319**	**19,639**
1997	17	17	100%	1,170	13,841	2,598	11,494	112	610	294	1,378	5	12	**4,179**	**27,334**
1998	16	16	100%	1,255	15,088	1,411	6,000	129	806	371	1,708	0	0	**3,166**	**23,602**
1999	18	18	100%	1,065	11,145	1,164	4,557	131	678	411	1,778	1	2	**2,772**	**18,160**
2000	15	15	100%	835	9,410	1,047	4,758	140	786	770	3,792	0	0	**2,792**	**18,746**
2001	14	13	93%	870	10,920	939	4,687	31	167	352	1,870	16	32	**2,208**	**17,676**
2002	16	15	94%	1,155	15,152	659	2,969	19	101	1,263	6,285	1	3	**3,097**	**24,510**
2003	21	19	90%	1,399	16,123	2,312	10,826	141	712	1,868	8,929	0	0	**5,720**	**36,590**
2004	16	11	69%	940	10,224	1,079	4,615	282	1,466	1,245	5,869	73	219	**3,619**	**22,393**
2005	22	22	100%	1,402	16,636	3,814	17,839	266	1,399	2,582	12,457	358	906	**8,422**	**49,237**
2006	13	9	69%	1,102	13,436	1,182	5,048	144	696	1,349	6,144	108	294	**3,885**	**25,618**
2007	14	14	100%	1,054	10,243	1,216	5,240	194	937	600	2,690	16	41	**3,080**	**19,151**
2008	12	11	92%	957	10,717	1,928	8,240	252	1,219	1,189	5,472	97	252	**4,423**	**25,900**
2009	15	15	100%	857	9,373	1,697	7,450	349	1,702	797	3,686	0	0	**3,700**	**22,211**
2010	14	13	93%	783	7,957	732	3,168	219	1,100	620	2,794	52	124	**2,406**	**15,143**
2011	14	14	100%	1,440	13,476	1,243	5,607	284	1,320	570	2,704	2	4	**3,539**	**23,111**
2012	15	13	87%	852	8,811	835	3,523	361	1,475	579	2,701	207	469	**2,834**	**16,979**
2013	31	30	97%	1,501	16,525	3,296	14,614	792	3,562	1,466	6,917	0	0	**7,054**	**41,618**
2014	20	10	50%	1,708	18,980	1,054	4,333	346	1,669	1,326	5,962	220	589	**4,654**	**31,533**
2015	10	10	100%	627	4,781	768	3,023	308	1,584	382	1,699	0	0	**2,085**	**11,087**
2016	20	18	90%	1,082	10,184	787	3,113	321	1,431	303	1,367	17	48	**2,510**	**16,141**

Source ADF&G Division of Subsistence Alaska Subsistence Fisheries Datbase (ASFDB), accessed May 2019.

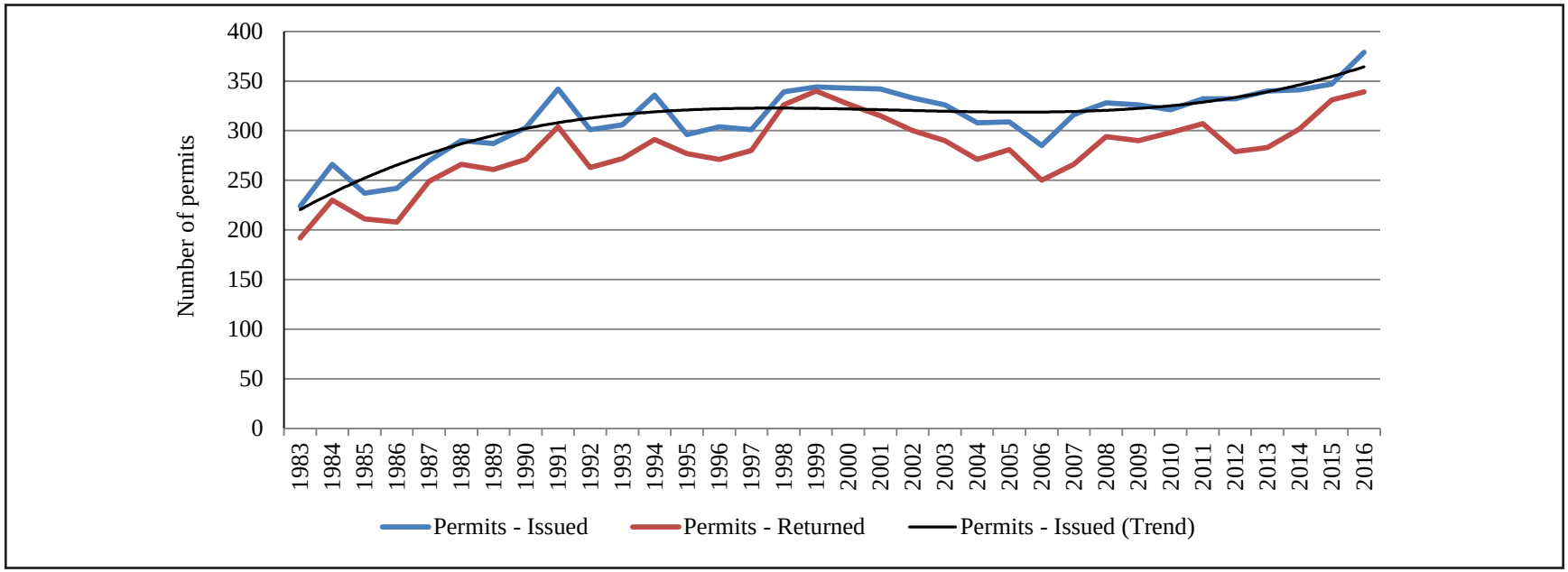


Figure 7-7.–Number of permits issued and returned by Dillingham residents, 1983–2016.

Table 7-5.–Historical harvest of salmon, based on returned permits, Dillingham, 1983–2016.

Year	Permits		Percentage of returned permits	Chinook		Sockeye		Coho		Chum		Pink		**Total**	
	Issued	Returned		Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	**Number**	**Pounds**
1983	224	192	86%	4,073	61,271	9,171	38,458	3,580	17,317	1,060	4,919	211	692	**18,094**	**122,658**
1984	266	230	86%	3,882	55,819	11,782	49,203	4,717	26,827	1,590	7,331	3,368	7,860	**25,339**	**147,039**
1985	237	211	89%	2,778	36,406	10,000	42,546	3,536	21,570	1,008	4,774	227	651	**17,549**	**105,947**
1986	242	208	86%	5,651	75,793	10,852	48,773	5,775	29,114	2,024	9,737	1,294	3,323	**25,595**	**166,739**
1987	270	249	92%	4,773	69,037	16,520	72,866	3,509	18,360	1,313	6,283	65	184	**26,180**	**166,730**
1988	290	266	92%	4,312	57,828	12,180	56,509	3,402	19,020	2,398	12,313	4,793	12,512	**27,085**	**158,183**
1989	287	261	91%	3,720	51,475	15,519	65,497	6,574	36,652	1,633	7,553	259	720	**27,706**	**161,898**
1990	303	271	89%	4,585	56,104	14,280	60,759	4,550	25,542	1,971	9,034	2,340	6,584	**27,726**	**158,022**
1991	342	304	89%	6,756	75,296	16,274	69,753	7,614	39,618	1,504	6,844	113	282	**32,261**	**191,792**
1992	301	263	87%	7,549	90,855	14,430	61,142	4,565	23,999	2,178	10,219	2,189	5,788	**30,911**	**192,003**
1993	306	272	89%	7,540	94,228	11,184	49,806	3,637	18,827	1,204	5,734	74	183	**23,640**	**168,778**
1994	336	291	87%	8,038	104,428	14,142	58,091	3,999	24,602	1,911	8,830	1,698	4,683	**29,788**	**200,634**
1995	296	277	94%	7,639	108,723	12,419	50,556	2,866	14,340	1,127	5,288	142	369	**24,192**	**179,275**
1996	304	271	89%	8,439	103,868	10,948	50,909	2,869	18,558	2,626	13,368	870	2,215	**25,752**	**188,917**
1997	301	280	93%	7,915	93,632	11,214	49,610	2,282	12,428	885	4,146	73	181	**22,368**	**159,997**
1998	339	326	96%	5,342	64,229	12,202	51,892	3,842	23,996	1,218	5,605	755	1,823	**23,359**	**147,545**
1999	344	340	99%	4,332	45,330	17,129	67,067	2,633	13,623	1,338	5,786	43	103	**25,474**	**131,908**
2000	343	327	95%	4,908	55,316	15,165	68,917	4,185	23,507	1,279	6,299	1,286	3,341	**26,824**	**157,380**
2001	342	315	92%	5,287	66,350	14,371	71,723	4,086	21,889	1,431	7,599	181	364	**25,357**	**167,926**
2002	333	300	90%	5,595	73,385	12,070	54,355	3,588	18,810	2,072	10,313	1,051	2,969	**24,376**	**159,832**
2003	326	290	89%	10,833	124,824	10,575	49,513	3,276	16,486	1,188	5,677	83	298	**25,955**	**196,797**
2004	308	271	88%	8,185	89,064	8,911	38,102	2,276	11,829	1,668	7,860	1,268	3,817	**22,308**	**150,672**
2005	309	281	91%	5,807	68,903	10,409	48,688	3,385	17,803	1,149	5,544	192	486	**20,942**	**141,424**
2006	285	250	88%	4,649	56,678	11,614	49,625	2,071	9,984	1,733	7,894	1,329	3,613	**21,397**	**127,793**
2007	316	266	84%	6,988	67,909	14,552	62,701	1,736	8,389	1,272	5,704	199	507	**24,747**	**145,210**
2008	328	294	90%	6,626	74,221	13,201	56,433	3,165	15,318	1,640	7,547	1,275	3,305	**25,908**	**156,822**
2009	326	290	89%	7,167	78,386	15,385	67,541	3,908	19,055	2,240	10,362	234	559	**28,934**	**175,903**
2010	321	298	93%	4,878	49,572	12,284	53,143	1,979	9,959	1,467	6,606	1,125	2,709	**21,732**	**121,989**
2011	332	307	92%	6,583	61,605	13,715	61,869	3,896	18,115	1,386	6,575	169	377	**25,749**	**148,541**
2012	332	279	84%	5,055	52,304	12,959	54,688	1,420	5,801	1,331	6,208	652	1,481	**21,417**	**120,482**
2013	340	283	83%	4,056	44,673	15,061	66,785	4,038	18,163	1,315	6,203	0	0	**24,470**	**135,824**
2014	341	302	89%	6,714	74,605	13,200	54,271	3,487	16,821	2,637	11,859	1,546	4,142	**27,584**	**161,698**
2015	347	331	95%	6,697	51,063	13,691	53,888	3,673	18,886	1,452	6,460	235	621	**25,748**	**130,918**
2016	379	339	89%	9,732	91,584	16,313	64,547	3,034	13,519	3,147	14,184	3,701	10,580	**35,927**	**194,414**

Source ADF&G Division of Subsistence Alaska Subsistence Fisheries Database (ASFDB), accessed May 2019.

To complement the historical record of the number of issued and returned permits, the survey form included questions to understand household participation and permit system compliance in the study communities. The questions asked whether a household obtained a permit for subsistence salmon fishing, how many people were listed on the permit and whether anybody listed on the permit was a non-household member from the same or another community, and various elements of net sharing. Survey questions focused on those elements of compliance and participation because the subsistence salmon permits used in Bristol Bay (Figure 7-1) require that a household list the names of household members who assist with operating a subsistence net, including the number of year-round residents; further notes on the subsistence permit explain that people using the net/site who are not members of the permit-issued household are required to have their own permit and file a separate report of their harvest. Also, access to the subsistence set gillnet fishery is an important means for households to obtain salmon, and lack of a household net is one element that may inhibit that access. Net sharing becomes an important part of community participation, and survey data can capture both an absence in household net use and the importance of sharing.

Clarks Point participation in the subsistence salmon fishery was about one-half of the total estimated population, with a total of 17 and 15 household members listed on permits in 2013 and 2014, respectively, with a mean of 2.1 household members listed on permits for both study years (Table 7-6; Table 2-1). The total number of households that reported listing non-household members on their permit was seven in 2013, and five in 2014. On average, 3.4 non-household members (either from Clarks Point or other communities) were listed on Clarks Point household permits in 2013, and 2.4 non-household members were listed on permits in 2014. Some households did list members from other communities on their subsistence permits: six households in 2013 and three in 2014, which averaged 1.8 (2013) and 2.7 (2014) non-community members listed on Clarks Point household permits. Lastly, survey research indicated that a certain number of households had a member who reported being listed on another household's permit; in Clarks Point, only in 2014 did two households report this occurrence. In relation to net sharing in Clarks Point, two households in 2013 shared a net with four other households, and two households shared a net in 2014 with five other households.

Ekwok had an average of 2.4 and 2.6 household members listed on subsistence salmon permits in 2013 and 2014, respectively, with a total of 41 and 42 household members listed in the study years (Table 7-7). The total amount of households that reported listing non-household members on their permit was six in both study years. On average, one non-household member (either from Ekwok or other communities) was listed on Ekwok household permits in 2013, and 1.5 non-household members were listed on permits in 2014. Some Ekwok households did list members from other communities on their subsistence permits: three households in 2013 and two households in 2014, which averaged one (2013) and 1.5 (2014) non-community members listed on Ekwok household permits. In 2013, two households reported having a member who was listed on another household's permit, which decreased to only one household in 2014. Households in Ekwok also shared subsistence nets: two households in 2013 shared their net with four other households, and three households shared a net in 2014 with seven other households.

New Stuyahok had an average of 3.5 and 2.8 household members listed on subsistence salmon permits in 2013 and 2014, respectively, with a total of 119 and 106 household members listed on permits in the study years (Table 7-8). The total amount of households that reported listing non-household members on their permit was 11 in 2013 and 20 in 2014. On average, 2.3 and 1.9 non-household members (either from New Stuyahok or other communities) were listed on New Stuyahok household permits in 2013 and 2014, respectively. No New Stuyahok households in 2013 listed members from other communities on their subsistence permits; only one household listed one non-community member on a permit in 2014. New Stuyahok households did report having a member who was listed on another household's permit: 20 households in 2013 and 17 households in 2014 reported this occurrence. Households in New Stuyahok also shared subsistence nets: seven households shared nets in both study years. Those 7 households in 2013 shared their nets with 12 other households. In 2014, seven households shared their nets with nine households.

Koliganek had an average of 2.2 and 3.5 household members listed on subsistence salmon permits in 2013 and 2014, respectively, with a total of 22 and 42 household members listed on permits in the study years (Table 7-9). The total amount of households that reported listing non-household members on their permit was eight in 2013 and five in 2014. On average, 2.9 non-household members (either from New Stuyahok or other communities) were listed on Koliganek household permits in 2013, and 2.4 listed in 2014. Four Koliganek households in 2013 listed eight members from other communities on their subsistence permits; only one household listed one non-community member on a permit in 2014. Koliganek households did have members who reported being listed on another household's permit: 3 households in 2013 and 12 households in 2014. Households in Koliganek also shared subsistence nets: in both study years two households shared nets with two and three other households, respectively.

The number of surveyed households in Dillingham in the study year 2014 was 200, and in 2016 was 205, and the following results are estimated given that a stratified sampling method was used in this community (Table 7-10). In 2014, the estimated number of households that obtained a permit was 279, compared to 302 in 2016. Despite the increase in 2016 of estimated total permit holders (an increase of an estimated 85 household members listed on permits in 2016 compared to 2014), the estimated average number of household members listed on permits was close for each study year: 2.7 and 2.8 in 2014 and 2016, respectively. The total estimated amount of households that reported listing non-household members on a permit was 50 in 2014 and 52 in 2016. An estimated 100 non-household members (either from Dillingham or other communities) were listed on permits in 2014, and 92 non-household members were listed in 2016. An estimated 17.1 households in 2014 listed 59 members from other communities on their subsistence permits. There was an increase in 2016 with an estimated 48 households listing 125 non-community members on their permits in 2016. Like all the other study communities for this project, Dillingham households did report having members who were listed on another household's permit: an estimated 51 households in 2014 and 62 households in 2016 reported this occurrence. Households in Dillingham also shared subsistence nets: in 2014, an estimated 87 households shared nets and, in 2016, an estimated 254 households shared a net with another household. Respondents shared a net with an estimated average of 1.6 and 2.4 households, respectively.

Table 7-6.–Summary of participation in subsistence fishery, Clarks Point, 2013 and 2014.

Permit participation characteristics	2013	2014
Eligible households	15	15
Households surveyed	13	13
Households reporting obtaining a subsistence salmon permit	8	7
Total household members listed on permits	17	15
Household members listed on permits		
Mean	2.1	2.1
Minimum	1	1
Maximum	4	4
Total households reporting listing non-household members on permit	7	5
Total non-household members listed on permits	24	12
Non-household members listed on permits		
Mean	3.4	2.4
Minimum	1	1
Maximum	6	6
Total households reporting listing people from other communities on permit	6	3
Total non-community members listed on permits	11	8
Non-community members listed on permits		
Mean	1.8	2.7
Minimum	1	1
Maximum	3	4
Total households reporting being listed on another household's permit	0	2
Total households sharing a net	2	2
Total number of households with whom respondents shared a net	4	5
Number of households with whom respondents shared a net		
Mean	2.0	2.5
Minimum	2	1
Maximum	2	4

Source ADF&G Division of Subsistence household surveys, 2014 and 2015.

Table 7-7.–Summary of participation in subsistence fishery, Ekwok, 2013 and 2014.

Permit participation characteristics	2013	2014
Eligible households	34	36
Households surveyed	29	30
Households reporting obtaining a subsistence salmon permit	17	17
Total household members listed on permits	41	42
Household members listed on permits		
Mean	2.4	2.6
Minimum	1	1
Maximum	5	6
Total households reporting listing non-household members on permit	6	6
Total non-household members listed on permits	6	9
Non-household members listed on permits		
Mean	1.0	1.5
Minimum	1	1
Maximum	1	3
Total households reporting listing people from other communities on permit	3	2
Total non-community members listed on permits	3	3
Non-community members listed on permits		
Mean	1.0	1.5
Minimum	1	1
Maximum	1	2
Total households reporting being listed on another household's permit	2	1
Total households sharing a net	2	3
Total number of households with whom respondents shared a net	4	7
Number of households with whom respondents shared a net		
Mean	2.0	2.3
Minimum	1	1
Maximum	3	4

Source ADF&G Division of Subsistence household surveys, 2014 and 2015.

Table 7-8.–Summary of participation in subsistence fishery, New Stuyahok, 2013 and 2014.

Permit participation characteristics	2013	2014
Eligible households	121	112
Households surveyed	89	101
Households reporting obtaining a subsistence salmon permit	37	43
Total household members listed on permits	119	106
Household members listed on permits		
Mean	3.5	2.8
Minimum	1	1
Maximum	7	6
Total households reporting listing non-household members on permit	11	20
Total non-household members listed on permits	23	35
Non-household members listed on permits		
Mean	2.3	1.9
Minimum	1	1
Maximum	4	5
Total households reporting listing people from other communities on permit	0	1
Total non-community members listed on permits	0	1
Non-community members listed on permits		
Mean	0.0	1.0
Minimum	0	1
Maximum	0	1
Total household reporting being listed on another household's permit	20	17
Total households sharing a net	7	7
Total number of households with whom respondents shared a net	12	9
Number of households with whom respondents shared a net		
Mean	1.7	1.3
Minimum	1	1
Maximum	4	3

Source ADF&G Division of Subsistence household surveys, 2014 and 2015.

Table 7-9.–Summary of participation in subsistence fishery, Koliganek, 2013 and 2014.

Permit participation characteristics	2013	2014
Eligible households	60	60
Households surveyed	48	51
Households reporting obtaining a subsistence salmon permit	12	14
Total household members listed on permits	22	42
Household members listed on permits		
Mean	2.2	3.5
Minimum	1	1
Maximum	5	6
Total households reporting listing non-household members on permit	8	5
Total non-household members listed on permits	23	12
Non-household members listed on permits		
Mean	2.9	2.4
Minimum	1	2
Maximum	5	3
Total households reporting listing people from other communities on permit	4	1
Total non-community members listed on permits	8	1
Non-community members listed on permits		
Mean	2.0	1.0
Minimum	1	1
Maximum	3	1
Total household reporting being listed on another household's permit	3	12
Total households sharing a net	2	2
Total number of households with whom respondents shared a net	2	3
Number of households with whom respondents shared a net		
Mean	1	1.5
Minimum	1	1
Maximum	1	2

Source ADF&G Division of Subsistence household surveys, 2014 and 2015.

Table 7-10.–Summary of participation in subsistence fishery, Dillingham, 2014 and 2016.

Permit participation characteristics	2014	2016
Eligible households	829	815
Households surveyed	200	205
Total estimated households obtaining a subsistence salmon permit	279.0	302.3
Total estimated household members listed on permits	746.8	831.8
Estimated household members listed on permits		
Mean	2.7	2.8
Minumum	1	1
Maximum	7	6
Total estimated households listing non-household members on permit	50.2	52.4
Total estimated non-household members listed on permits	100.4	91.7
Estimated non-household members listed on permits		
Mean	2.0	1.8
Minimum	1	1
Maximum	6	5
Total estimated households listing people from other communities on permit	17.1	47.9
Total estimated non-community members listed on permits	58.6	124.5
Estimated non-community members listed on permits		
Mean	1.2	2.6
Minimum	1	1
Maximum	2	5
Total estimated households listed on another household's permit	50.5	61.9
Total estimated households sharing a net	54.6	106.7
Total estimated number of households with whom respondents shared a net	87.4	254.2
Estimated number of households with whom respondents shared a net		
Mean	1.6	2.4
Minimum	1	1
Maximum	4	10

Source ADF&G Division of Subsistence household surveys, 2015 and 2017.

Overview Of Historical Harvests Based On Permit Returns

Historical harvests for each of the study communities are described below. These harvest estimates are developed from returned permits for the years 1983–2016, the latter of which is the last of the study years. Each permit holder specifies his or her place of residence on the permit, and harvest amounts for each community are expanded to give a representative estimate of species harvested annually. Permit harvest information is maintained in the ASFDB, which was the source for these data, and is presented annually by the Division of Subsistence in an annual subsistence and personal use salmon harvest report. The following series of figures depict historical estimated harvests based on permit returns: one chart shows total harvests of all species, and the other charts in each figure depict harvests by species (pink, chum, coho, sockeye, and Chinook salmon). Each annual estimated harvest amount (of individual fish) based on returned permits is represented by a circle. On each chart, the diamond represents the post-season household survey estimates for each study year of this project: 2013, 2014, and 2016 (Dillingham only).

Reasons for Household Survey and Subsistence Permit Harvest Estimate Discrepancies

Division of Subsistence research for the study communities of this report have also previously reported possible reasons for harvest estimate discrepancies based on survey and permit data (Evans et al. 2013:71; Holen et al. 2012:142; Schichnes and Chythlook 1991:116; Stariwat and Krieg 2016:25). It is the goal of this section to present data on two years of research and add further analysis to the communities of Dillingham, Clarks Point, Ekwok, Koliganek, and New Stuyuhok.

Several reasons point to why harvest estimates based on permit and survey data may differ, especially if survey data show less harvest than permit data. Permits require self-reporting, and some households record their harvests by date, location, and gear type (the most amount of detail), while other households do not. Rod and reel is not a legal subsistence gear for harvesting salmon in this region; however, some households add rod and reel harvests to their permits, and others do not. Whether or not rod and reel harvests can be excluded from the subsistence harvest estimate developed for the ASFDB depends on the level of detail provided on the permit. Household surveys, however, ask about all harvests by all gear types, and household survey data represented in these figures show harvests by subsistence gear only—harvests by other non-subsistence gear, primarily rod and reel, have been excluded from the values. The different methods of recording harvests means household survey estimates for the study years (2013, 2014, and 2016) based on household surveys may be decreased in comparison to those made according to permit returns because ADF&G cannot similarly exclude rod and reel harvests to generate a subsistence-only harvest estimate for permits that do not specify the gear type used.

Another difference in data may also be the result of spawning salmon (sockeye, chum, and coho) harvests being included in household survey estimates. Although subsistence permits require that all fish harvested be recorded on permits, spawning salmon are often not added to permits due to their late-season harvest timing. Most households return their permits at the end of the main subsistence fishing season but continue to fish spawning salmon into the months of September, October, and November. This may contribute to an increase in the overall estimated total harvest and harvest by species based on household surveys when compared to permit-only harvest estimates.

Another reason for estimate discrepancies may be that a household that did fish and returned a permit may not have been surveyed in the research year. Although researchers have a record of who obtained (and returned) permits in a community, a permitted fishing household may not have been present during the survey period or may have refused to be surveyed.

Lastly, permits for subsistence fishing in Bristol Bay may be issued to any Alaska resident. The individual obtaining the permit may choose to self-identify as a resident of a study community whether or not they live in the community for any period of time. In contrast, to qualify for household surveys, occupants needed three or more months of residency in the study community for the study year. As such, permits may be issued to more households than were in the community based on self-identification. Household surveys, therefore, did not capture data from an equal number of households as did permits issued for a particular community.

The key element to the following series of figures is to evaluate harvests over time via participation in the permit system and to gauge how close or far from the trend line are household survey estimates. Although additional permits were issued in the study years (to households that fished without a permit), this may not always indicate that those households issued ex post facto permits were high harvesters or contributed significant harvests than most regularly permit-participating households. If survey-based estimated salmon harvests appear to align with historical harvests estimated via the permit system, this indicates that there were no households in the survey sample that contributed to the survey-based harvest amount being under- or over-estimated. However, if there is a great difference between the survey-based harvest estimate and recent historical permit-based estimates, then the survey sample achievement likely factored into an under- or over-estimated harvest; for example, a surveyed high-harvesting household that did not historically turn in a permit would cause the survey-based estimate to be disparate in comparison to the recent historical permit-based estimates. With only two study years for each community for this project, time-series data require additional research in order to better obtain information on how representative annual permit-based estimates are of a community's overall harvest.

Clarks Point

The total harvest of all five salmon species is depicted in Figure 7-8 and Table 7-1, which show harvests, by individual fish, from 1983–2016. Clarks Point shows a stable trend line that hovered around an estimated total 1,000–1,500 individual salmon harvested in the 34-year period shown. In 2013, this study, via post-season surveys, estimated some additional harvest (the diamond [surveys] is slightly higher than the circle [permits]) than the preceding years (Figure 7-8–Total harvests). However, in 2014, a very large harvest estimate increase is shown, both from permit returns and surveys; this change is attributed primarily to sockeye and coho salmon harvests (Figure 7-8–Sockeye harvests, Coho harvests). This increase was the result of the inclusion in the 2014 data set of a Clarks Point household that provides salmon for several other households and consequently has a large harvest. This household was not surveyed and did not have a subsistence permit for 2013. The Chinook salmon harvest seems to be represented well in Clarks Point by both permit and survey efforts, meaning that post-season surveys did not necessarily capture more harvest than historically estimated for the community (Figure 7-8–Chinook harvests). Pink and chum salmon estimates aligned with historical estimates of these species, which indicates that there was no identifiable source from the survey sample that caused under- or over-estimation. (Figure 7-8–Pink harvests, Chum harvests). Post-season surveys seem to identify what Clarks Point residents normally harvest for the three species (Chinook, pink, and chum salmon) by aligning with the permit estimates of preceding decades prior to the study years.

Ekwok

The total harvest of all five salmon species combined is depicted in Figure 7-9–Total harvests. Ekwok showed a dramatic downward harvest trend beginning in the early 1980s—from a high of about 7,784 salmon in 1986, to an estimated low of slightly more than 1,300 salmon beginning in 2005 (Table 7-2). This contrasts with the previously mentioned trend of an increasing number of permits issued, particularly since 2000 (Figure 7-4); however, the annual salmon harvest estimates have benefitted from a consistently high return rate over the last two decades (Table 7-2). Fluctuations where estimated harvests are above and below the trend line began with higher variation in the early 1990s, until about the early 2000s. Post-season survey estimates for 2013 and 2014 align fairly consistently with Ekwok's permit-only estimates of the last decade for harvests of all fish, including sockeye and chum. (Figure 7-9–Total, Sockeye, and Chum harvests). In 2014, the Chinook salmon subsistence harvest based on household surveys was higher than the permit system estimates from previous decades (Figure 7-9–Chinook harvests). Also, more pink salmon subsistence harvests in 2014 were estimated via the post-season study effort compared to most of the historical permit system estimates (typically fewer than 50 fish) since 2001. Both the 2013 and 2014 post-season study efforts estimated higher coho harvests in comparison to most of the estimates from the last two decades; however, the 2014 survey-based estimate was lower than the permit-based estimate. The difference in the 2014 estimates is in part attributed to rod and reel harvests of this species being excluded from the survey-based subsistence harvest estimate (more discussion about harvests by gear type is under

the subheading "Commercial Harvest Retention and Rod and Reel Harvests"). In general, the charts in Figure 7-9 point to the fact that Ekwok households have harvested roughly similar amounts of salmon over time since the mid-1990s, and survey-based estimates of salmon appear to align with historical values.

New Stuyahok

The total harvest of all five salmon species combined is depicted in Figure 7-10–Total harvests. New Stuyahok showed a downward harvest trend beginning in the mid-1980s, from a high of about 20,000 salmon harvested in 1986 (Table 7-3). In 1983, the total estimated harvest was 18,714 salmon; in comparison, 5,716 salmon were harvested in 2016 despite relatively similar permit return percentages (75% and 77%, respectively) from a similar number of households issued a permit (40 and 43, respectively). The difference between the 1983 and 2016 permit system harvest estimates may be due to other characteristics of the community's harvest activity (for example, the intentional harvest of fewer salmon) rather than strictly due to fewer fish being recorded on permits. The trend line shows the harvest of salmon fluctuated between 5,000–10,000 fish from about the mid-1990s onward, except for a high year of nearly 12,000 salmon harvested in 2013 (Figure 7-10–Total harvests). For New Stuyahok, the permit return rate showed fluctuations from those households that participated in the subsistence salmon permit program (Figure 7-5). Since 1994, the percentage of returned household permits has varied (67%–100%), but the harvest trend is flat; therefore, the permit return rate has not appeared to greatly influence whether salmon harvests are high or low in comparison to the trend line.

In 2013, according to the estimates by both permits and post-season surveys, the harvest increased for all species, except pink salmon, and the total harvest overall in comparison to most harvest estimates since 1994 (Figure 7-10). In 2014, both permit system and post-season survey estimates are more closely aligned with the recent historical permit-based harvest estimates for the total harvest and also harvests of each species except Chinook salmon. For Chinook salmon in 2014, estimates were less than in 2013, but more than permit system estimates from 2015 and 2016, and also more than most of the recent historical permit-based estimates. Additionally, the survey-based estimate for 2014 is less than the permit-based estimate; according to post-season surveys a small amount of Chinook salmon were harvested by rod and reel, but the fact that those harvests are excluded from the survey-based estimate is likely not the only reason for the difference from the permit-based estimate for 2014 (see previous subheading "Reasons for Household Survey and Subsistence Permit Harvest Estimate Discrepancies").

Koliganek

Total harvest of asll five salmon species combined is depicted in Figure 7-11–Total harvests. Like Ekwok and New Stuyahok, the study community Koliganek also showed a downward harvest trend line. From a high of about 18,000 salmon harvested in 1984, estimates decreased: from 1987 onward, the permit-based estimates did not exceed 10,000 fish (Table 7-4). From 1992 through 2016, most Koliganek total salmon harvests ranged between about 2,000–5,000 fish; exceptions to that range occurred in 2003, 2013, and 2005 when the estimated harvests were 5,720, 7,054, and 8,422, respectively. In the study years for this community, estimated total salmon harvests were slightly more than in the preceding decades, and also post-study years 2015 and 2016. Thus, the addition of household surveys indicates that harvest reporting increased, thereby improving harvest estimates. While Chinook salmon permit system estimates have fluctuated over the past several decades, harvests estimated in this study based on post-season surveys appear aligned closely with historical values in 2013, but higher in 2014 (Figure 7-11–Chinook harvests). Sockeye salmon estimates are slightly higher in the first study year, which may be due, in part, to the inclusion of spawning sockeye harvests (Figure 7-11–Sockeye harvests). The coho salmon harvest estimates show a very high increase in 2013 compared to all other permit system estimates, which may be the result of post-season surveys capturing later-season harvest of this species that occurred after households already returned their permits. Similarly to other communities in this study, the high harvest of one or two particular species may be the result of a household (single or multiple) having harvested a large amount in one year, but not the preceding years; this may be a new household, a household that newly decided to obtain a permit, or a household that attributed their place of residence (their fishing location) as other than Koliganek for the years prior. Chum salmon harvests in 2013 align with historical harvest values; however, in 2014 survey results estimated

a higher harvest than the preceding 10 years, although the 2014 estimate was somewhat still within the range of the 2003 and 2005 permit estimates (Figure 7-1–Chum harvests). In 2013, there was no harvest recorded from either permits or surveys for pink salmon, and, in 2014, permits indicated more harvest than post-season surveys, though both estimates aligned with the permit-only estimate of 2012 (Figure 7-1–Pink harvests).

Dillingham

Total harvest of all five salmon species combined is depicted in Figure 7-12—Total harvests. Unlike the smaller communities in this study, Dillingham's total salmon harvest over time does not show an overall downward trend. From 1983, an increase in harvest occurred to about the mid-1990s, and following 1996, a slight decrease occurred until about 2006, followed by a general increase to 2016. All salmon species harvested ranged from about 20,000 fish to about 35,000 fish. As the number of issued and returned permits has increased for Dillingham households since 1983, the general trend of increased salmon harvests has also occurred (Table 7-5).

For both study years, the overall harvest estimates for Dillingham based on household surveys were increased compared to those estimated from returned permits. Chinook, sockeye, and pink salmon harvests in 2014 reflect historical harvest trends (Figure 7-12—Chinook, Sockeye, and Pink harvests); household surveys estimated nearly the same harvest as the permit system for those three species in 2014. In 2014 for coho salmon, and in 2016 for Chinook and sockeye salmon, post-season surveys over-estimated the harvest than what was historically estimated by the permit system in Dillingham. However, in 2016, for coho salmon, both estimates are aligned with historical permit values, indicating surveys captured what Dillingham typically harvests for coho salmon. Pink salmon survey estimates for 2014 are somewhat aligned with historical trends, yet in 2016 household surveys under-estimated when compared to the permits and over-estimated what has been historically estimated in the community (Figure 7-12—Pink harvests). The chum salmon harvest survey estimate in 2014 indicates an over-estimation than what was historically estimated, though the permit estimate was high in 2014 as well. The chum salmon harvest was again high in 2016 as estimated by permits, yet household surveys were more aligned with historical harvest trends (Figure 7-12—Chum harvests).

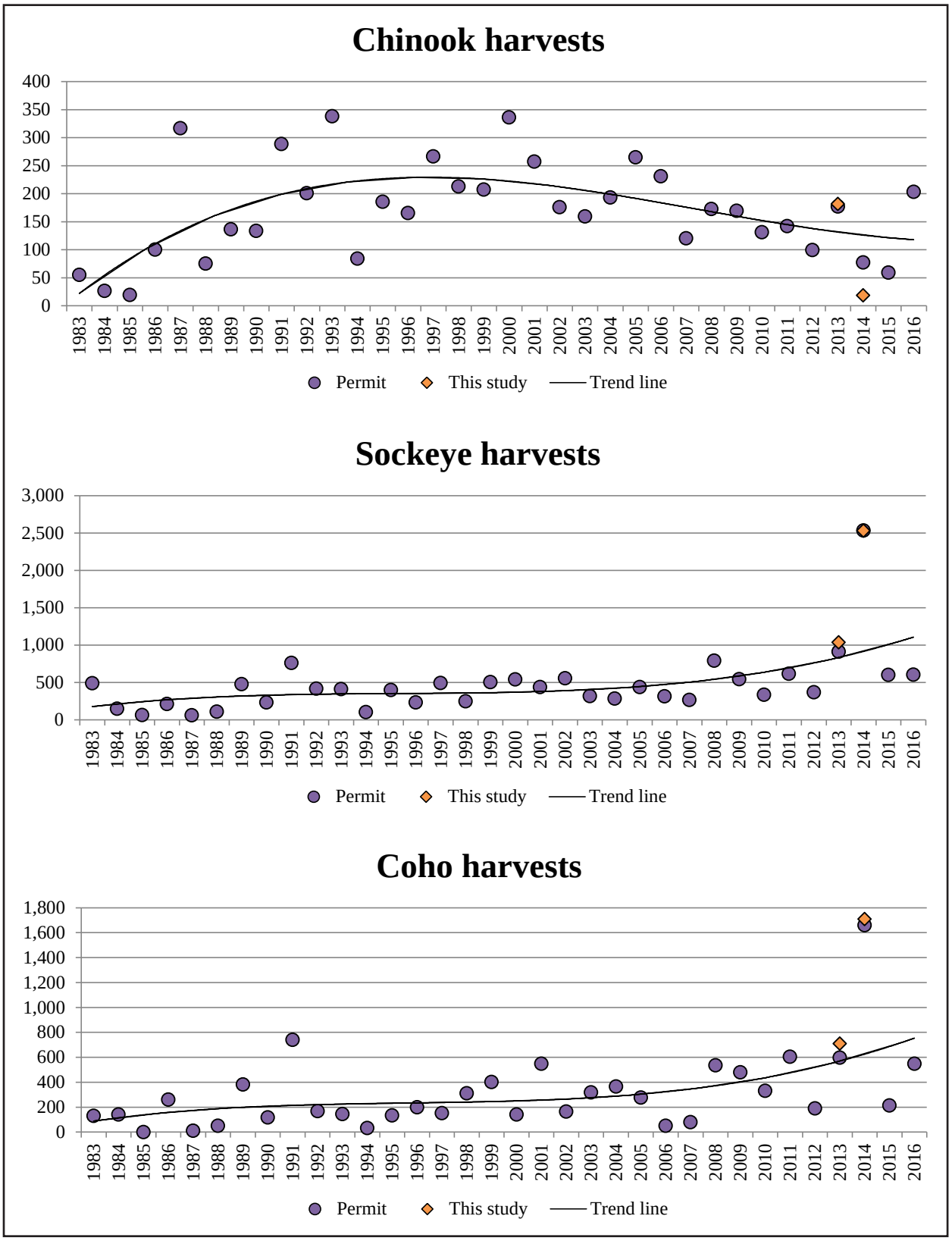
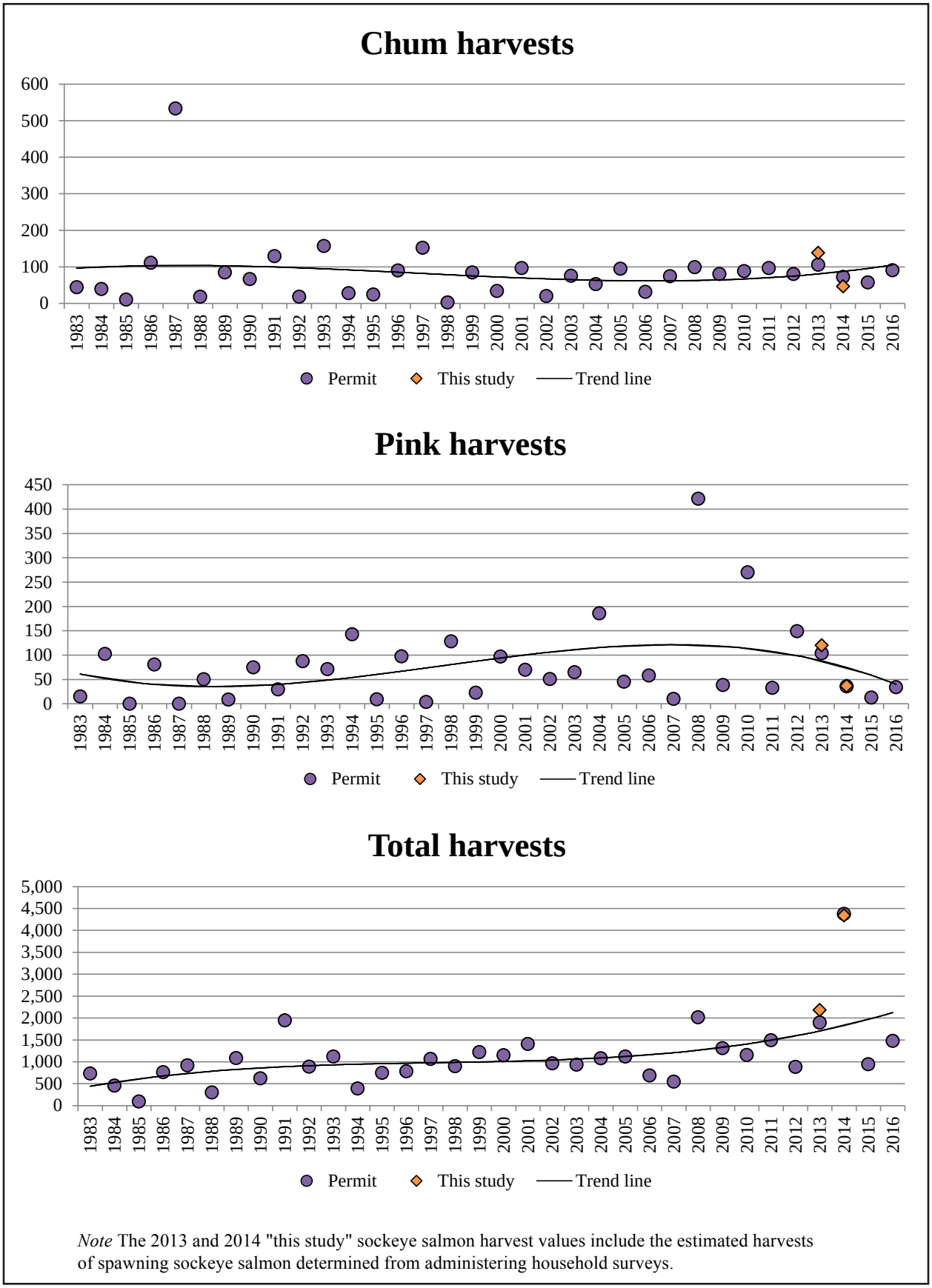


Figure 7-8.–Historical estimated subsistence salmon harvests by species, Clarks Point, based on permit returns, 1983–2016, and household surveys, 2013 and 2014



Note The 2013 and 2014 "this study" sockeye salmon harvest values include the estimated harvests of spawning sockeye salmon determined from administering household surveys.

Figure 7-8.–Page 2 of 2.

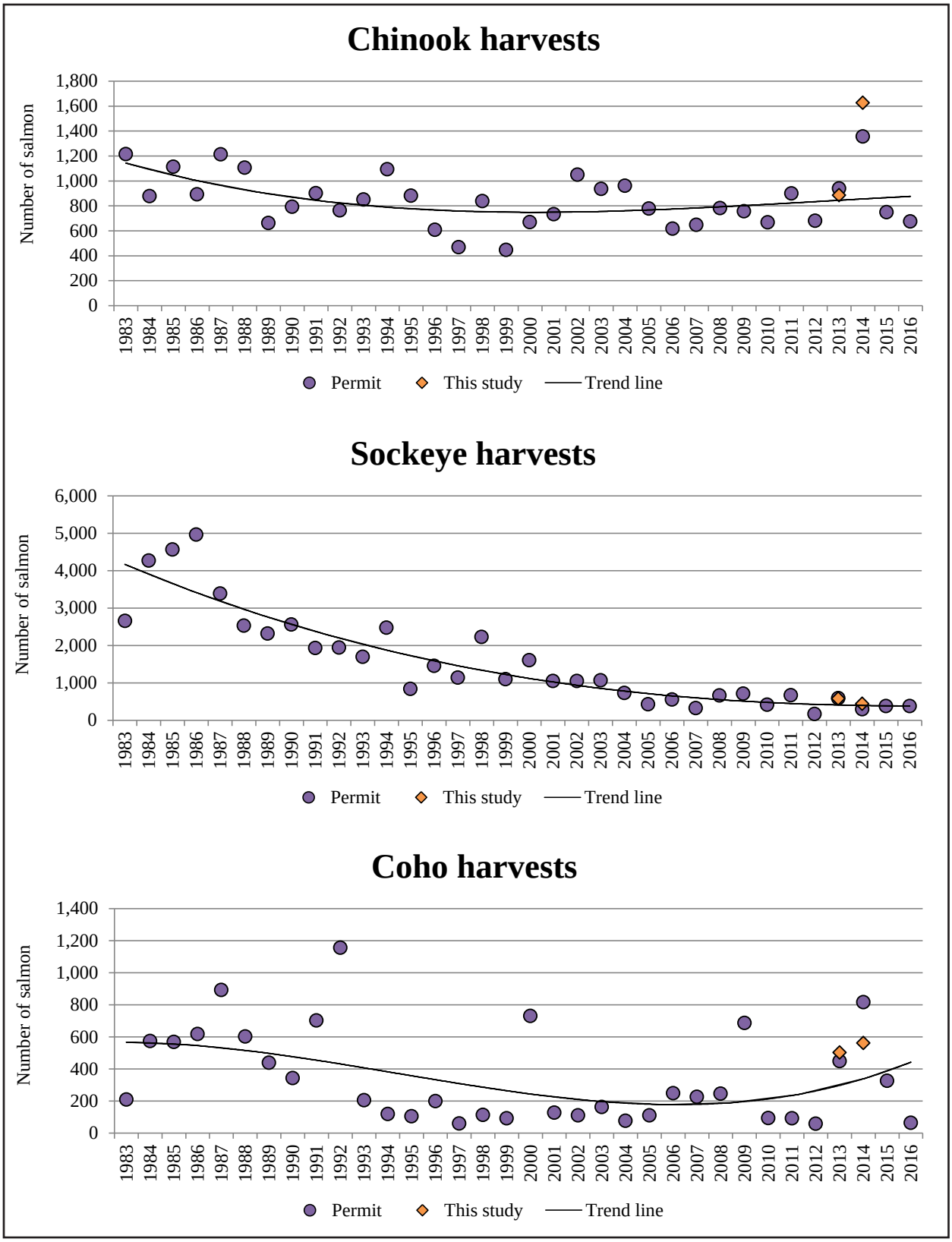
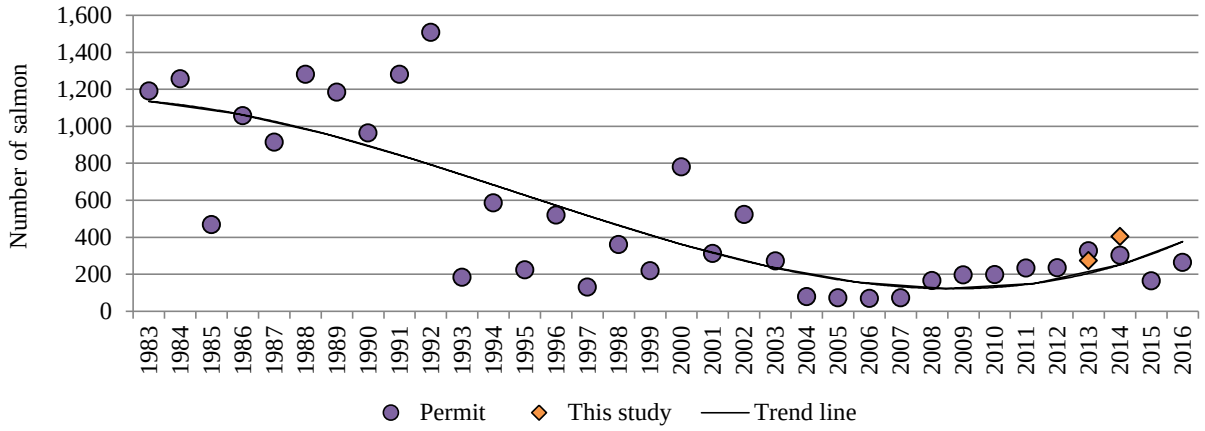
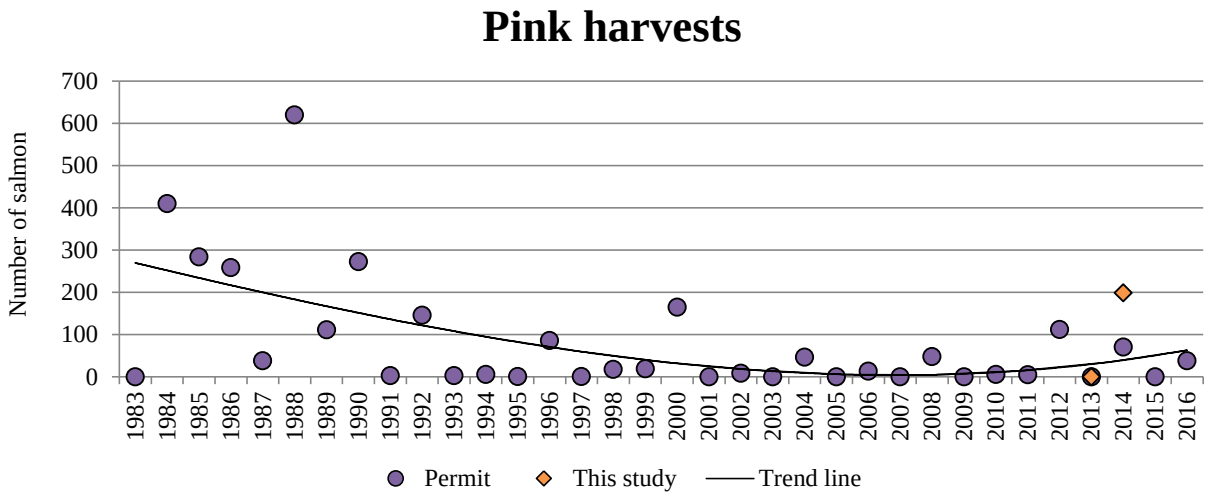
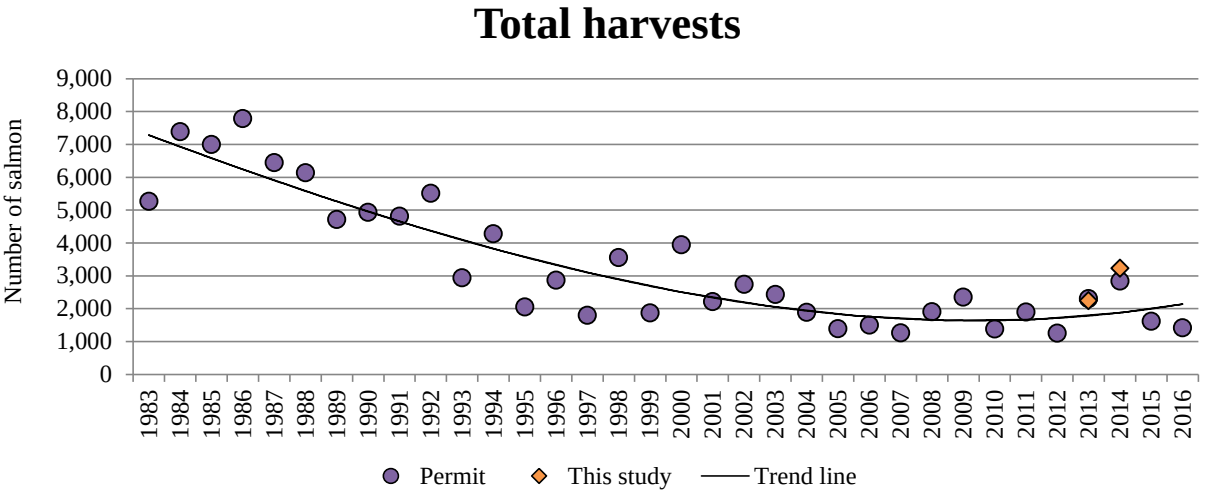


Figure 7-9.–Historical estimated subsistence salmon harvests by species, Ekwok, based on permit returns, 1983–2016, and household surveys, 2013 and 2014







Note The 2013 and 2014 "this study" sockeye salmon harvest values include the estimated harvests of spawning sockeye salmon determined from administering household surveys.

Figure 7-9.–Page 2 of 2.

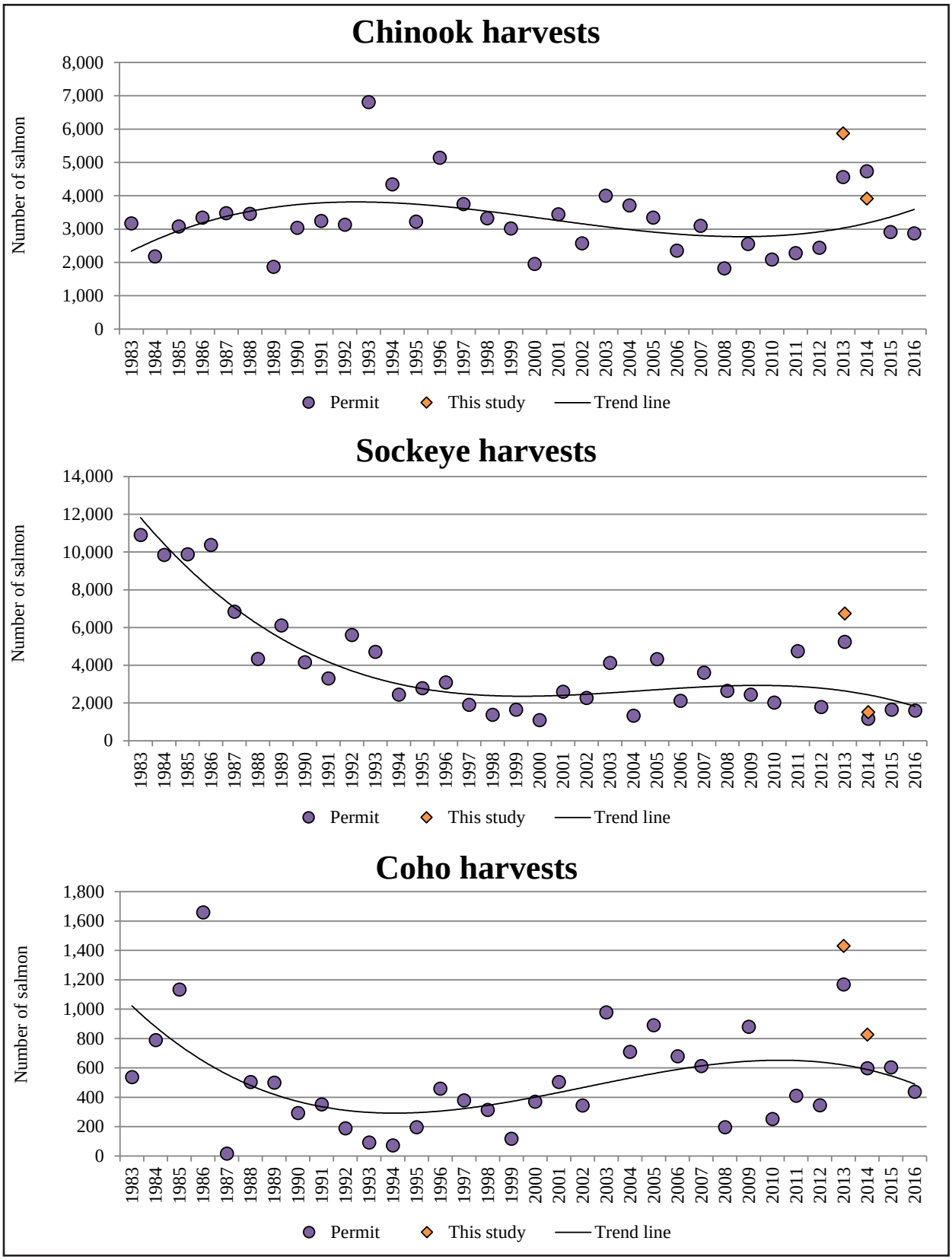
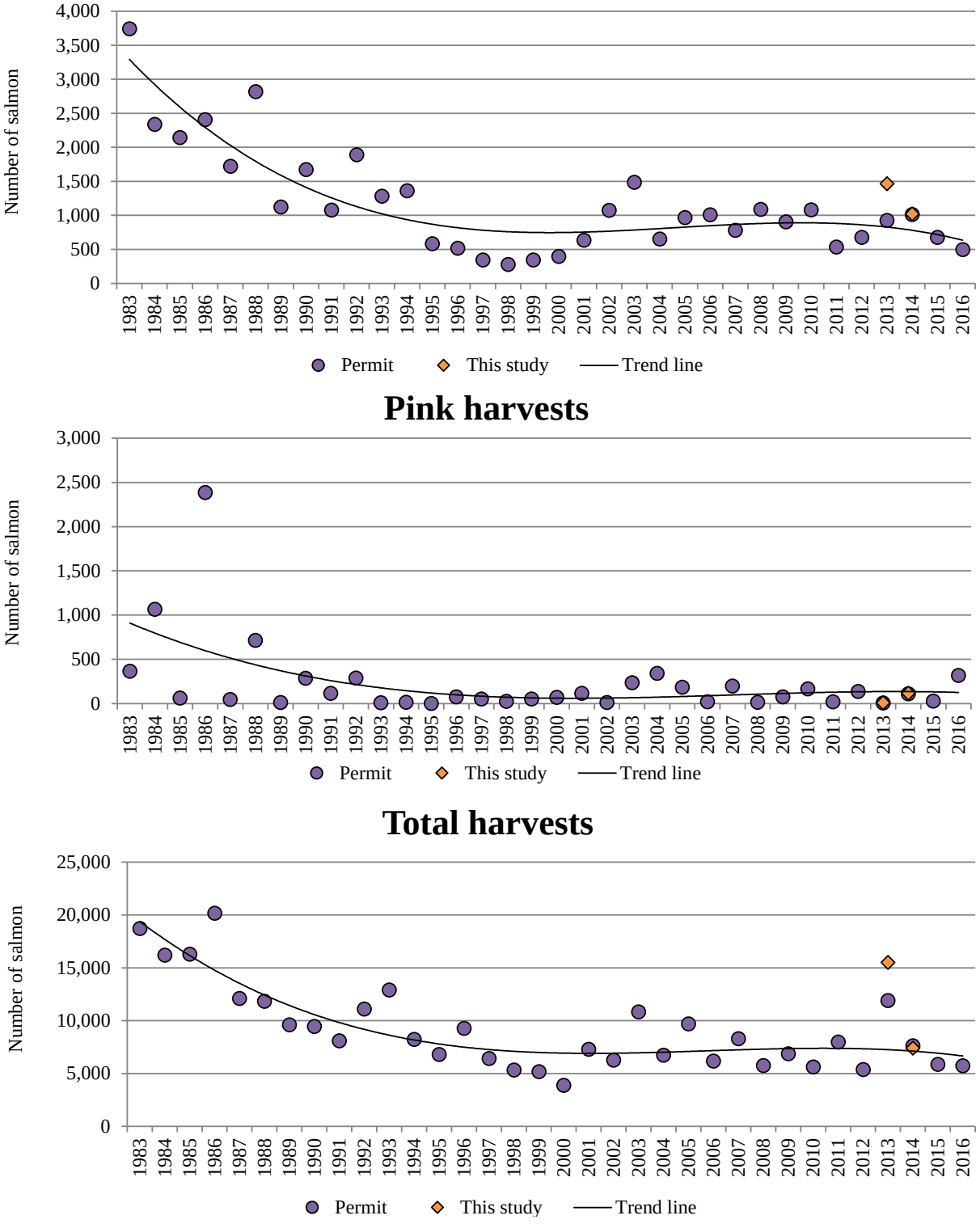


Figure 7-10.–Historical estimated subsistence salmon harvests by species, New Stuyahok, based on permit returns, 1983–2016, and household surveys, 2013 and 2014



Note The 2013 "this study" chum, coho, and sockeye salmon harvest values include the estimated harvests of spawning chum, spawning coho, and spawning sockeye salmon determined from administering household surveys; also, the 2014 "this study" sockeye salmon harvest value includes the estimated harvest of spawning sockeye salmon.

Figure 7-10.–Page 2 of 2.

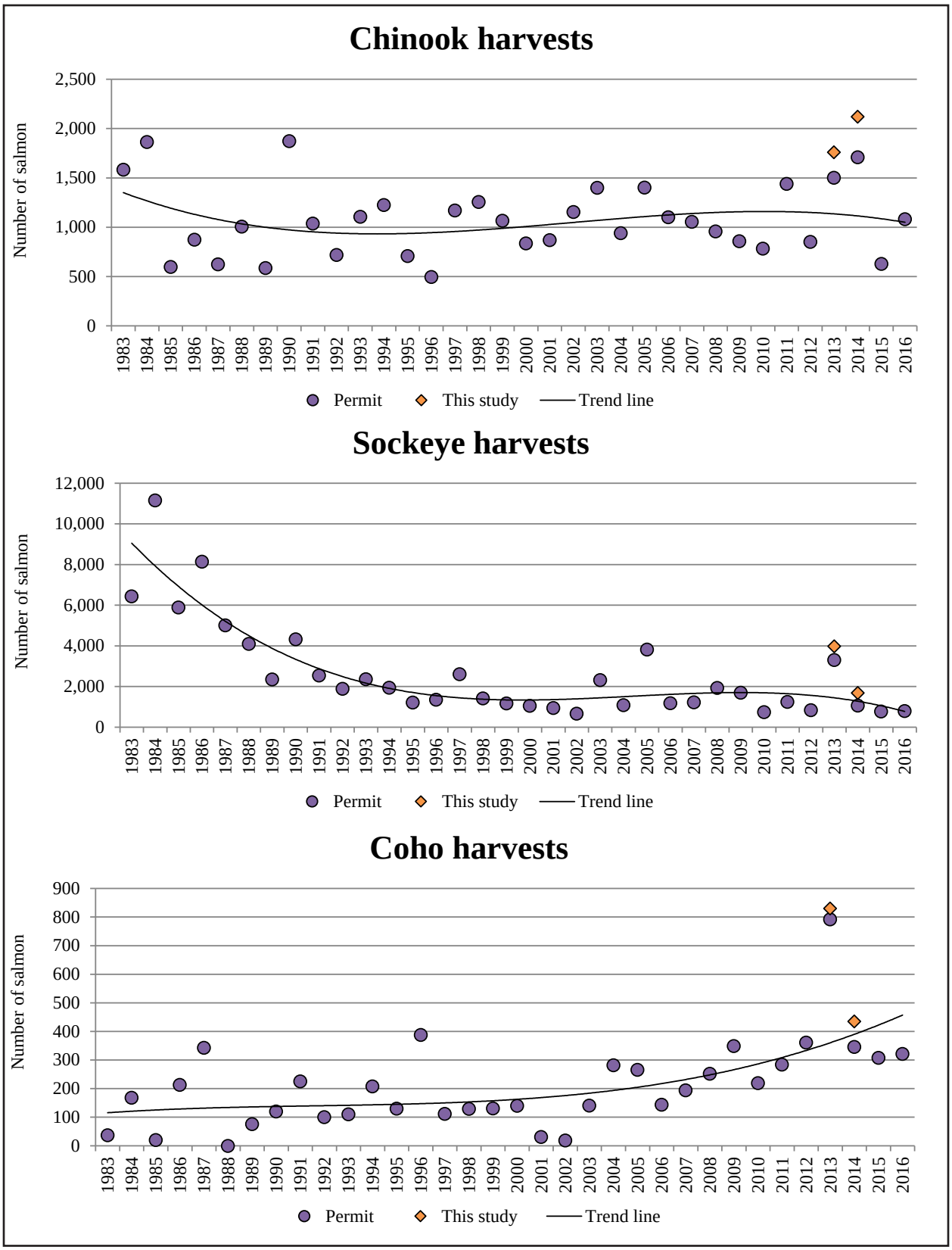
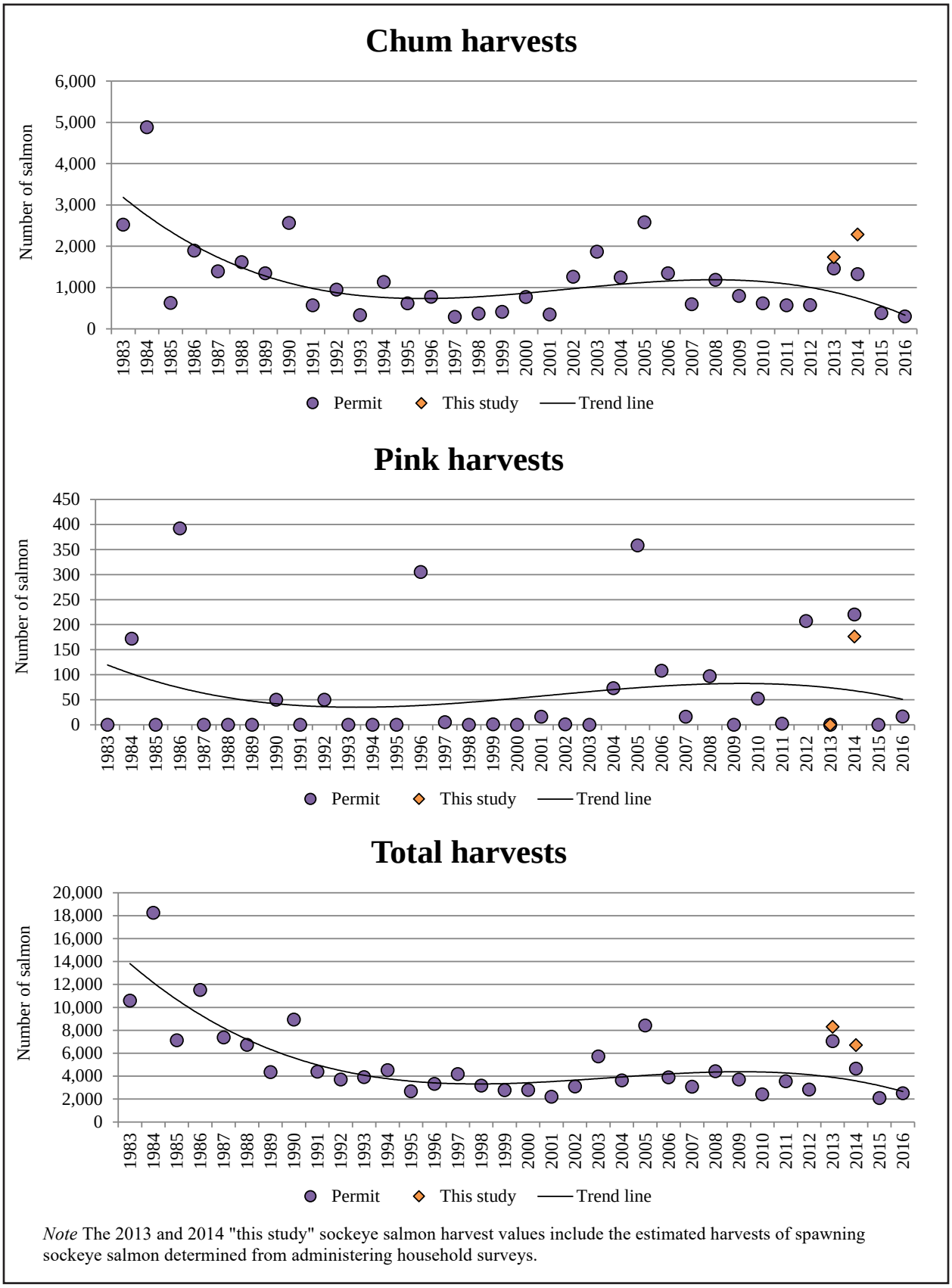


Figure 7-11.–Historical estimated subsistence salmon harvests by species, Koliganek, based on permit returns, 1983–2016, and household surveys, 2013 and 2014



Note The 2013 and 2014 "this study" sockeye salmon harvest values include the estimated harvests of spawning sockeye salmon determined from administering household surveys.

Figure 7-11.–Page 2 of 2.

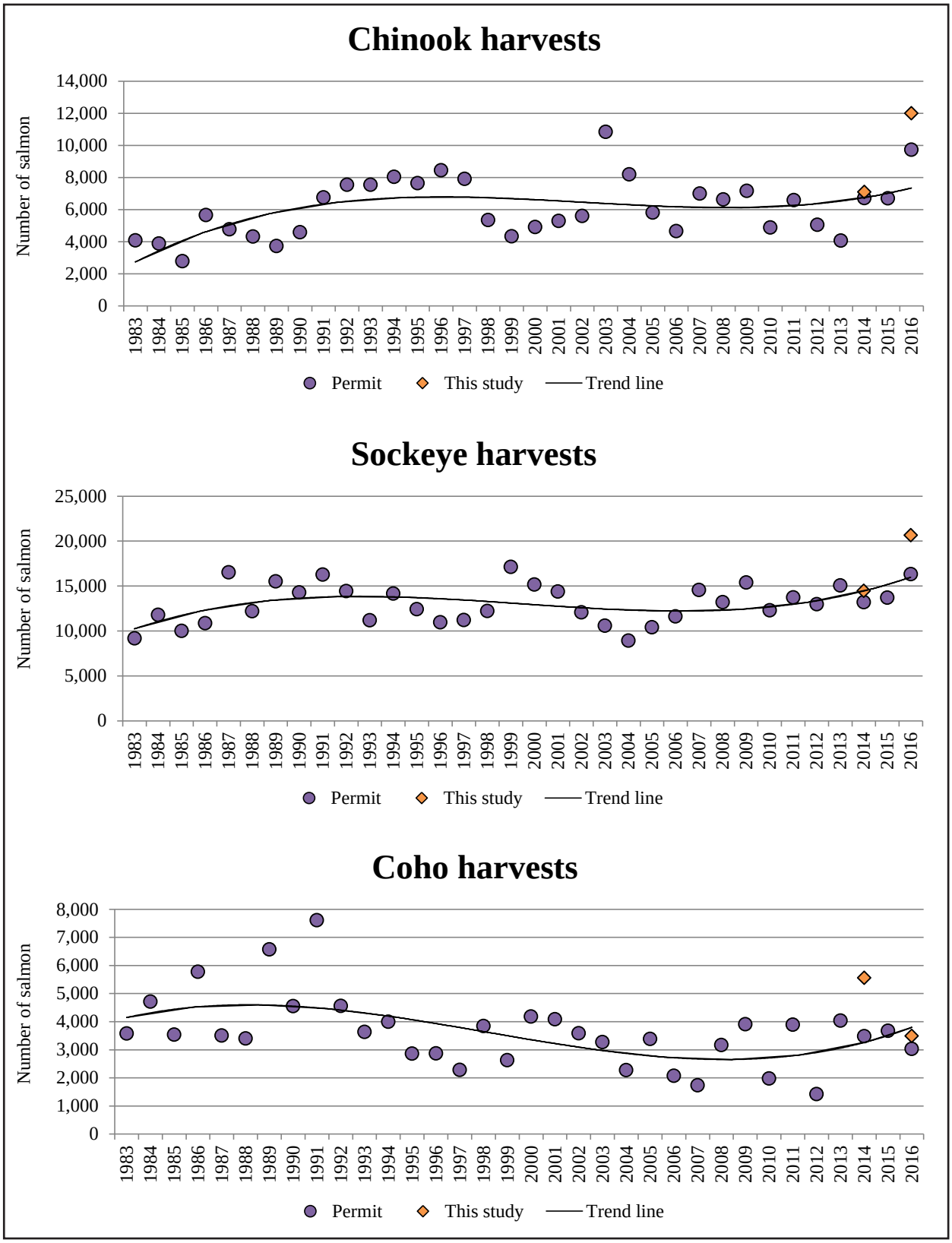
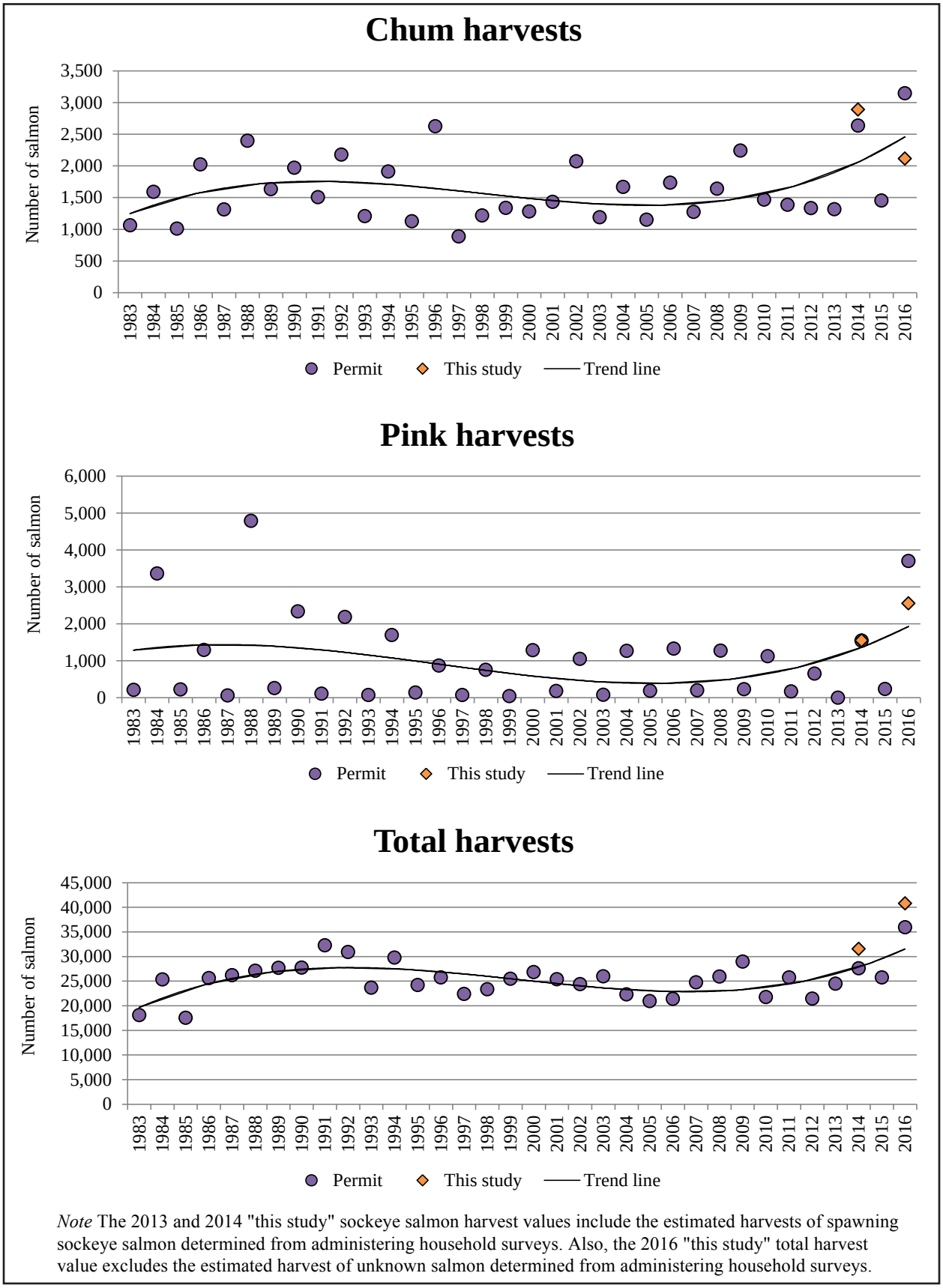


Figure 7-12.–Historical estimated subsistence salmon harvests by species, Dillingham, based on permit returns, 1983–2016, and household surveys, 2014 and 2016



Note The 2013 and 2014 "this study" sockeye salmon harvest values include the estimated harvests of spawning sockeye salmon determined from administering household surveys. Also, the 2016 "this study" total harvest value excludes the estimated harvest of unknown salmon determined from administering household surveys.

Figure 7-12.–Page 2 of 2.

Abundance and Subsistence Harvests of Salmon in the Nushagak District

Changes in Chinook salmon stock abundance for the Nushagak River watershed may affect salmon availability for subsistence fishers. A summary of Nushagak District Chinook and sockeye salmon run abundance is described below, as an expression of a total run for each study year. Subsistence harvests in the Nushagak District for sockeye and Chinook salmon, based on returned subsistence permits, are also given for each study year (2013, 2014, and 2016). Additionally, subsistence harvest values are provided for all salmon species. The Nushagak District includes the Wood River, Igushik River, Nuyakuk River, Mulchatna River, and Snake River.

Chinook Salmon: 2013

In the first study year of this project, 2013, the total Chinook run in the Nushagak District was 133,246 (Elison et al. 2018:86). This was above the 2007–2016 average of 121,523 fish, yet far under the 20-year average of 178,732 fish. The subsistence harvest in 2013 of Chinook salmon for the Nushagak District was 11,602 fish, below the 2007–2016 average of 12,649 fish, and the 20-year average of 12,672 fish (Table 7-11).

Sockeye Salmon: 2013

The sockeye salmon total run in 2013 for the Nushagak District was 5,630,357 fish (Elison et al. 2018:83). This was below the 2007–2016 average total run of 8,938,011 and the 20-year average of 8,580,092 fish. The Nushagak District subsistence sockeye salmon harvest totaled 30,283, above the 2007–2016 average of 25,718 fish and the 20-year average of 24,935 fish (Table 7-11).

In 2013, the total subsistence fish harvest of all species for the Nushagak District was 54,176 fish (Table 7-11). The total number of permits issued was 584.

Chinook Salmon: 2014

In the second year of this study, 2014, the total run of Chinook salmon in the Nushagak District was 96,872 fish (Elison et al. 2018:86). This was far below the 2007–2016 average of 121,523 fish, and far under the 20-year average of 178,732 fish. Subsistence harvests of Chinook salmon for the Nushagak District totaled 16,049 fish, above the 2007–2016 average of 12,649 fish and the 20-year average of 12,672 fish (Table 7-11).

Sockeye Salmon: 2014

The sockeye salmon total run in 2014 for the Nushagak District was 10,171,331 fish (Elison et al. 2018:83). This was above the 2007–2016 average total run of 8,938,011 fish and also the 20-year average of 8,580,092 fish. The Nushagak District subsistence sockeye salmon harvest totaled 27,073 fish, slightly above the 2007–2016 average of 25,718 fish and the 20-year average of 24,935 fish (Table 7-11).

In 2014, total subsistence salmon harvests of all species for the Nushagak District was 58,425 fish, an increase of 4,249 fish from 2013 (Table 7-11). The total number of permits issued was 581.

Chinook Salmon: 2016

In the third year of this study, 2016, the Chinook salmon total run in the Nushagak District was 166,006 fish (Elison et al. 2018:86). This was far above the 2007–2016 average of 121,523 fish, but under the 20-year average of 178,732 fish. Subsistence harvests of Chinook for the Nushagak District totaled 15,735 fish, slightly above both the 2007–2016 average of 12,649 fish and the 20-year average of 12,672 fish (Table 7-11).

Sockeye Salmon: 2016

The sockeye salmon total run in 2016 for the Nushagak District was approximately 11,345,527 fish (Elison et al. 2018:83). This was above the 2007–2016 average total run of 8,938,011 fish and the 20-year average of 8,580,092 fish. The Nushagak District subsistence sockeye salmon harvest totaled 24,790, slightly below the 2007–2016 average of 25,718 fish and the 20-year average of 24,935 fish (Table 7-11).

In 2016, total subsistence salmon harvest of all species for the Nushagak District was 53,500 fish, a decrease of approximately 4,925 fish from 2014 (Table 7-11). The total number of permits issued was 613.

Understanding Run Abundance Via Evaluating Subsistence Chinook Harvest

Chinook Salmon: Historical Harvests (1998–2016)

Chinook salmon subsistence harvests based on returned permits in the Nushagak District[1] have remained somewhat stable over time (Table 7-11). The most recent 10-year average (2008–2017) was 12,506 fish, the 10-year average from 1998–2007 was 12,495 fish, and the 20-year average was 12,501 fish (Table 7-11). Figure 7-13 shows subsistence harvests of Chinook salmon depicted in relation to the total run, in numbers of fish. Chinook salmon subsistence harvests appear to be somewhat stable over time, which the averages described above corroborate.

In a general sense, total run does sometimes mirror subsistence harvest, as depicted from 1998 onward (Figure 7-13). The reduction in harvest seen from 1998 to 2000 appears to follow the decrease in total run. Conversely, a parallel rise in both harvest and total run is seen from 2001 through 2003. Between 2004 through 2006 the Chinook total run decreased, and the harvests also declined; yet after that point subsistence harvests nearly stabilized for the following three years (2007–2009) while total run continued to reduce. From 2010 onward, total run estimates of Chinook salmon and subsistence harvests increased overall through 2016, although in a few instances only one characteristic increased in relation to the previous year while the other characteristic decreased. As evidenced by this research, the study years of 2014 and 2016 (given that more permits were issued in the field in comparison to the number issued in 2013) depict an increase in the Chinook harvest. Interestingly, 2013 does not show this occurrence, despite permits issued by staff as well.

Overall, it appears that in this area, run abundance is somewhat independent of the harvest needs of subsistence fishers; however, in more extreme low abundance years fishers are likely somewhat affected by diminished returns of Chinook salmon. Subsistence harvest may be an indicator of Chinook salmon abundance, although the harvest value cannot be relied on for accurate depictions of year-to-year run abundance. Years of near-constant subsistence harvest do not necessarily indicate poor Chinook salmon runs or returns, although further research may be needed to better understand this relationship. As the Chinook salmon subsistence harvest averages indicate, as well as the data presented in this report, subsistence fishers will likely continue to fish for their needs, unless anomalous years inhibit their ability to obtain salmon altogether.

1. The Nushagak District includes the Wood River, Igushik River, and the Nushagak-Mulchatna rivers. Communities within the Nushagak District include Dillingham, Manokotuk, Aleknagik, New Stuyahok, Ekwok, Clarks Point (which also included Ekuk), and Koliganek.

Table 7-11.–Subsistence salmon harvest by species, Bristol Bay Area, Nushagak District, 1998–2018.

Year	Permits issued	Sockeye	Chinook	Chum	Pink	Coho	**Total**
1998	562	25,217	12,258	2,487	1,076	5,316	**46,355**
1999	548	29,387	10,057	2,409	124	3,993	**45,969**
2000	541	24,451	9,470	3,463	1,662	5,983	**45,029**
2001	554	26,939	11,760	3,011	378	5,993	**48,080**
2002	520	22,777	11,281	5,096	1,179	4,565	**44,897**
2003	527	25,491	18,686	5,064	403	5,432	**55,076**
2004	511	17,491	15,610	3,869	1,944	4,240	**43,154**
2005	502	23,916	12,529	5,006	793	5,596	**47,841**
2006	461	20,773	9,971	4,448	1,591	3,590	**40,373**
2007	496	25,127	13,330	3,006	430	3,050	**44,944**
2008	571	26,828	12,960	4,552	1,923	5,133	**51,395**
2009	530	26,922	12,737	4,510	355	6,777	**51,300**
2010	528	22,326	9,150	3,660	1,672	2,983	**39,791**
2011	525	28,006	12,461	3,055	230	5,746	**49,498**
2012	517	20,587	10,350	3,072	1,309	2,642	**37,960**
2013	584	30,283	11,602	4,368	206	7,717	**54,176**
2014	581	27,073	16,049	5,731	2,110	7,463	**58,425**
2015	591	25,240	12,117	2,953	295	5,644	**46,248**
2016	649	27,425	16,576	4,602	4,409	4,792	**57,803**
2017	562	31,206	11,060	3,965	254	5,732	**52,218**
20-Year Avg.	543	25,373	12,501	3,916	1,117	5,119	48,027
1998–07 Avg.	522	24,157	12,495	3,786	958	4,776	46,172
2008–17 Avg.	564	26,590	12,506	4,047	1,276	5,463	49,881
2018 [a]	593	28,245	13,481	4,324	1,455	6,270	53,774

Source Salomone et al. (2019:93–95).

Note The sum of columns and rows may not equal the estimated total because of rounding. Harvests extrapolated over areas based on permits returned.

a. 5-year average was used because data were not available at the time of publication.

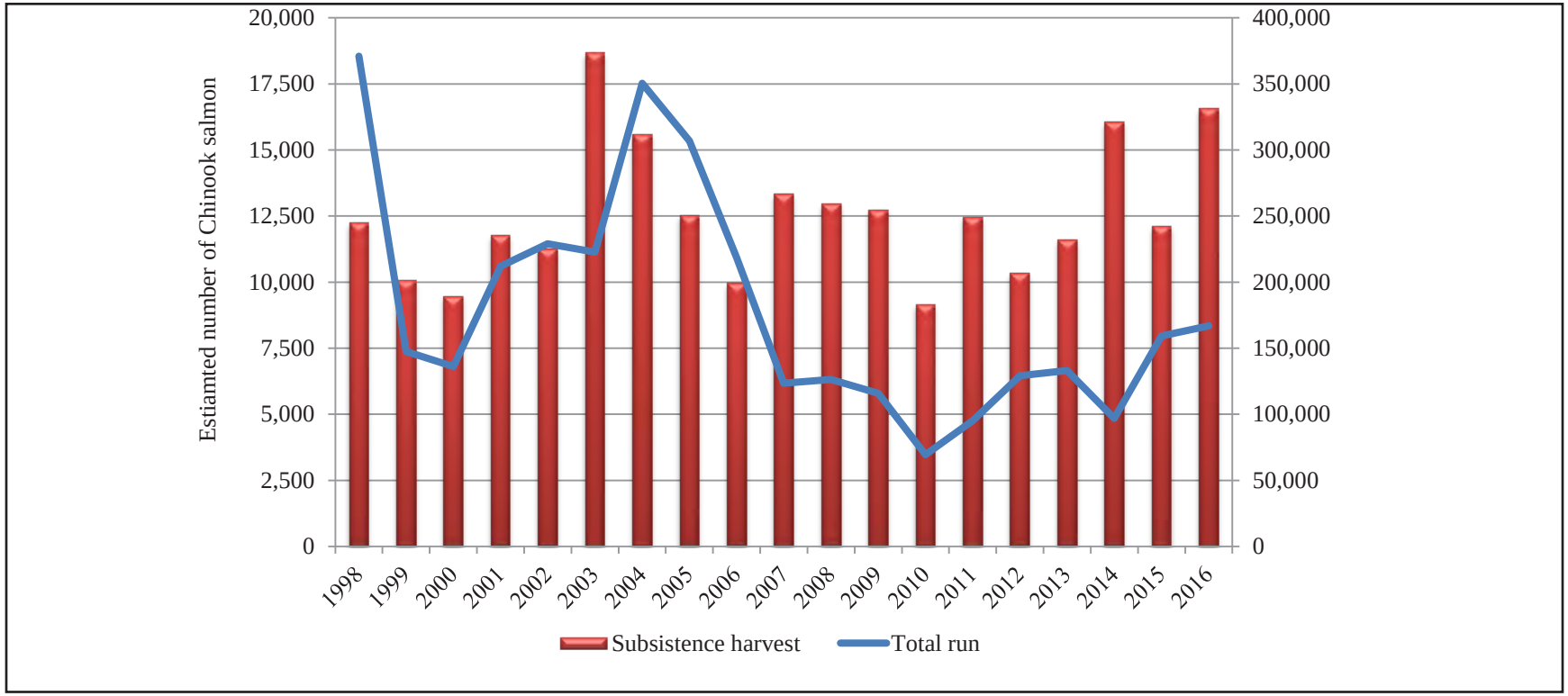


Figure 7-13.–Chinook salmon harvest and total run, in numbers of fish, Bristol Bay Area, Nushagak District, 1998–2018.

Subsistence Harvest Estimates Based on Returned Permits and Surveys

Each year, subsistence salmon household permits are issued and collected for the Bristol Bay Area to estimate harvests by each community. The post-season salmon harvest surveys administered to households in the study communities complement the permit system and increase the accuracy of documented subsistence salmon harvest levels. This section reviews the changes to the reported and estimated salmon harvests as the result of reconciling post-season survey data with returned permits, which helps to illustrate how well the permit system generally performs as a tool for documenting harvests. For each study community there is a set of tables (two for each community) that compares: 1) subsistence salmon permit participation based on surveys and returned permits (tables 7-12, 7-14, 7-16, 7-18, 7-20), and 2) harvest estimates from before and after the time that post-season surveys occurred (tables 7-13, 7-15, 7-17, 7-19, 7-21). The structure of these tables is described fully in Chapter 1: "Introduction" in the subsection "Survey Data Entry and Analysis."

Clarks Point: 2013

In 2013, there were 11 households in Clarks Point that obtained permits, and, of those, 9 households returned their permits at the end of the subsistence fishing season (82% return rate) (Table 7-12). During post-season harvest surveys, four permits were collected by researchers, two of which were from households that returned their permit during the survey, and two from households that subsistence fished for salmon but never obtained a permit. Also, based on analysis of the survey results, the estimated number of households that fished without a permit is two. As a result, a total of 13 permits were issued and returned in Clarks Point. Post-season survey efforts attempted to target all households in Clarks Point and since the proportion of contacted households was 94%, survey efforts combined with returned permits were able to describe a fairly high proportion of the subsistence salmon harvest.

In Clarks Point, in comparing the reported harvest from permits that were returned on time to the total from after post-season surveys occurred, the majority of added harvest was sockeye salmon (Table 7-13). There were 270 sockeye salmon added by households that returned a permit on time and then participated in subsistence salmon fishing again or otherwise changed their reported harvest. During post-season survey recall, these increased values were added to a household's survey and permit harvest amount. Another 212 sockeye salmon were added to the harvest by 2 households that fished with a permit but turned it in at the time of the survey. Note that no households that fished without a permit added to the reported sockeye salmon harvest. Overall 2 households that turned in a permit at the time of the survey added an additional 212 sockeye, 260 coho, and 35 Chinook salmon to the subsistence salmon harvest amounts. From those households that fished without a permit, 57 coho were also added to the overall subsistence salmon harvest values. The sum of reported harvests from permits and surveys appears in the fourth row in the "after surveys" section of the table; these are then estimated (fifth row) to represent the entire community. For Clarks Point, when harvests from returned on-time permits are compared to harvests from permits and surveys combined, the harvest of Chinook salmon harvest increased by 43 fish, sockeye and coho salmon roughly doubled, and chum and pink salmon remained about the same. The estimated harvest for each species based on returned permits alone (including permits from households that were not surveyed) is lower than the estimate based on permits and post-season surveys combined—but not by much. The Chinook salmon harvest estimates differ by only 12 fish, and the biggest difference was for sockeye salmon (102 fish).

Table 7-12.–Subsistence salmon permit participation estimates based on returned permits and surveys, Clarks Point, 2013.

	Clarks Point
Permits	
Before surveys	
Number of permits issued	11
Number of permits returned	9
Initial return rate	81.8%
After surveys	
Number of previously issued permits returned during survey	2
Surveyed households that fished without a permit[a]	2
Estimated total number of households that fished without a permit	2
Number of permits issued[b]	13
Revised number of permits returned	13
Final return rate	100.0%
Participation	
Total number of households	17
Total contacts	16
Proportion of contacted households	94.1%

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

a. According to both permit and survey returns combined.

b. Permits issued ex post facto were provided only to those households that were interviewed during post-season surveys.

Note During the household survey, it was found that two permits had been issued to individiuals who later formed a single household for the purposes of the household survey effort; the result is a discrepancy of one household between the lists.

Table 7-13.–Subsistence salmon harvest estimates based on returned permits and surveys, Clarks Point, 2013.

Harvest	Chinook	Sockeye	Coho	Chum	Pink
Before surveys					
Initial harvest reported on permits	135	471	280	121	100
Initial estimated harvest, all permit holders	165	576	342	148	122
After surveys					
Additional harvest added to previously returned permits	8	270	18	8	0
Harvest recorded on permits returned during the survey	35	212	260	2	4
Harvest by households that did not have permits	0	0	57	0	0
Reported harvest from both permits and surveys	178	953	615	131	104
Total estimated harvest, from both permits and surveys	189	1,013	653	139	111
Estimated harvest, from Alaska Subsistence Fisheries Database[a]	177	911	597	105	104

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

a. Based only on known fishers.

Ekwok: 2013

In total, the community of Ekwok obtained 20 permits and returned 16—an 80% initial return rate (Table 7-14). While administering surveys, researchers were able to obtain three more permits that had previously been unreturned. Post-season surveys identified three households that fished without permits. Of the households not surveyed, an estimated four fished without a permit. A total of 23 permits were issued, and 22 permits were returned—a final return rate of 96%, which left 1 household that did not get surveyed with an unreturned permit. Post-season survey efforts were able to describe a fairly high proportion of the subsistence salmon harvest: out of the 34 total households, there were 32 households that were surveyed or that returned a permit.

In Ekwok, the majority of added harvest to permits that were returned before the post-season survey effort was chum (127 fish), followed almost equally by Chinook, sockeye, and coho salmon harvests (53, 55, and 46 fish, respectively) (Table 7-15). Reasons for these harvests being added may include (similarly to Clarks Point) that a permit was returned initially, and then a household went fishing afterward. Another reason may be that a household did not think it was critical to note every salmon harvested, but when asked to recall their total harvest of all species, more were added to their survey than were originally reported on their permit. The next row shows the harvest values for the three households that obtained a permit but returned it during the survey. Overall these 3 households added an additional 171 Chinook, 112 sockeye, 140 coho, and 27 chum salmon to the reported harvest from Ekwok. From those households that fished without a permit, 50 Chinook, 70 sockeye, 89 coho, and 32 chum salmon were also added to the overall reported subsistence salmon harvest values. The sum of reported harvests from permits and surveys appears in the fourth row in the "after surveys" section of the table; these are then estimated (fifth row) to represent the entire community. Only the harvests reported by three surveyed households that fished without a permit were added to the permit database, and not the estimated harvest for the total estimated four households from Ekwok that fished without a permit. For Ekwok, when harvests from returned on-time permits are compared to harvests from permits and surveys combined, the harvest of Chinook salmon increased by 270 fish (624 to 898 fish), sockeye salmon almost doubled (324 to 561 fish), coho salmon nearly tripled (154 to 429 fish), and chum salmon slightly more than doubled (126 to 312 fish). The estimated harvest for each species based on returned permits alone (including the one permit from a household that was not surveyed) is lower than the estimate based on permits and post-season surveys combined—but by very little. The Chinook salmon harvest estimates differ by only 15 fish, and the biggest difference was for sockeye salmon (9 fish).

Table 7-14.–Subsistence salmon permit participation estimates based on returned permits and surveys, Ekwok, 2013.

	Ekwok
Permits	
Before surveys	
Number of permits issued	20
Number of permits returned	16
Initial return rate	80.0%
After surveys	
Number of previously issued permits returned during survey	3
Surveyed households that fished without a permit[a]	3
Estimated total number of households that fished without a permit	4
Number of permits issued[b]	23
Revised number of permits returned	22
Final return rate	95.7%
Participation	
Total number of households	34
Total contacts	32
Proportion of contacted households	94.1%

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

a. According to both permit and survey returns combined.

b. Permits issued ex post facto were provided only to those households that were interviewed during post-season surveys.

Table 7-15.–Subsistence salmon harvest estimates based on returned permits and surveys, Ekwok, 2013.

Harvest	Chinook	Sockeye	Coho	Chum	Pink
Before surveys					
Initial harvest reported on permits	624	324	154	126	0
Initial estimated harvest, all permit holders	780	405	193	158	0
After surveys					
Additional harvest added to previously returned permits	53	55	46	127	0
Harvest recorded on permits returned during the survey	171	112	140	27	0
Harvest by households that did not have permits	50	70	89	32	0
Reported harvest from both permits and surveys	898	561	429	312	0
Total estimated harvest, from both permits and surveys	954	596	456	332	0
Estimated harvest, from Alaska Subsistence Fisheries Database[a]	939	587	449	326	0

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

a. Based only on known fishers.

New Stuyahok: 2013

New Stuyahok is a larger community of more than 100 households (Table 4-4). The total number of issued (obtained) permits before household surveys were administered was 39, and 24 were returned on time, for an initial return rate of 62% (Table 7-16). Fourteen permits obtained at the start of the subsistence salmon fishing season were returned during household surveys, and 34 households were identified as fishing without permits. The total estimated number of households deemed to have likely fished without a permit was 46. There were 73 permits issued and 72 were returned once surveys were concluded, which improved the final permit return rate to 99%. Two additional households obtained permits and returned their permits but were not contacted during the survey effort. Overall, the proportion of contacted households via the combined effort of post-season surveys and the permit system was 74%.

In New Stuyhaok, the majority of added harvest from previously returned permits was for sockeye salmon, followed by coho, Chinook, and chum salmon (Table 7-17). From the 14 previously issued permits that were then returned during the survey effort, more than 2,000 sockeye salmon harvests were reported, as well as nearly 1,500 Chinook salmon, and nearly 200 each for coho and chum salmon. From the households that fished without permits nearly 1,500 of both Chinook and sockeye salmon were added to harvest levels, as well as nearly 400 of both coho and chum salmon. Comparisons of the initial reported values from returned permits to reported values from permits and surveys show that the Chinook salmon harvest tripled (1,493 to 4,496 fish), sockeye salmon harvest nearly quadrupled (1,376 to 5,160), and coho and chum salmon harvests nearly tripled. Estimated values are also given for harvest results from surveys and permits combined, as well as the estimated harvest from the ASFDB that is based only on returned permits (regardless of whether the returned permit came from a surveyed or unsurveyed household). Only the harvests reported by 34 surveyed households that fished without a permit were added to the permit database, and not the estimated harvest for the estimated total 46 households that fished without a permit. The estimated harvest for each species based on returned permits alone (including permits from households that were not surveyed) is far lower than the estimate based on permits and post-season surveys combined. The Chinook salmon harvest estimates differ by about 1,500 fish, and nearly 1,800 sockeye salmon. As these numbers show, compliance with the subsistence salmon permit system is somewhat low in New Stuyahok and the influence of post-season survey efforts is evident in the difference between the harvest values from permits only (ASFDB) and the estimates following post-season surveys (Table 7-17).

Table 7-16.–Subsistence salmon permit participation estimates based on returned permits and surveys, New Stuyahok, 2013.

	New Stuyahok
Permits	
Before surveys	
Number of permits issued	39
Number of permits returned	24
Initial return rate	61.5%
After surveys	
Number of previously issued permits returned during survey	14
Surveyed households that fished without a permit[a]	34
Estimated total number of households that fished without a permit	46
Number of permits issued[b]	73
Revised number of permits returned	72
Final return rate	98.6%
Participation	
Total number of households	123
Total contacts	91
Proportion of contacted households	74.0%

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

a. According to both permit and survey returns combined.

b. Permits issued ex post facto were provided only to those households that were interviewed during post-season surveys. Two permits were not included on the original household list, but were included in the tally reported in the ASFDB.

Table 7-17.–Subsistence salmon harvest estimates based on returned permits and surveys, New Stuyahok, 2013.

Harvest	Chinook	Sockeye	Coho	Chum	Pink
Before surveys					
Initial harvest reported on permits	1,493	1,376	397	345	0
Initial estimated harvest, all permit holders	2,426	2,236	645	561	0
After surveys					
Additional harvest added to previously returned permits	53	280	180	10	0
Harvest recorded on permits returned during the survey	1,496	2,065	170	182	0
Harvest by households that did not have permits	1,454	1,439	335	376	6
Reported harvest from both permits and surveys	4,496	5,160	1,082	913	6
Total estimated harvest, from both permits and surveys	6,077	6,975	1,462	1,234	8
Estimated harvest, from Alaska Subsistence Fisheries Database[a]	4,558	5,232	1,168	926	6

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

a. Based only on known fishers.

Koliganek: 2013

Koliganek had the lowest initial return rate in this study, 58%, with 12 initial permits obtained and 7 returned (Table 7-18). Four permits that were previously obtained but not returned on time were turned over to researchers during post-season surveys. Nineteen surveyed households fished without permits; a total estimated 24 households in New Stuyahok fished without permits. Only the harvests reported by 19 surveyed households that fished without a permit were added to the permit database, and not the estimated harvest for the estimated total 24 households that fished without a permit. In total, after post-season survey efforts, 31 permits were issued and 30 were retuned (97% return rate). Due to the combined efforts of returned permits and surveys, 80% of households were contacted to contribute subsistence salmon harvest information for Koliganek.

Similarly to the other study communities, more harvest was recorded once post-season surveys were administered. More Chinook salmon were added (120) to previously returned permits, as well as 15 sockeye salmon (Table 7-19). Coho salmon harvested actually reduced (by 59); this is likely due to removing harvests by rod and reel, which state regulations do not consider a legal subsistence gear type. Hundreds (nearly 600 Chinook and 500 coho salmon) to several thousand (about 2,185 sockeye and 1,100 coho salmon) harvests were added to initial harvest values by the households that fished without permits. Once permits and post-season surveys were used to calculate the total reported values, the reported harvests increased: Chinook salmon tripled (457 to 1,378), sockeye salmon nearly quadrupled (800 to 3,112), coho salmon tripled (214 to 650), and chum salmon harvested increased eight-fold (171 to 1,362). Division of Subsistence household surveys were able to capture a substantial proportion of the salmon harvest that Koliganek households were not reporting due predominantly to households not obtaining permits. Estimated values for combined survey and permit results, as well as the estimated harvest from the ASFDB, are also in Table 7-19. The estimated harvest for each species based on returned permits alone (including permits from households that were not surveyed) is lower than the estimate based on permits and post-season surveys combined. The Chinook salmon harvest estimates differ by only 222 fish, sockeye salmon by almost 600 fish, and chum salmon by about 230 fish.

Table 7-18.–Subsistence salmon permit participation estimates based on returned permits and surveys, Koliganek, 2013.

	Koliganek
Permits	
Before surveys	
Number of permits issued	12
Number of permits returned	7
Initial return rate	58.3%
After surveys	
Number of previously issued permits returned during survey	4
Surveyed households that fished without a permit[a]	19
Estimated total number of households that fished without a permit	24
Number of permits issued[b]	31
Revised number of permits returned	30
Final return rate	96.8%
Participation	
Total number of households	60
Total contacts	48
Proportion of contacted households	80.0%

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

a. According to both permit and survey returns combined.

b. Permits issued ex post facto were provided only to those households that were interviewed during post-season surveys.

Table 7-19.–Subsistence salmon harvest estimates based on returned permits and surveys, Koliganek, 2013.

Harvest	Chinook	Sockeye	Coho	Chum	Pink
Before surveys					
Initial harvest reported on permits	457	800	214	171	0
Initial estimated harvest, all permit holders	783	1,371	367	293	0
After surveys					
Additional harvest added to previously returned permits	120	15	-59	0	0
Harvest recorded on permits returned during the survey	203	112	60	81	0
Harvest by households that did not have permits	598	2,185	465	1,110	0
Reported harvest from both permits and surveys	1,378	3,112	650	1,362	0
Total estimated harvest, from both permits and surveys	1,723	3,890	813	1,703	0
Estimated harvest, from Alaska Subsistence Fisheries Database[a]	1,501	3,296	792	1,466	0

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

Note Negative numbers indicate downward adjustment. Under state permits, rod and reel is not a legal subsistence gear, so those harvests cannot be included in the subsistence totals.

a. Based only on known fishers.

Dillingham: 2016

As mentioned previously, research into Dillingham's subsistence salmon harvest and permit participation was done by stratified random sample: 105 households that obtained permits were surveyed and 100 households that did not obtain permits were also surveyed (Table 6-4). The number of permits issued was 357 and 277 were returned, an initial return rate of 78% (Table 7-20). Forty permits previously obtained (but not returned on time) were returned when researchers were conducting household surveys. Twenty-two surveyed households were identified as fishing without permits; an estimated overall 114 households fished without permits in 2016 in Dillingham. Only the harvests reported by 22 surveyed households that fished without a permit were added to the permit database, and not the estimated harvest for the estimated total 114 households that fished without a permit. Due to the survey effort a total of 379 permits were issued, and 339 were returned (89% final return rate). There were a total of 875 households eligible for post-season surveys and that obtained a permit and cited Dillingham as their permanent place of residence. The Division of Subsistence contacted 48% of those households (417) through post-season surveys and returned permits.

Table 7-21 shows the initial reported subsistence harvest of salmon, as well as the estimate, based on all permit holders and community size. Similar to the other study communities, more harvests of all of the salmon species were reported once surveys were conducted in Dillingham households. Just more than 1,000 sockeye salmon were added to previously returned permits, as well as 275 Chinook salmon and about 50 each of coho and chum salmon. From the 40 additional permits returned during the survey by households that fished with a permit, about 1,500 Chinook, 2,200 sockeye, 400 coho, and almost 180 chum salmon were added to the overall harvest values. More harvests were also reported by households that fished but did not obtain a permit, although only a modest proportion of the total reported harvest came from these households. However, comparing initial reported harvest values from permits only against the reported harvest from both permits and surveys, several thousand fish were added to the overall harvest count. Just more than 2,000 Chinook salmon were added, as well as 4,000 sockeye, nearly 700 coho, almost 300 chum, and about 400 pink salmon. The estimated harvest for each species based on returned permits alone (including permits from households that were not surveyed) is lower than the estimate based on permits and post-season surveys combined, especially for Chinook and sockeye salmon. The ASFDB estimated Chinook salmon harvest is about 1,600 fewer fish than combined survey and permit results; the sockeye salmon harvest is an estimated 3,300 fewer fish from permit returns only in comparison to the combined survey and permit estimated harvest.

Table 7-20.–Subsistence salmon permit participation estimates based on returned permits and surveys, Dillingham, 2016.

	Dillingham
Permits	
Before surveys	
Number of permits issued	357
Number of permits returned	277
Initial return rate	77.6%
After surveys	
Number of previously issued permits returned during survey	40
Surveyed households that fished without a permit[a]	22
Estimated total number of households that fished without a permit	114
Number of permits issued[b]	379
Revised number of permits returned	339
Final return rate	89.4%
Participation	
Total number of households[c]	875
Non-permit holders (final estimate)	518
Permit holders (pre-survey)	357
Total contacts	417
Proportion of contacted households	47.7%

Source ADF&G Division of Subsistence household surveys, 2017, and inseason catch permits, 2016.

a. According to both permit and survey returns combined.

b. Permits issued ex post facto were provided only to those households that were interviewed during post-season surveys.

c. Sampling for Dillingham was stratified into 2 groups–permit holders and non-permit holders; the estimate generated from household surveys is used here.

Table 7-21.–Subsistence salmon harvest estimates based on returned permits and surveys, Dillingham, 2016.

Harvest	Chinook	Sockeye	Coho	Chum	Pink
Before surveys					
Initial harvest reported on permits	6,546	10,584	2,040	2,540	2,889
Initial estimated harvest, all permit holders	8,437	13,641	2,629	3,274	3,723
After surveys					
Additional harvest added to previously returned permits	275	1,025	55	54	2
Harvest recorded on permits returned during the survey	1,515	2,222	427	178	155
Harvest by households that did not have permits	369	760	192	43	264
Reported harvest from both permits and surveys	8,705	14,591	2,714	2,815	3,310
Total estimated harvest, from both permits and surveys	11,370	19,630	3,856	3,368	4,824
Estimated harvest, from Alaska Subsistence Fisheries Database[a]	9,732	16,313	3,034	3,147	3,701

Source ADF&G Division of Subsistence household surveys, 2017, and inseason catch permits, 2016.

a. Based only on known fishers.

Summary of Harvest Estimates Based on Permits and Surveys

Despite the different-sized communities for this research project, household surveys show that a certain portion of households from every community obtains and returns permits on time, which is fully within compliance of the in-season permit system; however, a certain portion of households that obtain subsistence permits return their permit, but then continue subsistence fishing. Those late-season harvests can only be identified if post-season household surveys are done in a community.

Reported harvests and resulting estimates improve with a high rate of survey participation. In each study community, reported harvests on permits changed after post-season household survey efforts: if post-season survey efforts are not done, then a certain proportion of the harvest will not be recorded. Also, despite the decades-long history of the permit system being in place in the Nushagak watershed, historical use does not seem to indicate that more households will obtain permits, especially if they have not obtained them previously. Furthermore, as data show, community self-identification, merging households (for example, two households become one), or other changes within a community may result in permits obtained and returned that are likely to show some discrepancy between post-season survey efforts.

Comparison of Historical Household Survey and Permit Data

The following data present, by species, the estimated number of salmon harvested for each study community based on returned permits only (or ASFDB estimates) compared to the estimated number of salmon harvested based on household surveys for this project's study years and for previous study years; household survey estimates include spawning salmon harvests as footnoted on each figure. The years for which household survey estimates are available differ for each study community and only those years for which both types of estimates are available are provided for each community.

Figures show a confidence interval for each harvest estimate that is developed based on the sample achievement for the respective data collection methods (i.e., permit or household survey) and the range of responses (in harvest amount) within the sample. Confidence intervals are provided to show the variability in each sample. In cases where no confidence interval is present, 100% of households were contacted, 100% of permits were returned, or zero harvest was recorded. Similarly to the section described in subheading "Reasons for Household Survey and Subsistence Permit Harvest Estimate Discrepancies," there are a number of reasons why household surveys may indicate less harvest than permits.

Clarks Point

Clarks Point had household surveys done for study years 1989, 2008, 2013, and 2014 (Figure 7-14). In 1989, 100% of households were sampled, or a total of 17 (CSIS), thus no confidence intervals are shown. In 2008, 11 out of 18 households were surveyed, or 61% (CSIS). In 2013, the survey sample achievement was 100%; in 2014, 13 of 15 households were surveyed (Table 7-6).

When comparing the estimated number of harvested salmon in study years for Clarks Point, overall the permit and survey bars, by species, are fairly close in comparison, especially for the species most harvested: sockeye and coho salmon (Figure 7-14). In 1989, surveys estimated less harvest than was estimated based on returned permits for Chinook, sockeye, and coho salmon. For all species, the largest estimated harvest difference is seen in 2008, especially for sockeye, coho, and pink salmon. The separate confidence intervals for the permit- and survey-based estimates still overlap in the 2008 study year, indicating normal variation between the methods. In 2014, surveys estimated less harvest for Chinook and chum salmon, a difference likely due to several factors, including those discussed previously in the section "Reasons for Household Survey and Subsistence Permit Harvest Estimated Discrepancies" and possibly additional factors.

Ekwok

Ekwok was surveyed in 1987, 2013, and 2014. In 1987, 91% of households were sampled, with three households that declined or could not be surveyed (CSIS). In 2013, the final permit return rate was 96%, and in 2014, 30 out of 36 households were surveyed (Table 7-7). Confidence intervals are not shown for 1987 or 2014 for estimates from the permit database.

Salmon harvested for the three study years show fairly close comparability between permit and survey results, and when confidence intervals are given (2013) there is significant overlap between the estimated range of harvests, indicating normal variation in that year (Figure 7-15). Estimates from 1987 show the largest difference between survey and permit results, especially comparing the sockeye and chum salmon harvests. Surveys estimated slightly less harvest for Chinook (2013), sockeye (2013), coho (2014), and chum (2013) salmon.

New Stuyahok

Household surveys were done in New Stuyahok in 1987, 2005, 2013, and 2014. In 1987, 54% of households were surveyed from a selection of 40 randomly selected households (from an original projection of 80 year-round households) (CSIS). In 2005, 51% of households were sampled from a total of 96 households in the community (CSIS). In 2013, the final household survey sample achievement was 99%, and in 2014, 101 households were surveyed out of a total of 112 (Table 7-8).

The largest harvest difference between the two types of estimates in these study years is for sockeye salmon in 1987; however, the confidence intervals still overlap (Figure 7-16). Study year 1987 shows differences also for harvested chum, coho, and Chinook salmon. Note that pink salmon make up a low portion of the harvest for all of the study years. Household surveys estimated a lower harvest than permit returns for pink salmon in 2005, Chinook salmon in 2014, and sockeye salmon in 2005. In 1987, the coho salmon harvest estimated from permits was almost 0, yet surveys estimated more than 1,000 fish harvested. This is the only year and species for which the estimated harvest ranges depicted by confidence intervals from permits and surveys do not overlap. This indicates that a sampled household (or more than one household) contributed more coho salmon harvest than typically identified from permit-based estimates. For 2013, confidence intervals show significant variation and minimal overlap for Chinook and chum salmon harvests in 2013: household surveys estimated more harvest than permits. Overall, for most species and most years, estimated harvests seem to align well between methods, although it is clear that some variation is apparent when comparing results from permits and surveys.

Koliganek

Koliganek was surveyed in 1987, 2005, 2013, and 2014. In 1987, 88% of households, out of a total of 48, were sampled (6 households could not be reached); in 2005, 67% of households were sampled (out of a total of 42) (CSIS). For the study years of this project, there was a 97% survey sample achievement, and, in 2014, 51 out of 60 eligible households were surveyed (Table 7-9).

With one exception, every year, and for each species, survey estimates were more than permit estimates (Figure 7-17). The only year and species for which this was not the case is for pink salmon harvested in 2014: the survey estimate showed a very slight decrease from the permit estimate. Overall, sockeye salmon is the species that appears to show the greatest harvest estimate difference in the most years, including 1987, 2005, and 2013; however, Chinook in 2005, coho in 1987, and chum salmon in 2005 and 2014 also have high discrepancies between estimated harvests. In 1987, confidence intervals are largely disparate, showing a slight overlap only for chum salmon. In contrast, permit and survey comparisons are improved from this project's study years: for 2013 and 2014, variation between the harvest range for both methods appear normal, with overlap for each species (except pink salmon in 2013 when there was no harvest estimated).

Dillingham

Study years in Dillingham were 1984, 2010, 2014, and in 2016. In 1984, random samples of about 22% of households were selected from each of the 10 residential areas of Dillingham, for a total amount of 153 sampled households surveyed (CSIS). In 2010, a 2-strata survey was conducted where 164 households were identified having 2 of 3 characteristics: 1) a subsistence fishing permit, 2) commercial fishing permit, or 3) a moose harvest ticket (the project in Dillingham was done as a comprehensive household harvest and use survey, where all resources were asked about). Out of the 164 households, 101 of those were contacted; of the remaining 562 households, 135 were contacted (total households surveyed in 2010 was 726, or

28% sample achievement) (CSIS). For the study years of 2014 and 2016, see the sample achievement information in Chapter 5: “Dillingham” for a full sample description.

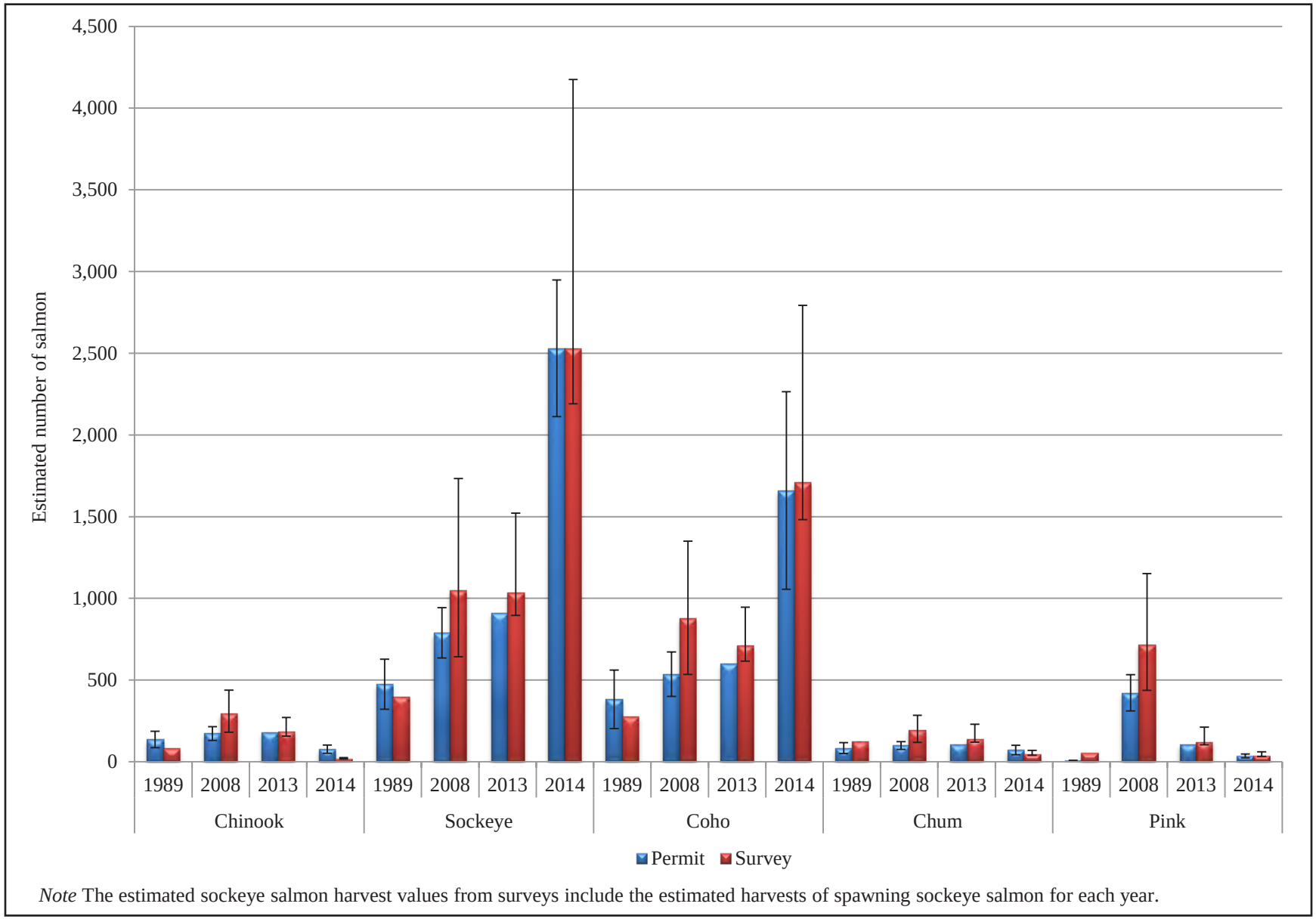
Confidence intervals are given for all study years for both permit and survey estimates (Figure 7-18). For only three data comparisons did surveys estimate less harvest than permits: 1984 for pink salmon, 2016 for chum salmon, and 2016 for pink salmon. Overall, variance between the samples (permits and surveys) appears normal, except for a few select instances.

In 2010, the Chinook salmon estimate from surveys was more than 5,000 fish more than the permit estimate and the range between estimated harvests did not overlap. The variation depicted is potentially explained by characteristic differences in the samples: households that returned permits and households that were surveyed likely were not the same household, and surveys captured significantly more harvest from households than self-reporting from permits. This can also be seen in 2010 with sockeye salmon harvests: surveys estimated roughly 12,000 more fish harvested than permits, a statistically significant difference from the permit system estimate. Lastly, the same pattern is shown for 2010 harvests of coho and chum salmon.

Note that in both study years for this project the confidence intervals overlap for every species when comparing the estimated harvest range from both permit and survey results.

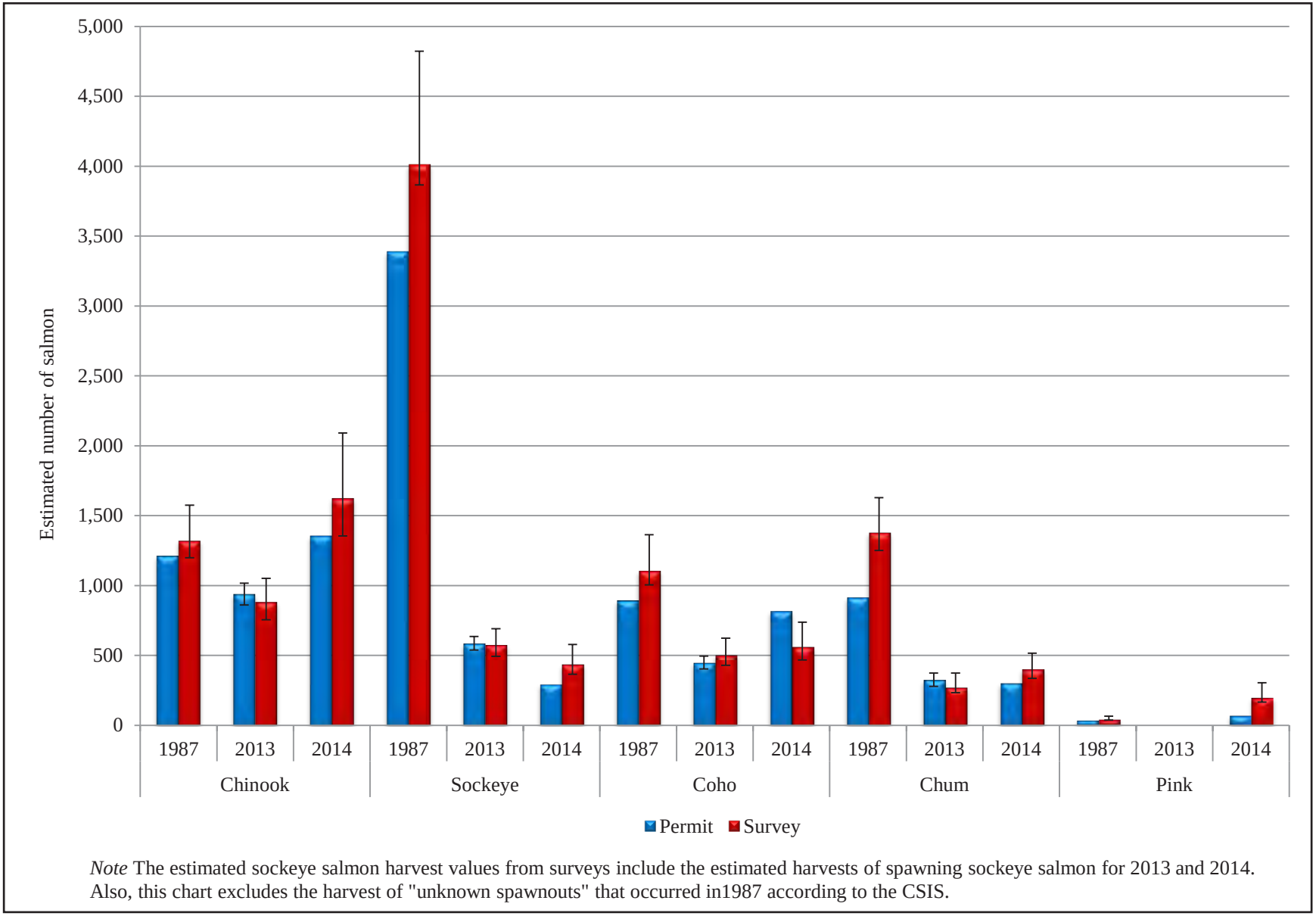
Summary of Historical Harvest Estimates Based on Permits and Surveys

The series of figures presented for each community reveal that while household surveys typically estimate higher harvest than permits (which include spawning fish values), harvest reports from in-season reporting compared with post-season recall, overall present relatively normal variation between the methods. Despite the normal variation, however, ranges within the methods do exist, since confidence intervals are very wide among some of the species in some of the years. Large estimated harvest variances do indicate that more refined reporting should be the goal in the Nushagak communities. An increased focus on improved self-reporting (in-season permits) and post-season sampling will help to reduce the variability of harvest values.



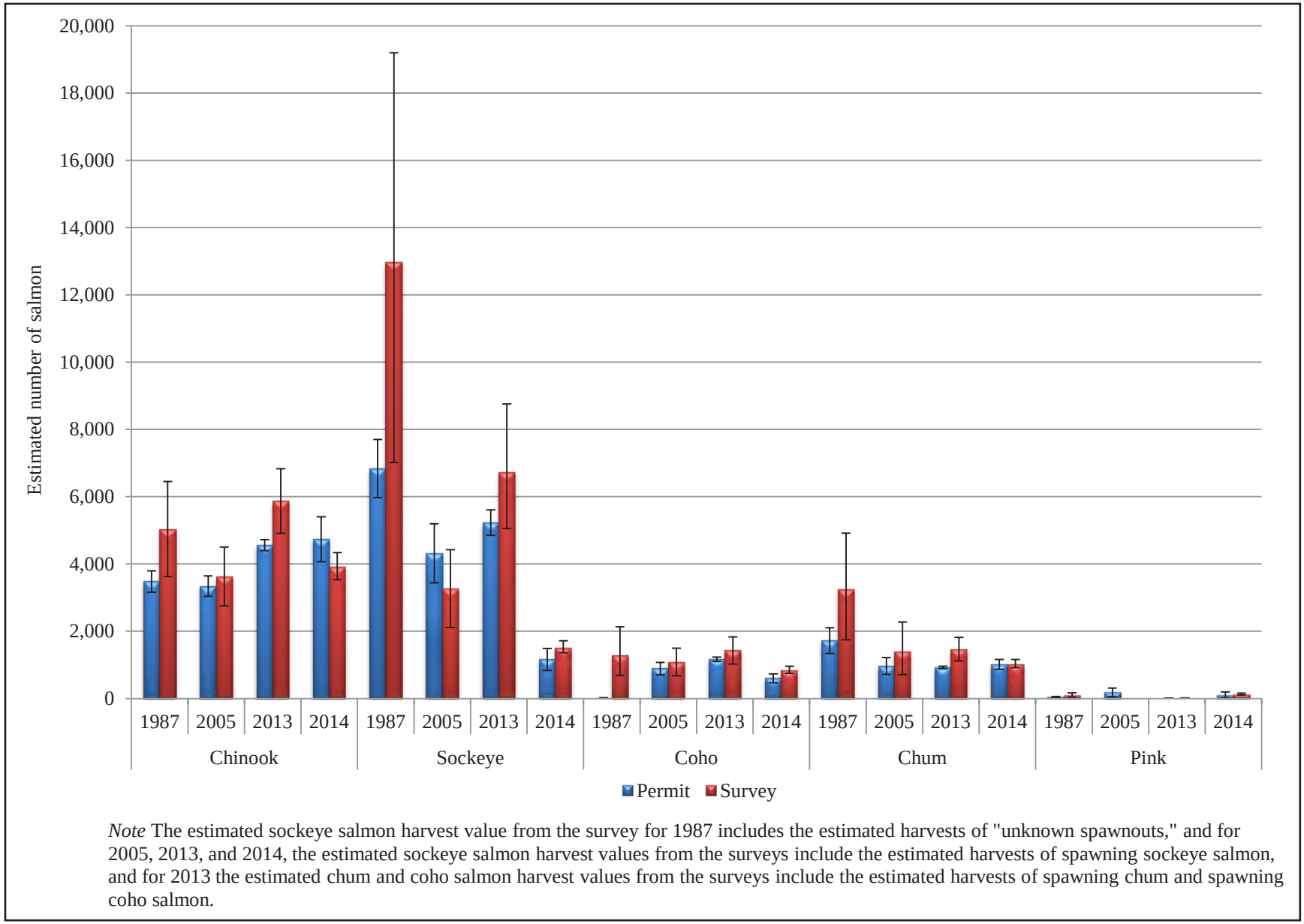
Note The estimated sockeye salmon harvest values from surveys include the estimated harvests of spawning sockeye salmon for each year.

Figure 7-14.–Comparison of historical permit estimates and survey estimates, Clarks Point, 1989, 2008, 2013, and 2014.



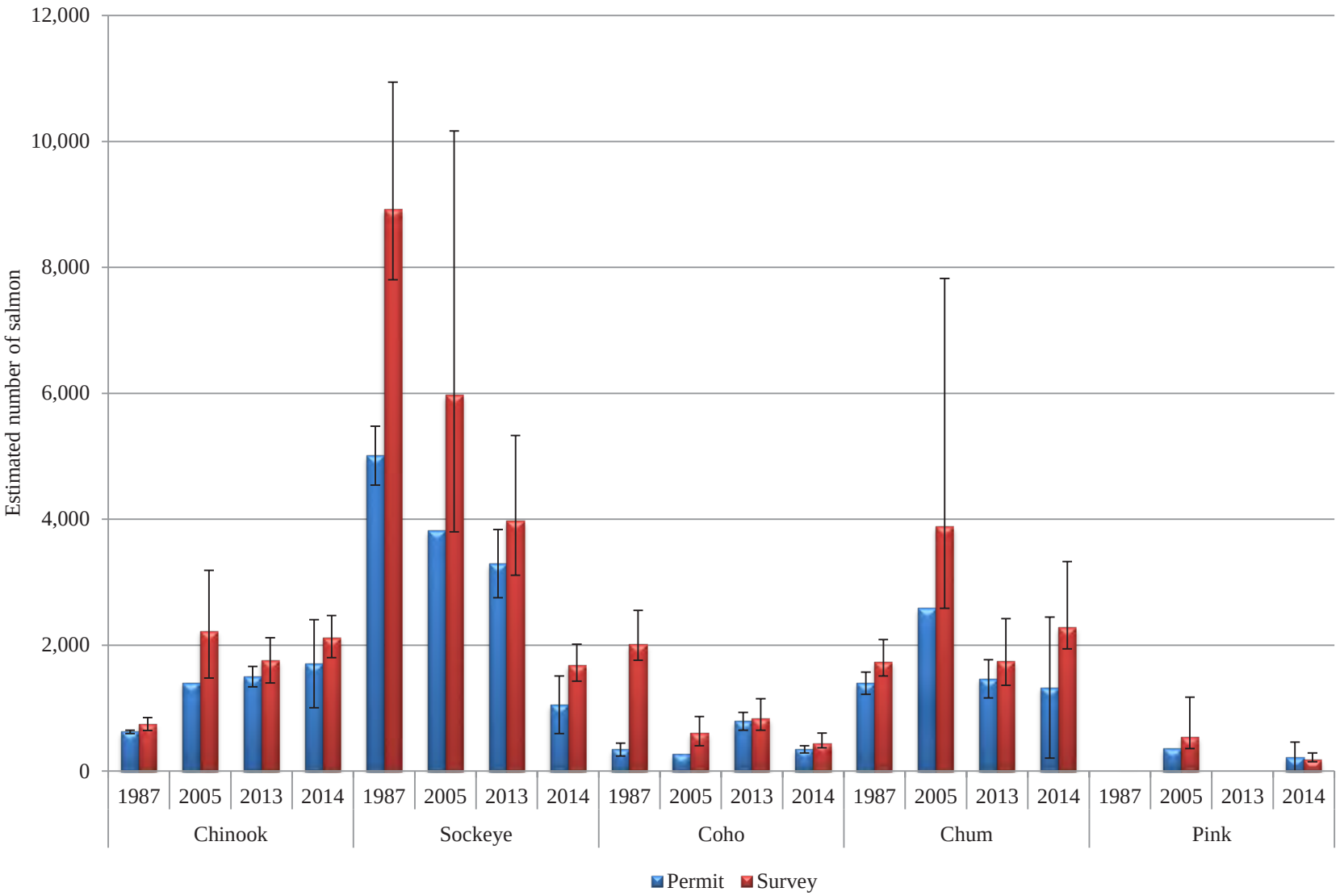
Note The estimated sockeye salmon harvest values from surveys include the estimated harvests of spawning sockeye salmon for 2013 and 2014. Also, this chart excludes the harvest of "unknown spawnouts" that occurred in1987 according to the CSIS.

Figure 7-15.–Comparison of historical permit estimates and survey estimates, Ekwok, 1987, 2013, and 2014.



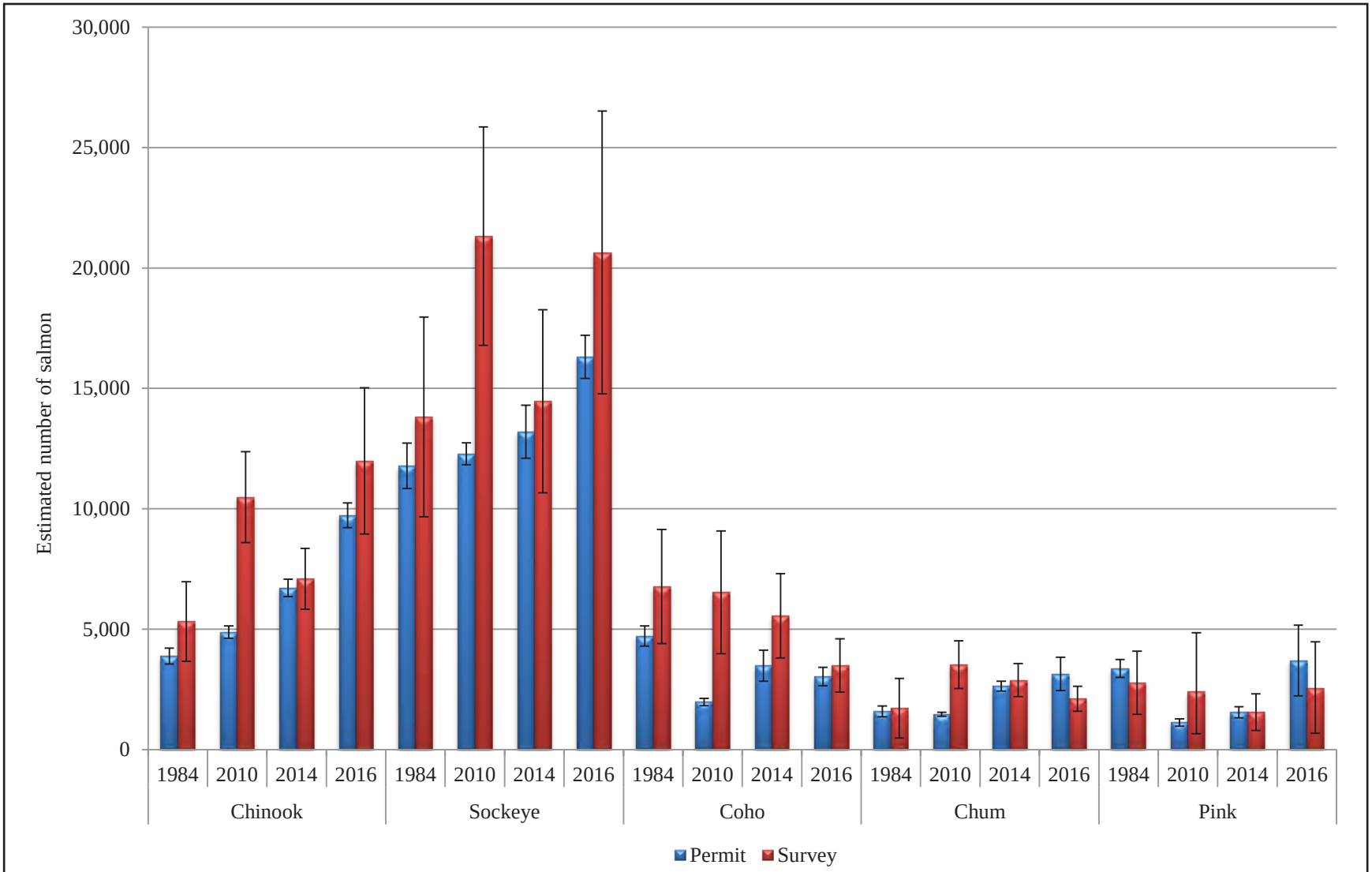
Note The estimated sockeye salmon harvest value from the survey for 1987 includes the estimated harvests of "unknown spawnouts," and for 2005, 2013, and 2014, the estimated sockeye salmon harvest values from the surveys include the estimated harvests of spawning sockeye salmon, and for 2013 the estimated chum and coho salmon harvest values from the surveys include the estimated harvests of spawning chum and spawning coho salmon.

Figure 7-16.–Comparison of historical permit estimates and survey estimates, New Stuyahok, 1987, 2005, 2013, and 2014.



Note The estimated sockeye salmon harvest value from the survey for 1987 includes the estimated harvests of "unknown spawnouts," and for 2005, 2013, and 2014, the estimated sockeye salmon harvest values from the surveys include the estimated harvests of spawning sockeye salmon.

Figure 7-17.–Comparison of historical permit estimates and survey estimates, Koliganek, 1987, 2005, 2013, and 2014.



Note This chart excludes the harvest of "unknown salmon" that occurred in 1984 according to the CSIS and in 2016 according to household surveys. Also, the estimated sockeye salmon harvest values from surveys for 2010, 2014 and 2016 include the estimated harvests of spawning sockeye salmon.

Figure 7-18.–Comparison of historical permit estimates and survey estimates, Dillingham, 1984, 2010, 2014, and 2016.

Commercial Harvest Retention and Rod and Reel Harvests

Each study community for this research project included households that participated in either commercial salmon retention for home use, harvesting with rod and reel gear, or both—to greater and lesser degrees. Although neither method is classified as a subsistence gear type under state regulations for Bristol Bay, many local residents use one or the other or both because they provide the ability to harvest salmon with methods other than subsistence gillnets. Regulations allow commercial fishers to retain fish for their own noncommercial uses (5 AAC 39.010). State regulations allow rod and reel subsistence harvest only in designated areas of Alaska, or through the ice, but not Bristol Bay, where rod and reel fishing is classified as a sport fishery that is managed by the ADF&G Division of Sport Fish. It is likely that most subsistence fishers who obtain subsistence permits do not record their rod-and-reel harvested fish on their permit; it would in fact be improper to do so because the permit does not authorize rod and reel subsistence fishing. On the other hand, Bristol Bay Area subsistence salmon permits require that commercially harvested salmon used for home use be recorded on the permit (and a section on the permit is provided for doing so). Division post-season surveys record commercial retention of salmon (and nonsalmon fish, if required by a research project), and harvest by all gear types, including rod and reel.

Due to the long history of the commercial salmon fishery in the Bristol Bay region (VanStone 1971), retention of commercially caught fish for home use has been recorded for several decades and is integrated into the CSIS database. Rod and reel gear allowed for a sport fishery has been used by Bristol Bay subsistence fishers since as early as 1984, indicating that, "Hooking and spinning rods during summer are preferred methods when small quantities of fresh fish are desired for immediate eating. Efficient nets would take more fish than desired at that particular time. Some people who do not own nets or reliable boats rely on rod and reel … for procuring the bulk of their subsistence fish … while other residents use rod and reel for recreation" (Wolfe et al. 1984:418). This research found that residents of the study communities continue to use rod and reel for the same reasons as their predecessors: to obtain fish for their subsistence needs, as well as for recreation. Below are comparisons of salmon harvests for each study community, by individual fish and gear type, for the study years of this project (2013, 2014, 2016), and other years in which post-season surveys were done in a community. All data presented here are compiled from post-season household surveys and are published in the CSIS database.

Clarks Point households' harvests of salmon have been primarily through subsistence methods (Table 7-22). In 1989, an estimated 57% of the total salmon harvested in the community was via subsistence method (gillnets), 43% by commercial retention, and only 0.2% by rod and reel. Based on numbers of fish caught, the species that was primarily harvested by commercial removal was sockeye salmon (an estimated 384 fish), followed by Chinook salmon (251 fish). However, commercial retention was the main method to harvest Chinook salmon—76% of this species harvest came from commercial catches. In 2008, 65% of the estimated total salmon harvested was from a subsistence gear type, 35% came from commercial removals, and 0.7% by rod and reel. The highest number of estimated fish removed from commercial harvests for home use was for coho (651), followed by sockeye (475), and Chinook salmon (226). However, chum salmon was the species for which the highest proportion (49%) of the species harvest came from commercial removals, followed by Chinook (43%), and coho salmon (42%). During the study years of this project, subsistence methods harvested much more (99% and 92%, respectively) of the total salmon amount than in the previous community study years. Commercial retention in 2013 accounted for 1% of the total harvest amount (with no rod and reel harvest). In 2013, only Chinook salmon were removed from commercial catches, for a total of 12% of the Chinook harvest (an estimated 24 fish out of a total of 181). In 2014, all salmon species, but not spawning salmon, were harvested by commercial retention, which made up 8% of the total harvest caught by all methods. As in 2013, no rod and reel harvest was estimated for 2014. Chinook salmon was the main species harvested from commercial catches for home use (81% of the total Chinook harvested). Sixty-one percent of pink salmon were harvested by commercial removals, as well as 39% of chum salmon.

Subsistence gear has been the dominant gear used for salmon harvests: 97%, 86%, and 79% of the total harvest came from subsistence gear in study years 1987, 2013, and 2014, respectively (Table 7-23). Only in 1987 did Ekwok households retain salmon from commercial catches: Chinook salmon (2% of the harvest

amount). Rod and reel was used in all three community study years, contributing from 3% (1987) of the total salmon harvest to 14% (2013), and 21% (2014). Coho salmon, in all three years, was the species harvested by rod and reel more than any other species, with an increase of salmon harvested by this gear type in each year: 11% of coho salmon were harvested by rod and reel in 1987, 32% in 2013, and 59% in 2014.

In the years 1987, 2005, 2013, and 2014, New Stuyahok households showed a preference for using subsistence gear for harvesting salmon, followed by rod and reel and commercial retention (Table 7-24). In 1987, 92% of the total estimated harvest of salmon was obtained through subsistence gear methods, followed by 1% by rod and reel, and 7% by commercial retention. In 2005, a slight decrease in the subsistence gear harvest occurred (86% of total salmon harvested), in conjunction with a large increase in the rod and reel harvest (13%), and fewer commercial removals (1%). In the study years for this project (2013 and 2014), 90% and 85% of the total salmon harvest came from subsistence gear, with 10% and 15% coming from rod and reel, respectively. Less than 1% of the total harvest came from commercial retention for both study years. Coho salmon is by far the species that was harvested the most by rod and reel, with an increase of rod and reel harvests for this species occurring in each year. Chinook salmon was the second species primarily contributing to the rod and reel harvest, although rod and reel gear never contributed much to the total Chinook harvest amount (1%–7%). Spawning sockeye salmon were also harvested in a large proportion by rod and reel. Commercial retention contributed a much smaller amount to the community harvest with some chum, Chinook, coho, and sockeye salmon retained from commercial catches throughout the four community study years shown.

Koliganek shows a similar change as New Stuyahok, where subsistence gear harvests have declined slightly over time, from 94% in 1987 to 85% in 2014; and, by comparison, there was an increase in rod and reel harvests (4% in 1987 to 14% in 2014) (Table 7-25). Commercial retention, which has always contributed a minimal amount of the total harvest, does not appear to follow any particular trend. Coho salmon (after being harvested by subsistence methods) are most harvested by rod and reel and are harvested this way more than the other species based on total number of fish. Spawning sockeye salmon was the resource next most harvested by rod and reel but contributed few fish to the total harvests. Chinook salmon were also harvested by rod and reel, yet more so by commercial removals (0.6%–3%) and subsistence methods (6%–22%).

Dillingham, a community with strong ties to the commercial fishery (similarly to Clarks Point, but less so compared to Ekwok, New Stuyahok, and Koliganek), does show commercial retention of all species over the four community study years (Table 7-26). Overall subsistence methods are still primarily used in Dillingham, with 82% (1984), 84% (2010), 93% (2014), and 93% (2016) of subsistence salmon harvested via subsistence gear. Rod and reel harvests appear to have remained somewhat stable over time, from 4% in 1984, to 2% in 2010, 3% in 2014, and 2% in 2016. Commercial retention of salmon for home use shows a sharp decline in the study years (4% for both years), although in both 1984 and 2010, 14% of the total estimated salmon harvested came from commercial removals. Both Chinook and coho salmon harvests were from commercial retention more than so for any other species. For example, in 1984, 22% of the total Chinook salmon harvest came from commercial catches. In the following three study years, declines in Chinook salmon retention occurred: the amount of the Chinook salmon harvest coming from commercial retention declined to only 6% in 2016. Comparatively, in 1984, 13% of coho salmon came from commercial catches, which increased to 19% in 2010, and then declined to 2% in 2016. Sockeye salmon followed a similar pattern as Chinook salmon: 15% of the sockeye salmon harvest in both 1984 and 2010 was from commercial retention, which declined to 4% and 5% in 2014 and 2016, respectively. Rod and reel harvest of coho salmon (the species harvested most by this method) has largely shown an increase over the years: 9% of coho salmon harvested in 1984, 7% in 2010, 10% in 2014, and 19% in 2016. Conversely, pink salmon were harvested by rod and reel in 1984 and 2010, but none were harvested with this method in either study year for this project. The sockeye salmon harvest also experienced a decline of harvest by rod and reel, yet an increase via subsistence methods (84%–85% in 1984 and 2010, to 95% in 2014 and 2016).

Table 7-22.–Estimated salmon harvests for home use by individual fish and gear type, Clarks Point, 1989, 2008, 2013, and 2014.

	1989		2008		2013		2014	
Resource	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Chum	130		376		138		75	
Subsistence methods	123	94.6%	193	51.3%	138	100.0%	46	61.5%
Rod and reel	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Commercial removal	7	5.4%	183	48.7%	0	0.0%	29	38.5%
Coho	337		1,543		710		1,824	
Subsistence methods	278	82.5%	875	56.7%	710	100.0%	1,709	93.7%
Rod and reel	0	0.0%	16	1.1%	0	0.0%	0	0.0%
Commercial removal	59	17.5%	651	42.2%	0	0.0%	115	6.3%
Chinook	331		520		205		98	
Subsistence methods	80	24.2%	295	56.6%	181	88.2%	18	18.8%
Rod and reel	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Commercial removal	251	75.8%	226	43.4%	24	11.8%	80	81.2%
Pink	57		871		120		95	
Subsistence methods	52	91.2%	715	82.1%	120	100.0%	37	39.0%
Rod and reel	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Commercial removal	5	8.8%	155	17.9%	0	0.0%	58	61.0%
Sockeye	745		1,229		802		2,616	
Subsistence methods	360	48.3%	746	60.7%	802	100.0%	2,500	95.6%
Rod and reel	1	0.1%	8	0.7%	0	0.0%	0	0.0%
Commercial removal	384	51.5%	475	38.6%	0	0.0%	115	4.4%
Spawning sockeye			314		231		28	
Subsistence methods			304	96.9%	231	100.0%	28	100.0%
Rod and reel			10	3.1%	0	0.0%	0	0.0%
Commercial removal			0	0.0%	0	0.0%	0	0.0%
Spawnouts (unspecified)	39							
Subsistence methods	37	94.9%						
Rod and reel	2	5.1%						
Commercial removal	0	0.0%						
Total	**1,639**		**4,853**		**2,206**		**4,735**	
Subsistence methods	930	56.7%	3,129	64.5%	2,182	98.9%	4,338	91.6%
Rod and reel	3	0.2%	34	0.7%	0	0.0%	0	0.0%
Commercial removal	706	43.1%	1,690	34.8%	24	1.1%	397	8.4%

Source ADF&G Division of Subsistence community subsistence information system (CSIS).

Note Blank cells indicate that no harvests of that species were indicated.

Note Due to rounding, the sum of columns and rows may not equal the estimated total.

Table 7-23.–Estimated salmon harvests for home use by individual fish and gear type, Ekwok, 1987, 2013, and 2014.

	1987		2013		2014	
Resource	Number	Percentage	Number	Percentage	Number	Percentage
Chum	1,402		336		403	
Subsistence methods	1,380	98.4%	273	81.2%	403	100.0%
Rod and reel	22	1.6%	63	18.8%	0	0.0%
Commercial removal	0	0.0%	0	0.0%	0	0.0%
Coho	1,246		741		1,382	
Subsistence methods	1,108	88.9%	503	67.9%	562	40.6%
Rod and reel	138	11.1%	238	32.1%	821	59.4%
Commercial removal	0	0.0%	0	0.0%	0	0.0%
Chinook	1,381		927		1,644	
Subsistence methods	1,323	95.8%	885	95.4%	1,626	98.9%
Rod and reel	34	2.5%	42	4.6%	18	1.1%
Commercial removal	24	1.7%	0	0.0%	0	0.0%
Pink	42				200	
Subsistence methods	42	100.0%	0	0.0%	199	99.4%
Rod and reel	0	0.0%	0	0.0%	1	0.6%
Commercial removal	0	0.0%	0	0.0%	0	0.0%
Sockeye	4,065		590		428	
Subsistence methods	4,010	98.6%	572	97.0%	414	96.6%
Rod and reel	55	1.4%	18	3.0%	14	3.4%
Commercial removal	0	0.0%	0	0.0%	0	0.0%
Spawning sockeye			6		24	
Subsistence methods			6	100.0%	24	100.0%
Rod and reel			0	0.0%	0	0.0%
Commercial removal			0	0.0%	0	0.0%
Spawnouts (unspecified)	255					
Subsistence methods	255	100.0%				
Rod and reel	0	0.0%				
Commercial removal	0	0.0%				
Total	**8,391**		**2,600**		**4,082**	
Subsistence methods	8,118	96.7%	2,239	86.1%	3,228	79.1%
Rod and reel	249	3.0%	361	13.9%	854	20.9%
Commercial removal	24	0.3%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence community subsistence information system (CSIS).

Note Blank cells indicate that no harvests of that species were indicated.

Note Due to rounding, the sum of columns and rows may not equal the estimated total.

Table 7-24.–Estimated salmon harvests for home use by individual fish and gear type, New Stuyahok, 1987, 2005, 2013, and 2014.

	1987		2005		2013		2014	
Resource	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Chum	3,253		1,432		1,478		1,022	
Subsistence methods	3,234	99.4%	1,395	97.4%	1,456	98.5%	1,021	99.9%
Rod and reel	19	0.6%	35	2.5%	22	1.5%	1	0.1%
Commercial removal	0	0.0%	2	0.1%	0	0.0%	0	0.0%
Coho	1,373		1,924		2,722		2,023	
Subsistence methods	1,269	92.4%	1,085	56.4%	1,389	51.0%	826	40.8%
Rod and reel	104	7.6%	839	43.6%	1,332	49.0%	1,185	58.6%
Commercial removal	0	0.0%	0	0.0%	0	0.0%	11	0.5%
Chinook	5,085		3,963		6,059		3,964	
Subsistence methods	5,038	99.1%	3,626	91.5%	5,871	96.9%	3,914	98.7%
Rod and reel	19	0.4%	274	6.9%	187	3.1%	48	1.2%
Commercial removal	28	0.6%	62	1.6%	1	0.0%	2	0.1%
Pink	100		2		8		161	
Subsistence methods	89	89.0%	2	100.0%	8	100.0%	119	73.8%
Rod and reel	11	11.0%	0	0.0%	0	0.0%	42	26.2%
Commercial removal	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Sockeye	12,188		2,997		6,688		1,462	
Subsistence methods	12,147	99.7%	2,813	93.9%	6,632	99.2%	1,424	97.4%
Rod and reel	41	0.3%	92	3.1%	56	0.8%	35	2.4%
Commercial removal	0	0.0%	92	3.1%	0	0.0%	2	0.2%
Spawning chum					10			
Subsistence methods					10	100.0%		
Rod and reel					0	0.0%		
Commercial removal					0	0.0%		
Spawning coho					41			
Subsistence methods					41	100.0%		
Rod and reel					0	0.0%		
Commercial removal					0	0.0%		
Spawning sockeye	1,688		1,688		162		110	
Subsistence methods	0	0.0%	453	26.8%	102	63.0%	86	78.8%
Rod and reel	0	0.0%	129	7.7%	60	37.0%	23	21.2%
Commercial removal	1,688		0		0	0.0%	0	0.0%

-continued-

Table 7-24.–Page 2 of 2.

	1987		2005		2013		2014	
Resource	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Spawnouts (unspecified)	844	50.0%						
Subsistence methods	829	98.2%						
Rod and reel	15	1.8%						
Commercial removal	0	0.0%						
Total	**24,531**		**10,900**		**17,166**		**8,742**	
Subsistence methods	22,606	92.2%	9,375	86.0%	15,508	90.3%	7,391	84.5%
Rod and reel	209	0.9%	1,369	12.6%	1,657	9.7%	1,335	15.3%
Commercial removal	1,716	7.0%	156	1.4%	1	0.0%	16	0.2%

Source ADF&G Division of Subsistence community subsistence information system (CSIS).

Note Blank cells indicate no harvest was indicated for that species.

Note Due to rounding, the sum of columns and rows may not equal the estimated total.

Table 7-25.–Estimated salmon harvests for home use by individual fish and gear type, Koliganek, 1987, 2005, 2013, and 2014.

	1987		2005		2013		2014	
Resource	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Chum	1,733		3,934		1,747		2,285	
Subsistence methods	1,727	100%	3,881	99%	1,739	99%	2,285	100%
Rod and reel	0	0%	30	1%	1	0%	0	0%
Commercial removal	6	0%	23	1%	8	0%	0	0%
Coho	2,436		989		1,538		1,493	
Subsistence methods	2,011	83%	603	61%	830	54%	435	29%
Rod and reel	419	17%	266	27%	678	44%	1,058	71%
Commercial removal	6	0%	120	12%	30	2%	0	0%
Chinook	1,001		2,430		1,933		2,146	
Subsistence methods	739	74%	2,220	91%	1,759	91%	2,121	99%
Rod and reel	40	4%	39	2%	16	1%	19	1%
Commercial removal	222	22%	171	7%	158	8%	7	0%
Pink	6		566		0		176	
Subsistence methods	6	100%	537	95%	0		176	100%
Rod and reel	0	0%	29	5%	0		0	0%
Commercial removal	0	0%	0	0%	0		0	0%
Sockeye	7,442		5,984		3,403		1,640	
Subsistence methods	7,255	97%	5,703	95%	3,254	96%	1,582	96%
Rod and reel	75	1%	12	0%	3	0%	47	3%
Commercial removal	112	2%	269	4%	146	4%	12	1%
Spawning sockeye			402		750		107	
Subsistence methods			263		719	96%	100	93%
Rod and reel			140		31	4%	7	7%
Commercial removal			0		0	0%	0	0%
Spawnouts (unspecified)	1,673							
Subsistence methods	1,663							
Rod and reel	10							
Commercial removal	0							
Total	**14,291**		**14,303**		**9,371**		**7,848**	
Subsistence methods	13,401	94%	13,206	92%	8,300	89%	6,699	85%
Rod and reel	544	4%	515	4%	729	8%	1,131	14%
Commercial removal	346	2%	583	4%	341	4%	19	0%

Source ADF&G Division of Subsistence community subsistence information system (CSIS).

Note Blank cells indicate that no harvests of that species were indicated.

Note Due to rounding, the sum of columns and rows may not equal the estimated total.

Table 7-26.–Estimated salmon harvests for home use by individual fish and gear type, Dillingham, 1984, 2010, 2014, and 2016.

	1984		2010		2014		2016	
Resource	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Chum	1,874		3,865		2,916		2,114	
Subsistence methods	1,716	91.6%	3,527	91.3%	2,888	99.0%	2,114	100.0%
Rod and reel	36	1.9%	3	0.1%	6	0.2%	0	0.0%
Commercial removal	122	6.5%	335	8.7%	22	0.8%	0	0.0%
Coho	8,699		8,877		6,516		4,433	
Subsistence methods	6,775	77.9%	6,535	73.6%	5,558	85.3%	3,495	78.8%
Rod and reel	808	9.3%	634	7.1%	635	9.7%	835	18.8%
Commercial removal	1,116	12.8%	1,708	19.2%	323	5.0%	104	2.3%
Chinook	7,095		12,311		7,808		12,910	
Subsistence methods	5,320	75.0%	10,489	85.2%	7,090	90.8%	11,988	92.9%
Rod and reel	217	3.1%	73	0.6%	169	2.2%	144	1.1%
Commercial removal	1,558	22.0%	1,749	14.2%	548	7.0%	778	6.0%
Pink	3,153		2,834		1,573		2,571	
Subsistence methods	2,778	88.1%	2,417	85.3%	1,553	98.8%	2,554	99.3%
Rod and reel	217	6.9%	74	2.6%	0	0.0%	0	0.0%
Commercial removal	158	5.0%	343	12.1%	20	1.2%	17	0.7%
Sockeye	16,371		23,825		13,783		20,543	
Subsistence methods	13,815	84.4%	20,287	85.2%	13,086	94.9%	19,499	94.9%
Rod and reel	176	1.1%	73	0.3%	198	1.4%	0	0.0%
Commercial removal	2,380	14.5%	3,465	14.5%	499	3.6%	1,044	5.1%
Spawning sockeye			1,168		1,484		1,145	
Subsistence methods			1,030	88.2%	1,375	92.7%	1,145	100.0%
Rod and reel			138	11.8%	109	7.3%	0	0.0%
Commercial removal			0	0.0%	0	0.0%	0	0.0%
Spawnouts (unspecified)	255							
Subsistence methods	255	100.0%						
Rod and reel	0	0.0%						
Commercial removal	0	0.0%						
Unknown salmon			17				518	
Subsistence methods			0	0.0%			518	100.0%
Rod and reel			17	100.0%			0	0.0%
Commercial removal			0	0.0%			0	0.0%

-continued-

Table 7-26.–Page 2 of 2.

	1984		2010		2014		2016	
Resource	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Total	**37,447**		**52,897**		**34,079**		**44,235**	
Subsistence methods	30,659	81.9%	44,285	83.7%	31,550	92.6%	41,313	93.4%
Rod and reel	1,454	3.9%	1,012	1.9%	1,117	3.3%	979	2.2%
Commercial removal	5,334	14.2%	7,600	14.4%	1,413	4.1%	1,943	4.4%

Source ADF&G Division of Subsistence community subsistence information system (CSIS).

Note Blank cells indicate no harvest was indicated for that species.

Note Due to rounding, the sum of columns and rows may not equal the estimated total.

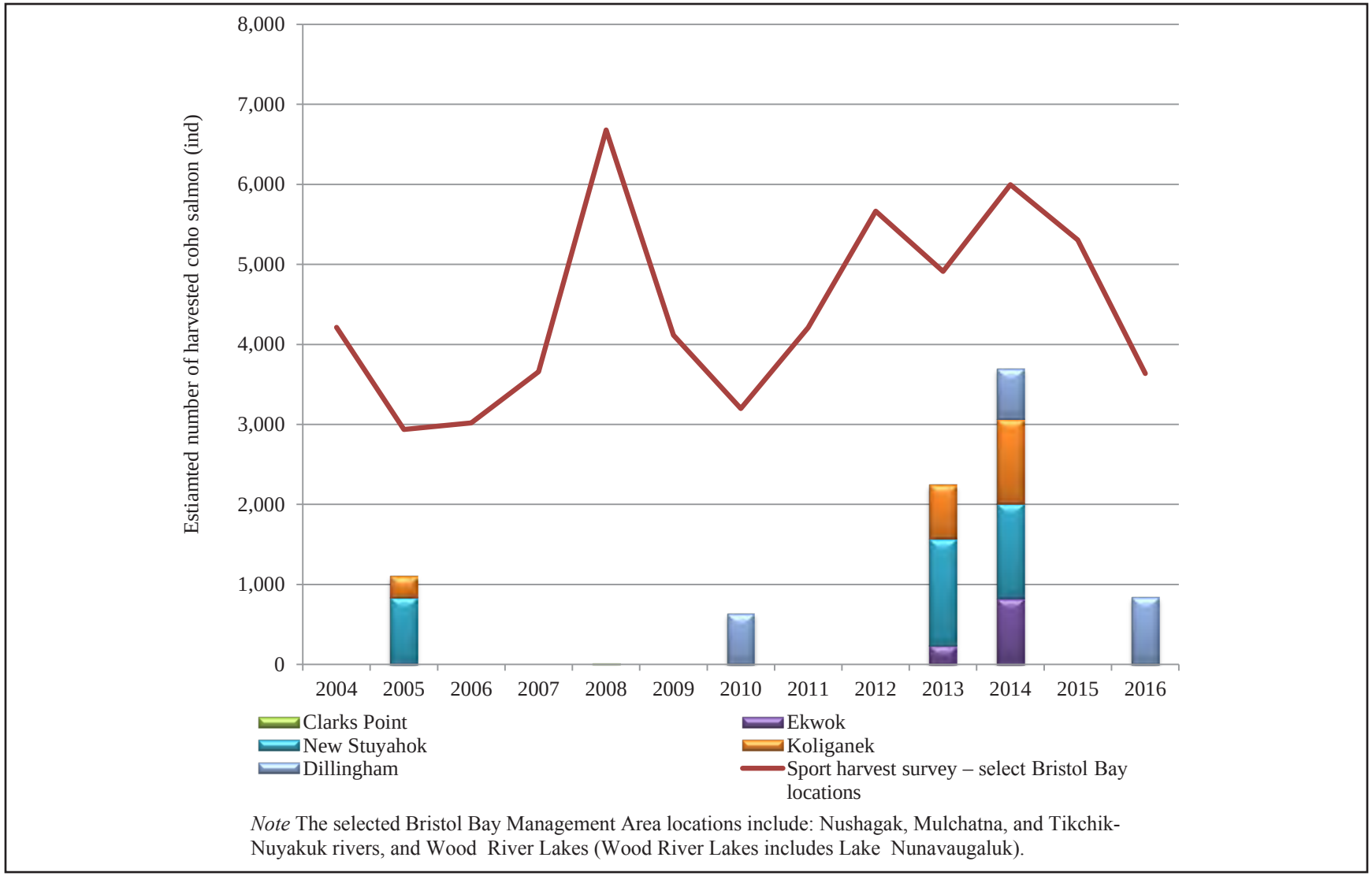
Understanding Run Abundance by Evaluating Local Communities' Rod and Reel Harvests

An objective of this research was to better understand run abundance through improved estimates of Chinook salmon harvests by a variety of gear types by local communities. The following figures depict estimated harvests of the two most common salmon species harvested in the sport fishery—coho and Chinook salmon—based on Division of Sport Fish harvest surveys from 2004–2016 (Dye and Borden 2018). Also shown are estimated rod and reel harvests for local communities based on household surveys by the Division of Subsistence (CSIS). The data from the Division of Sport Fish include: 1) coho salmon harvests from select rivers of the Central Section[2] of the Bristol Bay Management Area (i.e., Nushagak, Mulchatna, and Tikchik-Nuyakuk rivers, and Wood River Lakes[3]) and, 2) Chinook salmon harvests from the Nushagak River drainage[4] sport fishery. Harvests from these rivers were selected for comparison with household survey-based rod and reel harvest estimates because these are the locations that were depicted in this research project as areas of rod and reel use by local survey respondents of the study communities.

In 2013, the communities of Ekwok, New Stuyahok, and Koliganek had a combined estimated harvest of just more than 2,000 coho salmon caught by rod and reel (Figure 7-19). The estimated harvest in the sport fishery (for the 4 selected locations where sport and subsistence rod and reel use occurred) was about 4,900 coho salmon. In 2014, Dillingham households had an estimated rod and reel harvest of 635 coho salmon, while the sport fish harvest survey-based estimate was almost 6,000 coho salmon. Fluctuations in the sport fishery appear to mirror local rod and reel harvests for home use; for example, in 2010 the low harvest of coho salmon by rod and reel by Dillingham households parallels the dip in harvest for sport rod and reel harvest. Although data are incomplete for local communities, the limited information suggests that local rod and reel harvests of coho salmon for home use may approach harvest estimates in the sport fishery. For example, the combined estimated rod and reel coho harvest for the 5 study communities for 2014 of 3,699 fish is about 60% of the estimated sport harvest of 5,995 coho salmon.

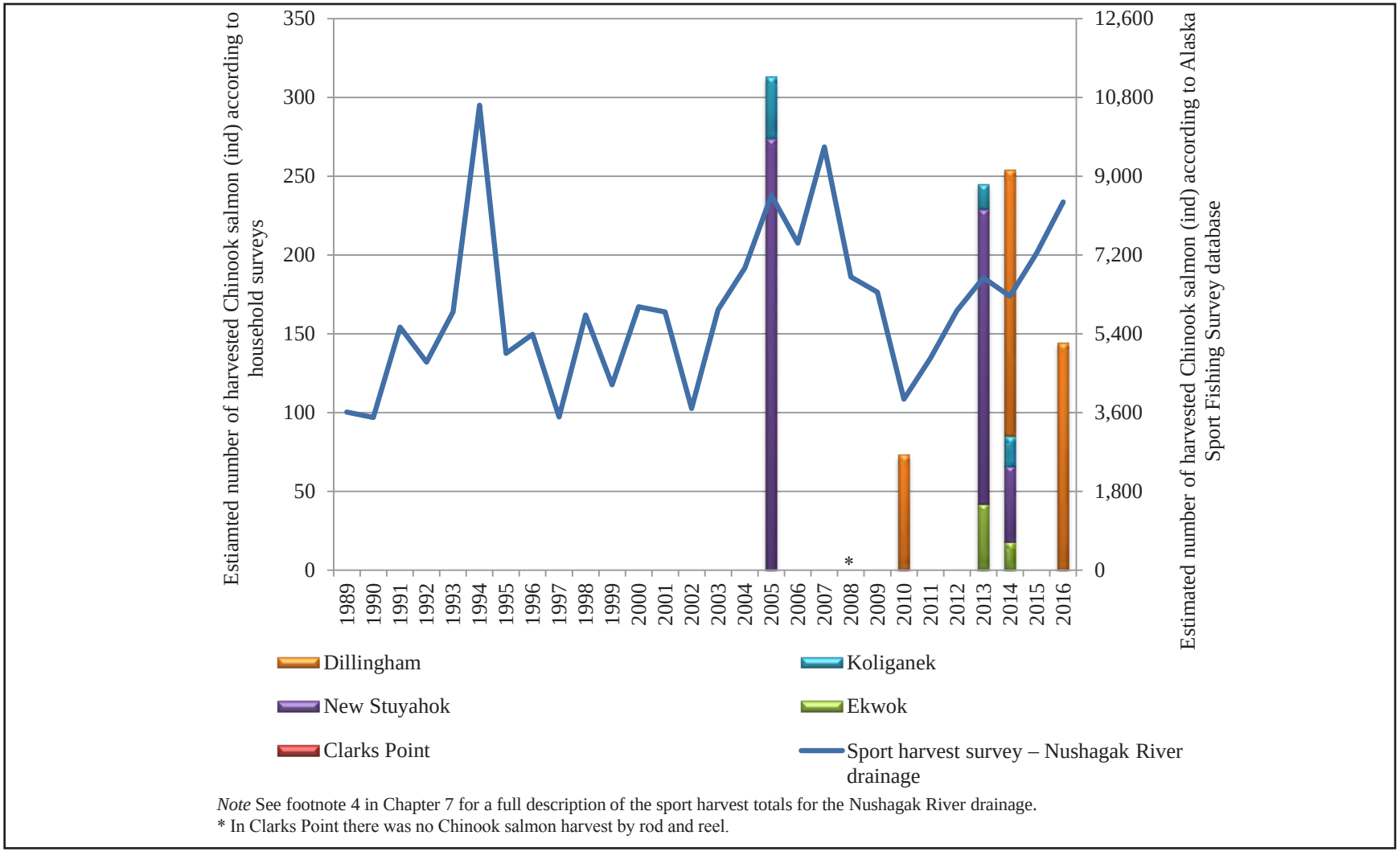
In contrast, the harvest of Chinook salmon by rod and reel by local communities is relatively small compared to estimated harvests in the Nushagak River drainage sport fishery. Figure 7-20 shows the sport harvest of Chinook salmon by rod and reel (secondary vertical axis), which is a significantly larger range of Chinook salmon harvested than depicted on the primary vertical axis showing the individual salmon harvested based on household survey results. For example, in 2013 and 2014, the estimated sport harvest of Chinook salmon was about 6,685 and 6,260 fish, respectively, while the estimated rod and reel Chinook salmon harvest by the local study communities combined was 245 and 254 fish—just 4% of the sport harvest total both years. The limited results of this research suggest that local rod and reel harvests of Chinook salmon for home use are only a very small portion of the total Chinook salmon return to the Nushagak District, but local rod and reel harvests of coho salmon may approach the contribution of the sport fishery to the estimate of the district's total coho salmon abundance.

2. The Central Section also includes the Agulowak and Agulukpak rivers, and an "Other section and drainage" category.
3. Wood River Lakes includes Lake Nunavaugaluk.
4. Sport harvest survey values are the sum of harvests below the sonar and above the sonar. Sport harvest total below the sonar for 1989–1996 is 50% of the Nushagak River system sport harvest; sport harvest total for 1997–2009 is Nushagak River sport harvest from Black Point to sonar. Sport harvest total above the sonar for 1989–1996 is 50% of the Nushagak River system sport harvest plus the Mulchatna River system, Tikchik–Nuyakuk rivers, and Koktuli River sport harvests; sport harvest total for 1997 to 2001 is 50% of the Nushagak River harvest plus the Black Point to Iowithla River, Nushagak River upstream of Iowithla River, Mulchatna River system, Tikchik–Nuyakuk rivers and the Koktuli River harvests. Sport harvest total above the sonar for 2002–2011 is Nushagak River excluding Black Point to sonar.



Note The selected Bristol Bay Management Area locations include: Nushagak, Mulchatna, and Tikchik-Nuyakuk rivers, and Wood River Lakes (Wood River Lakes includes Lake Nunavaugaluk).

Figure 7-19.–Estimated sport harvest of coho salmon based on sport harvest surveys, harvested from select Bristol Bay locations, 2004–2016, and estimated rod and reel coho salmon harvests based on post-season household surveys, study communities, 2005, 2008, 2010, 2013, 2014, and 2016.



Note See footnote 4 in Chapter 7 for a full description of the sport harvest totals for the Nushagak River drainage.
* In Clarks Point there was no Chinook salmon harvest by rod and reel.

Figure 7-20.–Estimated sport harvest of Chinook salmon based on sport harvest surveys, harvested from the Nushagak River drainage, 1989–2016, and estimated rod and reel Chinook salmon harvests based on post-season household surveys, study communities, 2005, 2008, 2010, 2013, 2014, and 2016.

8. LOCAL AND TRADITIONAL KNOWLEDGE OF SALMON AND SUBSISTENCE ON THE NUSHAGAK RIVER

Introduction

Documenting local and traditional knowledge is a critical component of participatory research with community members (Berkes 2012; Tobias 2009). Local observations, including long-range temporal and place-based perspectives, regarded as a relationship of connection and cumulative knowledge, serve to provide in-depth and holistic knowledge of human interaction with the environment.

Although there are many definitions used to describe local and traditional ecological knowledge (LTK/TEK), this knowledge often comes from an indigenous person. For the purposes of this qualitative analysis, which incorporated both key respondent interviews (KRIs) and comments from household surveys for data collection, not all respondents or households participating in this research were Alaska Native. Yet, the LTK shared by individuals, and then analyzed for themes and sub-themes, addressed what Kassam (2009:84) defines as knowledge, "best described by its attributes: context specificity, complex connectivity, empirical tendency, cumulative nature, and plurality." The CSRI program, formed by the Chinook Salmon Research Team, indicated that "LTK can provide detailed observations about abundance, distribution, run timing, condition, and habitat, often focused on specific locations and informed by considerable time depth" (ADF&G Chinook Salmon Research Team 2013:16) In addition, the Chinook Salmon Research Team acknowledged that LTK can produce further research questions and hypotheses for additional testing. Furthermore, the CSRI program incorporated LTK as a method to address the "long term commitment to address fundamental knowledge gaps, elucidate causal mechanisms behind observed trends, and improve management capabilities" (ADF&G Chinook Salmon Research Team 2013:2). These knowledge gaps are identified in the numerous examples given in the KRIs and the open-ended comments collected from the household survey respondents. It is this information that, while not exclusively indigenous, does provide data on salmon stocks that are directly defined by Kassam's attributes of knowledge. Furthermore, the *Chinook Salmon Stock Assessment and Research Plan, 2013,* clearly outlined that "there is clear evidence of recent and persistent statewide declines in Chinook salmon productivity, run abundance, and inshore harvest from available stock assessment data as well as from local and traditional knowledge sources" (ADF&G Chinook Salmon Research Team 2013:8). The recognition that LTK has yielded data was taken into consideration by the Chinook Salmon Research Team when evaluating that "such knowledge, based upon local observations and experience and generally shared within Alaska communities across generations, can provide detailed insights about salmon stocks. … In addition, studies of LTK directly engage fisheries users in cooperative efforts to document and understand stock status and trends" (ADF&G Chinook Salmon Research Team 2013:10). The information presented in this chapter includes LTK regarding the subsistence salmon fishery, Chinook salmon changes, social interaction among community members regarding subsistence practices, and the subsistence regulatory framework in the Nushagak River watershed, among other topics.

Qualitative information addressed the following study objectives:

1. What is the character of the contemporary Nushagak River Chinook salmon fishery?
2. Based on observations and documented LTK of subsistence fishers, what is causing the variation observed in Chinook salmon escapement of the Nushagak River?
3. Have subsistence users of the Nushagak River fishery been affected by fluctuating Chinook salmon escapements? If yes, when, and in what ways?

4. There were 17 total KRI participants for all five study communities (Table 8-1). Most were fully recorded interviews, with three interviews containing notes only because respondents did not want to be recorded. An additional interview was recorded, but due to the poor condition of the audio recording, transcription was not possible.

Developing Themes for Qualitative Results

Three iterations of theme development were used to develop the theme and sub-theme groups, and their subsequent meanings, to organize qualitative results. The first theme development effort was spurred by creating the KRI protocol. An interview protocol (see Appendix C) was drafted to guide the key respondents through a variety of topics. Generally, the topics included: 1) subsistence fishing, 2) history of the fishery, and 3) regulations. Broadly, these themes addressed the ecological and social observations that pertain to study objectives 1, 3, and 4. Under each of these main headings in the protocol question series, a variety of questions was asked to gain detailed information and knowledge about how each of these systems has been experienced and observed by a key respondent, and overall provide for a more holistic picture of the Nushagak watershed communities and their role within the subsistence salmon fishery.

A second iteration of compiling the list of theme and sub-theme groups was then developed through a literature review focused on ADF&G Division of Subsistence Technical Papers related to subsistence salmon-based research in the communities (see the subheading "A Brief Comparison of Harvest Data Between Study Years" appearing in each individual community result chapter), as well as the TEK project database *Neqa to Tepa, **Łuq'a to Chuqilin**: A database with traditional knowledge about the fish of Bristol Bay and the Northern Alaska Peninsula*.[1] This database was based on interviews with area residents in 2003 and included Clarks Point, Dillingham, Ekwok, Koliganek, and New Stuyahok, among many other communities in Bristol Bay. This database contains detailed information that was reviewed as the KRI protocol was developed to ensure questions addressed project objectives. For example, the database includes the keywords "ecological" and "sociological"—two general organizing principles for the themes. Under each keyword, a series of "theme" and "expanded meaning" results were given. For example, under the theme "population" was the expanded meaning, "population trend," and then an example was given as "more fish, less fish." This database review informed two developments for the Nushagak River qualitative data collection and analysis: it guided the development of the themes, sub-themes, and their meanings, and confirmed that the method to organize qualitative information was supported by previous research and literature.

A third theme development effort occurred based on evaluating comments from respondents during household survey administration. Because the household survey form asked an open-ended question (i.e., "Do you have any questions, comments, or concerns?"), other information relevant to a respondent was recorded without structure or guidance of topics. Open-ended answers were then evaluated in comparison to themes, sub-themes, and meanings that arose from developing the KRI protocol based on study objectives and reviewing the *Neqa to Tepa* database. Only one new theme from the open-ended survey comments, *Pebble Mine*, was added to the rest of the developed themes from the initial two iterations.

This triple-development of qualitative thematic information ensured that all narratives shared by household survey and KRI participants reflected an overall shared experience of the subsistence salmon fishery on the Nushagak River. The corresponding amount of repetition of a theme appearing in responses further characterized its relevance within the broad ecological and social topics. Not all the themes identified during the qualitative data review will be discussed at length in this chapter, but all are presented in tables 8-2, 8-3, and 8-4. The research objectives for this project will be explored below, but not all themes and meanings that emerged through the qualitative data analysis process will necessarily be used to enhance the findings for the

1. Coiley-Kenner, P. 2003. "From Neqa to Tepa: a database with traditional knowledge about the fish of Bristol Bay and the northern Alaska Peninsula." Version 2.0. Alaska Department of Fish and Game Division of Subsistence, Juneau. An expanded version of the database incorporating findings from eight Kvichak watershed communities was renamed "From Neqa to Tepa, Łuq'a to Chuqilin" to reflect the addition of Dena'ina Athabascan TEK (BBNA and ADF&G 1996; Krieg et al. 2005).

Table 8-1.–Key respondent interviews, study communities, 2013, 2014, and 2016.

Community	Number of total interview participants	Interview notes	Interviewers
Clarks Point	3	3 full interviews (with completed recordings)[a]	Theodore Krieg, Gabriela Halas
Ekwok	3	2 full interviews (with completed recordings); 1 participant documented by interviewer notes	Sarah Hazell, Sarah Evans, and Theodore Krieg
New Stuyahok	4	3 full interviews (with completed recordings)[b]	Sarah Hazell, Sarah Evans
Koliganek	5	3 full interviews (with completed recordings); 2 participants documented by interviewer notes	Theodore Krieg, Gabriela Halas
Dillingham	2	2 full interviews (with completed recordings)	Theodore Krieg, Gabriela Halas

a. One interview recording was indecipherable; researchers only relied on notes to write findings.

b. One interview had 2 participants

research objectives. More specifically, not all data are relevant to gaining more understanding of Chinook salmon in Bristol Bay, but all are relevant to understanding how communities, which are highly dependent on salmon in general, function while facing changing Chinook salmon populations, environmental change, social change, and other important factors of the subsistence way of life in the 21st century.

Local Observations of the Chinook Subsistence Fishery

Tables 8-2, 8-3, and 8-4 describe the main theme, sub-theme/expanded meaning, and then a description or example of each main theme. The themes are grouped by ecological observations, social observations, and other observations.

Ecological Observations

Stock Changes Over Time

As identified by the ADF&G Chinook Salmon Research Team, "Recent Alaska-wide downturns in productivity and abundance of Chinook salmon stocks have created social and economic hardships across many communities in rural and urban Alaska. There is a fundamental need to more precisely characterize productivity and abundance trends of Chinook salmon stocks across Alaska, gather essential information necessary to understand root causes of these widespread declines, and track population trends into the future" (ADF&G Chinook Salmon Research Team 2013:1).

Changes to salmon stocks of all species were fundamental points of discussion in the KRIs and the household surveys and provided examples relevant to subsistence fishers from all the study communities. Stock changes were identified as issues of salmon body condition, size, and run abundance. Below are examples of each sub-theme that both household survey and key respondents identified, which also address study objectives 1 and 3.

Condition of Chinook Salmon

Parasites

- A common observation in all survey years was worms in the flesh, or white spots in salmon meat; white spots seem to be increasing specifically in Chinook salmon.
- Fish with parasites were typically discarded (either thrown away or given to dogs) and were not trusted by interview respondents as being edible.
- In Ekwok, interviewees also had experience with seeing "white pus," and those fish would be discarded or fed to dogs.
- The condition of Chinook salmon flesh was indicated as being softer with a different color; the change in flesh condition was also noted to accompany the occasional deformity in the shape of an individual fish. However, New Stuyahok respondents indicated parasites were present in the flesh of Chinook salmon, but the meat retained its fatty and firm texture.
- Chinook were not the only species to have parasites: an Ekwok respondent saw white pus balls under the skin of coho and sockeye salmon also.

Table 8-2.–Qualitative analysis results, ecological observations, study communities, 2013, 2014, and 2016.

Ecological Observations		
Theme	***Sub-theme or expanded meaning***	***Description or example***
Stock changes	• Condition of Chinook salmon	• Health conditions (parasites, etc.) • Size of Chinook salmon
	• Abundance	• Run size observations
Fish migration	• Run timing	
	➢ Environmental concerns	• Environmental concerns ➢ Water temperature ➢ Water levels ➢ "Global warming"
	➢ General	• Habitat • Wind
Environmental changes	--	• Water temperature • Water levels • Changes to river • "Global warming" • Pollution
Bycatch	--	• Concerns about Chinook salmon bycatch (largely in trawl fishery)

Note "--" indicates that there were no sub-themes identified.

- One person mentioned the timing of parasites—usually worms were observed later in the season but recently they were noticed earlier.

Size of Chinook Salmon

- Several survey respondents mentioned that Chinook salmon are smaller and more "jacks" are being caught (the term "jack" is used to describe salmon, typically male, that are sexually mature and return to spawn after being in salt water for only a single winter2).
- The "big kings" (estimated at 50–60 lb) are not being caught anymore and the typical size seems to be 30–40 lb.
- A Clarks Point resident mentioned that the size of Chinook salmon has changed from their prior weight of 90–100 lb, to the current "big kings" of 50–70 lb, with the reasoning being that since large Chinook salmon were targeted in the past, this has led to a decrease in the genetic pool and diversity of Chinook, leaving only the relatively small fish available.
  - The size of Chinook salmon affects the type of product that is made from the harvested fish; for example, larger Chinook, indicated by their general size and fat content, are best used for smoking and making "dry fish," which is a particular way of processing salmon.
  - Size was also mentioned by one respondent in Dillingham who specifically indicated that smaller Chinook salmon migrate later in the summer (June), with larger ones coming earlier (May).

Chinook Salmon Abundance

As identified by the ADF&G Chinook Salmon Research Team, "Recent Alaska-wide downturns in productivity and abundance of Chinook salmon stocks have created social and economic hardships across many communities in rural and urban Alaska. There is a fundamental need to more precisely characterize productivity and abundance trends of Chinook salmon stocks across Alaska, gather essential information necessary to understand root causes of these widespread declines, and track population trends into the future" (ADF&G Chinook Salmon Research Team 2013:1).

- Some respondents in 2013 mentioned that the number of Chinook salmon seems to be decreasing and that there are not as many as before, while a few respondents indicated that they have seen plentiful fish and had not noticed any decline.
- One interview respondent noted that while he has seen fewer Chinook salmon over the past years and that he is worried about their abundance, he also recognized that Chinook are a variable species and populations may cycle.
- Spawned salmon eggs were also observed to be targeted by predators, such as Dolly Varden and rainbow trout, and avian predators, such as gulls and terns.
- Most respondents in the study communities indicated that the Nushagak watershed still has a good abundance of Chinook salmon and that their overall body conditions seem good, despite a decrease in size. Overall observations also seem to indicate that most people feel that, for subsistence fishing, the Chinook runs and harvests for the Nushagak watershed are quite high and successful. Commercial fishers, on the other hand, have felt the effect of a shrinking Chinook salmon fishery, both in abundance and size of Chinook, although this reduction seemed to have little bearing on subsistence setnetters.

2. Alaska Department of Fish and Game, "Chinook Salmon (*Oncorhynchus tshawytscha*): Species Profile (Life History)," http://www.adfg.alaska.gov/index.cfm?adfg=chinook.main (accessed July 2018).

Fish Migration

Run timing was grouped into two categories: 1) timing of runs as related to environmental reasons, and 2) general information about timing and migration.

Changes in Chinook Salmon Run Timing

Environmental Concerns

Water Temperature

- Respondents indicated that water temperature in general has been increasing. One respondent reported that if the winter is warm then fish will travel upriver more quickly; salmon wait until the temperature is right to travel.
- Observations of warming waters influencing fish to move "quicker" upriver was also supported by Dillingham and Koliganek respondents (2016 and 2014, respectively) who reported that when waters are cool, fish "mill around" Port Heiden and Port Moller ("too warm in [Nushagak] bay"), and once the waters get warmer, then they "stop for nothing."
- Several respondents reported that Chinook salmon are migrating earlier than "normal" due to warmer waters. Warmer waters, on the other hand, were also observed to affect the coho salmon runs, making them an overall "stronger" (that is, larger) run.
- Some New Stuyahok respondents also observed warmer waters in the Nushagak watershed, but shared that it did not affect subsistence fishing.

Water Levels

- Water levels reportedly indicate how long fish will stay in a given area, with one Koliganak resident expressing concern that the water was too low and affected fish populations due to diminished oxygen levels.
- Respondents from Koliganek all had differing opinions on water level or water quality changes, with some individuals reporting detailed change, and others indicating no change.

"Global Warming"

- A survey respondent from 2013 reported that global warming means fish are "staying out [in the bay], and not coming in [to the river systems]."
- A survey respondent from 2014 shared that elders say that if the weather is too hot then the fish "don't come in."
- An Ekwok resident indicated that the main Chinook salmon run is early due to climate change and weather, and that other fish species are also affected by hot weather.

Changes in Chinook Salmon General Migration Patterns

Habitat

- Migration changes were observed in relation to changes to habitat and habitat use by Chinook salmon. These changes were reported as changes to the rivers and Nushagak Bay due to shifting sand bars and changing channel depth and position. Respondents reflected that sand bars and channel depth affect Chinook salmon movement and migration into and through Nushagak Bay to the surrounding river corridors.

- Both key interview and 2013 household survey respondent comments from Clarks Point indicated that sand bars, changing channels, and bluff erosion may change how far or close Chinook salmon travel toward the Clarks Point beaches.
- Respondents from Clarks Point expressed that Chinook salmon do not come on "their side" anymore, meaning the bay side of Clarks Point, but instead travel exclusively in other channels, or on the side of the bay where Dillingham is located. Further changes include the development of new islands and increased vegetation on the existing Grassy Island, with a reduced creek system that was reported to affect fish movement.
- Increased silting of the bay and rivers was noted by Dillingham residents who indicated that the silting and changing of channels means Chinook salmon are not traveling the same routes as before, adding to the observed unpredictability of their migration. This habitat change was indicated to also affect fishing access since boats have had to change how they travel the rivers.
- Although shifting channels and sand bars were also included in descriptions of major changes to the region by another Dillingham resident, he was also quick to point out that changes are "continuous year to year," and that there may be areas that he is unable to fish for "10 years," but can eventually go back and fish them once environmental factors shift again.

Wind

- The direction of wind was observed to affect Chinook salmon migration and movement, thus potentially affecting the success of a Chinook run if fish get "pushed" toward accessible beaches and setnet sites. A Dillingham respondent indicated that southeast or southwest winds were "good" for Chinook salmon and would help subsistence fishers due to Chinook being close to the beaches.

Environmental Changes

Environmental changes were discussed at length in the KRIs and in household survey comments. General ecological changes were identified to various elements of the Nushagak River landscape, including local fisheries. Most changes to salmon, and Chinook salmon in particular, were reported as changes to migration and run timing (see the discussion and examples in the section "Stock Changes Over Time"). Below are more general environmental changes described by respondents, not limited to observations in relation to salmon. Not all environmental changes were indicated as affecting fishing or subsistence, but ecological change, in general, was an important over-arching theme.

Water Temperature

- Water temperature was a concern for one respondent in 2014 as a possible reason for more "sores" or lesions on sockeye salmon, including an increase in fungal infections.
- Observations were made regarding the increase in water temperature as an effect of sea ice conditions with a respondent from Clarks Point saying, "We usually are still hunting seal out on the ice packs at the end of April, and not anymore. The river goes out too early. Water temperature changes."

- Dillingham respondents also noticed changes with other species, notably smelt and seals traveling north to Lake Aleknagik.

Water Levels

- Many respondents indicated that a lack, or variability, of snow fall was observed to change or decrease water levels in the Nushagak River watershed.
- Water levels were indicted as an issue of concern in 2013 since fish mortality was observed due to a perceived lack of oxygen in areas of low water level.
- Fish die-offs due to low water were observed by a Koliganek key respondent who discussed the drying of smaller streams, and subsequent fatalities to salmon spawning "groups." The same Koliganek respondent who had observed pink salmon die-offs identified the connection between "deep holes" in the river "full of fish" that would, "have their eggs in all of them," The deep holes would be in sloughs where there was minimal or no current, thereby causing fish mortality events.
- Water levels were also mentioned in 2014 survey comments since sloughs were observed to be drying, and that this affected salmon spawning, as well as skiff travel.
- Spawned out salmon, or "red fish," were also observed to be affected by lower water, with a 2014 survey respondent noting that sockeye salmon could not get up to Lake Aleknagik due to shallow waters, thus they were harvested by hand.
- One key respondent from Ekwok explained that water level has the potential to affect a number of ecological processes, and both high and low water extreme events indicate environmental change is occurring, "Right now I'd say it's more extreme … like 2003 or 2004 the river went up [high water] three times, the ice went up, and then when we fished there we had a lot of real high water. Two years, three years ago our water went down to nothing, it was dry! So, you had the extremes; we didn't get any berries last year because the water was so low … there have been more changes in the environment, you can see—look at all the mosquitoes."
- Another Ekwok respondent indicated that river near the community site used to be 8–10 feet deep, and now was 2.5–8 feet deep.

Changes in the River Corridor

- Sand bars were noted to be increasing in areas of Nushagak Bay, as well as the Wood and Nushagak rivers. Sand bars that were underwater previously are now above water, with trees growing on some sand bars in the Koliganek area.
- Channels were observed to have changed in the rivers, making both navigation and Chinook salmon migration unpredictable.
- Dillingham respondents also indicated that an increase in silt in Nushagak Bay has caused people to not be able to park their boats on beaches anymore. Increasingly, boats need to be anchored further out with people walking in the mud to get their skiffs. Observations were made about sand bars are getting "bigger and bigger every year."

"Global Warming"

The term "global warming" was used by several respondents to describe a general indication of warming trends, often in relation to decades past. "It has gotten warmer," was a common observation and comments came from all sources: 2013/2014/2016 household surveys, and also key respondent interviews.

- Changes observed over time were used to describe fish migration changes (see the "Fish Migration" and "Environmental Changes" sections).
- Seasons were observed as having "really warm summers," temperatures being "too hot," or in the case of a New Stuyahok respondent, "Things are changing fast with climate change! One year it was so hot that sockeyes were dying off in the river before they spawned. This was three or four years ago when it was a hot summer and they said it reached 100 degrees up at New Stuyahok."
- A Dillingham key respondent also indicated "global warming" as "happening," and although he stated, "I don't know what global warming is going to do to us," he indicated increased brush growth occurring, both in abundance and location. The same respondent explained in detail how smoking fish in smokehouses is dependent on weather (wind, rain), and air temperature, as well as the presence of insects. These environmental factors all influence success of smokehouse use to process fish.

Pollution

- Pollution did not seem to be a major concern for respondents, although one individual mentioned the Fukushima explosion in Japan in 2011 during a household survey for 2013. This respondent was concerned that nuclear effluent may harm salmon in Bristol Bay and that testing should get done to ensure their safety for consumption.
- Pollution from Bristol Bay canneries was mentioned by one 2014 household survey respondent. The concern was related to cannery waste or discharge. Another respondent was concerned that the "bio-waste pool" in Dillingham was "full and ready to spill" over onto Kanakanak Beach, a local setnet site.
- Dredging in the Dillingham boat harbor was a concern for one respondent as a possible factor affecting shifting channels of the bay. This was seen as a possible reason why fish moved to the "other side" of the bay. Another respondent echoed this concern, adding a further detail that dredging may be "covering" salmon food with additional silt.

Bycatch in Commercial Fisheries

Bycatch and its effect on Chinook salmon was discussed frequently by survey respondents in all survey years, and by key respondents in the study communities. In general, respondents felt that the Chinook salmon bycatch amount should be further reduced. Bycatch of Chinook mostly occurs in the trawl fisheries, primarily for pollock. The Gulf of Alaska (GOA) and the Bering Sea and Aleutian Island (BSAI) groundfish fishery had an average Chinook salmon bycatch in 1994–2006 of 19,000 and 47,000 fish, respectively. In 2007–2011, the GOA had a Chinook salmon bycatch of 28,000 fish, and the BSAI of 41,000 fish (ADF&G Chinook Salmon Research Team 2013:44). The North Pacific Fishery Management Council (NPFMC) has implemented measures to reduce Chinook salmon bycatch in the pollock fishery, introducing "hard cap" values for the BSAI, which require immediate closure of the pollock fishery when Chinook salmon bycatch numbers have been met[3]. Other incentives and measures are in place to counter the effect of bycatch on Chinook and other salmon populations. The bycatch issue is of major concern to local residents of Bristol Bay, as evidenced in survey comments and interview narratives.

- Most respondents were concerned that the trawl fishery reduced Chinook salmon populations, and/or affected Chinook migration runs.

3. Reducing Bycatch in Alaska PDF flyer. NPFMC. https://www.npfmc.org/salmon-bycatch-overview/ (accessed June 7, 2018).

- Several respondents mentioned that they have personally seen or had family members who worked in the commercial fishery, and had witnessed Chinook salmon "thrown overboard," sparking concerns of waste. The respondents with this concern also mentioned that they were aware that "subsistence comes first," and that bycatch was unfair and disrespectful to both the fish and those dependent on harvesting fish for their livelihood.

Social Observations

Regulations

Subsistence regulations have changed over time in the Nushagak District and a current regulations map and description of subsistence regulations can be found in the first report chapter, "Introduction." Below are the main themes addressed by surveyed households and interview respondents. Not all themes had to do specifically with the regulatory framework but included elements of management.

Counting Fish

Salmon escapement and general fish management were discussed at length both in open-ended survey form responses and in the key respondent interviews.

- Several comments noted that weirs and counting towers should be established earlier in the season to reflect perceived earlier timing of Chinook salmon migration.
- One Ekwok resident identified that escapement counts of Chinook salmon are further challenged by shifting river channels. He said that Chinook salmon travel in the middle of the river, reducing the possibility of accurate counting because towers typically are situated on the edge of rivers.
- Several respondents mentioned that Chinook salmon escapement counting should begin earlier in the season to ensure proper resource allocation to different fisheries.

Competition Among Subsistence Users

- A few comments from the Dillingham 2016 surveys expressed concern over competition for beach setnet sites (such as Kanakanak Beach), as well as other sites not being accessible due to private land restricting access or terrain making access possible only by ATV or boat use.
- Reported waste (of both targeted and non-targeted species) was observed by respondents in all study years at popular subsistence setnet sites in Dillingham, and respondents suggested that improved regulations on marking sites would improve enforcement, thus reducing waste of fish, including Chinook salmon.

Subsistence Fishing Schedule

- Dillingham respondents noted concern during the 2016 household surveys that some subsistence users who work Monday–Friday were limited in their ability to fish due to the 3-day a week subsistence opener.4

Subsistence Fishing Gear

Drift Gillnet

- Two people completing the 2016 Dillingham surveys commented that drift gillnetting in the Wood and Nushagak rivers should be allowed under subsistence regulations to reduce over-

4. As noted in Chapter 1: "Introduction," the 3-day a week subsistence fishing opener limitation was removed at the December 2018 Alaska Board of Fisheries meeting; changes to 5 AAC 01.310(d) went into effect for the 2019 fishing season.

Table 8-3.–Qualitative analysis results, social observations, study communities, 2013, 2014, and 2016.

Social Observations		
Theme	***Sub-theme or expanded meaning***	***Description or example***
Regulations	• Counting towers • Competition among subsistence users • Subsistence fishing schedule • Subsistence fishing gear ➢ Drift gillnet ➢ Rod and reel • Competing with commercial fishery • Sport fishing • General	• Feedback regarding the regulatory system
Subsistence as priority	--	• Perspective on subsistence as integral to way of life
Pebble Mine	--	• Perspectives on Pebble Mine affecting Bristol Bay/Nushagak River
Meeting harvest needs	• Deciding about quantity of salmon needed	• How an individual or family decide the amount of fish needed, and if those needs are met • What type of salmon contribute to what kind of processed product
Traditional management	• No waste • Customs	• How best to fish and process harvest to avoid waste • "Only take what you need" • "Throw bones back in water"

-continued-

Table 8-3.–Page 2 of 2.

Social Observations		
Theme	***Sub-theme or expanded meaning***	***Description or example***
Social relations	• Passing down practices	• Transmitting traditional knowledge about subsistence fishing
	• Sharing and distribution	• Salmon are shared and distributed widely
	• Social changes	• Changes in social relationships (especially with youth), activities, and general life

Note "--" indicates that there were no sub-themes identified.

harvest. Some respondents reported that there is a certain amount of waste during setnetting since users not required to tend their nets. Drift gillnetting was indicated as an alternative to the issue of a lack of setnet attendance because individuals can better control what they catch since they are directly handling the driftnets from skiffs.

- One 2013 household survey respondent reported that drift gillnetting does occur on the Nushagak River (though illegal), and that setnet enforcement needs to make sure that nets are securely fastened to beach sites.

Rod and Reel

Although rod and reel fishing is not a subsistence gear type by regulation in the Nushagak watershed, many surveyed households who used rod and reel gear expressed that this gear type is used for subsistence since retained salmon are harvested for home use, and that the salmon are harvested with the intent to provide for households' needs.

- Some respondents reported that their rod and reel harvest is reported on their subsistence permits.
- In 2013, a survey respondent mentioned that "it would be nice to subsistence fish with rod and reel because you can be selective with what you keep," and that it can be more efficient and easier on the resource since there is less "bycatch" of undesirable species. Another survey respondent in 2014 indicated that his rod and reel harvest was not reported on his subsistence permit, but was "still subsistence," while another respondent in the same year indicated that community members "like to get their subsistence silvers with rod and reel."

Competing with the Commercial Fishery

- Survey respondents in 2014 expressed concern that due to inaccurate escapement counts on the Nushagak River, Chinook salmon would be allocated to the commercial fishery;

these respondents felt there was too much competition with the commercial industry, which should strictly be regulated for subsistence users.

Sport Fishing

- One Dillingham survey respondent was concerned that the sport fishery does not properly report the quantity of fish being "shipped out of the community," and others (during all the study years) mentioned they would like to see a reduction in sport fishing participation in the Nushagak watershed.
- Other 2013 household survey respondents expressed concerns that ADF&G manages "more" for the sport fishery than for the subsistence fishery and that "catch and release" fishing should be banned because fish die upon the "release."

General Comments on Regulations

- Some survey respondents indicated that subsistence regulations are easy to interpret ("seamless"), while others had varying experiences with regulations or management, such as fish and game enforcement, and difficulties understanding the regulations book.
- Several survey respondents expressed that the subsistence permit system was necessary and worked well.
- One survey respondent in 2013 wished to see an online permit system established, both for obtaining permits and reporting harvest numbers.
- Some comments made in all study years pertained to how multiple households were fishing together and confusion about how to report harvests. If fishing activities and harvests were shared, participants in the surveys were not sure how a fish given to another household was recorded on a permit. Clarity of regulations and general education about the permit system was expressed as a good idea to regulate and improve harvest reporting.
- One survey respondent said, "The marine advisory website is really confusing. It is hard to find information. We used to have a biologist that gave us a list of what we need on boats but he's gone."
- A university course was mentioned as a good way to teach people how to fish, how to "slime," cut, and process their catch. Education should also include elders teaching culture camps and being more involved with youth.
- A 2016 Dillingham survey respondent was concerned that jet boats may affect spawned eggs in river systems
- ADF&G bureaucracy was also mentioned as a "barrier" to improve fisheries management, as well as exhibiting a perceived underlying priority given to the sport fishery.

Subsistence as Priority

The importance of subsistence, and the notion that "people can't live without it [subsistence]" appeared often in the comments from household survey and key interview respondents. Subsistence was reiterated as the Alaska state legal priority. Furthermore, people mentioned that the subsistence way of life would be threatened by mining, and "would destroy the way of life" known to communities. One sentiment expressed in the surveys and interviews insisted, "You should recognize that we are always going to subsist. You cannot take that away from us. The Western way of life is not always the best." This powerful statement exemplifies the centuries-old connection to a way of life that at times was seen to be complicated by the regulatory framework.

Pebble Mine

Concerns regarding the Pebble Mine were brought up unsolicited by respondents in the 2016 Dillingham surveys and in the 2013/2014 household surveys in all communities. Feedback from the open-ended survey comments was from respondents who did not want to see Pebble Mine in the Bristol Bay area due to potential threats to fish populations, subsistence fisheries, and other natural resources. Pollution and contamination were seen to threaten fish populations, and oil spills or other accidents were deemed not worth the risk of developing Pebble Mine. No single comment from any survey or interview data supported Pebble Mine; all perspectives focused on the mine's negative effect on the region.

- One respondent from 2013 stated, "I don't think they should ever put a mine in the headwaters of Bristol Bay. We have always had lots of salmon and that is something that is part of our economy. It is a renewable resource."
- Other respondents indicated having a "fear" of potential damages from a mine site, that Pebble is "trying to kill us off," and some respondents simply stated, "Stop Pebble Mine." One commenter declared, "You can't eat gold."

Several survey respondents mentioned the subsistence priority, and the importance of living off the land, that "fish keep us alive," and "long term fish is better than short term mine."

Meeting Harvest Needs

The ability of the subsistence fishery to meet a household's or individual's needs was addressed directly in the surveys, when households were asked if they "get enough" salmon through "their own efforts or sharing." Meeting needs is an element of food security, meaning that a household needs to feel their ability to eat is being met by their ability to obtain food. Respondents offered a variety of comments regarding this question, and reasons for meeting or not meeting needs ranged widely in each community for each study year. Qualitative data for reasons behind meeting needs are also explored in each community results chapter under the subheadings "*Assessments of Use of Chinook, Sockeye, and Coho Salmon Through Harvest or Sharing*."

- Several respondents from the 2016 Dillingham household surveys commented that they had plenty of fish and the opportunity locally was "very encouraging," and that the "season was good." One respondent indicated it was difficult to get a net out and to get Chinook salmon.
- In 2013, opinions were variable with five different comments from KRIs ranging from not getting enough Chinook salmon for the year, to not getting enough for specific processes (salting or strips), or gear limitations (the individual did not own a boat or net).
- In the KRIs, respondents expressed more detail regarding how many Chinook and other salmon species they would need to feel that their needs were met. Out of the three interviews in New Stuyahok, one person mentioned 60–80 Chinook salmon would suffice for the supply to last through the winter; this estimate included salmon for sharing with households in need. This respondent indicated that she was able to "get what she needs." The other respondent mentioned a similar amount, 50 Chinook salmon, but that she would try to get more due to the size of her family. Another key respondent in Ekwok mentioned about 50 Chinook salmon is the ideal amount and that they have not had issues harvesting this amount throughout the years. In Clarks Point, two respondents were interviewed. One hundred Chinook salmon were cited by a middle-aged individual as the amount his mother would harvest to last their household through the winter.
- Individuals once able to setnet and fish in Clarks Point have had to travel to the Wood River to obtain their Chinook salmon and meet their needs. Changing topography, such as erosion on bluffs and changing sandbars, have altered traditional fishing locations. The same

respondent also compared historical Chinook salmon needs (100 fish) with his current needs (30 fish), citing decreased community and family needs.

- In Dillingham, where 2 people were interviewed, 30 Chinook salmon were needed by one individual, and 50 Chinook were more ideal for the other. This amount was stressed as the amount needed to can (jar) the fish and to be able to give some away. For this respondent, the economy was an important factor, and she felt she needed to "…can as much fish as I can." This respondent also indicated that her household "…always had fish. Never had any difficulty [in obtaining their fish]." The same sentiment was echoed by the second Dillingham respondent, who indicated that he has always been able achieve his full harvest goal.
- In Koliganek, five individuals were interviewed, and all indicated that about 50–100 Chinook salmon would be sufficient to meet their household needs. A few respondents mentioned that smaller families over time have caused the needs to decrease, and that they only take what salmon they need. Another Koliganek respondent indicated that 80–100 Chinook salmon suffice for his family and that the only time his needs are not met is when the Chinook run is late and coincides with his commercial fishing employment.
- One interviewee felt that communities of Bristol Bay "…were always in the land of plenty," compared to other parts of Alaska, such as the Yukon–Kuskokwim Delta. This respondent seemed to echo the overall feeling that communities in Bristol Bay have done considerably better than other communities whose residents are also dependent on healthy salmon runs for subsistence needs.

Traditional Management

Traditional management of the subsistence salmon fishery was discussed as a part of the KRIs. In *Neqa to Tepa, **£uq'a to Chuqilin,*** the TEK project database, the theme of traditional management was categorized as "customary rule"; the main examples were waste prohibitions and catch-and-release prohibitions. The project surveys and interviews found similar results, with two main sub-themes emerging from the data: no waste and customs. Although KRI and household survey comments did not go into great detail regarding traditional management practices, the message was clear: to continue to have plentiful salmon and a healthy subsistence fishery, overall respect for the resource was necessary. This was expressed through no waste practices, taking only what was needed, and ensuring that sharing was an integral part of community life.

No Waste

- Not wasting fish, by taking only what was needed, was the most common management tool used by the Nushagak watershed communities in this study. Taking only the necessary amounts meant that needs were fulfilled for both the family that was fishing, and for the community as a whole, especially for elders and those who could not fish for themselves. Overall "no wasting" was a sign of respect for the land and water, and as one Clarks Point resident asserted, "You respect the land. Because every year it's going to bring back the same fish, ducks, geese, animals. They [his parents] finally drilled it into me; I'm drilling it into them [the local youth]."
- Two respondents in Koliganek also spoke of taking only what one needs, and both added to not "overdo your catch," or if "you clean 'em out you're not going to have any."

Customs

- A key interview respondent shared that some people, in some of the communities in the Nushagak region, practiced "throwing the bones of salmon back into the water" to

ensure their return, yet people did not perform that custom in Clarks Point. A Dillingham respondent echoed knowledge of this salmon processing custom, but also indicated she did not participate. The concept of "…not to waste and not to take more than we can," was the management method she employed. This approach was also expressed by the other Dillingham respondent, adding that cleaning any fish you did not want, and then distributing it to family and friends, was the best way to show one's intention to take care of the resource. Not wasting fish was reported as a key component to management, as one key respondent in Koliganek stated, "Just don't waste. Any scrap you have, clean it all up, bring it back down to the river to bring it back to where it came from. That's a tradition we use. Give thanks for everything that you get."

Social Relations

The theme of social relations was further broken down into three sub-themes: 1) passing down practices, 2) sharing and distribution, and 3) social changes. Passing down practices pertained to the transmission of traditional knowledge about subsistence fishing and included many comments on the role that elders play to encourage knowledge about and the practice of subsistence, especially to the youth of a community. Sharing and distribution identified that salmon are a heavily shared resource in Nushagak communities. Social change, as observed by members of each study community, identified changes especially in youth, related to both a subsistence way of life and life in general.

Revealing the social relations inherent in the study communities also addresses Objective 1: the character of the contemporary Nushagak Chinook salmon fishery. This broad overview of community interaction with the subsistence fishery helps develop a more detailed understanding of how subsistence fishing relates to the day-to-day functioning of a community, and the importance of the fishery—economically, nutritionally, and socially/culturally.

Passing Down Practices

- A survey respondent from 2013 shared, "I learned a lot from my elders about how to live the subsistence lifestyle. I want my children to live the subsistence way." A survey comment from 2013 shared, "I really enjoy teaching others how to put up fish. It was my mother who taught me." A New Stuyahok interview respondent shared that she knew the tradition from many years prior, from having it passed down from her parents, and that the children knew the "subsistence way of life." On the other hand, this respondent was aware that other community members, and in particular youth, did not always learn or get traditions passed down, and that they "don't know what to do." An Ekwok interview respondent commented, "We're doing it the same way as my parents, how I was taught." Passing down knowledge also spanned into methods of traditional management, with one Dillingham key respondent stating, "Take what you need has been driven into us by our grandmas and grandpas and dads and moms." Lastly, a Koliganek key respondent linked passing down knowledge to management practices by indicating, "If you waste, pretty soon you will have nothing. The old people used to tell me that. If you waste, they [the fish] will go away."
- A Koliganek key respondent shared a comment about the importance of passing down subsistence knowledge and subsistence as a way of life:

  > Practical knowledge is better than going to school. And there is always stuff that we know for our subsistence way of life. You just need to teach it … because I was taught. My mom and dad said, "In order for you to survive this is what you gotta do." And I say it to my kids. And it's that simple. But the thing is, don't sit on your ass if there are things that have to get done … get out there and help or you will end up with nothing.

Having the younger generation members take responsibility for their own learning is reflected in the above comment. An Ekwok key interviewee responded to questions about teaching youth by indicating, "That's my job, my job is to teach my kids and grandkids. It's nobody else's job to do that. That's what you should take as your responsibility, anybody on this river. You have kids, if you want them to take that traditional, you have to go out there and show them how to do it."

Sharing and Distribution

- Many respondents, from both surveys and key respondent interviews, reported extensive family sharing, noting that both receiving and giving was an integral part of assessing if a harvest was "enough." A 2016 survey respondent from Dillingham indicated, "It's important to know that if we bring in more than we need it's shared, especially with people who don't have permits." Other survey comments indicated that residents did not harvest, but only received fish.
- Another respondent, also from Dillingham, reported, "We share with the people on the Yukon because they can't fish"; this was in reference to diminished Chinook salmon abundance on the Yukon–Kuskokwim Delta. Another respondent, from the 2014 surveys, indicated the same: the salmon was shared with family members as far north as Noorvik in the Kotzebue Sound area. Interestingly, one 2013 survey respondent reported it bothered her that resource harvesters from other locations came to fish in the Nushagak watershed when they had a different agenda regarding Pebble Mine, "Lots of people from Iliamna Lake come over to this area to harvest fish, but they are pro-Pebble Mine and want our local resources."
- Collaboration between households was also a very common element within the Nushagak subsistence fishery, with multiple households fishing together and then distributing the harvest among themselves. Survey comments from 2013 and 2014 reported roughly three to four households fishing together and then sharing the total harvest. A Dillingham key respondent indicated that without the help of her sons, she may not get the amount she needs for her household. This respondent also elaborated, explaining that she was aware that not everyone had the ability to rely on able family members to fish for more than one household, and that it likely contributed to her high level of food security; she said, "[I] always get my fish, I have not had a problem." Additionally, this same respondent also indicated that she needs about 50 fish, with 10 more fish being the amount she needs to give away to elders and others who cannot fish. The perspective on sharing and distribution appeared ingrained into respondents' ideas about the necessary harvest amount for subsistence. The need for sharing was echoed by a New Stuyahok key respondent as well, who indicated, "I take 60–80 kings and I'm good for the winter. For family and friends and relatives. For sharing."
- Gear was also a part of sharing; a survey comment from 2014 reported, "More people don't have boats and nets, so we share."

Social Changes

- Social changes spanned a variety of comments, from economic, cultural, changing subsistence practices, and the role of youth in the study communities. One respondent commented, "Young people [are] getting food stamps … we work our butts off for what we get, but when you go to the store, these people [young people] are living on steaks and all the other things so why the heck would they want to go out and bust their butt and put up fish or do whatever, even if it's kind of traditional, you know? So that has some really bad effects on doing it traditional." Another respondent in the same community lamented the change in

processing, "Nowadays you see a guy throw away the tail, the backbone, and the heads of the fish." The loss of traditional methods was further elaborated on as the same respondent commented, "The young people nowadays are using the king salmon fish for salting, feeding, and stripping. They rarely use sockeye. They just throw the dog salmon away. I think that there is this whole wanton waste thing going on in the villages." Conversely, one key respondent mentioned, "The ones I taught they show big interest. They are putting up their own kings now. I'm glad I got the chance to teach them." Although another respondent had not noticed changes among the younger generations, a third respondent indicated, "I['ve] seen lots of changes. There's a few [community members] that are taking their kids out. But a lot of them are not."

- Social change was also reported as having to do with an increase in wage employment, as well as an increase fuel prices. These two elements were noted to limit some people's engagement with subsistence activities.

Other Observations and Additional Information

The KRIs and household survey comments yielded more qualitative results than discussed in this chapter. In terms of addressing the study objectives—1) the character of the contemporary Nushagak Chinook salmon fishery, 2) LTK-based observations on Chinook salmon stock variation, and 3) effect on subsistence fishers—the above collection of themes, sub-themes, and examples provide rich and detailed information addressing the three objectives. Ecological observations largely addressed objectives 1 and 2 and social observations addressed Objective 3. The other main group, organized as "other observations," fall out of the bounds of the study objectives and will not be discussed here, although elements of gear types were mentioned as they related to subsistence gear preferences (drifting the river systems), and processing/preservation as related to Chinook salmon size changes (and preferred foods to make out of certain-sized Chinook). In general, the "other observations" not discussed include: 1) fishing methods, gear types, and division of labor, 2) first memories of salmon fishing, and 3) preservation and processing.

Table 8-4.–Qualitative analysis results, other observations, study communities, 2013, 2014, and 2016.

Other Observations		
Theme	***Sub-theme or expanded meaning***	***Description or example***
Fishing methods, gear types, and division of labor	• Fishing partners and division of labor by gear use and harvest processing	• Who fished, fishing methods and gear, and processing roles of family members
First memories	--	• Earliest memories and stories of subsistence fishing
Preservation/processing	• Salmon type preferences	• Various methods for processing, and species preference for each preservation process

Note "--" indicates that there were no sub-themes identified.

Participant Observation as a Method for Qualitative Data

The third objective for this project was to conduct participant observation to gain a better understanding from local users about the Nushagak watershed subsistence fishery. For researchers, to be embedded within a local setting, and to observe users, offered a chance to gain more insight not achieved through household quantitative surveys or KRIs. Since recording local and traditional knowledge was an objective of this project, and this project was led by a diverse group of researchers who had varying levels of contact and connection to the locations and subsistence users, gaining context and knowledge through observation was critical. As Kassam notes, "The research sites are the location, and locality, condition, and conditionality from which we can understand the relationships between the biological and cultural" (Kassam 2009:223).

In 2014, two researchers traveled to Lewis Point to observe and engage with subsistence salmon fishers. The same researchers then traveled to Ekwok, New Stuyahok, and Koliganek in June 2015 for participant observation. In 2017 and 2018, an ADF&G researcher fished with a subsistence setnet in Dillingham, and, although on personal time, was able to observe the subsistence fishery at a variety of beaches and setnet sites, as well as talk to local residents about subsistence fishing practices.

Field notes from the participant observation trips in 2014 and 2015 were analyzed for themes and sub-themes pertaining to the qualitative information categories discussed above. Most of the field notes were developed based on one or two main individuals in each community whom researchers spent time with and discussed subsistence activities. Most of the field notes comprised observations about processing activities, since participant observation was occurring during active fishing months (June). Discussions among community members were also held about which salmon species was preferred for which fishing method and why; this theme was not presented in this chapter, so the summary below features only those themes and sub-themes that matched the overall objectives of this research.

Stock Changes

- One New Stuyahok resident mentioned that Nushagak Chinook salmon are smaller and that an increase in jacks has been observed.

Environmental Changes

- A different Ekwok resident reported that 2015 was "the worst bug year in ages," attributing this to drier conditions and lack of snowfall in the region. A Koliganek resident reported increased erosion along the river banks.
- In Koliganek, one resident discussed the drying of creeks and lower water levels. Some sloughs were no longer accessible, and creeks were changing to gravel beds.

Bycatch

- Trawl fishers and their effect on Chinook salmon was a concern expressed by one individual in New Stuyahok, who also expressed a general need to research ocean conditions.

Meeting Harvest Needs

- One Koliganek resident reported that she needs 200 Chinook salmon "to feel comfortable going into the winter."

Passing Down Practices

- In Ekwok, a community member described past fisheries where his grandmother used to harvest 2,000–3,000 salmon (for a season). The same person also shared that his grandmother knew when to set her net because a "swallow with rings around their necks [cliff swallow] would appear or start flying around." He made a point of indicating that in the past, fishing was based on TEK/environmental cues, and not based on "modern technological conveniences/innovations."

Sharing and Distribution

- Also, in Ekwok, the same individual summarized above helped set a net for a neighbor.

Social Changes

- In New Stuyahok several people expressed concerns that the cost of gas was too high and that the ability to return to an area to fish was limited due to fuel expenses.

9. DISCUSSION AND CONCLUSIONS

Overview of Findings for the Study Communities

This research project, a part of the Chinook Salmon Stock Assessment and Research Plan (ADF&G Chinook Salmon Research Team 2013), highlights for five Bristol Bay communities that subsistence salmon fishing remains a critical component to each community's nutritional, economic, and cultural well-being. All five communities are directly involved in subsistence salmon harvests and uses, yet all present unique characteristics, be it geographic, demographic, or salmon harvest and use amounts. Findings regarding the primary goals of this project—the study of LTK for the Nushagak River Chinook salmon stock and research into the existing subsistence permit system (harvest monitoring and assessment program)—form the bulk of this report, but it also includes more detailed community information, harvest data, harvest locations during the study years, and qualitative ethnographic information to obtain a holistic perspective of the subsistence salmon fishery in the Nushagak Bay and Nushagak River communities of Dillingham, Clarks Point, Ekwok, Koliganek, and New Stuyahok.

Demographic Changes and Subsistence Salmon Harvest Trends

In order to gain insight into how changes in population size, subsistence salmon harvest trends, and the overall health (e.g., abundance) of Nushagak River salmon stocks affect local subsistence users, the following section explores this research project's data in relation to these components.

Since the 1950s the population of Clarks Point has declined (Figure 2-2). Figure 7-8 shows the historical subsistence salmon harvests by Clarks Point households, and from the early 1980s the trend for the total number of salmon harvested has increased despite the decrease in population. Although the population of Clarks Point was somewhat stable starting about 1990 through 2010 (before decreasing to an estimated 30 people during the project study years), total salmon harvests have generally increased. A reason for this change may be that, despite there being fewer people in the community, several households have remained active subsistence fishing participants. Various economic and social changes have occurred in Clarks Point over time (e.g., cannery or school closures), but more research would be needed to better understand how household participation in subsistence salmon uses and harvests reflects these changes.

It is worth noting that in both 2013 and 2014 in Clarks Point, households that described a reduced Chinook salmon harvest in comparison to other recent years and provided a reason why, mostly cited resource availability as the cause (Table 2-16; Table 2-21). These survey responses may reflect the effects of the changing characteristics of the ecology of Nushagak Bay described during key respondent interviews from Clarks Point. For example, key respondents reported that changing sand bars in the bay may have altered salmon migration routes, especially for Chinook salmon. Also of note is that a small number of respondents that indicated their harvests of salmon other than Chinook had increased due to increased effort (Table 2-22). These reports of increased effort demonstrate that Clarks Point residents must adjust their level of effort based on the variability of the salmon runs. Furthermore, the importance of sharing subsistence salmon was noted by Clarks Point survey respondents, and the overall slight but continuous rise in harvest numbers may speak to the importance of sharing for this small community.

Ekwok's population has remained somewhat stable over time (Figure 3-2); however, total subsistence salmon harvests steadily declined, beginning in the early 1980s, until some stabilization occurred starting in the mid-2000s (Figure 7-9). This suggests that despite a stable population, social change, such as increased participation in the cash economy, may contribute to the overall decline in total salmon harvests. For example, in 2013, employment (i.e., working/no time) was cited by more households than other reasons for why the harvest of Chinook salmon and all other salmon was less compared to other recent years (Table 3-16). Interestingly, some households indicated that salmon resources were "not needed" as a reason for lowered harvests, which may point to other social and economic changes in Ekwok. For example, a reduction in dog team use due to increased snowmachine use, and residents' changing from a traditional wild foods-based diet to more consumption of Western foods (as indicated by data review meeting participants), may

have precipitated some of these changes. For both study years there was a small response that indicated increased harvest of Chinook salmon, although more so in the second study year (2014). Overall, more of the cited reasons for why Chinook salmon harvests increased compared to recent years appeared to be related to ecological factors (e.g., increased resource availability, favorable weather, and more success for the effort expended) rather than social factors (e.g., needed more salmon and increased effort, and had help) (Table 3-17; Table 3-23). However, the stabilization of total salmon harvested in the last 15 years may also indicate that households, despite probable effects of social or cultural changes, have established patterns of subsistence salmon harvest that meet households' needs.

New Stuyahok has experienced a rise in population since 1950 (Figure 4-2), including the years following the early 1980s when permit-based subsistence salmon harvest estimates start, as depicted in Figure 7-10. The 1950 estimated population was 88, and since about 2010 the population has stabilized at around 500 people (Figure 4-2). Subsistence salmon harvests declined from 1983 until about 1990, and have since ranged from approximately 3,800 to 12,900 total salmon harvested from 1991 through 2016 (Figure 7-10). The reason cited by the most New Stuyahok households for lower Chinook salmon harvests compared to recent years was ecological (resource availability) in 2013 and social (family/personal) in 2014 (Table 4-16; Table 4-22). Similar to Ekwok, for both study years there was a small response that indicated increased harvest of Chinook salmon, although slightly more so in the second study year (2014). Also similar to Ekwok, for the study years combined, more of the reasons for why Chinook harvests increased were related to ecological factors rather than social factors (Table 4-17; Table 4-23).

Koliganek's population pattern somewhat mirrored that of New Stuyahok's, showing a gradual increase since 1950; the population was an estimated 90 people in 1950, increased to approximately 200 residents by 2010, and stabilized at that population through the study years (Figure 5-2). Also, similar to New Stuyahok, a gradual decline in salmon harvests occurred from the early 1980s to about the early 1990s, despite an overall population increase.

Koliganek residents attributed lower Chinook salmon harvests in the study years compared to other recent years to a variety of reasons; however, more social than ecological reasons were cited in both study years combined, and working/no time was the most cited reason for less harvest of Chinook salmon (Table 5-16; Table 5-22). Also, the households that assessed less Chinook salmon harvest and cited less resource availability and unsuccessful harvest effort might be identifying an issue with salmon escapement since Koliganek is located in the upper Nushagak River watershed area.

The Nushagak District Chinook salmon run was estimated to be smaller in 2013 than in 2014 (Elison et al. 2018:86); however, of the Koliganek households that harvested more Chinook salmon in 2013 compared to the recent past and cited a reason why, increased effort (not increased resource availability) was the top cited reason (Table 5-17). It is possible that when subsistence fishers see that the run is smaller they increase their effort to get the salmon needed for their household.

Dillingham's population since 1950 has grown, peaked in the early 2000s, and has slightly decreased through about 2010 (Figure 6-2). The population estimate of 2,293 for the last study year is in line with the somewhat stable population estimated since 2010. As a hub community, which experiences an influx of people with differing levels of interest and involvement in subsistence salmon fishing, it is not surprising that Dillingham's participation in subsistence activities would reflect an overall salmon harvest that has fluctuated, which is what may be inferred from the historical total salmon harvest trend (Figure 7-12).

Regarding reasons for lower Chinook salmon harvests, Dillingham respondents cited time limitations due to work as the main reason in both 2014 and 2016 (Table 6-16; Table 6-22). In administering household surveys, key respondent interviews, and conducting participant observation, researchers noted that many households and individuals identified regulations (especially the limitation that allowed subsistence openers only for three periods per week that lasted 24 hours each) as inhibiting factors that prevented Dillingham households from being able to easily obtain salmon. Between the study period and the time that this report was finalized, a regulatory change for subsistence fishing in the Nushagak District occurred (see footnote 5 in Chapter 1: "Introduction"), and more research is required to analyze how these changes may or may

not affect subsistence salmon harvests in Dillingham. However, this research suggests that the regulatory changes that went into effect for the 2019 fishing season were likely justified and that Dillingham subsistence fishers will likely benefit from more liberalized harvest regulations.

Although reasons for less harvest of Chinook salmon cited by Dillingham households tended to be social factors, ecological factors were more often cited to explain assessments for more harvest of Chinook salmon (Table 6-17; Table 6-23).

Subsistence Gillnets, Commercial Retention, and Rod and Reel Gear

This research investigated the use of various gear types to harvest salmon in the study communities. Although subsistence gillnets (generally setnets) were by far the most commonly used gear type for obtaining salmon in all study communities, respondents offered several reasons for why they prefer to obtain salmon using a particular method at particular times, whether it be subsistence gillnets, rod and reel gear, other gear, or retaining salmon from commercial fishing harvests. Each household, depending on its community location, salmon species preference, and economic characteristics (such as involvement in commercial fishing) might use a variety of gear types to obtain salmon for home use.

An advantage of subsistence setnets over other methods such as rod and reel is that they can yield a large harvest in one or two instances of fishing, such as, for example, during one tide. This research also identified other features of subsistence setnet use; for instance, setnet use promotes inter-generational shared workloads, shared materials (nets, boats, smokehouses), and shared harvests.

Chinook salmon was the most common species removed from commercial harvests for home use, and this practice was used primarily by households in Clarks Point, Dillingham, and Koliganek—communities where there is more active participation in commercial fishing. From key respondent interviews and participant observation, researchers noted that Chinook salmon is the preferred species for smoking, kippering, and canning, and learned that Chinook salmon is a less desirable species to commercial canneries, which reduces the market for selling Chinook salmon. Additionally, key respondents indicated that the changing ecology of Nushagak Bay (in terms of sand bars and wind) directly affected the migration patterns of Chinook salmon, making them more difficult to access directly from beach locations (especially in Clarks Point); this highlights the importance to a household of being able to obtain Chinook salmon from their commercial catch. This research found that the distribution and abundance of Chinook salmon in the bay must be considered in order to understand a household's choice about gear type preferences. Furthermore, the subsistence salmon permit includes a section where a household is required to note the amount of salmon retained from commercial catches; additional research is necessary to identify any discrepancies between what households report on subsistence permits as commercial retention compared to what is noted on the commercial fish ticket as home pack.

Rod and reel, which is legal sport fishing gear, was another frequently used gear type in the study communities to obtain salmon for home use. Like commercial retention, the use of rod and reel is associated with community location and the ability households or individuals have to access salmon habitat. In the Nushagak River communities of Ekwok, Koliganek, and New Stuyahok, rod and reel was used mostly to harvest coho salmon, which is a late-season salmon run that migrates typically in August and September. This research found that rod and reel gear was enthusiastically pursued as an available tool for selective harvest, such as to harvest only a few fish at a time, for recreation, and as an effective harvest method to achieve nutritional, cultural, and social goals – an integral part of the subsistence way of life. "Catch-and-release" fishing, a common feature of rod and reel sport fisheries, was not commonly practiced by study community residents. Residents of the study communities typically expressed that they focused on harvesting sockeye and Chinook salmon with gillnets to obtain the bulk of their household's needs, whereas coho salmon were pursued to continue eating fresh fish through the late summer and fall, and to enjoy this harvest activity once the processing of primarily gillnet-caught sockeye and Chinook salmon was completed.

This research also found that local households generally do not report their rod and reel harvests either on an ADF&G Division of Sport Fish harvest surveys or on their subsistence permit (reporting rod and

reel harvests on a Bristol Bay subsistence permit is not consistent with current regulations). The estimated harvests of coho and Chinook salmon with rod and reel by local residents, as estimated from this project's survey results are compared to the sport fishery harvest survey estimates, in Chapter 7: "The Subsistence Permit System." This information can be used by fisheries managers to better understand local rod and reel salmon harvests. Post-season household surveys are an important tool for assessing community harvests by rod and reel because this harvest is likely underrepresented in responses to the Division of Sport Fish harvest survey.

Lastly, other gear types (e.g., dip net, seine, and unspecified gear types) were used in the study communities to harvest salmon for home use, as identified by household surveys, key respondent interviews, and participant observation. Other gear did not produce a significant portion of the salmon harvested for subsistence; nevertheless, further research could provide a better understanding of other gear used by local subsistence fishers.

The Subsistence Permit Program

Evaluating Participation: Including Non-Household Members on Permits

One of the findings of this research project showed that some households list three different types of individuals on their household subsistence permits: 1) those who permanently reside in the household, 2) those who do not reside in the household but reside in the community, and 3) those who neither reside in the household nor reside in the community. The subsistence salmon permit for Bristol Bay specifies that a permit holder must list all the permanent members of the household (in number), and to list (by name) those who will "assist in the operation of the subsistence net." However, subsistence regulations specify one permit may be issued per household (5 AAC 01.330(c)). A household means "a person or persons having the same residence" (5 AAC 39.975(20)). The results from this research document the importance of sharing nets during the fishing season, as well as sharing labor and the resource itself. The reasons why a household would list non-household members on the permit are uncertain. Most likely, a household would list non-household members if they might assist with operating the net. Other potential reasons that require further research are: 1) households may believe that a permit is per net (not per household), so they list others sharing their net, 2) the non-household members added to a permit might be low-level harvesters or unlikely to complete their own household permit so another household adds those people to its permit, or 3) since there are no household harvest limits for Nushagak District subsistence salmon fishery, subsistence fishers may have little incentive for each household to obtain its own permit.

The Division of Subsistence publishes a report that summarizes the annual subsistence salmon permit return rates and harvest estimates based on permit data and harvest assessment surveys from across the state; the report includes salmon harvest estimates both by place of residence and by location fished as reported on returned permits. In general, a key issue with a household including non-household members on its subsistence permit is that the subsistence monitoring program will not have accurate household participation information. It is likely that the number of salmon harvested by the location fished is accurately reported on these permits. However, when a non-household member from the same community as the permitted household is added to the permit, the magnitude of household level participation in the community is underrepresented in the permit database. Underrepresentation of participation may have several effects, such as, for example, in the regulatory realm and in the public review process for natural resource development projects. The Board of Fisheries, when evaluating proposals and assessing resource use, should be provided with the most accurate information regarding participation within a community or region. Likewise, resource development projects require accurate information regarding the uses and harvests of resources over time. When a non-household member added to a permit is from another community in Alaska, then both participation and harvest amounts are underrepresented for the place of residence of that non-household member; additionally, harvest amounts by place of residence are inflated for the permitted household's location.

Because an individual may self-report their community of residence on a household subsistence permit, or be incorrectly added to another household's permit, the department has little ability to identify inaccuracies

about household participation and estimated harvest by place of residence during data analysis; only increased education regarding the correct way to complete a subsistence permit may help with improving these data. Conducting post-season household surveys presents a good opportunity to educate subsistence fishers about the subsistence permit system rules, and the surveys are also a good tool to use for capturing fishing activity details, such as identifying households that fished without a permit or which permits were returned from a fisher who is not a permanent community resident.

On-Time Permit Returns, Lack of Permit Returns, Late-Season Fishing, and Subsistence Fishing Without Permits

In general, households that obtain subsistence salmon permits have a fairly high rate of returning their permits at the end of the salmon fishing season. Prior to the post-season surveys, the initial subsistence permit return rate ranged from 58%–82%: Koliganek (58%), New Stuyahok (62%), Dillingham 78%, Ekwok (80%), and Clarks Point (82%). Because of the high return rate for the households that obtain permits, subsistence salmon harvest estimates for communities based on reported harvests from these permit holders are likely reasonably accurate. However, as this research shows, some permits are not returned. In some cases, such as if post-season surveys occur, those permits are returned to researchers. But otherwise, the permits remain unreturned, leaving open the question of how representative the returned permits are of the community overall. In order to address this issue, it is important to have a responsive and communicative vendor present in communities who encourages both the obtaining and return of permits. A complete record of harvest is an important tool a community can use to show managers, the Board of Fisheries, and natural resource development project managers the continued importance of salmon as a subsistence resource to its residents.

Another issue for the permit program is that a certain proportion of the salmon is harvested after permits are returned. Late-season fishing (typically for coho and spawned-out sockeye salmon) is usually the reason for this missing harvest record. Research has found that late-season harvest values are identified from post-season household surveys. Although recalling harvests may be difficult for some respondents, especially as more time passes since the time of harvest, other households have been known by researchers to keep a detailed record of their own from each day they harvested salmon, and post-season surveys afford households an opportunity to add late-season harvests to their harvest record.

Lastly, this research demonstrates that some community members fish without permits. A certain portion of harvested salmon therefore goes unreported, but post-season surveys can help assess the accuracy of the permit record. For some households, the practice of fishing without a permit is likely a result of lack of regulatory knowledge; unless more outreach takes place, a certain proportion of the community will likely not obtain permits, no matter the role of the vendor.

Although some households do not obtain permits, a consistent and relatively high return rate among those households that do allows the Division of Subsistence to accurately estimate harvests based on expanded the reported harvest from returned permits to the total number of permits in the community. During post-season survey administration, researchers found virtually no reluctance on the part of households to report harvests; this included harvests from any gear type, harvests without permits, or harvests that occurred after permits were returned—all of which contribute a more robust understanding of salmon uses and harvest by community households. This likely at least in part based on the long history the division has working in Bristol Bay communities, and the relationships of trust between community residents and division researchers that have been established and maintained.

Further Discussion of the Contemporary Chinook Salmon Subsistence Fishery

Exploring the contemporary character of the subsistence fishery of the Nushagak River watershed specifically related to Chinook salmon was a focus of this research project. Many observations about Chinook salmon were shared with research staff during the study years. Primarily, the health of Chinook salmon was discussed in terms of body condition (e.g., parasites in the flesh and reduced size of Chinook salmon) and their overall abundance; Chinook salmon abundance was noted as having declined somewhat over time. Although changes to Chinook salmon were noted by research participants, most respondents

indicated that these changes did not seem to present major issues regarding harvest by subsistence users. Key respondent interviews were a central component to this research and allowed for a more thorough exploration of changes in waters near the communities, who often linked environmental fluctuations such as water temperature and water levels to possible effects on Chinook salmon migration and run timing. Because each study community is in a unique geographic setting within the Nushagak River watershed, each contributed specific knowledge of habitat changes, such as changing sand bars, bank erosion, or channel depth, that were judged by interview respondents as influencing Chinook salmon. Without input from a variety of research respondents (both from surveys and interviews), some of the detailed data about Chinook salmon may not have been documented.

Subsistence users surveyed during this research project were knowledgeable about, and supportive of, fisheries science, especially when related to salmon escapement. Counting weirs and towers were cited as important components of maintaining a healthy fishery, yet questions were raised on when escapement counts should begin (seasonally), and how counts might be affected by changing environmental conditions. For example, a respondent who witnessed later Chinook salmon returns and attributed them to warmer water conditions also indicated that habitat change in the river corridor has the potential to influence Chinook salmon to migrate in deeper water, which is more likely to be in the middle channel of the river. Escapement counts of Chinook salmon are then perceived to be less accurate since counting towers are situated on the edge of the river. This research shows that the shared knowledge of the subsistence user is varied and incorporates a multitude of components, and that the contemporary subsistence fisher is aware of and tuned-in to a variety of local, traditional, and scientific information.

Lastly, fisheries managers and policymakers should consider local and traditional knowledge when evaluating salmon stock concerns because they may contribute more in-depth knowledge about abundance beyond data provided by weirs, sonar, or tower counts. LTK research for this project contributed a wealth of information not captured solely during post-season household harvest surveys. Additionally, observations about local fisheries can be used to plan further research, which, although presented from the localized perspective, may be useful in addressing watershed-level concerns by other local users and fisheries scientists alike.

Conclusions and Recommendations

The communities that participated in this research demonstrated a high use of salmon for home use, and, research over time continued to show that subsistence salmon make up a large proportion of households' wild foods (tables 7-22, 7-23, 7-24, 7-25,and 7-26; see also Fall [2018]). In late 2018 the Alaska Board of Fisheries changed the Bristol Bay subsistence fishing regulations, and these changes may influence future subsistence practices of community members. The 2019/2020 regulations (the first year the new 2018 regulations went into effect) can be found on the ADF&G website.[1] Understanding how many households within a community obtain permits and how those households list individuals on the permits, as well as understanding salmon harvest levels and gear use, contributes to an overall better and more detailed understanding of the subsistence permit system and helps to identify any changes that may be needed to improve its performance. This report concludes with a list of key findings and recommendations directed to the Division of Subsistence permit program, fisheries managers, local community residents, and local community leadership.

Key Findings

1. Subsistence harvests of total salmon show a general decline since the early 1980s in three of the five study communities (Ekwok, Koliganek, and New Stuyahok), and a harvest increase for Clarks Point and Dillingham. General declines and periods of variability in abundance of individual salmon species appear over time; despite these differences the importance and continued vitality of the subsistence salmon fishery is undeniable. This

1. Alaska Department of Fish and Game. 2019. "2019–2020 Statewide Subsistence and Personal Use Fishing Regulations," http://www.adfg.alaska.gov/index.cfm?adfg=subsistenceregulations.finfish (accessed July 2019).

research based its key findings on participant observation, key respondent interviews, a literature review, harvest data from surveys and permit returns, and additional information gathered from survey questions and open-ended inquiry by researchers. The richness of information provided by the combined methods of data collection provided a thorough documentation of the subsistence fishery in this region. As stated in other division research regarding subsistence salmon fisheries: "Subsistence salmon fishing provides substantial quantities of food to all community residents, ties extended families and neighbors together, creates bonds between adults and children via the continued transmission of knowledge, and perpetuates connections between individuals and the natural environment" (Hutchinson-Scarbrough et al. 2016:191).

2. The two years of household survey data demonstrate that relying solely on returned subsistence salmon permits resulted in underestimated harvest values in the five study communities, primarily New Stuyahok and Koliganek. Returned permits from Clarks Point and Ekwok, due in part to their small community size, are more likely to represent the total harvest in the community. Although the other communities typically have vendors that issue and obtain completed permits, Dillingham benefits from having an ADF&G office in the community, which likely increases the convenience for a subsistence fisher to obtain and return permits.
3. Annual abundance variation of the five salmon species may affect the subsistence harvest. While Bristol Bay continues to yield productive salmon runs (especially sockeye salmon), annual variations in run abundance of other species, primarily Chinook salmon, may influence how subsistence users chose to allocate their harvest time, effort, and processing preferences. Trends in the subsistence fishery need to be understood in the context of variability; these include trends in harvest for consumption, as well as cultural and social elements that may change as a result of species availability.
4. The social organization of families for harvesting and processing salmon, as well as the sharing of equipment and harvests, is an important characteristic of the subsistence fishery; however, this may create challenges for a harvest monitoring program that focuses on household permits.
5. This research project mirrors previous and relevant division research into subsistence salmon fishing regarding familial structures and harvest planning: "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" (Fall et al. 2010:182).
6. Subsistence users are knowledgeable about salmon and through active and continuous use of the resource can describe changes over time for each salmon species. Specifically, users provided information about the reduction in the size of Chinook salmon over the last several decades. Users of the resource also noted that environmental conditions, primarily warming oceans, have had an effect on salmon, either in abundance or in migration patterns.
7. Mapping locations of salmon harvests demonstrated that subsistence users use many areas to harvest the five species of salmon, as well as spawning sockeye, coho, and chum salmon.

These areas have changed over time, largely due to fluctuating environmental conditions such as varying water levels, sand bars, river channels, wind direction, and erosion.

8. Subsistence fishers continue to use rod and reel in addition to nets to harvest salmon, especially coho salmon. The Division of Sport Fish collects harvest, catch, and effort information via the Statewide Harvest Survey which is an annual random mail-out survey of sport fishing license holders; any resident over 18 is required to have a license to harvest fish with a rod and reel (J. Dye, Sport Fishery Biologist III, ADF&G, Dillingham, personal communication). However, it is unlikely that rod and reel harvests by local community residents are represented by this random sample. Division of Subsistence post-season surveys are necessary in order to continue to record these local rod and reel harvests.
9. This research found that respondents continued to place high importance on inter-generational involvement as a part of subsistence and that subsistence goes beyond the acquisition of food: subsistence is a way of life. As a respondent commented, "I learned a lot from my elders about how to live the subsistence lifestyle. I want my children to live the subsistence way." However, respondents also indicated that the level of "work" required to engage with subsistence activities can seem like a barrier to youth, and that a lack of involvement of parents could diminish the inter-generational connection to subsistence over time This research also documented evidence of the involvement of youth and the commitment of parents and elders to teaching traditional skills and values. Older generations were concerned that youth were not as engaged in subsistence fishing as they had been, but there was also strong support for culture camps, inter-generational passing of knowledge, and a strong community focus on sharing. These elements were a way to ensure the continued use of subsistence skills and involvement by youth specifically, and the community in general.
10. Traditional forms of management continue to be relevant in the study communities and encompassed the following key principles: no waste of the resource, passing down knowledge of various fishing customs and subsistence skills, and the importance of the sharing and distribution of salmon.
11. Social change in the communities included two main concerns: that full-time work often infringed on subsistence activities, and that young people did not share the same level of commitment to fishing and the subsistence way of life as their elders. Although respondents still found ways to engage with the subsistence way of life, working and having less time may mean that some traditional practices change to accommodate different schedules. For example, freezing filets may become more prevalent if individuals do not have time for more time-consuming activities such as drying or cold-smoking fish. Community members made clear that reliance on the cash economy also often means managing inflexible work schedules, and overall constraints on free time may have detrimental effects to community well-being, especially when time cannot be allocated for activities that support the subsistence way of life.

Recommendations

1. The use of local vendors is critical in sustaining the subsistence salmon harvest and monitoring assessment program in the Bristol Bay Area. Vendors that can encourage a household to obtain and return a permit are of great value to the division and the community that they represent. Vendors can encourage accurate reporting, which in turn will further benefit the community, as mentioned previously. Additionally, vendors may potentially act as

liaisons between the Division of Subsistence and the community by reporting harvest issues experienced by permit holders, information about salmon returns, and other community observations. The vendor program must be expanded to communities lacking a vendor. Finding a reliable vendor must be the focus prior to the fishing season, and current vendors must be maintained.

2. As a result of this research a new Bristol Bay permit was revised by division staff (Appendix F; revision completed April 2019 for the 2019 subsistence fishing season). This recommendation was realized mid-way through this research project. The revised permit more explicitly and clearly presents subsistence regulations and provisions, such as one permit per household and the number of year-round residents in a household who should be listed on the permit. With these changes, management staff anticipate that inclusion of non-household members on permits will be reduced, and less confusion will exist regarding subsistence regulations.
3. Due to changes in the Bristol Bay subsistence regulations in 2018, further research is needed to assess the reception by the subsistence users to these new regulations, especially the removal of the three-day-a-week subsistence fishing restriction along the beaches near Dillingham. Also, dip net was a new gear type allowed on the Dillingham beaches, which may provide further opportunity for salmon harvest.
4. Fisheries managers within the Divisions of Commercial Fisheries and Sport Fish along with Division of Subsistence staff should implement more outreach and education about different gear type reporting requirements and assess opportunities for improvements to the subsistence and sport fishing harvest assessment programs.
5. Additional outreach by the Division of Subsistence and local fisheries managers on the importance of permits is necessary in each community, since each face their own challenges regarding permit returns. In the meantime, post-season harvest surveys need to continue in order to develop final reliable harvest estimates.
6. Since this research project is similar in scope to previous division research on subsistence salmon harvest activities, and their importance to Alaska communities, the following four recommendations from a previous report by Fall et al. (2010:183–184) provide the final key suggestions that pertain to this Chinook Salmon Stock Assessment and Research Plan project:
    a. 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.
    b. 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.

c. 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.

d. 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 in-season data collection via postseason interviews.)

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APPENDIX A—EXAMPLE SURVEY FORM (DILLINGHAM, 2016)

SALMON SUBSISTENCE SURVEY
DILLINGHAM, ALASKA
January 1, 2016 to present

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:	113
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
907-267-2353

HOUSEHOLD MEMBERS

HOUSEHOLD ID _____

Between January 1, 2016 and present…
…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 2016, DID THIS PERSON SUBSISTENCE FISH FOR SALMON? (circle)	IN 2016, DID THIS PERSON HELP PROCESS SALMON? (circle)
HEAD 1	Y N	M F			Y N	Y N	Y N
HEAD 2	Y N	M F			Y N	Y N	Y N
03	Y N	M F			Y N	Y N	Y N
04	Y N	M F			Y N	Y N	Y N
05	Y N	M F			Y N	Y N	Y N
06	Y N	M F			Y N	Y N	Y N
07	Y N	M F			Y N	Y N	Y N
08	Y N	M F			Y N	Y N	Y N
09	Y N	M F			Y N	Y N	Y N
10	Y N	M F			Y N	Y N	Y N
11	Y N	M F			Y N	Y N	Y N
12	Y N	M F			Y N	Y N	Y N
13	Y N	M F			Y N	Y N	Y N
14	Y N	M F			Y N	Y N	Y N
15	Y N	M F			N Y	Y N	Y N

PERMANENT HH MEMBERS: 01 **DILLINGHAM: 113**

SALMON HOUSEHOLD ID

	IN 2016 DID MEMBERS OF YOUR HH...		IN 2016, HOW MANY (_____) DID YOUR HOUSEHOLD HARVEST?				REMOVED FROM COMMERICAL HARVEST FOR HOME USE	UNITS	IN 2016...	
	...USE (_____)?	...TRY TO HARVEST (_____)?	CAUGHT WITH SET GILLNET	CAUGHT WITH DRIFT GILLNET	CAUGHT BY OTHER METHODS	CAUGHT WITH ROD AND REEL			...DID YOUR HH SHARE (_____) WITH OTHERS?	...DID OTHERS SHARE (_____) WITH YOUR HH?
	(circle)		*(number taken by each gear type)*				*(number)*	*(ind)*	*(circle)*	
KING SALMON *CHINOOK SALMON*	Y N	Y N						IND	Y N	Y N
113000003										
SOCKEYE SALMON *REDS*	Y N	Y N						IND	Y N	Y N
115000003										
SPAWNING SOCKEYE	Y N	Y N						IND	Y N	Y N
117050000										
SILVER SALMON *COHO SALMON*	Y N	Y N						IND	Y N	Y N
112000003										
CHUM SALMON *DOGS*	Y N	Y N						IND	Y N	Y N
111020003										
PINK SALMON *HUMPYS*	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 2016.

NON-COMMERCIAL SALMON: 04 **DILLINGHAM: 113**

FISHERY PARTICIPATION

HOUSEHOLD ID

Last year, did your household get a subsistence salmon permit? Y N

If YES...

What was the permit number?

How many members of your household were listed on the permit? (#)

Were people outside of your household listed on the permit? Y N

If YES...

How many people outside of your household were listed on the permit? (#)

Were 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

If YES...

What was the permit number? (#)

Between January 1, 2016 and present...

WHERE did members of your household CATCH salmon? *(Mark all harvest locations on map)*

Fishery Participation Notes:

FISHERY PARTICIPATION :370 **DILLINGHAM: 113**

SALMON HOUSEHOLD ID

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

Between January 1, 2016 and present...
...Did members of your household USE or TRY TO HARVEST salmon?..... Y N

If YES, continue on this page...

KING (CHINOOK) SALMON 113000000

Last year, did your household get enough KING SALMON for your own household's needs, through your own efforts and\or sharing? Y N

If NO ...how MANY TOTAL king salmon did you need?..... (#)

If NO ...why did your household NOT get enough?

How would you describe your harvests of KING SALMON in 2016, as compared to the past 5 years? X L S M
IF less or more, why? *X = did not fish*

OTHER SALMON 110000000

How would you describe your harvests of SALMON OTHER THAN KINGS in 2016, as compared to the past 5 years? X L S M
IF less or more, why? *X = did not fish*

RED (SOCKEYE) SALMON 115000000

Last year, did your household get enough SOCKEYE SALMON for your own household's needs, through your own efforts and/or sharing? Y N

If NO ...how MANY TOTAL sockeye salmon did you need?..... (#)

If NO ...why did your household NOT get enough?

SILVER (COHO) SALMON 113000000

Last year, did your household get enough SILVER SALMON for your own household's needs, through your own efforts and/or sharing? Y N

If NO ...how MANY TOTAL coho salmon did you need?..... (#)

If NO ...why did your household NOT get enough?

NON-COMMERCIAL SALMON: 04 **DILLINGHAM: 113**

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: 300 **DILLINGHAM: 113**

APPENDIX B—LETTERS SUPPORTING THE PROJECT

November 12th, 2013

Ekwok Village Council
P.O. Box 70
Ekwok, AK
99580

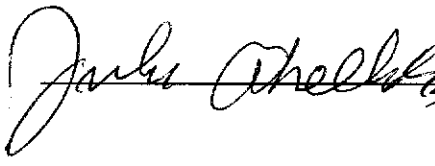
Division of Subsistence
Alaska Department of Fish and Game
333 Raspberry Road
Anchorage, AK
99518

To the Division of Subsistence, Alaska Department of Fish and Game:

The Ekwok Village Council would like to acknowledge support for the Division of Subsistence project which will investigate the abundance and health of Nushagak River Chinook salmon stocks. Study communities include New Stuyahok, Ekwok, Koliganek, and Clarks Point. We have met with Division of Subsistence representative, Ted Krieg, and we are aware the project will take place over a period of two years beginning in the fall of 2013. The division has informed us the project focuses on Chinook salmon but will include other salmon in the subsistence harvest survey. Key respondent interviews and participant observation will focus on Chinook salmon. We are aware that Division of Subsistence protocol insures that participating households will remain anonymous throughout the reporting process and that participation in the survey is completely voluntary. Division representatives have informed us that they will be documenting individual and/or community concerns that members feel should be addressed and included in the final report.

We have scheduled our participation to occur before the end of February 2014, which will include administration of a salmon harvest survey. We are aware that the Subsistence Division will schedule a second visit for June to observe and participate in subsistence salmon fishing activities. We will help the Division find community members who are willing to help conduct the surveys as contract workers (Local Research Assistants). Once the research has concluded, we understand the Subsistence Division will return to Ekwok to present the results for community feedback and to verify the inclusion of any community concerns for the final report. We also understand we will have the opportunity to review a draft of the report before it is finalized. The Division of Subsistence will send a complete final report for our records and short summary reports for all community households involved in the study in June 2015.

Sincerely,

, Village Council President - Dated: 11/12/2013

October 24th, 2013

New Koliganek Village Council
P.O. Box 5057
Koliganek, AK
99576

Division of Subsistence
Alaska Department of Fish and Game
333 Raspberry Road
Anchorage, AK
99518

To the Division of Subsistence, Alaska Department of Fish and Game:

The New Koliganek Village Council would like to acknowledge support for the Division of Subsistence project which will investigate the abundance and health of Nushagak River Chinook salmon stocks. Study communities include New Stuyahok, Ekwok, Koliganek, and Clarks Point. We have met with Division of Subsistence representative, Ted Krieg, and we are aware the project will take place over a period of two years beginning in the fall of 2013. The division has informed us the project focuses on Chinook salmon but will include other salmon in the subsistence harvest survey. Key respondent interviews and participant observation will focus on Chinook salmon. We are aware that Division of Subsistence protocol insures that participating households will remain anonymous throughout the reporting process and that participation in the survey is completely voluntary. Division representatives have informed us that they will be documenting individual and/or community concerns that members feel should be addressed and included in the final report.

We have scheduled our participation to occur in before the end of February 2014, which will include administration of a salmon harvest survey. We are aware that the Subsistence Division will schedule a second visit for June to observe and participate in subsistence salmon fishing activities. We will help the Division find community members who are willing to help conduct the surveys as contract workers (Local Research Assistants). Once the research has concluded, we understand the Subsistence Division will return to Koliganek to present the results for community feedback and to verify the inclusion of any community concerns for the final report. We also understand we will have the opportunity to review a draft of the report before it is finalized. The Division of Subsistence will send a complete final report for our records and short summary reports for all community households involved in the study in June 2015.

Sincerely,

Herman Nelson Sr., Village Council President - Dated: 10-24-2013

October 31, 2013

New Stuyahok Traditional Council
P.O. Box 49
New Stuyahok, AK
99636

Division of Subsistence
Alaska Department of Fish and Game
333 Raspberry Road
Anchorage, AK
99518

To the Division of Subsistence, Alaska Department of Fish and Game:

The New Stuyahok Traditional Council would like to acknowledge support for the Division of Subsistence project which will investigate the abundance and health of Nushagak River Chinook salmon stocks. Study communities include New Stuyahok, Ekwok, Koliganek, and Clarks Point. We have met with Division of Subsistence representative, Ted Krieg, and we are aware the project will take place over a period of two years beginning in the fall of 2013. The division has informed us the project focuses on Chinook salmon but will include other salmon in the subsistence harvest survey. Key respondent interviews and participant observation will focus on Chinook salmon. We are aware that Division of Subsistence protocol insures that participating households will remain anonymous throughout the reporting process and that participation in the survey is completely voluntary. Division representatives have informed us that they will be documenting individual and/or community concerns that members feel should be addressed and included in the final report.

We have scheduled our participation to occur in November 2013, which will include administration of a salmon harvest survey. We are aware that the Subsistence Division will schedule a second visit for June to observe and participate in subsistence salmon fishing activities. We will help the Division find community members who are willing to help conduct the surveys as contract workers (Local Research Assistants). Once the research has concluded, we understand the Subsistence Division will return to New Stuyahok to present the results for community feedback and to verify the inclusion of any community concerns for the final report. We also understand we will have the opportunity to review a draft of the report before it is finalized. The Division of Subsistence will send a complete final report for our records and short summary reports for all community households involved in the study in June 2015.

Sincerely,

Traditional Council President

APPENDIX C—KEY RESPONDENT INTERVIEW PROTOCOL

Key Respondent Interview Questions: CSRI Nushagak Project

Subsistence Fishing Questions:

- What is your earliest memory of salmon fishing?
- What type of salmon do you fish for?
- Who do you fish with?
- What gear type do you use for harvesting the different types of salmon?
    - Rod and Reel
    - Gill Net
    - Seine
    - Any from commercial catch?
    - Has your gear changed over time?
- Where do you fish for the different types of salmon species? (map locations)
- What is your pattern of salmon fishing for the summer/fall?
- How do you decide how many fish you need for your family for the winter?
- Do you have any difficulties getting enough fish?
    - If you didn't get enough salmon, what happened?
- Do you prefer male or female fish for the different salmon species?
- How do you process the fish?
  Quantity for:
    - Freeze
    - Smoke- (type of wood)
    - Dry
    - Salt
    - Can
- Who does which jobs to preserve fish for the winter?
- How are tasks divided up?
    - Gender?
    - Age?
- Do you observe any traditional practices when harvesting salmon? (i.e. traditional management?)
- Do you make any handicrafts from salmon/skin?

History:

- Can you tell me about subsisting for salmon in your community in the past?
    - Are the runs better or worse?
    - Is the quality of the fish any different?
    - How about the quality of the water? (temperature, water levels, pollution)

    - Have you observed any changes to the migration timing of different salmon species?
    - Do you have to fish in different areas now?
        - Where?
- Has the number of salmon you harvest changed from past years?
    - If so, which type of salmon has been affected?
        - By how much?
- Have you noticed any changes in the health of king salmon?
- If you have noticed significant changes to salmon fishing and/or salmon abundance, what do you think is the main reason?
- Have you noticed any changes among younger generations in relation to salmon harvesting?
- How would you like your knowledge passed on to younger generations?

<u>Regulations:</u>

- Are any regulations affecting your opportunity for subsistence?
- Do you have any recommendations for regulatory change or management?

<u>General Comments:</u>

Do you have any questions or other comments?

<u>Lewis Point Questions:</u>

- Did you or your family harvest salmon at Lewis Point in the past?
- What is the difference between 1st, 2nd, 3rd, and 4th place?
    - If so, do you still fish there?
        - If not, why don't you fish there any longer?
        - Do you ever plan on returning?
        - Do you still have a cabin to use at Lewis Point?
        - Do you still have a smokehouse and drying racks?
    - If not, where do you and your family harvest salmon?
    - In 10 years, what do you think you would see at Lewis Point?

APPENDIX D—CONVERSION FACTORS

Appendix Table D-1.– Salmon conversion factors, Clarks Point, Ekwok, Koliganek, and New Stuyahok, 2013.

Resource name	Scientific name	Conversion factor
Chum salmon	*Oncorhynchus keta*	4.74
Coho salmon	*Oncorhynchus kisutch*	4.50
Chinook salmon	*Oncorhynchus tshawytscha*	13.39
Pink salmon	*Oncorhynchus gorbuscha*	2.26
Sockeye salmon	*Oncorhynchus nerka*	4.44
Spawning chum salmon	*Oncorhynchus keta*	4.74
Spawning coho salmon	*Oncorhynchus kisutch*	4.50
Spawning sockeye salmon	*Oncorhynchus nerka*	4.44
Unknown salmon	*Oncorhynchus spp.*	7.04

Note All species were reported in individual salmon.

Appendix Table D-2.– Salmon conversion factors, Clarks Point, Ekwok, Koliganek, and New Stuyahok, 2014.

Resource name	Scientific name	Conversion factor
Chum salmon	*Oncorhynchus keta*	4.74
Coho salmon	*Oncorhynchus kisutch*	4.50
Chinook salmon	*Oncorhynchus tshawytscha*	13.39
Pink salmon	*Oncorhynchus gorbuscha*	2.26
Sockeye salmon	*Oncorhynchus nerka*	4.44
Spawning sockeye salmon	*Oncorhynchus nerka*	4.44
Unknown salmon	*Oncorhynchus spp.*	6.51

Note All species were reported in individual salmon.

Appendix Table D-3.– Salmon conversion factors, Dillingham, 2014.

Resource name	Scientific name	Conversion factor
Chum salmon	*Oncorhynchus keta*	4.74
Coho salmon	*Oncorhynchus kisutch*	4.50
Chinook salmon	*Oncorhynchus tshawytscha*	13.39
Pink salmon	*Oncorhynchus gorbuscha*	2.26
Sockeye salmon	*Oncorhynchus nerka*	4.44
Spawning sockeye salmon	*Oncorhynchus nerka*	4.44
Unknown salmon	*Oncorhynchus spp.*	7.04

Note All species were reported in individual salmon.

Appendix Table D-4.– Salmon conversion factors, Dillingham, 2016.

Resource name	Scientific name	Conversion factor
Chum salmon	*Oncorhynchus keta*	4.51
Coho salmon	*Oncorhynchus kisutch*	4.46
Chinook salmon	*Oncorhynchus tshawytscha*	9.41
Pink salmon	*Oncorhynchus gorbuscha*	2.86
Sockeye salmon	*Oncorhynchus nerka*	3.96
Spawning sockeye salmon	*Oncorhynchus nerka*	3.96
Unknown salmon	*Oncorhynchus spp.*	3.93

Note All species were reported in individual salmon.

APPENDIX E—PROJECT SUMMARY



COMMUNITY SUMMARY - Technical Paper No. 453

Nushagak River Chinook Salmon: Local and Traditional Knowledge and Subsistence Harvests

Alaska Department of Fish and Game, Division of Subsistence Technical Paper Number 453. Published 2019. By Gabriela Halas and Margaret Cunningham.

Study Overview:

The communities of Clarks Point, Ekwok, New Stuyahok, Koliganek, and Dillingham were selected as part of the Chinook Salmon Research Initiative. In 2013 and 2014, Alaska Department of Fish and Game (ADF&G) researchers conducted household salmon surveys in Clarks Point, Ekwok, New Stuyahok, and Koliganek, and in 2014 and 2016 in Dillingham. They asked community members about their salmon use and harvest and participation in the subsistence fishery and harvest monitoring program (the subsistence salmon permits). The survey results helped develop household use and harvest estimates for salmon; identify fishing and harvest locations and gear types used to harvest salmon; and gather assessments of changes to harvests and sufficiency of salmon supply. Interviews and participant observation explored the social and economic relationship that the communities have to salmon with a specific emphasis on local and traditional knowledge about Nushagak River Chinook salmon stock abundance, health, habitat, and fisheries management, as well as individual experiences and histories regarding subsistence practices in Bristol Bay. This research was recommended in 2013 by the ADF&G Chinook Salmon Research Team and fully funded by ADF&G.

Project Objectives

The purpose of the project was to assess the character of the subsistence salmon fishery in the Nushagak River and watershed, looking both at harvest and perceptions of change. Although the focus of the project was on Chinook salmon, the research looked at all five salmon species. The subsistence permit system was also evaluated from community members' experiences, in terms of how well the current permits document harvest levels and participation in subsistence fishing. The research also looked at what people think causes variation in Chinook migration and escapement, and if subsistence users feel that they have been affected by changes in Chinook and the other salmon species.

Community Information

The estimated 5-year (2015–2016) averages for community populations by the American Community Survey (ACS) were: Dillingham pop. 2,296, New Stuyahok pop. 566, Koliganek pop. 162, Ekwok pop. 79, and Clarks Point pop. 47. The same range of years was used to estimate the population of Alaska Native individuals in each community. The majority of the population in all of the study communities is Alaska Native, with Dillingham's population at 67% Alaska Native. New Stuyahok's population was 99% Alaska Native, Koliganek's was 86%, Ekwok's was 96%, and Clarks Point's was 100%.

"I learned a lot from my elders about how to live the subsistence lifestyle. I want my children to live the subsistence way."

-Community member interview, 2013



Splitting fish at Lewis Point, 2014 (*top left*). Processing salmon alongside the Nushagak River, 2014 (*above*).

Each community showed unique characteristics related to subsistence salmon uses and harvests as well as commonalities. Either sockeye or Chinook salmon was the most harvested species, in pounds usable weight, for all the study communities in every study year. Subsistence gillnet was the most common gear type used to harvest salmon, but coho salmon accounted for more of the rod and reel gear harvest than any other species at every community that used rod and reel gear. For both study years, the range of per capita harvests for all salmon spanned from 91 lb to 701 lb per person, and for Chinook salmon from 42 lb to 218 lb per person.

Acknowledgments

The Division of Subsistence would like to thank the members of each study community—Dillingham, Clarks Point, Ekwok, Koliganek, and New Stuyahok—as well as their respective tribal and city councils. Local research assistants who worked on this project were: Nadine Wassily, Crystal Clark, Sergai Andrew, Sophia Petla, Andrew Wassily, Alberta Hoseth, Sophie V. Sorensen, Molly Dischner, Dan Dunaway, Devin Lisac, and Steve Wassily. This project would not have been possible without their help.

Ethical Principles for the Conduct of Research

The Division of Subsistence follows strict guidelines for research principles outlined in the *Alaska Federation of Natives Guidelines for Research* and by the National Science Foundation, Office of Polar Programs in its *Principles for the Conduct of Research in the Arctic*, the *Ethical Principles for the Conduct of Research in the North* (Association of Canadian Universities for Northern Studies 2003), as well as the Alaska confidentiality statute (AS 16.05.815). These principles stress community approval of research designs, informed consent, anonymity or confidentiality of study participants, community review of draft study findings, and the provision of study findings to each study community upon completion of the research.

Highlights of Interview Findings

Key respondent interviews generated a wealth of information. Residents mentioned **Ecological and Social** changes in the communities and provided many observations of concern they have made over the years.

Ecological Observations:

1. Chinook salmon:
    a. Size of Chinook—getting smaller, more "jack" Chinook, small Chinook migrate later
    b. Abundance—generally still good but can be variable in cycles
    c. Migration—Chinook migrating later due to changes in water temperature (water is warmer)
    d. General health—some parasites seen but generally Chinook in good health
2. Climate Change, "Global Warming"
    a. Salmon migration is affected by warmer ocean waters
    b. Sea ice conditions changing
3. Environmental conditions:
    a. Shifting channels and sand bars
    b. Changing wind patterns
    c. Water levels decreasing
4. Bycatch
    a. Bycatch of Chinook by trawlers was a concern

Social Observations:

1. Regulations/Management
    a. Escapement counting could be established earlier
    b. There is some competition among subsistence set net sites, especially in Dillingham
    c. Previous regulations for a 3-day a week schedule limited the subsistence fisher (repealed at the 2018 Board of Fisheries meeting)
    d. Some competition felt between subsistence user and commercial and sport fishing interests
2. Subsistence is a priority
    a. Subsistence fishing, hunting, and the way of life practiced by many in the communities was seen as integral to community and individual well-being
3. Traditional Management
    a. Not wasting anything and "take only what you need" is a part of traditional management
4. Social Relationships
    a. Transmitting traditional knowledge about subsistence fishing is very important
    b. Salmon are shared and distributed widely

"I really enjoy teaching others how to put up fish. It was my mother who taught me."

-Community member interview, 2014

Highlights of Harvest Survey Findings

Since this study incorporated two years' worth of data for five communities, the figures below provide a snapshot of what the larger technical paper offers. Fishing for salmon using a variety of gear types was a unique feature in each community based on location of the community, preference for salmon species, and ties to the commercial fishing industry. The figures below show the estimated pounds of each salmon species harvested by gear type used by community members; for example, subsistence gillnet, rod and reel, or salmon retained from the commercial catch for home use.

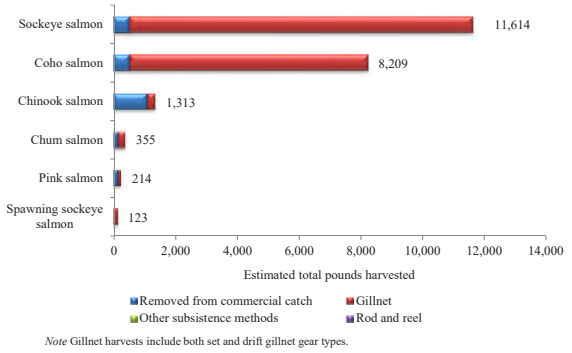


Figure 1.–Estimated pounds of salmon harvested by gear type, Clarks Point, 2014.

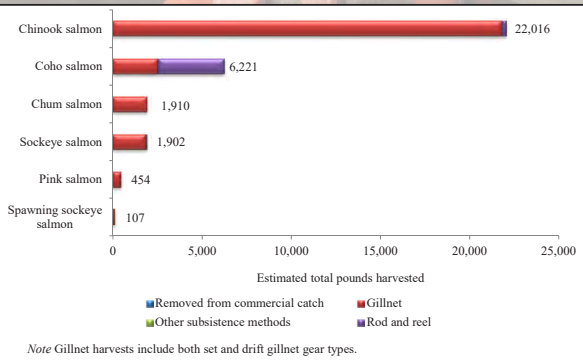


Figure 2.–Estimated pounds of salmon harvested by gear type, Ekwok, 2014.

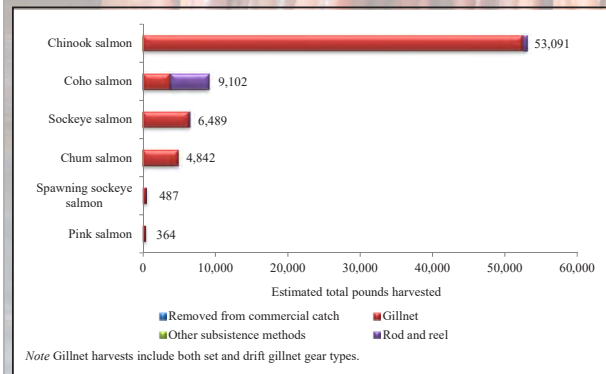


Figure 3.–Estimated pounds of salmon harvested by gear type, New Stuyahok, 2014.

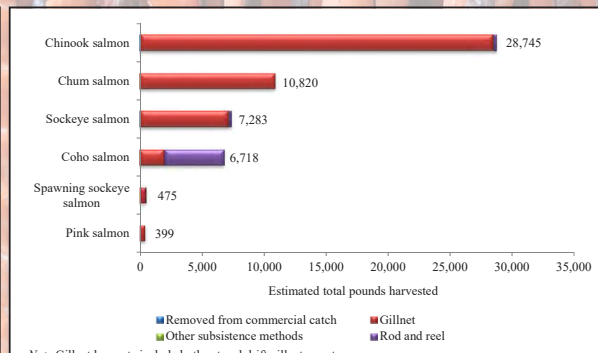


Figure 4.–Estimated pounds of salmon harvested by gear type, Koliganek, 2014.

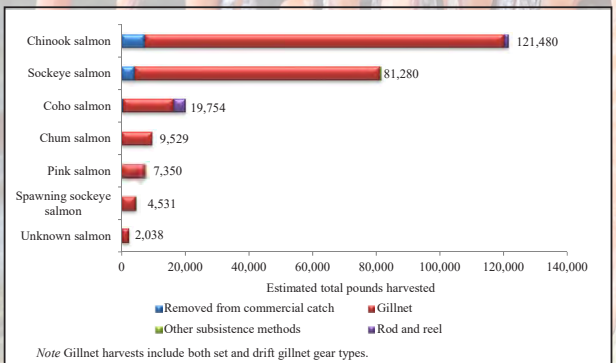


Figure 5.–Estimated pounds of salmon harvested by gear type, Dillingham, 2014.

Where to Find the Project Data and Final Report

The Community Subsistence Information System

The Community Subsistence Information System (CSIS) is an online database that hosts Alaska community harvest information gathered by the ADF&G Division of Subsistence. The results of this project's household surveys, as well as data from previous surveys, are available through the CSIS. To access the CSIS online:

https://www.adfg.alaska.gov/sb/CSIS/

Technical Paper

The results of this study can be found in the following technical paper:

Halas, G. and M. Cunningham. 2019. Nushagak River Chinook Salmon: Local and Traditional Knowledge and Subsistence Harvests. Alaska Department of Fish and Game Division of Subsistence, Technical Paper No. 453, Anchorage.

Two copies of the technical paper were sent to each tribal council in Clarks Point, Ekwok, Koliganek, New Stuyahok, and Dillingham. An additional copy was sent to the City of Dillingham.

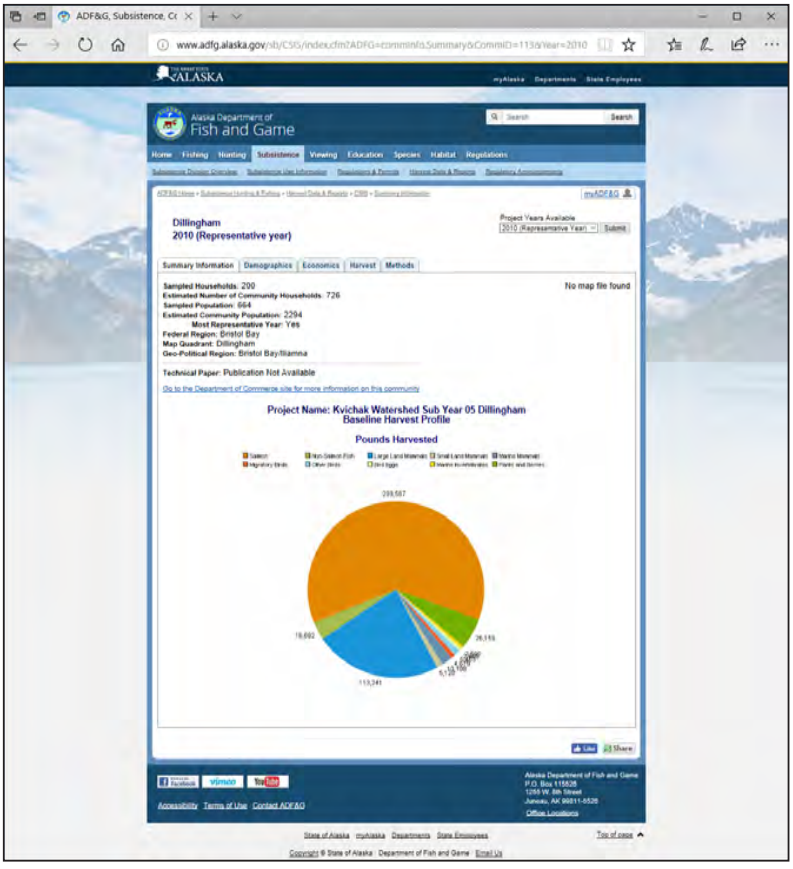
To download a copy of the full technical paper:
http://www.adfg.alaska.gov/techpap/TP453.pdf

How Can This Data be Used?

Reports and the data included in reports can be used to support proposals to develop or change subsistence fishing rules and regulations, including gear types, seasons, and limits, to ensure that fish populations are managed sustainably and the priority for subsistence uses is recognized in law. Information on the board processes, how to develop proposals, and board and advisory committee schedules are on the ADF&G website under Regulations.

The Alaska Board of Fisheries Process Overview

The Alaska Board of Fisheries' (BOF) main role is to conserve and develop the fishery resources of the state. This involves setting seasons, bag limits, and methods and means for the state's subsistence, commercial, sport, guided sport, and personal use fisheries.
The BOF receives written proposals, comments, and oral and written testimony from members of the public, local Fish and Game advisory committees, and ADF&G. The board then deliberates on regulations that respond to people's concerns while also considering the need for long-term conservation and sustainable use



Dillingham data summary for 2010 displayed on the CSIS.

of the resource. BOF meetings are open to the public and provide opportunity for public comment. They work under a regional cycle every three years.

Proposals for BOF meetings are accepted from December 1–April 10 in the year before the scheduled BOF meeting. Public comments can be submitted to the ADF&G Boards Support Section at any time up to two weeks prior to the start of the board meeting. The BOF is especially interested in proposals and comments that represent a collective, consensus approach to problem-solving, such as tribal council or advisory committee comments. Comments are included with the meeting packet materials prepared for the BOF meeting. A final chance to submit written comments is to do so in person at the meeting or via fax, and those are provided to board members periodically throughout the meeting.

ADF&G Fish and Game Advisory Committees

Fish and Game advisory committees (AC) are an important component of the BOF process. Advisory committees are local groups that meet to discuss fish and wildlife issues, provide a local forum for those issues, and make recommendations to the Alaska boards of Fisheries and Game. The Nushagak Advisory Committee represents the communities of Dillingham (5 seats), Aleknagik (1), Togiak (1), Manokotak (1), Clarks Point (1), Koliganek (1), New Stuyahok (1), Ekwok (1), and Portage Creek (1), with 13 designated and two undesignated seats. The Nushagak AC is located on the west side of Bristol Bay in Game Management Unit 17. It is an active committee holding 2–3 in-person and teleconference meetings per year focusing on both fish and game management issues.

Community harvest data from the 2013, 2014, and 2016 household surveys are available to the public and may be used by the AC (or any other person wishing to be part of the BOF process) to submit proposals or use as testimony.

For information on the **Nushagak AC** and how to become involved:

Contact the ADF&G Regional Coordinator: Taryn O'Connor-Brito by phone: (907) 842-5142, or email: taryn.oconnor-brito@alaska.gov

Or visit the ADF&G website by going to this link:

https://www.adfg.alaska.gov/index.cfm?adfg=process.acinfo&ac=nushagak

Want to know more? To find out more about advisory committees or how to submit a proposal, contact the Board Support Regional Coordinator for your area:

Arctic: 442-1717
Interior: 459-7263
Southwest: 842-5142
Southcentral: 267-2354
Southeast: 465-4110
Western: 543-2433
Statewide: 465-4110

You can also visit:

- www.boards.adfg.state.ak.us
- http://www.adfg.alaska.gov/static/regulations/regprocess/fisheriesboard/pdfs/forms/bof_process.pdf
- http://www.adfg.alaska.gov/static/regulations/regprocess/gameboard/pdfs/bog_process.pdf

Contact Us

Please feel free to contact project staff with any questions or comments about the project and report. Additionally, let us know if you have any items of concern or items of interest regarding local wild resources that you would like studied. We welcome the opportunity to work together with individuals, communities and organizations to develop research projects that inform you, your community, fish and game managers, and policy makers.



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The Alaska Department of Fish and Game complies with Title II of the Americans with Disabilities Act of 1990. This summary is available in alternative communication formats. If you need assistance, please contact the Department ADA Coordinator at (907) 465-6078;TTY/Alaska Relay 7-1-1 or 1-800-770-8973.

APPENDIX F—BRISTOL BAY SUBSISTENCE SALMON FISHERY PERMIT (REVISED FEBRUARY 2019)

Alaska Department of Fish & Game

Bristol Bay Subsistence Salmon Fishery Permit

ALASKA RESIDENTS ONLY

Issuing Community: _____

Permit No.: _____

Year: _____

First Name | Initial | Last name

Permanent Mailing Address | City

State | Zip Code | Phone Number

Number of year-round residents in household:

1. Only **one** Subsistence Salmon permit may be issued to each household per year.

Please list the HOUSEHOLD members who will assist in operation of the Subsistence Net:

1._____ 2._____ 3._____

4._____ 5._____ 6._____

Drainage to be fished: Naknek ☐ Kvichak ☐ Egegik ☐ Ugashik ☐

Nushagak ☐ Togiak ☐ Other_____

Number of fathoms allowed at this site: 10 25

Please circle gear type you will be using:

Dip net **Set gear** **Seine** **Drift net** **Spear** **Other**_____

I understand that I am applying for a subsistence fishing permit for my household in accordance with current regulations and hereby swear the information contained on this application is a true statement as witnessed by my signature below; and that I have been an Alaska resident for the last calendar year.

Applicant's signature _____ Date _____

TO BE COMPLETED BY ISSUING OFFICER ONLY

The above– named person and designated household members are authorized to fish for salmon for subsistence purposes in the Bristol Bay Area during the calendar year of _____ according to current laws and regulations of the State of Alaska.

Authorizing Officer Signature _____ Date _____

2. Fish caught for subsistence use may not be sold or allowed to enter commercial use.
3. An accurate record of fish taken under authority of this permit must be returned to the Alaska Department of Fish and Game when the permit expires. Failure to return subsistence catch records is grounds for denial of future permit privileges.
4. Commercially-caught salmon may also be utilized for subsistence purposes and must be reported on the back of this form as well as a Commercial Fish Ticket.

Return form to: Division of Subsistence, ADF&G, 333 Raspberry Rd, Anchorage, AK 99518
Fax: 907-267-2450 or email dfg.sub.permits@alaska.gov

Revised 2/2019

DAILY SUBSISTENCE SALMON CATCH TOTALS

Please record the dates and locations fished.

Please report spawned-out (red fish) in the "Spawned Red" column.

Community: _____

Permit #: _____

Year: _____

DID NOT FISH ☐ Name: _____

Date	Location	Gear	Red	Spawned Red	King	Chum	Pink	Coho

Date	Location	Gear	Red	Spawned Red	King	Chum	Pink	Coho

What was your total SUBSISTENCE harvest?

Does not include commercial fish retained for home use.

Record Total Here ▶

Red	Spawned Red	King	Chum	Pink	Coho

Did you COMMERCIAL fish? YES ☐ **NO** ☐

Please record Salmon caught during Commercial Fishing for home use, even if you already recorded it on your fish ticket. Record Total Here ▶

Red	King	Chum	Pink	Coho