Technical Paper No. 497

Subsistence Harvest and Use of Salmon in Nanwalek and Port Graham, Alaska, 2016 and 2017

by
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Alaska Department of Fish and Game

Division of Subsistence

Symbols and Abbreviations

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

Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

This report provides updated information about the current subsistence salmon permit program in the Lower Cook Inlet (LCI) Management Area, where the Port Graham, Koyuktolik, Port Chatham, and Windy Bay subdistricts are located. The report details results of household surveys administered in the communities of Port Graham and Nanwalek during the fall of 2016 and winter of 2018; surveys collected information about the harvest and use of salmon during the 2016 and 2017 calendar years. These responses, coupled with detailed harvest mapping, participant observation, and ethnographic interviews, provide a valuable, year-over-year picture of the subsistence salmon harvest, and can be compared with reported harvests through the existing permit program to assess its effectiveness in documenting the LCI subsistence salmon harvest. This study quantifies subsistence salmon harvests, and documents household harvest assessments and permit concerns, in each community to identify several potential modifications to the permit program, including changes to the distribution and collection of permits, as well as the inclusion of a harvest calendar on which fishers can note daily harvests. Research was funded by the Alaska Sustainable Salmon Fund in alignment with its monitoring and assessment goals.

Key Words: Subsistence, Permit, Lower Cook Inlet, Alaska Sustainable Salmon Fund, Port Graham, Nanwalek, Port Chatham, Windy Bay, Koyuktolik

1. INTRODUCTION

The subsistence harvests of salmon from the Lower Cook Inlet (LCI) Management Area are essential for residents of the lower Kenai Peninsula, not only as a source of food but for the inherent cultural value that fishing, fish processing, and sharing fish hold for community residents. To provide for these needs, the Alaska Board of Fisheries (BOF) authorized a subsistence setnet fishery in 1980 that required having a subsistence salmon permit in the Port Graham and Koyuktolik subdistricts of the LCI Management Area, extending the opportunity, effective in 2002, to the Port Chatham and Windy Bay subdistricts (Hammarstrom and Dickson 2003:63; Stanek 1981) (Figure 1-1). While subsistence salmon fishing opportunities are also available in the Seldovia Bay Subdistrict, this study focused on the communities of Nanwalek and Port Graham (both located in the Port Graham Subdistrict), where harvest reporting and permit system management underwent major changes beginning in 2012. Quantitative and qualitative data collected in Nanwalek and Port Graham for the 2016 and 2017 study years provide updated information on permitting protocols and salmon harvest estimates in the LCI Management Area.

Nanwalek and Port Graham are unincorporated communities on the lower Kenai Peninsula. Both are predominantly Alaska Native communities that had populations of approximately 150–250 persons in 2017 according to the American Community Survey (U.S. Census Bureau n.d.). Results of this study affirm that, during the 2016–2017 study years, subsistence salmon fishing remained an integral part of local livelihoods, with both communities using all five species of Pacific salmon available in Alaska: chum salmon (*Oncorhynchus keta*), coho salmon (*O. kisutch*), Chinook salmon (*O. tshawytscha*), pink salmon (*O. gorbuscha*), and sockeye salmon (*O. nerka*). Study results also identify several areas for improvement to the subsistence salmon permit system, including a permit format more conducive to recording daily harvests and more regular communication between fisheries managers and community members. This study was funded by the Alaska Sustainable Salmon Fund and supported the mission of the Alaska Department of Fish and Game (ADF&G) Division of Subsistence to gather, quantify, evaluate, and report information about customary and traditional uses of fish stocks.

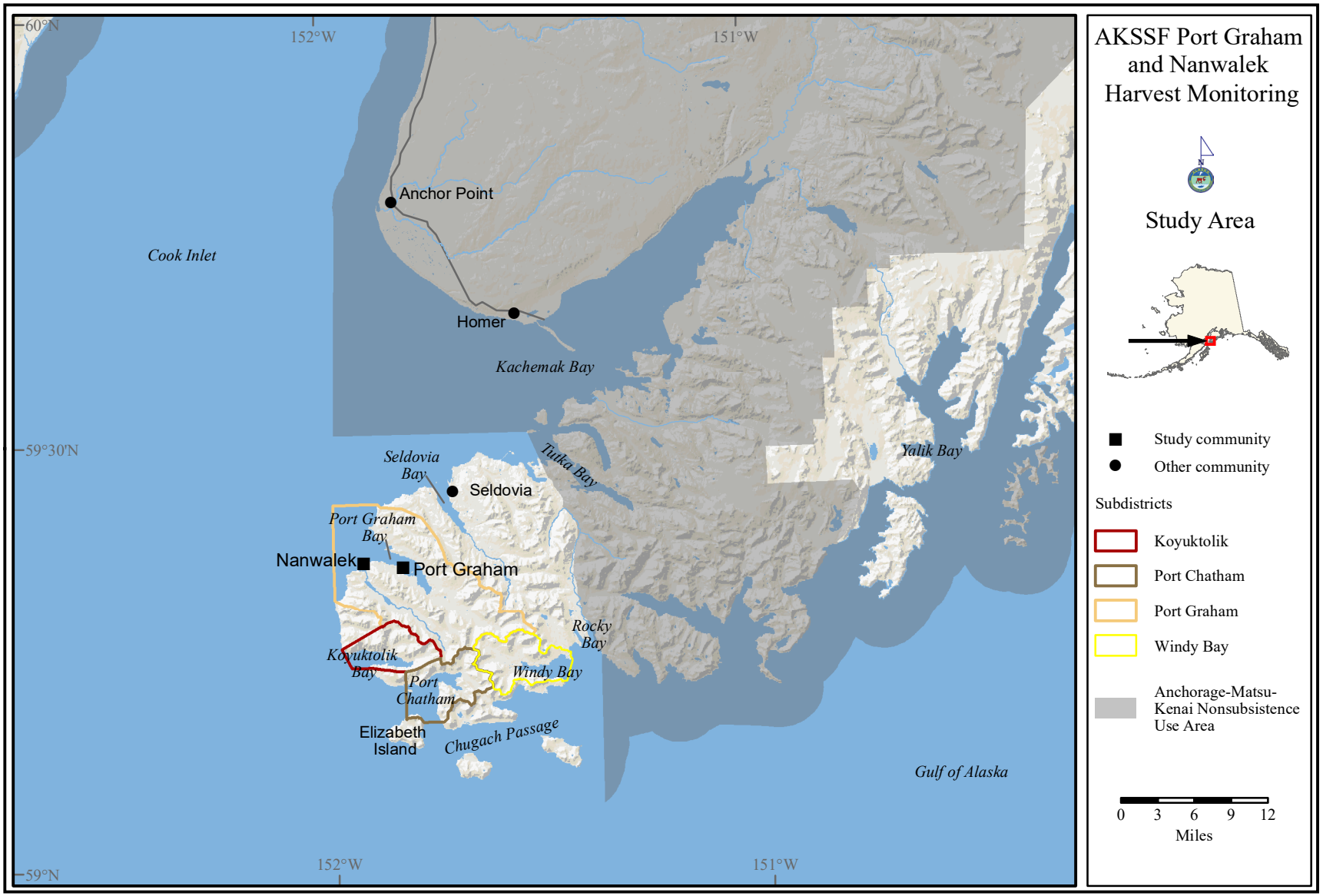

Figure 1-1.–Map of study communities and subdistrict boundaries of Lower Cook Inlet Management Area.

Project Background

The Alaska Sustainable Salmon Fund (AKSSF) provides funding to protect, restore, and conserve Pacific salmon and steelhead populations. AKSSF awarded funding to this study after a 2015 call for proposals. This study focused on the collection of accurate household harvest data through surveys to supplement information from returned subsistence permits to support sustainable fisheries management. While annual harvest reports are available for both Nanwalek and Port Graham through the subsistence permit system, there remains a large gap between permit reporting and harvest estimates based on household surveys.

Prior to 2012, the ADF&G Division of Subsistence issued household permits through cooperative agreements with the Nanwalek and Port Graham tribal councils. Additionally, the division had sufficient funds and staffing to annually distribute permits in the communities before the fishing season, then return later in the year to collect them, with few exceptions, such as in 2002 (Fall et al. 2003:126). Permits issued by the Division of Subsistence included a separate harvest calendar that was provided to aid subsistence fishers with recording daily harvests. Staff worked closely with the two tribal councils and community members, often conducting outreach efforts and relying on the calendars containing catch records being collected periodically throughout the season by local assistants hired by the councils. Due to funding reasons, responsibility for distributing, collecting, and publishing results of subsistence salmon permits for Seldovia, Port Graham, and Nanwalek was transferred to the Division of Commercial Fisheries, Homer office, in 2012. In 2012, the Division of Commercial Fisheries began issuing only a permit; the permit conditions required the documentation of daily harvests on the lower portion of the permit and for permits to be returned to the ADF&G office in Homer at the end of the fishing season (due November 30). With the changes in permit administration, funding, and staffing, community participation in the permit program declined. Division of Commercial Fisheries records show a total of 32 permits returned for both the Port Graham and Koyuktolik subdistricts combined in 2016 and two permits returned in 2017, compared with 53 permits returned in 2011 (Fall et al. 2020:185).

Limitations of the current reporting system, including low participation, preclude producing reliable long-term harvest counts or estimates. This subsistence fishery has been monitored by ADF&G staff since the late 1970s, with mandatory reporting on subsistence set gillnet fishing in place since 1981 (Hollowell et al. 2014:142–143; Stanek 1981). Although rod and reel fishing is conducted outside the subsistence regulatory structure, residents of these communities rely on rod and reel fishing for substantial numbers of fish for home use and either the harvest calendar or permit form has included space for reporting these harvests in all years. The historical harvests reported annually by ADF&G for the Port Graham and Koyuktolik subdistricts reflect actual permit reports (of both gillnet and rod and reel harvests) rather than estimates. From 1981 through 2011, harvest results fluctuated in those subdistricts from a high of 14,342 salmon in 2002 to a low of 761 salmon in 2007, when harvest reporting was described as "incomplete" and no permits were returned from Nanwalek (Fall et al. 2009:110, 115; 2015:186). From 2002–2011, there was an average of 34 permits returned from Nanwalek households and 25 returned from Port Graham households (Hollowell et al. 2013:134–135). Since 2012, harvest reporting from households in Nanwalek and Port Graham has been markedly more erratic compared to earlier years of harvest monitoring. In 2012–2015, fewer than five permits were returned annually by Nanwalek households, with reported total harvests as low as 35 fish (2015) and as high as 7,669 fish (2013) (Hollowell et al. 2019a:135). There were 10 or fewer permits returned annually by Port Graham households during the same period, with total reported harvests falling between 1,007 fish (2012) and 2,606 fish (2014) (Hollowell et al. 2019a:134).

This study used a two-year survey effort—including household surveys, ethnographic interviewing, and participant observation—to calculate total harvest estimates for Port Graham and Nanwalek households that may be compared against reported harvests on permits. This report makes several recommendations that may enable residents to more easily document their own harvest, as well as suggests improvements to the permit system so that it works for the community as well as provide better information for fishery managers.

Regional Background

Nanwalek and Port Graham are neighboring communities in the Kenai Peninsula Borough, both of which are located about 35 air miles southwest of Homer. Situated only 3 miles apart, both communities trace their history to Alexandrovk, a Russian trading post that was located at present-day Nanwalek. By 1800, Russian traders and missionaries had relocated approximately 100 Sugpiat Alaska Natives from dispersed settlements around the outer Kenai coast to Alexandrovk (Salomon et al. 2011; Stanek 2000). Today, most residents of Nanwalek and Port Graham are of mixed Russian and Sugpiaq descent. As a result of the Alaska Native Claims Settlement Act in 1971, residents of both communities became shareholders of the Chugach Alaska Corporation, an Alaska Native regional corporation. The village corporation of Port Graham is the Port Graham Corporation, and Nanwalek's is the English Bay Corporation.

The land immediately surrounding the two communities is predominantly a mix of village corporation holdings, Alaska Native allotments, state land, and private parcels. On its eastern edge, the lower peninsula is bounded by the two units of Kachemak Bay State Park. Further east, the high, glaciated Kenai mountains are managed by Kenai National Wildlife Refuge and Kenai Fjords National Park. Nanwalek and Port Graham are situated at the furthest western edge of this landmass, where Cook Inlet and Kachemak Bay transition into the Gulf of Alaska. The region's economy has long relied on natural resources available from a rich intersection of mountains and ocean. Before Russian contact, local Sugpiat lived in dispersed, multi-family groups around the outer Kenai Peninsula. During the Russian period, the lower Kenai was a hub of fur hunting and trade. After the U.S. acquired Alaska in 1867, the local economy shifted toward commercial fishing and fish processing, industries that remained central to Nanwalek and Port Graham into the 1980s. Commercial fishing's role in the cash economies of the two study communities began declining in the 1980s when the area suffered poor salmon runs. The commercial fishing economy did not recover after the 1989 *Exxon Valdez* oil spill. Since 1989, local employment has been largely through tribal government and associated grants, with some logging in the headwaters of the Port Graham and English Bay river systems.

Historically, the communities of Nanwalek and Port Graham have sustained themselves with resources available from the sea, especially salmon (Fall 2006; Salomon et al. 2011; Stanek 1985). As data from this and previous Division of Subsistence studies confirm, the annual wild food calendar in both communities is anchored by summer salmon fishing and preservation. According to household surveys conducted by the division between 1987 and 2014, salmon makes up between 33% and 57% of the annual wild resource harvest in Port Graham, in total pounds harvested. Corresponding studies in Nanwalek demonstrate even higher use, with salmon constituting between 39% and 74% of the total annual wild resource harvest (Fall 2006:97, 125; Jones and Kostick 2016:231, 331).

Regulatory Context

As portrayed in Figure 1-1, the majority of lower Cook Inlet falls within the Anchorage-Matsu-Kenai Nonsubsistence use area, established by the Joint Boards of Fisheries and Game in 1992 and 1993 (Fall 2013). However, waters surrounding Nanwalek and Port Graham lie outside the nonsubsistence area, and residents of both communities are defined by subsistence ways of life. At a meeting in 1980, after an initial request from residents of Nanwalek and Port Graham, the BOF established a subsistence set gillnet fishery in the Port Graham and Koyuktolik subdistricts (Stanek 1985). Community residents continue to use these fisheries, which were supplemented in 2002 by the addition of subsistence fisheries authorized in the Port Chatham and Windy Bay subdistricts on the peninsula's southern tip (Hammarstrom and Dickson 2003:63). The BOF determined that salmon were customarily and traditionally taken or used for subsistence and established an amount reasonably necessary for subsistence (ANS) range of between 4,800 and 7,200 salmon (5 AAC 01.566(d)). Under current regulations, subsistence salmon permits are required to subsistence fish for salmon and harvest reporting is mandatory. The collection of permit data serves several purposes for management agencies, including: identifying trends in fish populations, documenting subsistence harvests, serving as a basis for allocation decisions, and contributing to an understanding of salmon run timing and fish availability, among others. Other current regulations open subsistence salmon fishing in all four subdistricts on April 1 (5 AAC 01.560). Port Chatham and Windy Bay subdistricts close

on August 1, while the Port Graham and Koyuktolik subdistricts close two months later, on September 30. Weekly fishing periods are from 10:00 pm Thursday to 10:00 am Wednesday, totaling 132 hours per week with a 32-hour midweek closure. There are no household bag or possession limits (5 AAC 01.595). Gillnets are limited to 35 fathoms in length, 45 meshes in depth, with mesh no larger than 6 inches (5 AAC 01.570).

Generally, the fish targeted in this subsistence fishery are sockeye salmon returning to the English Bay Lakes system and Port Graham River. Other important species harvested are coho and pink salmon (Fall et al. 2014; Hollowell et al. 2014). The native sockeye salmon returns to the English Bay Lakes system, which are also the only commercially significant stock of sockeye salmon in the Southern District of the LCI Management Area, were severely depressed for much of the late 1980s and early 1990s (Hollowell et al. 2014:22). The English Bay system failed to meet minimum annual escapement goals for sockeye salmon between 1985 and 1993 (Hammarstrom and Dickson 2003:62). During this time, closures of subsistence, commercial, and sport fisheries limited local access to sockeye salmon. In 1989, an enhancement program was initiated for the English Bay Lakes system located upstream of Nanwalek, which began with an egg take in 1989 and release of sockeye salmon fry in 1990 (Cook Inlet Regional Planning Team 2007:11-27). From 1990 through 2015, the English Bay Lakes system received sockeye salmon releases in all but seven years (Hollowell et al. 2019a:157–158).

Despite enhancement, the run strength continues to fluctuate, and inseason escapement monitoring of this stock has been in place since 1994 (Hammarstrom and Dickson 2006; Hollowell et al. 2014). During the fishing season, fisheries (including subsistence set gillnetting in the Port Graham, Koyuktolik, Port Chatham, and Windy Bay subdistricts) are controlled with emergency orders. Closures of varying length have occurred during several recent seasons. For example, in 2012, which was several years prior to this project proposal being developed, subsistence fishing was closed in the southern section of the Port Graham subdistrict for 24 days (from June 22 to July 15) and for 14 days in the northern section (from June 22 to July 5) (Hollowell et al. 2014:14). The 2012 closures were due to a below-anticipated run of sockeye salmon at the English Bay Lakes weir. Inseason management was very active in study year 2016, when low escapement at the English Bay weir prompted a closure to the entire Port Graham Subdistrict subsistence fishery by 10:00 am on July 7.[1] A subsistence fishery opening was announced to provide a 48-hour fishing period beginning on July 11, and another 76-hour period opened beginning July 18.[2, 3] Then, 90% of the sustainable escapement goal (SEG) was reached by July 14 and the subsistence fishery was re-opened on July 21 at 10:00 pm with fishing periods lasting 6.5 days weekly, which extended through the season.[4] In 2017, sockeye salmon escapement at the English Bay weir was within the SEG by June 19 (Hollowell et al. 2019b:84). At the request of the Port Graham tribal council, ADF&G extended subsistence fishing in the Port Graham Subdistrict to 6.5 days per week, an increase of one day per week from the regulatory standard (Hollowell et al. 2019b:18).[5]

1. Alaska Department of Fish and Game. 2016. "News Release: Lower Cook Inlet Salmon Fishery News Release #9," accessed October 17, 2023. http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/688989772.pdf
2. Alaska Department of Fish and Game. 2016. "News Release: Lower Cook Inlet Salmon Fishery News Release #10," accessed October 17, 2023. http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/696604671.pdf
3. Alaska Department of Fish and Game. 2016. "News Release: Lower Cook Inlet Salmon Fishery News Release #11," accessed October 17, 2023. http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/706514417.pdf
4. Alaska Department of Fish and Game. 2016. "News Release: Lower Cook Inlet Salmon Fishery News Release #11," accessed October 17, 2023. http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/706514417.pdf
5. Alaska Department of Fish and Game. 2017. "News Release: Lower Cook Inlet Salmon Fishery News Release #6," accessed October 17, 2023. http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/793222176.pdf

Study Objectives

The project had the following objectives:

- Objective 1: Obtain updated subsistence salmon harvest information through household surveys to compare with reported harvest in the Port Graham, Koyuktolik, Port Chatham and Windy Bay subdistricts for the 2016 and 2017 fishing seasons.
- Objective 2: Document fishing locations and harvest recording at fishing locations to better understand how residents of Nanwalek and Port Graham document their harvests of salmon.
- Objective 3: Make recommendations for a revised harvest monitoring program based on study 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] the *Principles for the Conduct of Research in the Arctic* (Social Science Task Force, U.S. Interagency Arctic Research Policy Committee 1995:56–57), and the *Ethical Principles for the Conduct of Research in the North* (ACUNS 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

Consistent with research principles, in fall of 2015, division researchers presented a project proposal to the Alaska Native tribal organizations representing the residents of Nanwalek and Port Graham: Nanwalek Indian Reorganization Act (IRA) Council and Port Graham Village Council. To ensure the broadest possible awareness of this project and to inform all community members of project purposes, researchers held public meetings in Nanwalek and Port Graham prior to household surveys being administered for the first study year where ADF&G staff discussed community concerns about harvest monitoring, management, stock assessment, and other issues related to subsistence practices. Local research assistants (LRAs) from Nanwalek and Port Graham were contracted to assist with surveys in both communities for both study years (Table 1-1).

The field research employed three integrated social science data gathering methods. First, systematic household surveys were used to gather quantitative data on salmon harvest activity in two study years, including harvest quantities, timing, and locations. Second, ethnographic key respondent interviews (KRIs) provided valuable context on the state of fisheries, permits, and community relationships with regulatory agencies. Finally, participant observation allowed a more thorough understanding of harvest patterns at fishing locations, including how residents document their harvest. Researchers worked with LRAs to administer surveys, set up key respondent interviews, and coordinate participant observation.

6. Alaska Federation of Natives. 1993. "Alaska Federation of Natives Guidelines for Research." Alaska Native Knowledge Network, accessed March 2015. https://www.uaf.edu/ankn/indigenous-knowledge-syst/alaska-federation-of-nati/

Table 1-1.–Project staff.

Task	Name	Organization
Southern Regional Program Manager	Brian Davis	ADF&G Division of Subsistence
Southern Regional Program Manager	Lauren Sill	ADF&G Division of Subsistence
Principal Investigator	Malla Kukkonen	ADF&G Division of Subsistence
Principal Investigator	Brian Davis	ADF&G Division of Subsistence
Principal Investigator	Amy Wiita	ADF&G Division of Subsistence
Administrative support	Tamsen Coursey-Willis	ADF&G Division of Subsistence
Administrative support	Cheryl Park	ADF&G Division of Subsistence
Administrative support	Pam Amundson	ADF&G Division of Subsistence
Administrative support	Alejandra Rico	ADF&G Division of Subsistence
Data Management Lead	David Koster	ADF&G Division of Subsistence
Programmer	Margaret Cunningham	ADF&G Division of Subsistence
Data entry	Zayleen Kalalo	ADF&G Division of Subsistence
	Jon Jeans	ADF&G Division of Subsistence
	Margaret Cunningham	ADF&G Division of Subsistence
	Lehua Otto	ADF&G Division of Subsistence
	Alea Robinson	ADF&G Division of Subsistence
	Hannah Johnson	ADF&G Division of Subsistence
	Anna Peterson	ADF&G Division of Subsistence
	Alexzandra DePue	ADF&G Division of Subsistence
Data cleaning/validation	Margaret Cunningham	ADF&G Division of Subsistence
Data analysis	Margaret Cunningham	ADF&G Division of Subsistence
	David Koster	ADF&G Division of Subsistence
Cartography	Gayle Neufeld	ADF&G Division of Subsistence
Editorial Review Lead	Mary Lamb	ADF&G Division of Subsistence
Field Research Co-Lead	Malla Kukkonen	ADF&G Division of Subsistence
Field Research Co-Lead	Amy Wiita	ADF&G Division of Subsistence
Survey field staff	Lauren Sill	ADF&G Division of Subsistence
Survey field staff	Jackie Keating	ADF&G Division of Subsistence
Survey field staff	Lisa Hutchinson-Scarbrough	ADF&G Division of Subsistence
Survey field staff	Zayleen Kalalo	ADF&G Division of Subsistence
Survey field staff	Erica Mitchell	ADF&G Division of Subsistence
Local research assisstant	Barbara Swenning	Nanwalek
Local research assisstant	Teresa Evans	Nanwalek
Local research assisstant	Teresa Cook	Nanwalek
Local research assisstant	Pauline Berestoff	Nanwalek
Local research assisstant	Jennifer Flood	Port Graham
Local research assisstant	Rita Meganack	Port Graham
Local research assisstant	Christalina Jager	Port Graham

Table 1-2.–Sample achievement, Nanwalek, 2016 and 2017.

Sample information	2016	2017
Number of dwelling units	61	64
Interview goal	61	64
Households interviewed	58	53
Households failed to be contacted	3	6
Households declined to be interviewed	0	2
Households moved or occupied by nonresident	0	3
Total households attempted to be interviewed	61	61
Refusal rate	0.0%	3.6%
Final estimate of permanent households	61	61
Percentage of total households interviewed	95.1%	86.9%
Interview weighting factor	1.1	1.2
Sampled population	58.0	53.0
Estimated population	235.6	269.3

Source ADF&G Division of Subsistence household surveys, 2016 and 2018.

Table 1-3.–Sample achievement, Port Graham, 2016 and 2017.

Sample information	2016	2017
Number of dwelling units	61	60
Interview goal	61	60
Households interviewed	39	49
Households failed to be contacted	10	3
Households declined to be interviewed	12	8
Households moved or occupied by nonresident	0	0
Total households attempted to be interviewed	61	60
Refusal rate	23.5%	14.0%
Final estimate of permanent households	61	60
Percentage of total households interviewed	63.9%	81.7%
Interview weighting factor	1.6	1.2
Sampled population	39.0	49.0
Estimated population	158.0	146.9

Source ADF&G Division of Subsistence household surveys, 2016 and 2018.

Systematic Household Surveys

The primary method for collecting subsistence harvest and use information in this project was a systematic household survey. Following comments at the scoping meetings, ADF&G finalized the survey instrument in October 2016. This survey investigated basic demographics, salmon harvests, changes to use compared to recent previous years, and the receipt and return of subsistence salmon permits. The instrument also allowed for location-specific harvest reporting with the intention for comparison of permit returns by management subdistrict.[7] Questions about demographics and changes in resource use are consistent with information collected in previous study years and with data in the Community Subsistence Information System (CSIS).[8] Appendix A is an example of the survey instrument used in this project.

7. Due to very low permit return levels, and issues matching permits to surveys, the division was unable to conduct this level of comparison in a way that would produce meaningful or valid assessments.
8. ADF&G Community Subsistence Information System: http://www.adfg.alaska.gov/sb/CSIS/ (hereinafter cited as CSIS).

Table 1-4.–Survey duration, study communities, 2016.

Community	Interview length (in minutes)		
	Average	Minimum	Maximum
Nanwalek	19	5	100
Port Graham	26	5	55

Source ADF&G Division of Subsistence household surveys, 2016.

Table 1-5.–Survey duration, study communities, 2017.

Community	Interview length (in minutes)		
	Average	Minimum	Maximum
Nanwalek	25	5	64
Port Graham	32	5	210

Source ADF&G Division of Subsistence household surveys, 2018.

The survey areas for both Nanwalek and Port Graham corresponded with road-accessible dwellings within each census designated place (CDP). Researchers attempted to contact all occupied households in each community. For the 2016 study year, 58 out of 61 eligible households in Nanwalek were surveyed, for a 95% response rate (Table 1-2). For the 2017 study year, 53 out of 61 eligible households were surveyed, for an 87% response rate. The research team was unable to contact three households in 2016 and six households for the 2017 study year. No households in 2016 declined to participate in the survey (0% refusal), and two declined for 2017 (4% refusal). In Port Graham for 2016, researchers conducted surveys with 39 out of 61 eligible households resulting in a response rate of 64%; of note, during the survey administration period, there was a death in the community, which reduced household contact and survey participation (Table 1-3). For the 2017 study year, 49 out of 60 eligible households were surveyed for a response rate of 82%. Researchers were unable to contact 10 households in 2016 and three households in 2017. Twelve households declined to be surveyed in 2016 (24% refusal) and eight declined for 2017 (14% refusal).

Household Survey Implementation

Nanwalek

An initial scoping meeting at the Nanwalek IRA Council office was held on June 23, 2016, by ADF&G staff Malla Kukkonen and Brian Davis. Household surveys were conducted by ADF&G staff Kukkonen, Amy Wiita, and Erica Mitchell from October 25–30, 2016, for the 2016 study year. Two local research assistants, one of whom had helped with a previous ADF&G study in 2015, were trained on the first day of the survey effort. The Nanwalek IRA Council provided updated household lists as well as public space for survey meetings. For the 2017 study year, division staff conducted surveys on March 14–24, 2018. ADF&G staff Wiita, Jaqueline Keating, and Lauren Sill were joined in this effort by three local research assistants. On average, surveys took 19 minutes to administer in 2016 and 25 minutes in 2017 (tables 1-4 and 1-5).

Port Graham

Kukkonen and Davis conducted a scoping meeting at the Port Graham Village Council office on June 21, 2016. Survey administration occurred during October 31 through November 4, 2016, and two LRAs helped to coordinate and administer household surveys. For the 2017 study year, household surveys were conducted February 6–15, 2018. Division staff Wiita, Lisa Hutchinson-Scarborough, and Zayleen Kalalo were supported by three local research assistants. On average, surveys lasted 26 minutes in 2016 and 32 minutes in 2017 (tables 1-4 and 1-5).

Key Respondent Interviews

During visits to the study communities, researchers consulted tribal councils, elders, and LRAs to find knowledgeable community members who could talk to researchers about salmon stocks, run timing, community permit concerns, environmental changes, and other community concerns. Respondents were compensated for their time and expertise. During the 2016 study year, open-ended interviews allowed respondents to direct researchers toward topics of concern for each community. By assessing these responses alongside the project's objectives, researchers developed a study-specific interview protocol for the project's second year (Appendix B). This protocol directed conversations toward select topics: subsistence permits, regulations, commercial fishing, hatcheries, and the status of coho and Chinook salmon. Respondents were invited to note changes over time in these, and other, topics of community concern. In several KRIs, 11x17-inch paper maps were used to orient respondents to the geographic features in question when describing subsistence activities. Conversations with key respondents were audio recorded in all but one case, when the respondent requested that researchers take notes instead. Key respondents were informed that, to maintain anonymity, their names would not be used. These interviews provided additional context for the quantitative data, information for the community background section at the beginning of each chapter, the seasonal round sections, harvest-over-time analysis, and the community comments and concerns section at the end of each chapter.

ADF&G staff Kukkonen and Davis conducted one KRI in Nanwalek on June 23, 2016. Kukkonen returned to Nanwalek with ADF&G staff member Mitchell on September 28–29, 2016, to complete two more KRIs. Researchers conducted six KRIs in Nanwalek between March 14–24, 2018, for the 2017 study year. Kukkonen and Mitchell conducted three KRIs in Port Graham between September 27–28, 2016. ADF&G researchers Wiita and Davis conducted two KRIs between June 19–24, 2017, one more between July 27–August 1, 2017, and two during the time when household surveys were administered on February 6–15, 2018. Given limited opportunity for participant observation, researchers completed more KRIs than outlined in the original scope of the investigation plan. For the project overall, there were a total of nine interviews in Nanwalek and eight interviews in Port Graham.

Participant Observation

ADF&G researchers engaged in participant observation during both study years. In September 2016, Kukkonen and Mitchell visited fishing locations on the Port Graham River system, documenting current and historical harvest and processing practices. Wiita and Davis engaged in participant observation at a setnet site and fish camp between June 19–24, 2017. Wiita returned to observe rod and reel fishing and fish preservation in Port Graham between July 27 and August 1, 2017. This trip also included a visit to harvesting locations on Koyuktolik Bay. Participant observation was guided by the division's best practices for qualitative data collection, including informed consent and detailed documentation through field notes, photographs, and focused interviewing.

Mapping Locations of Salmon Fishing Activities

During household surveys in both study years, researchers asked respondents to indicate fishing locations by species and gear type. Points were generally used to mark fixed harvest locations, like setnet sites or rod and reel fishing from a beach. Polygons were used to indicate broader harvest effort, such as areas fished while trolling. While lines were available for depicting specific trolling courses, respondents in both study years tended to indicate this information using either points or polygons.

Search and harvest areas were documented on iPads using an application designed on the ArcGIS Runtime SDK for iOS platform that was developed by HDR, Inc., an environmental research firm in Anchorage.[9] Each point, line, or polygon was drawn on a U.S. Geological Survey topographic relief map downloaded on the iPad. 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 the state of Alaska. Once a feature was accepted,

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

the researcher added attributes that noted month(s) of use of the area, method of access to the resource, the species searched for or harvested and amount harvested if successful, and the gear type used to harvest salmon. Map features were matched to the survey instrument to ensure that all harvest data were recorded accurately. The data were uploaded to the Division of Subsistence geographic information system (GIS) SQL Server spatial database, a spatial database engine (SDE), through the application's sync functionality. Once data collection was completed, the data were transferred from the SDE to an individual project file geodatabase.

Data Analysis and Review

Survey Data Entry and Analysis

Researchers coded completed surveys for data entry while in the field. Coding was reviewed by Information Management (IM) staff within the Division of Subsistence prior to data entry. For consistency, responses were coded following standardized conventions used by the Division of Subsistence to facilitate data entry, data validation, and long-term documentation. IM staff set up database structures with Microsoft SQL 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 built in Microsoft Access were available on secure network drives. Daily incremental backups of this database occurred with full backups occurring weekly. This ensured that no more than one day of data entry would be lost in the event of a catastrophic failure. All survey data were entered twice, and each set compared in order to minimize data entry errors.

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

Division of Subsistence staff also used SPSS for analyzing the survey information. Analysis included review of raw data frequencies, cross tabulations, table generation, estimation of population parameters, and calculation of confidence intervals for the estimates. Instances of missing information were evaluated to ensure these cases were sporadic, random, and uniformly distributed among all surveys and questions. There was no indication that response bias may be present based on a review of the instances of missing information. Each instance of missing information was dealt with on a case-by-case basis according to standardized practices. For data elements where a non-zero mean could be derived from sampled data, missing data were replaced with the mean of those valid responses. In cases where the mean values resolved to zero, but a non-zero amount was implied by the missing data code, a minimal substitution was applied. Division analysts documented adjustments in SPSS syntax.

Harvest estimates and responses to all questions, except categorical responses, were calculated by using the principle that a sample mean can be used as an unbiased estimator of the population mean (Cochran 1977). For analysis the sample mean was the arithmetic mean, or average, of households that agreed to participate and the population was the total number of occupied and eligible households present in the community during the study period. These calculations are standard methods for extrapolating sampled data. As an example, the formula for harvest expansion is:

$$\hat{X} = N\bar{y} \tag{1}$$

$$\bar{y} = \frac{\sum_{i=1}^{n} x_i}{n} \tag{2}$$

where:

N = total number of households in a community,

$\bar{y}$ = the mean harvest (amount of resources or pounds) of returned surveys,

n = the number of returned surveys,

x_i = the reported harvest (amount of resources or pounds) of a household i, and

$\hat{X}$ = the total estimated harvest (amount of resources or pounds).

In addition to community estimates, 95% confidence intervals were calculated to evaluate the relative precision of the mean. The confidence interval is depicted either as a percentage or range of values. Confidence intervals were calculated using raw, unexpanded data. This metric represents a confidence level of 95% that the true population mean falls within the calculated range (Goldsman and Goldsman 2021). A wide confidence interval implies less confidence in the estimate. For interpretation, a confidence interval range that falls below the sum of reported values implies that no statistically significant difference exists between the reported and estimated values, thus the true population value may plausibly be represented by the sample. Additionally, a confidence interval where the lower bound falls below zero suggests that there is no statistically significant difference from zero. However, because the sampling fractions for these surveys is so large, a wide confidence interval indicates high levels of inequality between harvesters and indicates additional super-harvesters may be present in the surveyed portion of each community. Because the sample was taken from a finite population of households, confidence intervals were calculated using finite population correction as formulated below (Cochran 1977).

$$\mathrm{CI\%}(\pm) = \frac{t_{a/2} \times \frac{s}{\sqrt{n}} \times \sqrt{\frac{N-n}{N-1}}}{\bar{y}} \tag{3}$$

where:

$t_{\frac{a}{2},n-1}$ = student's two-tailed t critical value for α=0.95 and n–1 degrees of freedom,

s = sample standard deviation,

n = the number of returned surveys,

N = total number of households in the community, and

$\bar{y}$ = sample mean.

The corrected final data from the household surveys will be added to the Division of Subsistence CSIS. The CSIS is a publicly accessible database maintained by the Division of Subsistence and includes community-level study findings.

Population Estimates and Other Demographic Information

A primary goal of this study was the collection of demographic information for all year-round households in each study community. For this study, "year-round" was defined as being domiciled in the community both when the surveys took place and for at least 6 months during each study year (2016 and 2017). 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.

Ethnographic Interview Transcription and Analysis

Upon return from fieldwork, digitally audio recorded interviews were transcribed and reviewed for accuracy. Each interview was assigned a unique number and cataloged according to community, date, location, and individuals present. Researchers identified common themes, from broad categories (i.e., knowledge about salmon species as it relates to seasonality of harvest and gear types) to more detailed information (i.e., the relationships between permit format, availability, and return rates). Ethnographic material provides both specific and thematic support for assessments of subsistence salmon fishing in the two communities.

Participant Observation

Field notes from the participant observation trips in 2016 and 2017 were analyzed for themes pertaining to the qualitative information categories developed during key respondent interview analysis. Researchers identified three emergent topics related to specific resources (coho salmon, winter Chinook salmon, hatchery fish), and three related to regulation (permits, regulations, commercial fishing). Researchers analyzed participant observation notes and recordings for general changes over time and primary issues of concern in each community. By combining focused observation and informal interviews conducted during harvesting activities, researchers gathered broad qualitative information to address the core objectives of this report and also identified areas for further research.

Map Data Entry and Analysis

Maps were generated based on data collected using the ArcGIS iPad application. All data were entered on the iPad in the field during interviews and synced to the division's SDE, then transferred to an individual project geodatabase. To create community-level maps, spatial data were first sorted by community and then by resource and examined for accuracy. For the purpose of presenting study results, household data were aggregated to the community level to protect confidentiality of individual households. The data were dissolved[10] by study year to the resource level (salmon overall) and gear type. Data were published only if a minimum of three households were represented. While spatial harvest data were collected for all gear types, this report primarily concerns subsistence harvest methods and therefore depicts gillnet-specific use areas in maps, which are available for both years in Port Graham and for 2017 in Nanwalek[11] (see Appendix D). Although non-local use areas—specifically in the Kenai River drainage—were documented in both study years, the maps published in this report depict an extent that shows the local salmon search and harvest areas where activities were most concentrated. Maps were reviewed at community review meetings to ensure accuracy and to identify any data the community would like to keep confidential, although no privacy concerns were expressed when draft maps were presented to the communities.

Community Review Meetings

ADF&G staff Keating and Kalalo presented preliminary survey findings and associated search area and harvest maps at meetings in each community. The Port Graham data review meeting took place at the Port Graham Village Council office on March 14, 2019, with five attendees. Comments from attendees included concern that harvest estimates alone do not reflect the increasing need for residents to travel farther away from the community to harvest fish due to lower abundance. Attendees also voiced concerns about the influx of charter boats based in Homer that were fishing around Port Graham. One resident specifically noted that charter boats seemed to watch where subsistence harvesters were fishing so they could use the same areas. The Nanwalek data review took place the following day, March 15, 2019. Staff presented project results during a tribal council meeting at the IRA Council office with six council members and three guests in the audience. Nanwalek residents expressed concern that fish were being intercepted by other subsistence harvesters and suggested that the next subsistence fisheries study for Nanwalek and Port Graham should include the remainder of the LCI Management Area communities. No concerns for the draft harvest and spatial data were expressed by residents of either Nanwalek or Port Graham during community review.

Final Report Organization

This report summarizes the results of systematic household surveys and mapping interviews conducted by ADF&G staff and LRAs. It also summarizes resident feedback provided at community review meetings. With regard to the 2016 and 2017 harvest and use data, content from both Nanwalek and Port Graham are based on the same survey instrument and are internally consistent. The two communities have been surveyed for many prior comprehensive surveys, so it has been possible to make harvest and use comparisons

10. The term "dissolved" refers to an analytical procedure of aggregating data (individual household search and use areas) into a single unit, to represent a composite whole (a search and use area for a community).

11. A map depicting gillnet harvest and use areas was not produced for the 2016 study year due to data being collected by fewer than three households.

between the communities across longer timescales. However, the survey instrument in this project differs from the standard comprehensive survey used for some of those preceding studies. Significantly, this survey focused only on salmon (leaving out all other resources) and abridges the demographic section (leaving out sections on employment and food security). Most importantly, the 2016 and 2017 survey instruments ask specifically about subsistence permit use. These differences allow meaningful comparison between Nanwalek and Port Graham and between each of the two study years, but leave less latitude for comparison with the rich, regional sequence of broader harvest and use information.

This report considers Nanwalek and Port Graham in separate chapters, with specific attention to each community's harvest and use patterns, both in the two study years and compared to previous years. In both chapters, results begin with a description of the community and an overview of the seasonal round as it relates to salmon resources. The chapters then proceed into quantitative summaries of harvest and use patterns in the study years, including an analysis of demographics, resource sharing patterns, and household specialization. Where possible, each chapter compares study year results with historical data. In line with research objective 3, both community's responses to permit-specific questions are treated as a separate heading. Each community chapter includes a section documenting local comments and concerns (gathered during surveys, key respondent interviews, participant observation, and community review meetings). The report continues with a discussion and conclusion chapter, in which data from both communities are compared with one another and with relevant historical context. The final section closes with an overview of study findings, conclusions, and a set of recommendations.

2. NANWALEK

Community Background

Nanwalek is located on the southwest tip of the Kenai peninsula, about 35 miles southwest of Homer (Figure 1-1). The country around Nanwalek grades from Sitka spruce and hemlock rainforest at sea level into alpine meadow and tundra above approximately 800-ft elevation. The coastline is a mix of bluff-backed beaches, nearshore reefs, and small, semi-protected coves. Nanwalek's public airport runs the length of a wide spit between English Bay and the lagoon that terminates the English Bay Lakes and river system. In Sug'stun, the local Alutiiq dialect, Nanwalek means "the place with the lagoon" (Stanek 2000). Historically, this river system has supported the study area's most productive sockeye salmon run (Jones and Kostick 2016).

Nanwalek residents are predominantly Alaska Native, identifying primarily with Sugpiaq heritage. There is evidence of the presence of Alaska Natives of the Ocean Bay tradition on the lower Kenai Peninsula dating back 4,500 years (Stanek 1985:31–51; Workman and Workman 1988). For a more comprehensive description of the complex, culturally diverse human history of the outer Kenai, see *The Last 1300 Years of Prehistory in Kachemak Bay: Where Water is Less* by Workman and Workman (1988). Immediately prior to Russian contact, Sugpiat people in the area lived in small, dispersed settlements around the lower Kenai Peninsula and Prince William Sound. Large-scale human settlement at present-day Nanwalek dates back to 1786, when the Russian-American fur company established Fort Alexandrovsk at the English Bay lagoon (Csoba DeHass 2007; Fall 2006; Stanek 2000). Russian traders coerced Sugpiaq men into hunting sea otters and forced their families to resettle near Alexandrovsk (Stanek 2000). In 1800, approximately 100 Sugpiat lived at Alexandrovsk, with many women and children held as ransom for otter hunting services (Salomon et al. 2011; Stanek 2000).

By 1850, the Russian fur trade was struggling. For a few years, when fur was particularly unprofitable, Alexandrovsk's entire Sugpiaq population was relocated to work a nearby coal mine (Stanek 2000). By the end of the Russian era, the Sugpiat of the Kenai's outer coast had already experienced irrevocable changes in their traditional ways of life. Multiple resettlements, forced labor, epidemic disease, and the introduction of new social structures like the Russian Orthodox church had left deep changes in the cultural heritage of lower Kenai Sugpiat. When the United States purchased Alaska in 1867, the community (then called English Bay) began a slow shift toward engaging in commercial fishing under the Alaska Commercial Company. Local families fished for salmon, Pacific herring and cod, crab and shrimp and, after the Port Graham Cannery was established in 1910, many also worked in the packing industry. Commercial fishing and cannery work were Nanwalek residents' primary wage source from the early 1900s through the 1980s (Stanek 1985).

Several key respondents from Nanwalek point to the 1989 *Exxon Valdez* oil spill (EVOS) as a turning point in the commercial fishing industry. While little oil reached waters adjacent to Nanwalek, the spill has created long-lasting, well-documented changes in coastal food webs (Fall 2006; Salomon et al. 2011). Though the spill marked an unmistakable decline, Nanwalek's commercial salmon industry had been in trouble since the mid-1980s. Low returns to the English Bay Lakes system forced commercial closures every year since 1985, and most commercial setnetters had already sold permits and gear by 1989. Compared to the late 1970s, when, according to Braund and Behnke (1980:209), commercial fishing and packing provided "the bulk of the year's cash for the majority of Port Graham and English Bay residents," the years just before and after EVOS saw striking divestments from commercial fishing. In 1987, fishing and cannery work provided 24% of Nanwalek's annual income; by 1993, that figure was down to 0.4% (Stanek 2000:93).

In 1990, ADF&G released sockeye salmon fry, initiating an English Bay fisheries enhancement project for the rehabilitation of commercially viable sockeye salmon (Cook Inlet Regional Planning Team 2007:11–27). Enhancement efforts, known as the Nanwalek Salmon Enhancement Project, have seen several iterations, including the harvest and hatchery-rearing of English Bay Lakes eggs and the introduction of fry from the

Cook Inlet Aquaculture Association (CIAA) Trail Lakes Hatchery. Despite demonstrable improvement, escapement has fluctuated at the English Bay Lakes weir.

Through all of these changes, Nanwalek residents have maintained strong ties to subsistence foods and ways of life. Resources from the sea, especially salmon, continue to be important to everyday life in Nanwalek, both as sources of sustenance and as essential components of community identity. For a comprehensive look at the importance of processing and preparing salmon to Sugpiaq identity, see *Ethnographic Overview and Assessment for Nanwalek and Port Graham* by Stanek (2000).

Nanwalek is an unincorporated community in the Kenai Peninsula Borough. The Native Village of Nanwalek, a federally recognized tribe, is governed by its own Indian Reorganization Act (IRA) council, which is funded largely through the regional non-profit Chugachmiut. As a result of the Alaska Native Claims Settlement Act of 1971 (ANCSCA), tribal residents became members of Chugach Alaska Corporation and English Bay Corporation, both of which typically provide an annual dividend. Following a drop in commercial fishing profits in the 1990s, the Nanwalek IRA Council sought and obtained grants for housing and infrastructure development. Local residents, through contracts with the village council, have constructed new homes, a day-care facility, low-income housing, and a health clinic. Full- and part-time work available through the village council—including housing and road maintenance, utility services, and monitoring of the English Bay fish weir—accounted for the majority of Nanwalek's cash economy in the 1990s (Stanek 2000). In 2014, the largest percentage of cash income in Nanwalek was through the local government (44%), followed by Alaska Permanent Fund dividends (22%) (Jones and Kostick 2016:210). In 2016 and 2017, Nanwalek maintained an IRA council office, a community center, a library, health clinic, and school. A resident family operated a small store. Transportation in and out of Nanwalek is available by boat or small plane, with two local carriers offering daily air service from Homer.

Seasonal Round

Residents of Nanwalek harvest a variety of wild foods from the surrounding land and waters. Historically, marine invertebrates have been an important source of year-round protein, though recent declines in shellfish abundance, size, and distribution have changed this pattern (Salomon et al. 2011; Stanek 1985). In recent years, marine mammals, birds and eggs, and large land mammals have remained important to Nanwalek residents. For a more comprehensive overview of all resources harvested by Nanwalek residents, see results from study year 2014, which are published in the division's Technical Paper No. 420 (Jones and Kostick 2016).

As noted by previous researchers, salmon fishing has historically anchored the annual subsistence calendar (Stanek 2000). From late spring until late fall, Nanwalek residents engage in concentrated salmon harvesting efforts using a variety of gear types. In contemporary times, salmon are harvested using gillnets (under subsistence regulations) and by trolling and using rod and reel (under sport fishing regulations). The salmon season begins in late spring, when the first sockeye salmon appear in local saltwater and are harvested using set gillnets. Pink salmon are caught in setnets and on sportfishing gear in increasing numbers throughout the summer. Coho salmon begin running in August and can be found in the English Bay River system into October. Nanwalek residents troll year-round for Chinook salmon.

During fieldwork in 2018, one key respondent shared with researchers that Nanwalek residents use a variety of techniques to preserve the summer's salmon harvest. In addition to frozen and jarred fish, smoked, dried, half-dried, and salted salmon contribute to the year-round diet in Nanwalek. Some portions, including backbones, pink salmon humps, and coho heads, are prepared in specific ways for later consumption (NW7).

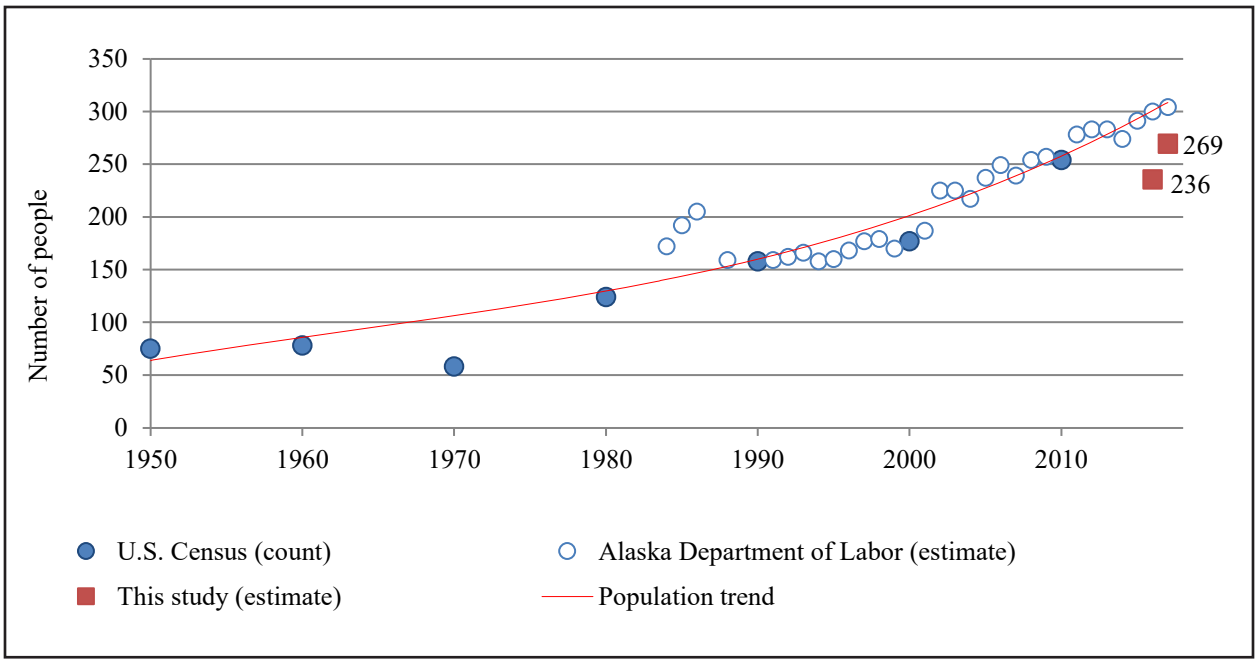

Figure 2-1.–Historical population estimates, Nanwalek, 1950–2017.

Population Estimates and Demographic Information

According to residents, Nanwalek is a growing community: "… just more people, more fish you got to put away, more of everything" (NW1). This perception corresponds with data from the U.S. Census Bureau and Alaska Department of Labor and Workforce Development (ADLWD), and with the population estimates by the Division of Subsistence, the latter of which estimated 236 people in Nanwalek in 2016 and 269 people in 2017 (Figure 2-1). Table 2-1 provides a direct comparison of study results with 2010 U.S. Census data; Figure 2-1 provides a long-term comparison of population counts and estimates alongside the division's most recent study year estimates.

Local respondents suggest that the population is increasing because of a higher reproductive rate and a greater number of people staying in the community or returning after time spent away. According to community members of varying ages, Nanwalek is a desirable place to raise a family, especially for people with roots in the area (NW1; NW6). As seen in figures 2-2 and 2-3 and tables 2-2 and 2-3, Nanwalek's demographic profile is weighted heavily toward younger generations. The median age of Nanwalek residents during both study years was 22, compared to a national median age of 38 during the same years (Table 2-1).[1] In both study years, more than one-third of residents were younger than 15 years old. There were more females in Nanwalek than males; females composed 52% of the total population in 2016 and 55% of the total population in 2017 (tables 2-2 and 2-3).

Nanwalek is a predominantly Alaska Native community. Based on division estimates, 88% of households were Alaska Native in 2016, with a slight increase to 93% in 2017 (Table 2-1). These estimates are based on personal reporting of ethnicity of the household heads. As depicted in Figure 2-4, various sources of population data indicate that the majority of Nanwalek residents were Alaska Native during the 2016–2017 study period.

1. "Median Age of the Resident Population of the United States from 1960 to 2021," Statista, accessed September 2023. https://www.statista.com/statistics/241494/median-age-of-the-us-population/

Table 2-1.–Sample and demographic characteristics, Nanwalek, 2016 and 2017.

Characteristics	Nanwalek 2016	Nanwalek 2017
Sampled households	58	53
Eligible households	61	61
Percentage sampled	95.1%	86.9%
Sampled population	224	234
Estimated community population	235.6	269.3
Household size		
Mean	3.9	4.4
Minimum	1	1
Maximum	8	10
Age		
Mean	27.0	26.7
Minimum[a]	0	0
Maximum	83	84
Median	22.5	21.5
Length of residency		
Total population		
Mean	20.2	21.4
Minimum[b]	0	0
Maximum	73	84
Heads of household		
Mean	31.7	34.0
Minimum[b]	1	1
Maximum	73	84
Alaska Native		
Estimated households[c]		
Number	53.6	56.4
Percentage	87.9%	92.5%
Estimated population		
Number	214.6	256.7
Percentage	91.1%	95.3%
U.S. Census 2010		
Households	55	55
Population	254	254
Alaska Native population	227	227
American Community Survey 5-year average		
Households	55	56
Range[d]	38 – 72	41 – 71
Population	216	231
Range[d]	162 – 270	174 – 288
Alaska Native population	198	209
Range[d]	147 – 249	158 – 260

Sources U.S. Census Bureau (n.d.); U.S. Census Bureau (n.d.) for American Community Survey (ACS) 2016 and 2017 estimates (5-year average for 2012–2016 and 2013–2017); and ADF&G Division of Subsistence household surveys, 2016 and 2018.

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

b. Residency length of 0 (zero) indicates residency of less than 12 months.

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

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

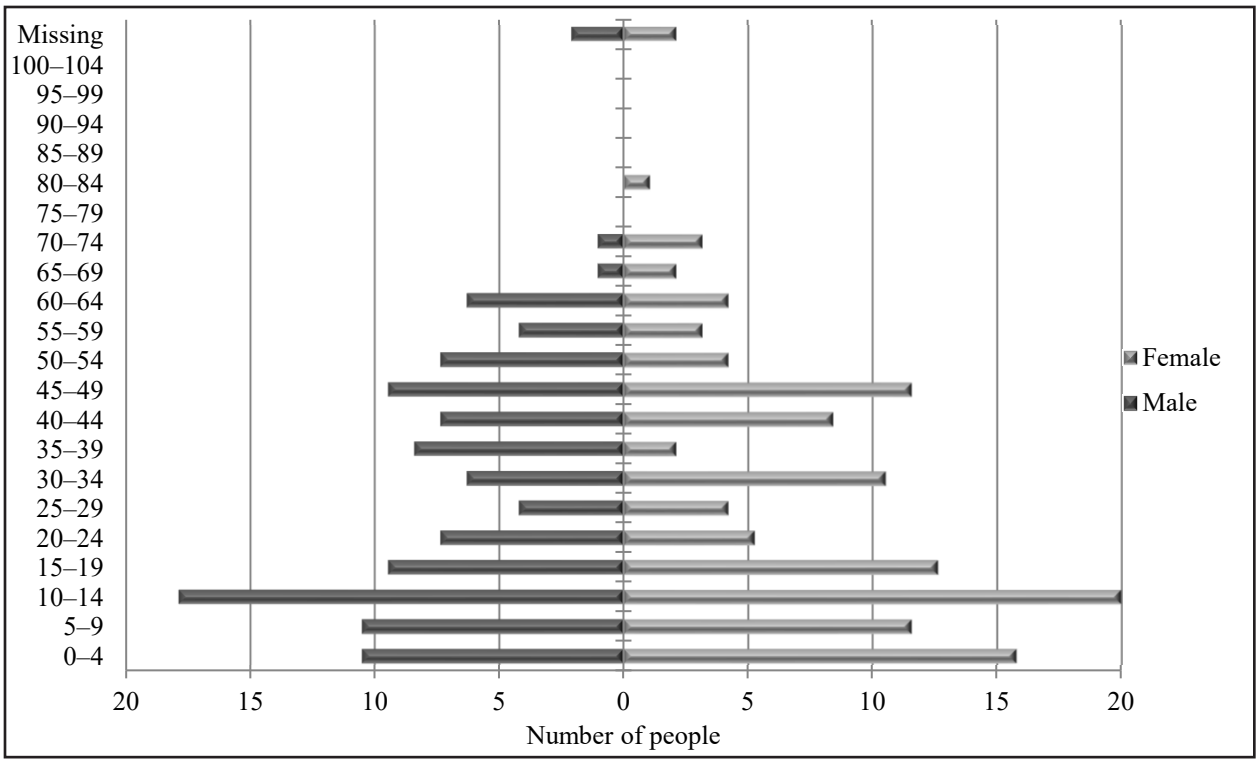

Figure 2-2.–Population profile, Nanwalek, 2016.

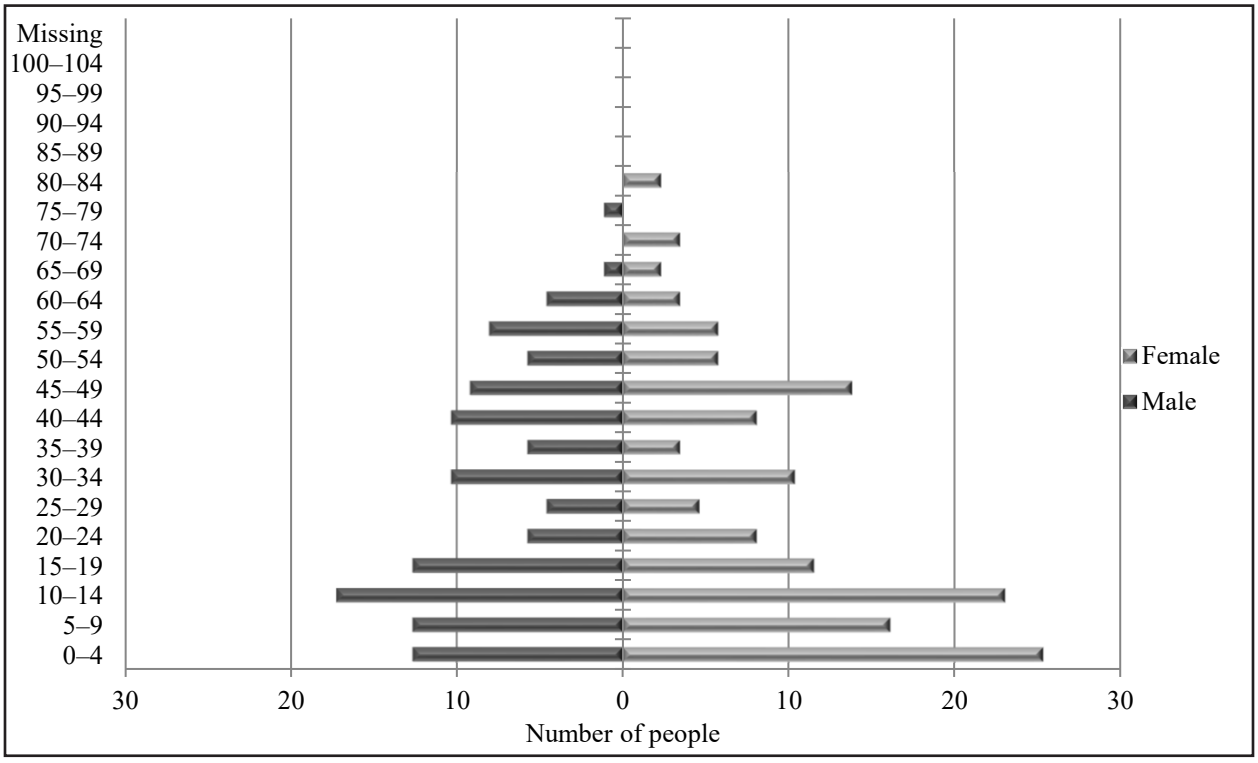

Figure 2-3.–Population profile, Nanwalek, 2017.

Table 2-2.–Population profile, Nanwalek, 2016.

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	10.5	9.3%	9.3%	15.8	12.9%	12.9%	26.3	11.2%	11.2%
5–9	10.5	9.3%	18.5%	11.6	9.5%	22.4%	22.1	9.4%	20.5%
10–14	17.9	15.7%	34.3%	20.0	16.4%	38.8%	37.9	16.1%	36.6%
15–19	9.5	8.3%	42.6%	12.6	10.3%	49.1%	22.1	9.4%	46.0%
20–24	7.4	6.5%	49.1%	5.3	4.3%	53.4%	12.6	5.4%	51.3%
25–29	4.2	3.7%	52.8%	4.2	3.4%	56.9%	8.4	3.6%	54.9%
30–34	6.3	5.6%	58.3%	10.5	8.6%	65.5%	16.8	7.1%	62.1%
35–39	8.4	7.4%	65.7%	2.1	1.7%	67.2%	10.5	4.5%	66.5%
40–44	7.4	6.5%	72.2%	8.4	6.9%	74.1%	15.8	6.7%	73.2%
45–49	9.5	8.3%	80.6%	11.6	9.5%	83.6%	21.0	8.9%	82.1%
50–54	7.4	6.5%	87.0%	4.2	3.4%	87.1%	11.6	4.9%	87.1%
55–59	4.2	3.7%	90.7%	3.2	2.6%	89.7%	7.4	3.1%	90.2%
60–64	6.3	5.6%	96.3%	4.2	3.4%	93.1%	10.5	4.5%	94.6%
65–69	1.1	0.9%	97.2%	2.1	1.7%	94.8%	3.2	1.3%	96.0%
70–74	1.1	0.9%	98.1%	3.2	2.6%	97.4%	4.2	1.8%	97.8%
75–79	0.0	0.0%	98.1%	0.0	0.0%	97.4%	0.0	0.0%	97.8%
80–84	0.0	0.0%	98.1%	1.1	0.9%	98.3%	1.1	0.4%	98.2%
85–89	0.0	0.0%	98.1%	0.0	0.0%	98.3%	0.0	0.0%	98.2%
90–94	0.0	0.0%	98.1%	0.0	0.0%	98.3%	0.0	0.0%	98.2%
95–99	0.0	0.0%	98.1%	0.0	0.0%	98.3%	0.0	0.0%	98.2%
100–104	0.0	0.0%	98.1%	0.0	0.0%	98.3%	0.0	0.0%	98.2%
Missing	2.1	1.9%	100.0%	2.1	1.7%	100.0%	4.2	1.8%	100.0%
Total	**113.6**	**100.0%**	**100.0%**	**122.0**	**100.0%**	**100.0%**	**235.6**	**100.0%**	**100.0%**

Source ADF&G Division of Subsistence household surveys, 2016.

Table 2-3.–Population profile, Nanwalek, 2017.

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	12.7	10.4%	10.4%	25.3	17.2%	17.2%	38.0	14.1%	14.1%
5–9	12.7	10.4%	20.8%	16.1	10.9%	28.1%	28.8	10.7%	24.8%
10–14	17.3	14.2%	34.9%	23.0	15.6%	43.8%	40.3	15.0%	39.7%
15–19	12.7	10.4%	45.3%	11.5	7.8%	51.6%	24.2	9.0%	48.7%
20–24	5.8	4.7%	50.0%	8.1	5.5%	57.0%	13.8	5.1%	53.8%
25–29	4.6	3.8%	53.8%	4.6	3.1%	60.2%	9.2	3.4%	57.3%
30–34	10.4	8.5%	62.3%	10.4	7.0%	67.2%	20.7	7.7%	65.0%
35–39	5.8	4.7%	67.0%	3.5	2.3%	69.5%	9.2	3.4%	68.4%
40–44	10.4	8.5%	75.5%	8.1	5.5%	75.0%	18.4	6.8%	75.2%
45–49	9.2	7.5%	83.0%	13.8	9.4%	84.4%	23.0	8.5%	83.8%
50–54	5.8	4.7%	87.7%	5.8	3.9%	88.3%	11.5	4.3%	88.0%
55–59	8.1	6.6%	94.3%	5.8	3.9%	92.2%	13.8	5.1%	93.2%
60–64	4.6	3.8%	98.1%	3.5	2.3%	94.5%	8.1	3.0%	96.2%
65–69	1.2	0.9%	99.1%	2.3	1.6%	96.1%	3.5	1.3%	97.4%
70–74	0.0	0.0%	99.1%	3.5	2.3%	98.4%	3.5	1.3%	98.7%
75–79	1.2	0.9%	100.0%	0.0	0.0%	98.4%	1.2	0.4%	99.1%
80–84	0.0	0.0%	100.0%	2.3	1.6%	100.0%	2.3	0.9%	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	**122.0**	**100.0%**	**100.0%**	**147.3**	**100.0%**	**100.0%**	**269.3**	**100.0%**	**100.0%**

Source ADF&G Division of Subsistence household surveys, 2018.

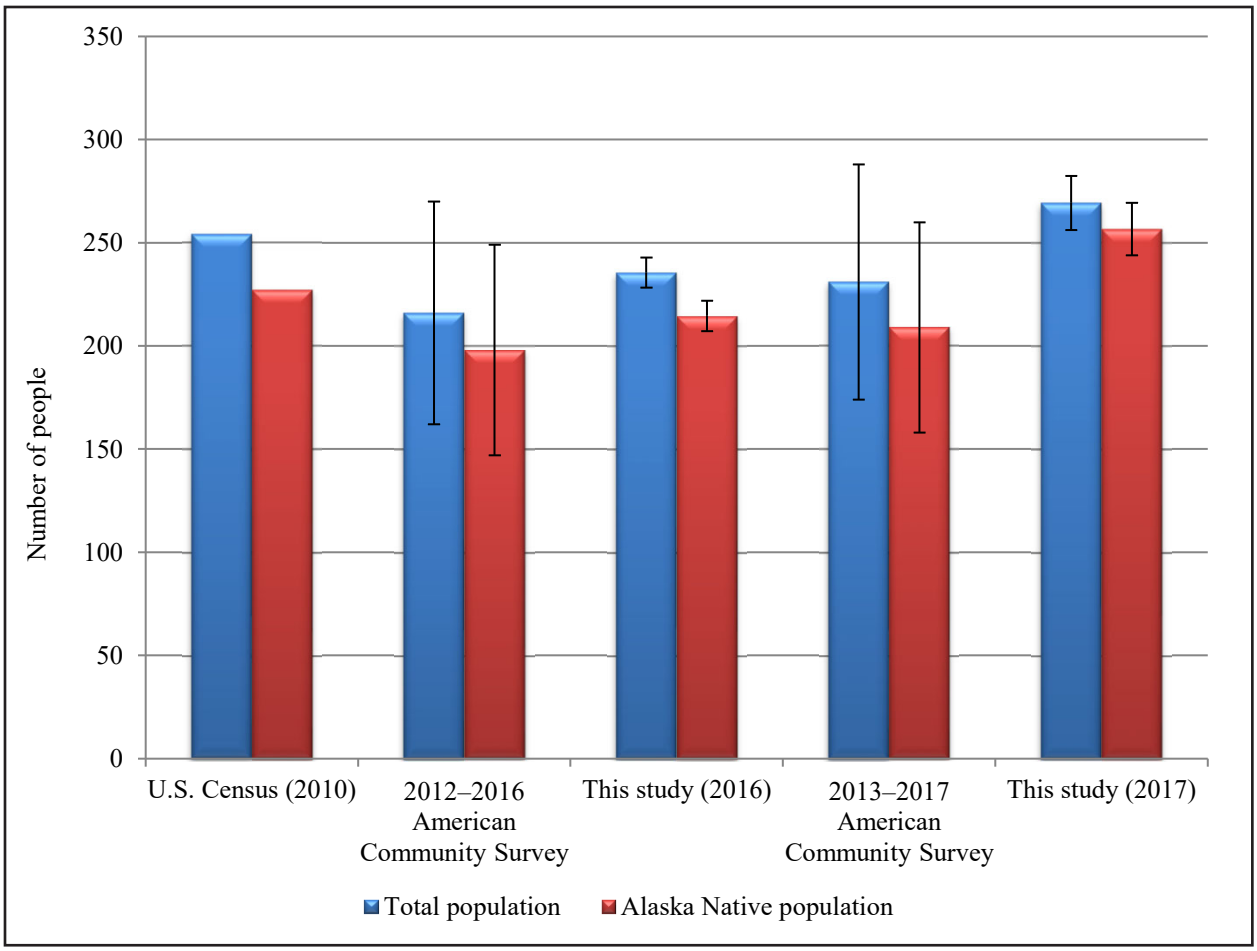

Figure 2-4.–Alaska Native and overall population estimates, Nanwalek, 2010, 2016, and 2017.

Summary of Harvest and Use Patterns

Data were collected to determine the percentages of community households that used salmon, attempted to harvest or harvested these species, and gave away or received salmon resources for household use. Tables 2-4 and 2-5 report estimated salmon harvest and use by Nanwalek households in 2016–2017. Estimated harvests of salmon are depicted by individual fish harvested and in pounds usable weight (see Appendix C for conversion factors) and the values account for resources harvested by any member of the surveyed household during the study year. The "use" category includes all salmon harvested, given away, or used by a household, plus salmon acquired from other harvesters, either as gifts, by barter or trade, or through partnerships. Differences between harvest and use percentages reflect sharing among households, which results in a wider distribution of wild foods.

In every participation category (used, attempted to harvest, harvested, received from others, and gave away), Nanwalek households had greater involvement with salmon resources in 2017 than in 2016 (Figure 2-5). Nearly the entire community (98%) used salmon during the 2017 study year, up from 90% in 2016. Both participation and fishing success rates rose between the study years, likely due to a better sockeye salmon run in 2017 and increased fishing opportunity. As noted in Chapter 1, openings in the Port Graham Subdistrict are based on sockeye salmon escapement at the English Bay weir, with below-expected 2016

escapements resulting in a 5-day closure (July 7–11).[2, 3] Higher escapement by mid-June in 2017 resulted in an increase of the regulatory opening of 5.5 days per week to 6.5 days per week (Hollowell et al. 2019b:18).[4] In 2016, 72% of households fished but a small proportion were not successful: 69% of households harvested salmon. In 2017, 91% of households fished for salmon and every household that fished caught salmon. In 2016, an estimated 20,000 lb usable weight of salmon, or nearly 5,000 fish, were harvested (Table 2-4). In 2017, both figures nearly doubled, with more than 39,000 lb and nearly 10,000 fish harvested (Table 2-5). This equates to approximately 88 lb of salmon harvested per person in 2016 and 146 lb per person in 2017 (tables 2-4 and 2-5).

In 2016, coho salmon (38% of total estimated harvest weight) was the most harvested salmon species, followed by sockeye (36%), pink (20%), Chinook (5%), and chum (1%) salmon (Figure 2-6). In 2017, the harvest composition shifted slightly: sockeye salmon (39% of total harvest weight) composed almost the same proportion of the total harvest weight, but there was a notable increase in the pink salmon harvest (up to 31% of total harvest weight from the previous year's 20%), and a decrease in the coho salmon harvest (down to 24% from the previous year's 38%) (Figure 2-7). In both years, harvests of chum and Chinook salmon trailed far behind the other three species (figures 2-6 and 2-7). While still low in 2017, chum salmon harvests increased to 4% of the total estimated harvest weight; Chinook salmon harvests decreased to 2% of the total harvest by weight. As will be discussed further below, based on previous division studies, Chinook and chum salmon have always composed a small portion of overall salmon harvests in Nanwalek.

2. Alaska Department of Fish and Game. 2016. "News Release: Lower Cook Inlet Salmon Fishery News Release #9," accessed October 17, 2023. http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/688989772.pdf
3. Alaska Department of Fish and Game. 2016. "News Release: Lower Cook Inlet Salmon Fishery News Release #10," accessed October 17, 2023. http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/696604671.pdf
4. Alaska Department of Fish and Game. 2017. "News Release: Lower Cook Inlet Salmon Fishery News Release #6," accessed October 17, 2023. http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/793222176.pdf

Table 2-4.–Estimated use and harvest of salmon, Nanwalek, 2016.

	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	**89.7**	**72.4**	**69.0**	**70.7**	**46.6**	**20,746.8**	**340.1**	**88.1**	**20,746.8**	**lb**	**340.1**	**10.0**
Chum salmon	10.3	8.6	8.6	1.7	0.0	130.7	2.1	0.6	25.2	ind	0.4	23.3
Coho salmon	74.1	56.9	55.2	43.1	34.5	7,808.5	128.0	33.1	1,651.2	ind	27.1	14.9
Chinook salmon	34.5	13.8	13.8	24.1	3.4	1,104.3	18.1	4.7	84.1	ind	1.4	33.5
Pink salmon	72.4	62.1	58.6	34.5	25.9	4,149.3	68.0	17.6	1,304.1	ind	21.4	9.6
Sockeye salmon	87.9	67.2	63.8	50.0	39.7	7,553.9	123.8	32.1	1,801.6	ind	29.5	9.7

Source ADF&G Division of Subsistence household surveys, 2016.

Table 2-5.–Estimated use and harvest of salmon, Nanwalek, 2017.

	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	**98.1**	**90.6**	**90.6**	**83.0**	**67.9**	**39,199.4**	**642.6**	**145.5**	**39,199.4**	**lb**	**642.6**	**12.3**
Chum salmon	50.9	37.7	37.7	20.8	20.8	1,638.9	26.9	6.1	316.5	ind	5.2	17.8
Coho salmon	84.9	67.9	62.3	56.6	47.2	9,503.1	155.8	35.3	2,009.5	ind	32.9	14.9
Chinook salmon	52.8	22.6	20.8	41.5	11.3	815.7	13.4	3.0	62.2	ind	1.0	42.5
Pink salmon	88.7	79.2	79.2	41.5	45.3	12,161.2	199.4	45.2	3,822.3	ind	62.7	14.9
Sockeye salmon	92.5	81.1	81.1	50.9	56.6	15,080.5	247.2	56.0	3,596.7	ind	59.0	14.8

Source ADF&G Division of Subsistence household surveys, 2018.

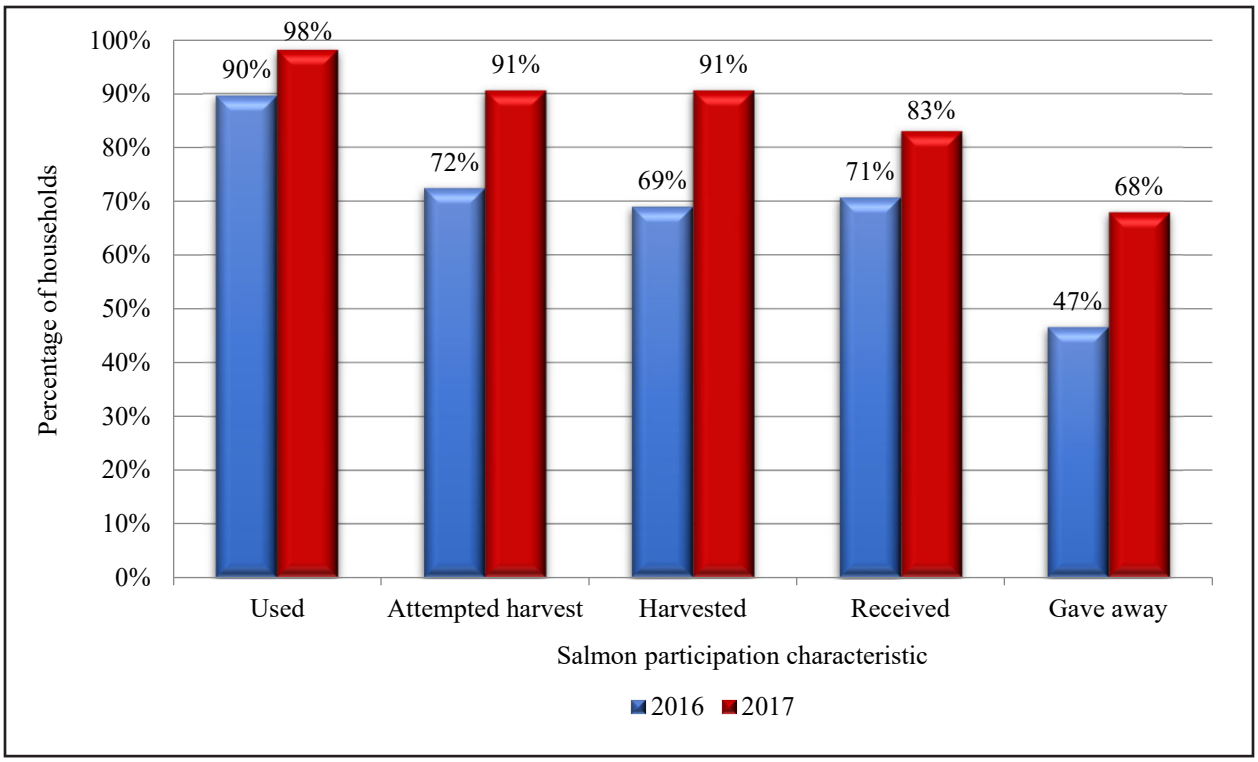

Figure 2-5.–Percentage of households using, attempting to harvest, harvesting, receiving, and giving away salmon, Nanwalek, 2016 and 2017.

Increased abundance and harvests in 2017 likely also influenced sharing patterns. Salmon were widely shared in both 2016 and 2017; fewer households in both years harvested salmon than used this resource category (Figure 2-5). In 2016, 71% of households received salmon from another household and in 2017 the proportion of receiving households increased to 83%. In 2016, all species except chum salmon were shared; sockeye salmon were shared the most (by 40% of households) (Table 2-4). Fewer chum salmon were harvested in 2016 than 2017, which may account for a lack of sharing of that species in 2016. In 2017, all five species of salmon were shared, with sockeye salmon still shared most widely (by 57% of households) (Table 2-5).

Household Specialization in Resource Harvesting

Previous studies (Wolfe 1987; Wolfe et al. 2010) have shown that in most rural Alaska communities, a relatively small portion of households produces most of the community's fish and wildlife harvests, which they share with other households. A study of 3,265 households in 66 rural Alaska communities found that about 33% of the households accounted for 76% of subsistence harvests (Wolfe et al. 2010). Although overall the set of very productive households was diverse, factors that were associated with higher levels of subsistence harvests included larger households with a pool of adult male labor, higher wage income, involvement in commercial fishing, and community location.

As shown in Figure 2-8, for the 2016 and 2017 study years, an estimated 71% of Nanwalek's salmon harvest (as estimated in pounds usable weight) was harvested by 21%–26% of the community's households. A more productive sockeye salmon run in 2017 likely contributed to greater overall participation in salmon fishing (Hollowell et al. 2019b). It is expected that the harvest of a single resource category, such as salmon, would be more specialized than the findings of Wolfe et al. (2010); however, EVOS appears to have exacerbated this finding. The Division of Subsistence completed a recent longitudinal analysis of historical sockeye salmon harvests in Nanwalek, finding a long-term increase in household specialization that has

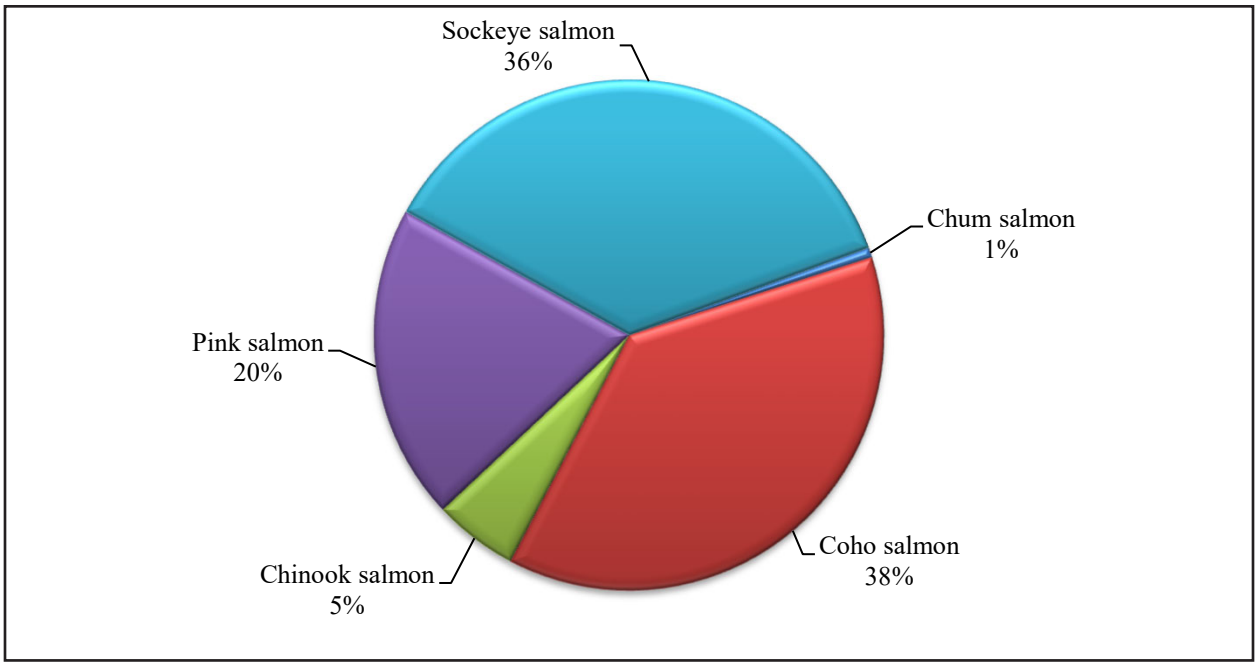

Figure 2-6.–Composition of salmon harvest, in pounds usable weight, Nanwalek, 2016.

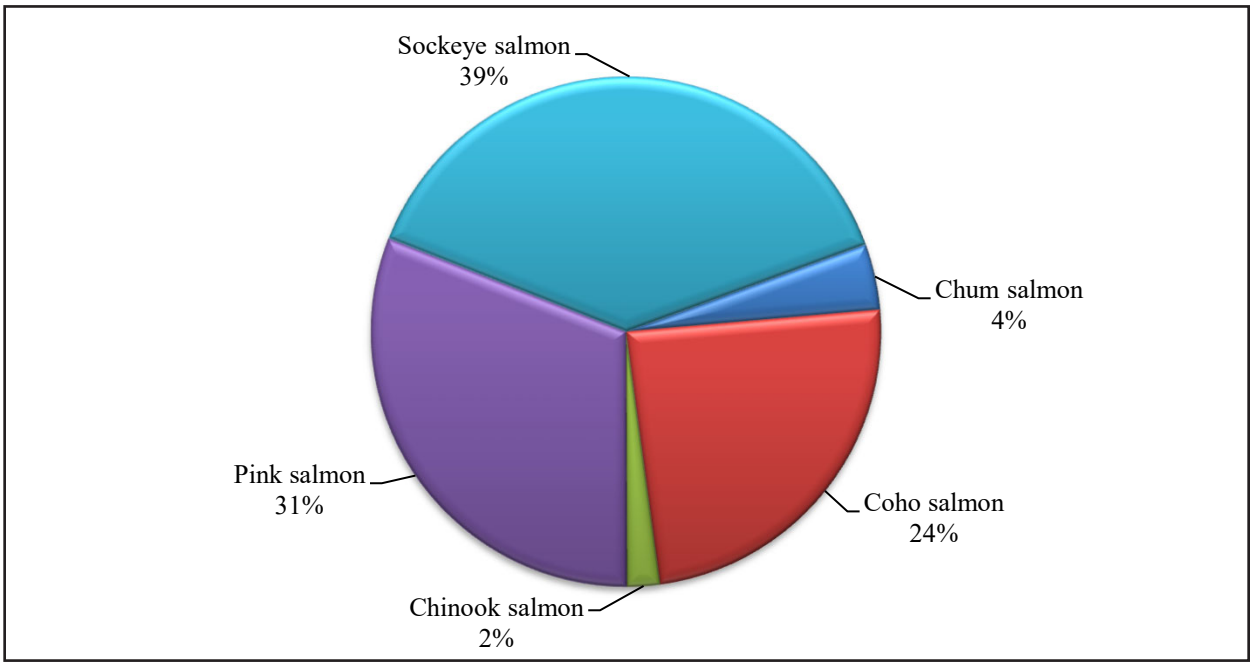

Figure 2-7.–Composition of salmon harvest, in pounds usable weight, Nanwalek, 2017.

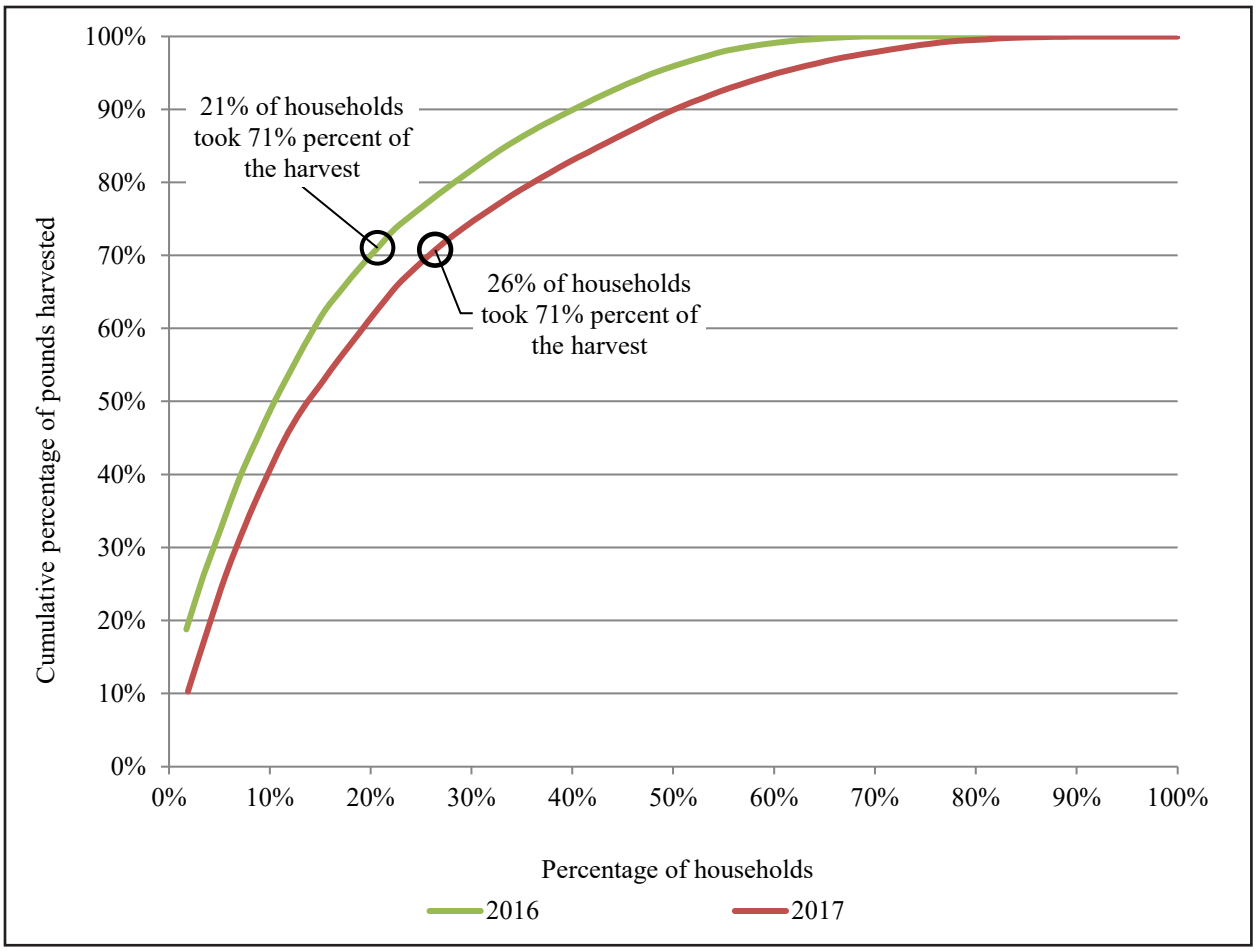

Figure 2-8.–Household specialization, Nanwalek, 2016 and 2017.

been especially marked following EVOS. In 1987, before the spill, the highest one-third of harvesting households produced 55% of the total sockeye salmon harvest weight; by 2014, the highest one-third of harvesting households accounted for 81% of the total sockeye salmon harvest (Keating et al. 2020:20, 22). As fewer households provide most of the community's salmon, Nanwalek's food system has become less resilient because harvesting disruptions for only a few households can result in community-wide shortfalls. Further analysis of the study findings, beyond the scope of this report, might identify current characteristics of the highly productive salmon harvesting households in Nanwalek.

Salmon Use and Harvest Characteristics by Gear Type

In 2016 and 2017, Nanwalek residents harvested the greatest number of salmon with stationary rod and reel gear, followed by subsistence setnets and trolling gear (tables 2-6 and 2-7). As estimated in usable pounds, stationary rod and reel gear was the primary gear used to harvest all species of salmon except Chinook salmon in both 2016 and 2017; trolling was the method employed most frequently for harvesting Chinook salmon (figures 2-9 and 2-10; tables 2-8 and 2-9). In 2016, subsistence setnets were used to harvest coho and sockeye salmon, and in 2017 setnet gear was used to harvest all five species of salmon. Few to no salmon were retained from commercial catches in either year. While the survey instrument did not ask specifically about additional fishing gear in either study year, survey respondents reported harvesting fish using dip nets in 2017, and there were small harvests of coho and pink salmon caught using unspecified subsistence gear in 2017.

Table 2-6.–Estimated harvest of salmon by gear type and resource, Nanwalek, 2016.

			Subsistence methods									
	Removed from commercial catch		Set gillnet		Subsistence gear, any method		Rod and reel		Troll gear		Any method	
Resource	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Salmon	**0.0**	**0.0**	**841.4**	**3,809.7**	**841.4**	**3,809.7**	**3,947.1**	**15,978.5**	**77.8**	**958.5**	**4,866.3**	**20,746.8**
Chum salmon	0.0	0.0	0.0	0.0	0.0	0.0	25.2	130.7	0.0	0.0	25.2	130.7
Coho salmon	0.0	0.0	525.9	2,486.8	525.9	2,486.8	1,120.1	5,296.9	5.3	24.9	1,651.2	7,808.5
Chinook salmon	0.0	0.0	0.0	0.0	0.0	0.0	13.7	179.5	70.5	924.9	84.1	1,104.3
Pink salmon	0.0	0.0	0.0	0.0	0.0	0.0	1,304.1	4,149.3	0.0	0.0	1,304.1	4,149.3
Sockeye salmon	0.0	0.0	315.5	1,322.9	315.5	1,322.9	1,484.0	6,222.2	2.1	8.8	1,801.6	7,553.9

Source ADF&G Division of Subsistence household surveys, 2016.
Note The harvested number of salmon is represented as individual fish harvested.

Table 2-7.–Estimated harvest of salmon by gear type and resource, Nanwalek, 2017.

			Subsistence and personal use methods							
	Removed from commercial catch		Set gillnet		Dip net		Other		Subsistence gear, any method	
Resource	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Salmon	**23.0**	**96.5**	**1,091.1**	**4,331.5**	**43.7**	**198.1**	**21.9**	**87.4**	**1,156.7**	**4,617.0**
Chum salmon	0.0	0.0	34.5	178.8	15.0	77.5	0.0	0.0	49.5	256.3
Coho salmon	0.0	0.0	293.5	1,387.9	0.0	0.0	11.5	54.4	305.0	1,442.3
Chinook salmon	0.0	0.0	3.5	45.3	0.0	0.0	0.0	0.0	3.5	45.3
Pink salmon	0.0	0.0	460.4	1,464.8	0.0	0.0	10.4	33.0	470.7	1,497.7
Sockeye salmon	23.0	96.5	299.2	1,254.7	28.8	120.6	0.0	0.0	328.0	1,375.3

-continued-

Table 2-7.–Continued.

	Rod and reel		Troll gear		Any method	
Resource	Number	Pounds	Number	Pounds	Number	Pounds
Salmon	**8,576.8**	**33,850.9**	**50.6**	**635.1**	**9,807.2**	**39,199.4**
Chum salmon	267.0	1,382.6	0.0	0.0	316.5	1,638.9
Coho salmon	1,702.2	8,049.9	2.3	10.9	2,009.5	9,503.1
Chinook salmon	11.5	151.1	47.2	619.4	62.2	815.7
Pink salmon	3,351.5	10,663.4	0.0	0.0	3,822.3	12,161.2
Sockeye salmon	3,244.5	13,603.9	1.2	4.8	3,596.7	15,080.5

Source ADF&G Division of Subsistence household surveys, 2018.
Note The harvested number of salmon is represented as individual fish harvested.

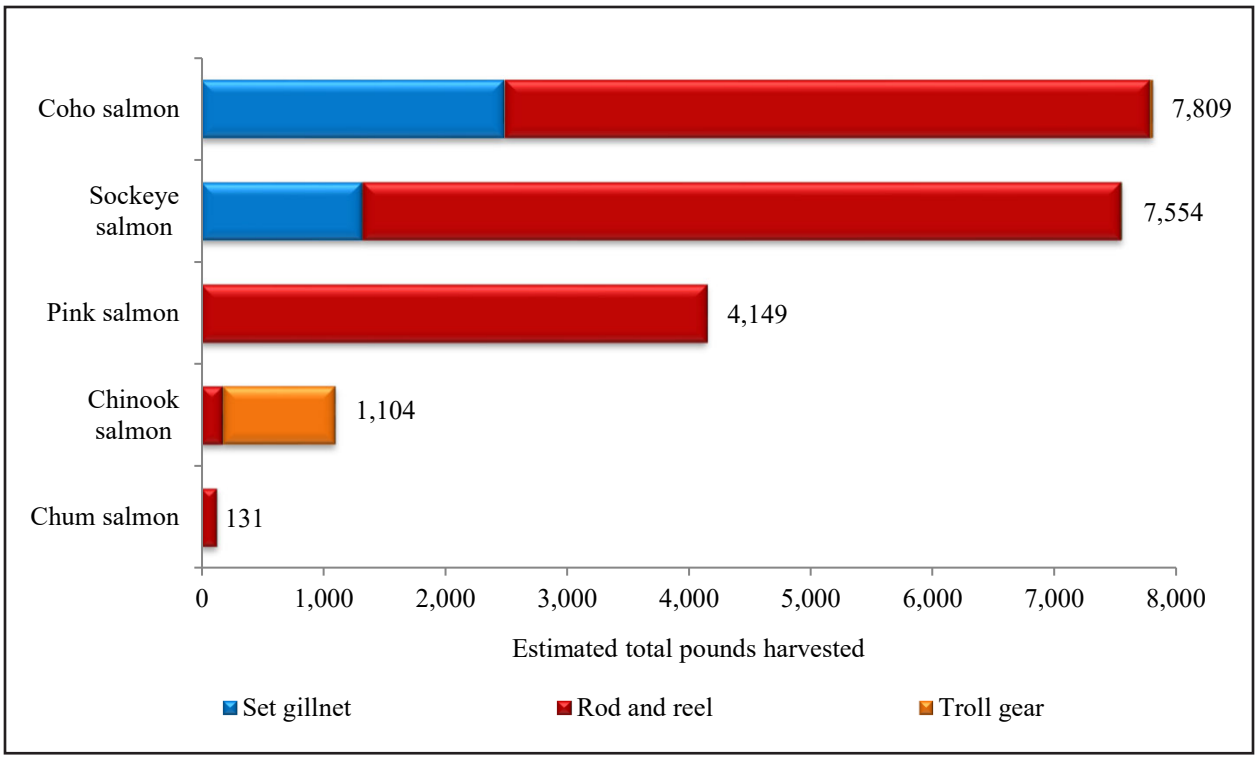

Figure 2-9.–Estimated harvest of salmon in pounds usable weight by gear type and resource, Nanwalek, 2016.

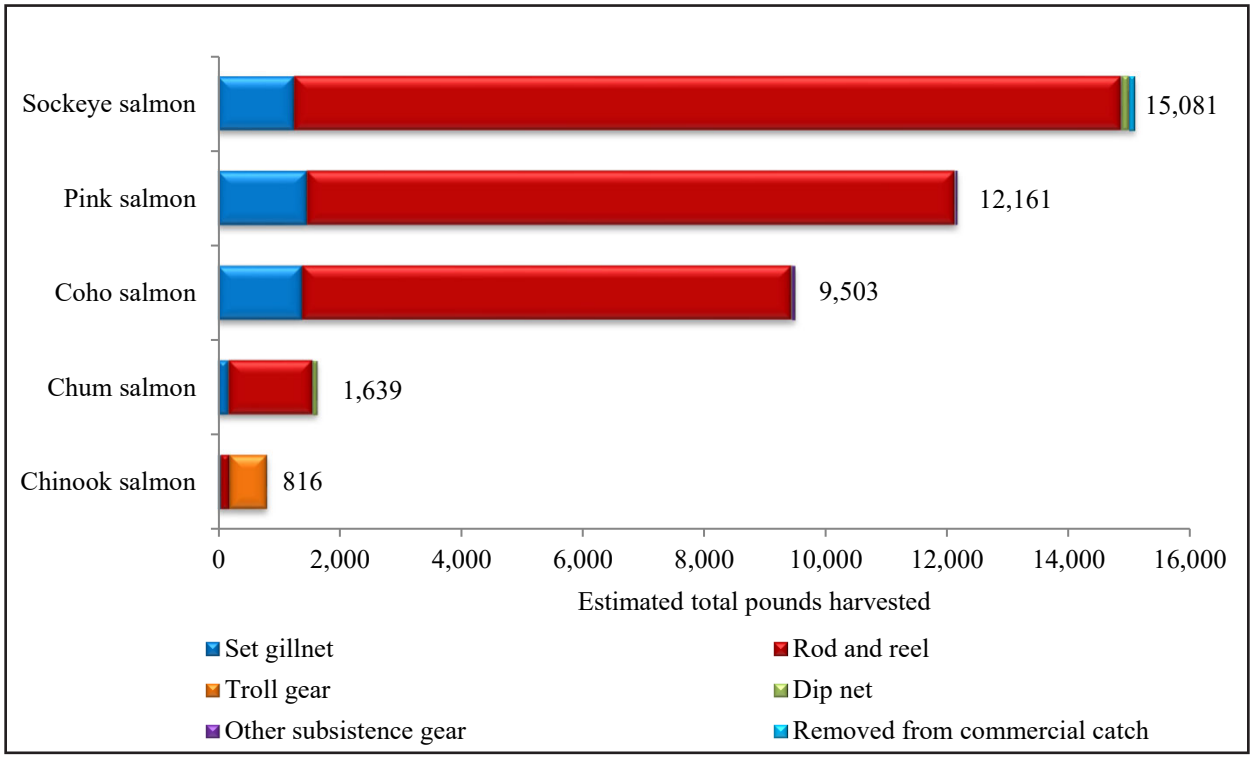

Figure 2-10.–Estimated harvest of salmon in pounds usable weight by gear type and resource, Nanwalek, 2017.

Table 2-8.–Estimated percentages of salmon harvested by gear type, resource, and total salmon harvest, Nanwalek, 2016.

Resource	Percentage base	Removed from commercial catch	Subsistence methods				
			Set gillnet	Subsistence gear, any method	Rod and reel	Troll gear	Any method
Salmon	**Gear type**	**0.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
	Resource	**0.0%**	**18.4%**	**18.4%**	**77.0%**	**4.6%**	**100.0%**
	Total	**0.0%**	**18.4%**	**18.4%**	**77.0%**	**4.6%**	**100.0%**
Chum salmon	Gear type	0.0%	0.0%	0.0%	0.8%	0.0%	0.6%
	Resource	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%
	Total	0.0%	0.0%	0.0%	0.6%	0.0%	0.6%
Coho salmon	Gear type	0.0%	65.3%	65.3%	33.2%	2.6%	37.6%
	Resource	0.0%	31.8%	31.8%	67.8%	0.3%	100.0%
	Total	0.0%	12.0%	12.0%	25.5%	0.1%	37.6%
Chinook salmon	Gear type	0.0%	0.0%	0.0%	1.1%	96.5%	5.3%
	Resource	0.0%	0.0%	0.0%	16.3%	83.8%	100.0%
	Total	0.0%	0.0%	0.0%	0.9%	4.5%	5.3%
Pink salmon	Gear type	0.0%	0.0%	0.0%	26.0%	0.0%	20.0%
	Resource	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%
	Total	0.0%	0.0%	0.0%	20.0%	0.0%	20.0%
Sockeye salmon	Gear type	0.0%	34.7%	34.7%	38.9%	0.9%	36.4%
	Resource	0.0%	17.5%	17.5%	82.4%	0.1%	100.0%
	Total	0.0%	6.4%	6.4%	30.0%	0.0%	36.4%

Source ADF&G Division of Subsistence household surveys, 2016.

Table 2-9.–Estimated percentages of salmon harvested by gear type, resource, and total salmon harvest, Nanwalek, 2017.

Resource	Percentage base	Removed from commercial catch	Subsistence and personal use methods						
			Set gillnet	Dip net	Other	Subsistence gear, any method	Rod and reel	Troll gear	Any method
Salmon	**Gear type**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
	Resource	**0.2%**	**11.0%**	**0.5%**	**0.2%**	**11.8%**	**86.4%**	**1.6%**	**100.0%**
	Total	**0.2%**	**11.0%**	**0.5%**	**0.2%**	**11.8%**	**86.4%**	**1.6%**	**100.0%**
Chum salmon	Gear type	0.0%	4.1%	39.1%	0.0%	5.6%	4.1%	0.0%	4.2%
	Resource	0.0%	10.9%	4.7%	0.0%	15.6%	84.4%	0.0%	100.0%
	Total	0.0%	0.5%	0.2%	0.0%	0.7%	3.5%	0.0%	4.2%
Coho salmon	Gear type	0.0%	32.0%	0.0%	62.3%	31.2%	23.8%	1.7%	24.2%
	Resource	0.0%	14.6%	0.0%	0.6%	15.2%	84.7%	0.1%	100.0%
	Total	0.0%	3.5%	0.0%	0.1%	3.7%	20.5%	0.0%	24.2%
Chinook salmon	Gear type	0.0%	1.0%	0.0%	0.0%	1.0%	0.4%	97.5%	2.1%
	Resource	0.0%	5.6%	0.0%	0.0%	5.6%	18.5%	75.9%	100.0%
	Total	0.0%	0.1%	0.0%	0.0%	0.1%	0.4%	1.6%	2.1%
Pink salmon	Gear type	0.0%	33.8%	0.0%	37.7%	32.4%	31.5%	0.0%	31.0%
	Resource	0.0%	12.0%	0.0%	0.3%	12.3%	87.7%	0.0%	100.0%
	Total	0.0%	3.7%	0.0%	0.1%	3.8%	27.2%	0.0%	31.0%
Sockeye salmon	Gear type	100.0%	29.0%	60.9%	0.0%	29.8%	40.2%	0.8%	38.5%
	Resource	0.6%	8.3%	0.8%	0.0%	9.1%	90.2%	0.0%	100.0%
	Total	0.2%	3.2%	0.3%	0.0%	3.5%	34.7%	0.0%	38.5%

Source ADF&G Division of Subsistence household surveys, 2018.

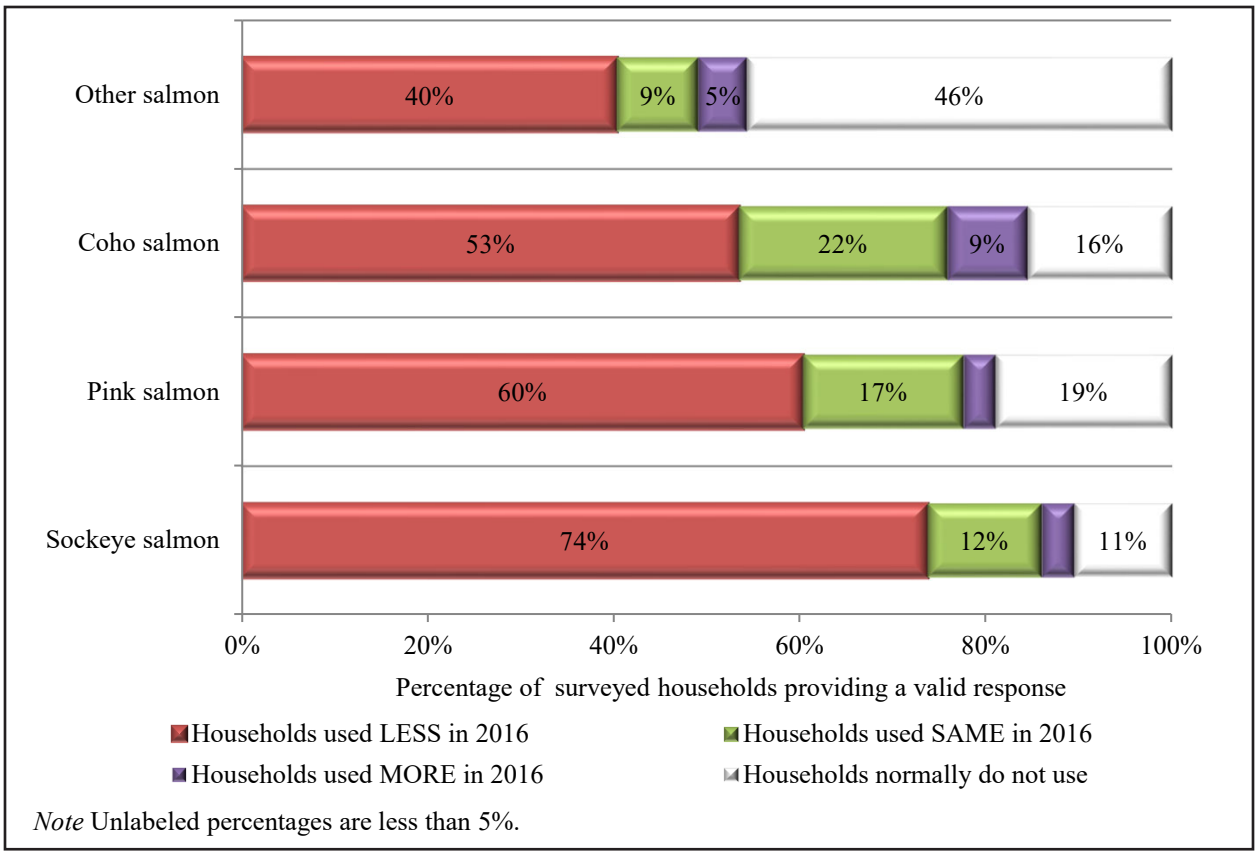

Figure 2-11.–Changes in household use of resources compared to recent years, Nanwalek, 2016.

Comparing Harvests and Uses in 2016–2017 with Previous Years

Harvest Assessments

Researchers asked respondents to assess their own harvests in two ways: whether they used more, less, or about the same amount of salmon resources in 2016 and 2017 as in the past five years, and whether they got "enough" resources. Households also were asked to provide reasons if their use was different or if they were unable to get enough of a resource. If they did not get enough of a resource, they were asked to evaluate the severity of that impact on their household and to identify reasons for the shortfall. They were also asked whether they did anything differently (such as supplement with store-bought food or switch to a different subsistence resource) because they did not get enough. This series of questions was asked about sockeye, pink, and coho salmon, and about chum and Chinook salmon combined, referred to as "other salmon" in the presented survey results. Because not everyone uses all resources, some households did not respond to the assessment questions. Additionally, some households that do typically use a resource simply did not answer questions. This section discusses responses to those questions.

In 2016, most respondents (between 53%–74%) indicated that they used less coho, pink, and sockeye salmon than in the previous five years (Figure 2-11; Table 2-10). Sockeye salmon were especially missed, with the highest percentage of households reporting less use. Forty percent of responding households said that they used less "other" salmon, including chum and Chinook salmon. A minority of responding households explained that they used the same amount of salmon in 2016 as in previous years, from a high of 22% (coho salmon) to a low of 9% ("other" salmon). An even smaller percentage of responding households (3%–9%, depending on resource) reported using more salmon than in previous years. Varying percentages of households indicated that they do not normally use one species or another, with a high of 46% of households indicating that they normally do not use "other" salmon.

Table 2-10.–Changes in household use of resources compared to recent years, Nanwalek, 2016.

Resource	Sampled households	Valid responses[a]	Households reporting use: Total households Number	Total households Percentage	Less Number	Less Percentage	Same Number	Same Percentage	More Number	More Percentage	Households not using Number	Households not using Percentage
Other salmon	58	57	31	54.4%	23	40.4%	5	8.8%	3	5.3%	26	45.6%
Coho salmon	58	58	49	84.5%	31	53.4%	13	22.4%	5	8.6%	9	15.5%
Pink salmon	58	58	47	81.0%	35	60.3%	10	17.2%	2	3.4%	11	19.0%
Sockeye salmon	58	57	51	87.9%	42	73.7%	7	12.3%	2	3.5%	6	10.5%

Source ADF&G Division of Subsistence household surveys, 2016.

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

Table 2-11.–Reasons for less household use of resources compared to recent years, Nanwalek, 2016.

Resource	Valid responses[a]	Households reporting reasons for less use	Family/ personal Number	Family/ personal Percentage	Resources less available Number	Resources less available Percentage	Lack of equipment Number	Lack of equipment Percentage	Less sharing Number	Less sharing Percentage	Lack of effort Number	Lack of effort Percentage
Other salmon	57	23	7	30.4%	1	4.3%	7	30.4%	1	4.3%	7	30.4%
Coho salmon	58	31	6	19.4%	15	48.4%	1	3.2%	1	3.2%	7	22.6%
Pink salmon	58	35	6	17.1%	24	68.6%	0	0.0%	1	2.9%	6	17.1%
Sockeye salmon	57	42	4	9.5%	29	69.0%	0	0.0%	1	2.4%	7	16.7%

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Table 2-11.–Continued.

Resource	Valid responses[a]	Households reporting reasons for less use	Other reasons Number	Other reasons Percentage	Working/ no time Number	Working/ no time Percentage	Regulations Number	Regulations Percentage	Small/diseased resource Number	Small/diseased resource Percentage	Unsuccessful Number	Unsuccessful Percentage
Other salmon	57	23	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Coho salmon	58	31	1	3.2%	2	6.5%	0	0.0%	0	0.0%	2	6.5%
Pink salmon	58	35	1	2.9%	1	2.9%	0	0.0%	1	2.9%	1	2.9%
Sockeye salmon	57	42	4	9.5%	0	0.0%	1	2.4%	0	0.0%	3	7.1%

Source ADF&G Division of Subsistence household surveys, 2016.

Note Respondents could provide multiple reasons for less use.

a. Valid responses do not include households that did not provide any response to the less, same, or more use assessment question.

Table 2-12.–Reasons for more household use of resources compared to recent years, Nanwalek, 2016.

Resource	Valid responses[a]	Households reporting reasons for more use	Increased availability		Used other resources		More success		Received more		Substitute for unavailable resource	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	57	3	1	33.3%	0	0.0%	1	33.3%	1	33.3%	0	0.0%
Coho salmon	58	5	2	40.0%	1	20.0%	1	20.0%	1	20.0%	1	20.0%
Pink salmon	58	2	1	50.0%	0	0.0%	0	0.0%	1	50.0%	1	50.0%
Sockeye salmon	57	1	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1	100.0%

Source ADF&G Division of Subsistence household surveys, 2016.

Note Respondents could provide multiple reasons for more use.

a. Valid responses do not include households that did not provide any response to the less, same, or more use assessment question.

When asked why they used less in 2016 than in the previous five years, resource availability was the most frequently cited reason for sockeye (69% of households that used less), pink (69%), and coho (48%) salmon (Table 2-11). Three reasons—family/personal reasons, lack of effort, and equipment—were cited equally (30% of households that used less) as reasons for less use of Chinook and chum salmon combined, both of which are commonly sought using time- and gear-intensive trolling methods. For the small percentage of households that reported using more salmon in 2016, increased availability, receiving more from others, and substituting the resource for another unavailable resource were cited most frequently (Table 2-12).

Compared to 2016 results, a greater percentage of households reported using the same amount or more of each salmon resource in 2017 (figures 2-11 and 2-12). By species, 41% of surveyed Nanwalek households reported using the same amount or more coho salmon, 59% reported using the same amount or more pink salmon, and 42% of responding households reported using the same amount or more sockeye salmon (Table 2-13). Thirty-four percent of sampled households reported using the same amount or more "other" salmon, comprising Chinook and chum salmon. A greater percentage of households said that they "do not normally use" salmon resources in 2016 than in 2017; however, this response may often be used to account for a year without use of a resource, and the changes are likely related more to a higher overall use of salmon in 2017 (figures 2-11 and 2-12).

When assessing 2017 changes in use, households tended to note family and personal reasons, work conflicts, and lack of effort as the primary reasons for less use of most resources (Table 2-14). However, when considering less use of "other" salmon, most households identified the same reasons, in relatively similar percentages, as in 2016: 23% identified family and personal reasons, 23% noted lack of effort, and 27% noted lack of equipment (tables 2-11 and 2-14). Lack of resource availability, which was cited most frequently for changes in use of coho, pink, and sockeye salmon in the previous year, was only cited by 0%–3% of the responding households that used less of those species in 2017. For those households that used more salmon in 2017, both greater availability and increased effort were cited as the main reasons for pink and sockeye salmon (Table 2-15). Reasons for increased use of coho salmon were split evenly—cited by 20% of respondents each—between increased availability, receiving more, needing more, increased effort, and substituting coho salmon for other unavailable resources. For "other salmon," both increased effort and receiving more from others were cited by one household.

During both years of the study, Nanwalek residents were also asked whether they got enough of each salmon resource. In 2016, a minority of sampled households reported getting enough (12%–29% across

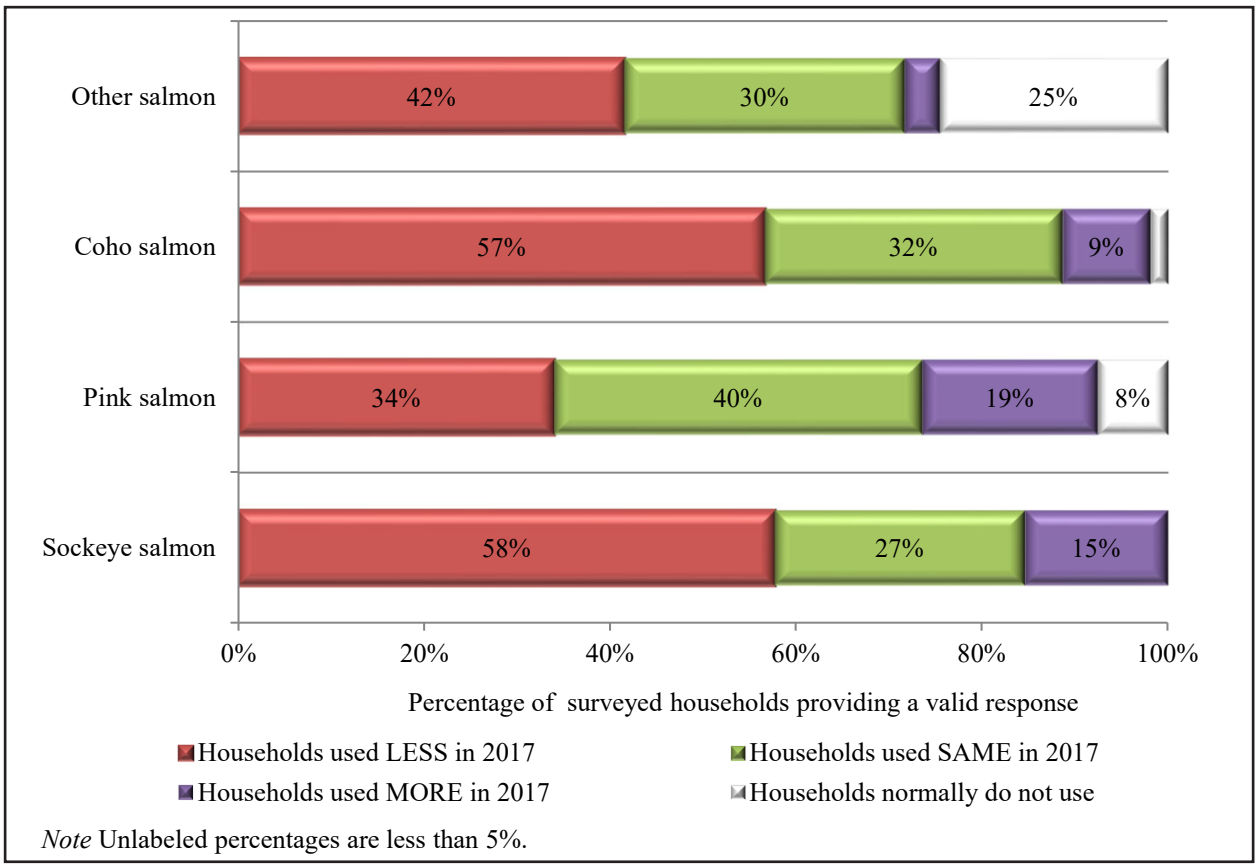

Figure 2-12.–Changes in household use of resources compared to recent years, Nanwalek, 2017.

resources), with the complement indicating that they did not get enough (41%–72% across resources) (Figure 2-13). In 2017, a greater proportion of sampled households reported getting enough (36%–64% across resources), though a substantial proportion of the remaining sampled households reported that they did not get enough (28%–51% across resources) (Figure 2-14). For all species, as in the assessments regarding changes in use, a smaller percentage of households indicated that they do not normally use the species in 2017 compared to 2016.

When asked to rate the impact of resource shortfalls, a majority (55%–77% across resources) of responding households in 2016 called it "major," while a substantial minority called the effect "minor" (23%–34% across resources) (Table 2-16). Seven percent of responding households called the lack of sockeye salmon "severe," while 5% said it was "not noticeable." In 2017, the overall perception of not getting enough salmon dropped toward "minor" and "not noticeable" impacts, though shortfalls of pink and sockeye salmon were still called a "major" impact by most responding households (59%–60%) (Table 2-17). In 2017, 11% of responding households called the lack of coho salmon "severe." More households called the changes "not noticeable" in 2017 compared to the previous year, with changes in other salmon called "not noticeable" by 29% of responding households (tables 2-16 and 2-17). In both study years, households that did not get enough salmon of any type adapted primarily by supplementing with other (both subsistence and commercial) foods (tables 2-18 and 2-19). In both 2016 and 2017, food supplementation was weighted heavily toward commercial foods. In 2016, one household noted that it increased harvest effort to compensate for a lack of "other" salmon, while in 2017, several households said that they "made do" for a lack of coho and sockeye salmon (two households each). In 2017, one household reported compensating for a lack of sockeye salmon by getting a job.

Table 2-13.–Changes in household use of resources compared to recent years, Nanwalek, 2017.

Resource	Sampled households	Valid responses[a]	Households reporting use: Total households Number	Total households Percentage	Less Number	Less Percentage	Same Number	Same Percentage	More Number	More Percentage	Households not using Number	Households not using Percentage
Other salmon	53	53	40	75.5%	22	41.5%	16	30.2%	2	3.8%	13	24.5%
Coho salmon	53	53	52	98.1%	30	56.6%	17	32.1%	5	9.4%	1	1.9%
Pink salmon	53	53	49	92.5%	18	34.0%	21	39.6%	10	18.9%	4	7.5%
Sockeye salmon	53	52	52	98.1%	30	57.7%	14	26.9%	8	15.4%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2018.

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

Table 2-14.–Reasons for less household use of resources compared to recent years, Nanwalek, 2017.

Resource	Valid responses[a]	Households reporting reasons for less use	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
Other salmon	53	22	5	22.7%	1	4.5%	0	0.0%	6	27.3%	3	13.6%	5	22.7%	1	4.5%	1	4.5%
Coho salmon	53	30	7	23.3%	0	0.0%	0	0.0%	4	13.3%	2	6.7%	15	50.0%	0	0.0%	0	0.0%
Pink salmon	53	18	5	27.8%	0	0.0%	0	0.0%	1	5.6%	0	0.0%	5	27.8%	0	0.0%	1	5.6%
Sockeye salmon	52	30	5	16.7%	1	3.3%	0	0.0%	3	10.0%	1	3.3%	9	30.0%	0	0.0%	0	0.0%

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Table 2-14.–Continued.

Resource	Valid responses[a]	Households reporting reasons for less use	Working/ no time Number	Working/ no time Percentage	Regulations Number	Regulations Percentage	Small/diseased resource Number	Small/diseased resource Percentage	Did not get enough Number	Did not get enough Percentage	Equipment/fuel too expensive Number	Equipment/fuel too expensive Percentage	Used other resources Number	Used other resources Percentage	Competition Number	Competition Percentage	Other reasons Number	Other reasons Percentage
Other salmon	53	22	1	4.5%	0	0.0%	0	0.0%	1	4.5%	1	4.5%	2	9.1%	0	0.0%	0	0.0%
Coho salmon	53	30	7	23.3%	0	0.0%	0	0.0%	2	6.7%	1	3.3%	0	0.0%	0	0.0%	0	0.0%
Pink salmon	53	18	6	33.3%	0	0.0%	0	0.0%	2	11.1%	0	0.0%	0	0.0%	0	0.0%	1	5.6%
Sockeye salmon	52	30	10	33.3%	1	3.3%	0	0.0%	4	13.3%	0	0.0%	0	0.0%	1	3.3%	4	13.3%

Source ADF&G Division of Subsistence household surveys, 2018.

Note Respondents could provide multiple reasons for less use.

a. Valid responses do not include households that did not provide any response to the less, same, or more use assessment question.

Table 2-15.–Reasons for more household use of resources compared to recent years, Nanwalek, 2017.

Resource	Valid responses[a]	Households reporting reasons for more use	Increased availability		Weather		Received more		Needed more		Increased effort	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	53	2	0	0.0%	0	0.0%	1	50.0%	0	0.0%	1	50.0%
Coho salmon	53	5	1	20.0%	0	0.0%	1	20.0%	1	20.0%	1	20.0%
Pink salmon	53	10	3	30.0%	0	0.0%	0	0.0%	1	10.0%	3	30.0%
Sockeye salmon	52	8	6	75.0%	0	0.0%	0	0.0%	0	0.0%	2	25.0%

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Table 2-15.–Continued.

Resource	Valid responses[a]	Households reporting reasons for more use	More success		Had more time		Got/fixed equipment		Substitute for unavailable resource		Other reasons	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	53	2	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Coho salmon	53	5	0	0.0%	0	0.0%	0	0.0%	1	20.0%	0	0.0%
Pink salmon	53	10	2	20.0%	1	10.0%	0	0.0%	1	10.0%	1	10.0%
Sockeye salmon	52	8	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2018.

Note Respondents could provide multiple reasons for more use.

a. Valid responses do not include households that did not provide any response to the less, same, or more use assessment question.

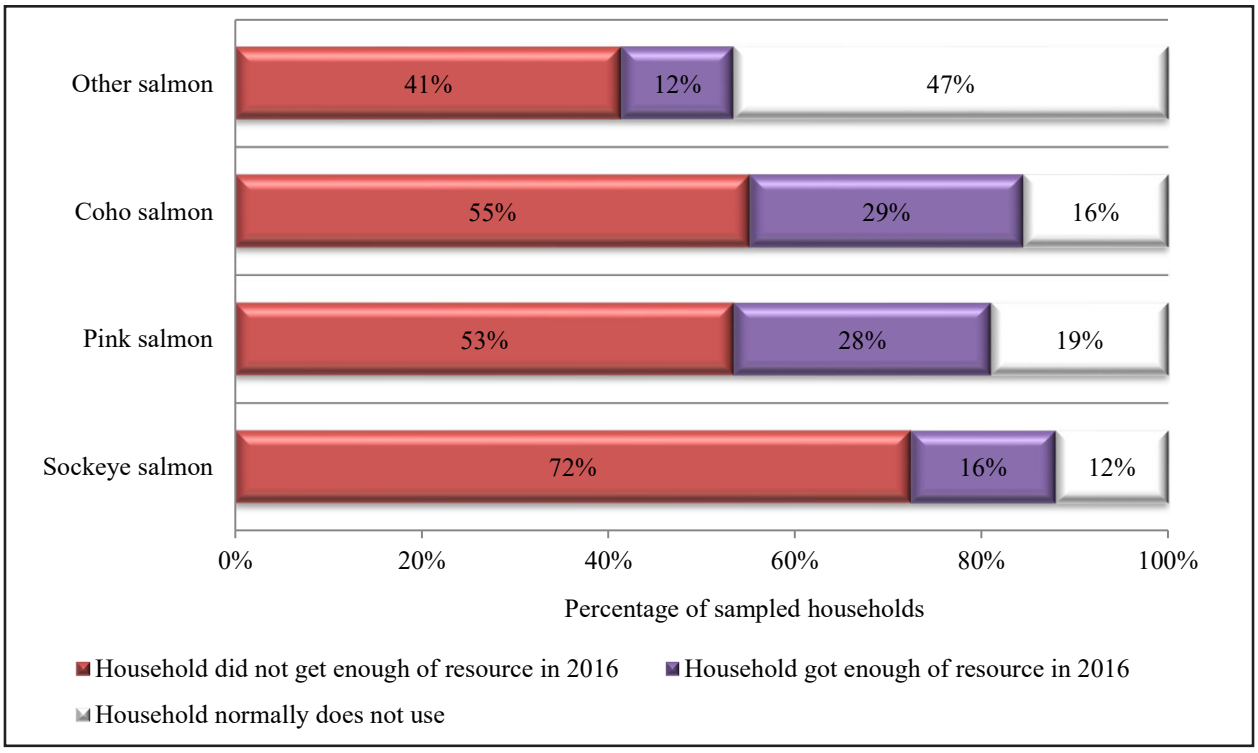

Figure 2-13.–Percentage of sampled households reporting whether they had enough resources, Nanwalek, 2016.

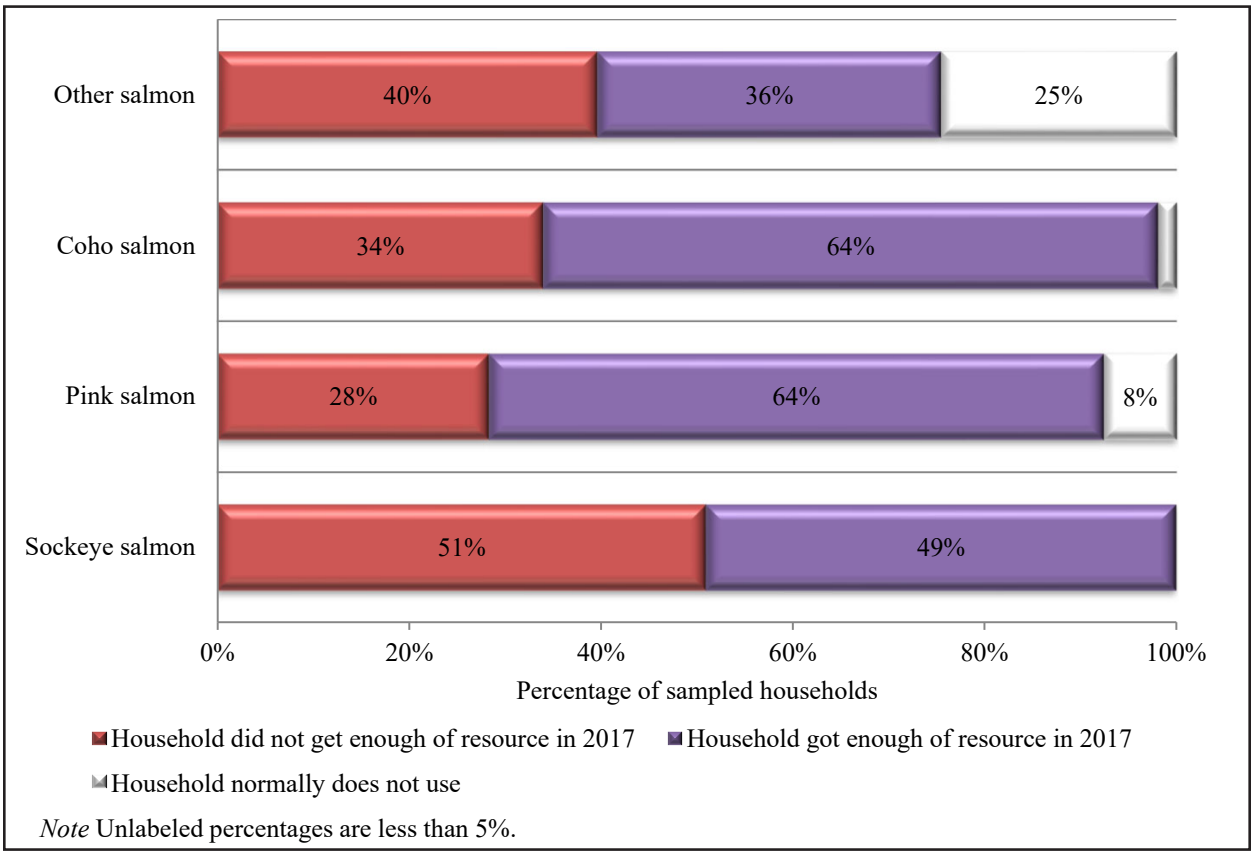

Figure 2-14.–Percentage of sampled households reporting whether they had enough resources, Nanwalek, 2017.

Table 2-16.–Reported impact to households reporting that they did not get enough of a type of resource, Nanwalek, 2016.

		Households not getting enough _____.				Impact to those not getting enough _____.									
	Sampled	Valid responses[a]		Did not get enough		No response		Not noticeable		Minor		Major		Severe	
Resource	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	58	31	53.4%	24	77.4%	0	0.0%	0	0.0%	7	29.2%	16	66.7%	1	4.2%
Coho salmon	58	49	84.5%	32	65.3%	0	0.0%	0	0.0%	11	34.4%	21	65.6%	0	0.0%
Pink salmon	58	47	81.0%	31	66.0%	0	0.0%	0	0.0%	7	22.6%	24	77.4%	0	0.0%
Sockeye salmon	58	51	87.9%	42	82.4%	1	2.4%	2	4.8%	13	31.0%	23	54.8%	3	7.1%

Source ADF&G Division of Subsistence household surveys, 2016.

a. Does not include households failing to respond to the question and those households that did not use the resource.

Table 2-17.–Reported impact to households reporting that they did not get enough of a type of resource, Nanwalek, 2017.

		Households not getting enough _____.				Impact to those not getting enough _____.									
	Sampled	Valid responses[a]		Did not get enough		No response		Not noticeable		Minor		Major		Severe	
Resource	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	53	40	75.5%	21	52.5%	1	4.8%	6	28.6%	9	42.9%	5	23.8%	0	0.0%
Coho salmon	53	52	98.1%	18	34.6%	0	0.0%	1	5.6%	9	50.0%	6	33.3%	2	11.1%
Pink salmon	53	49	92.5%	15	30.6%	0	0.0%	0	0.0%	6	40.0%	9	60.0%	0	0.0%
Sockeye salmon	53	53	100.0%	27	50.9%	0	0.0%	1	3.7%	8	29.6%	16	59.3%	2	7.4%

Source ADF&G Division of Subsistence household surveys, 2018.

a. Does not include households failing to respond to the question and those households that did not use the resource.

Table 2-18.–Things households reported doing differently as the result of not getting enough of a resource, Nanwalek, 2016.

		Bought/bartered		Used more commercial foods		Replaced with other subsistence foods		Asked others for help		Increased effort to harvest	
Resource	Valid responses[a]	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	12	1	8.3%	9	75.0%	3	25.0%	1	8.3%	1	8.3%
Coho salmon	19	0	0.0%	18	94.7%	3	15.8%	0	0.0%	0	0.0%
Pink salmon	17	0	0.0%	15	88.2%	5	29.4%	0	0.0%	0	0.0%
Sockeye salmon	25	0	0.0%	19	76.0%	9	36.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2016.

Note Respondents could provide multiple responses.

a. Does not include households failing to respond to the question and those households that did not use the resource.

Table 2-19.–Things households reported doing differently as the result of not getting enough of a resource, Nanwalek, 2017.

Resource	Valid responses[a]	Bought/bartered		Used more commercial foods		Replaced with other subsistence foods		Asked others for help		Made do		Got a job	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	10	0	0.0%	8	80.0%	3	30.0%	1	10.0%	0	0.0%	0	0.0%
Coho salmon	13	1	7.7%	10	76.9%	2	15.4%	0	0.0%	2	15.4%	0	0.0%
Pink salmon	11	0	0.0%	8	72.7%	3	27.3%	0	0.0%	0	0.0%	0	0.0%
Sockeye salmon	16	1	6.3%	11	68.8%	5	31.3%	0	0.0%	2	12.5%	1	6.3%

Source ADF&G Division of Subsistence household surveys, 2018.

Note Respondents could provide multiple responses.

a. Does not include households failing to respond to the question and those households that did not use the resource.

When asked why they did not get enough salmon resources, households tended to respond differently in each of the study years. In 2016, resource availability was cited most frequently for shortfalls in the three top-targeted salmon species: sockeye, coho, and pink salmon (Table 2-20). Of households that said they did not get enough, 71% of households did not have enough pink salmon due to resource availability, 67% percent said the same of sockeye salmon, and 44% said that coho salmon were less available. Of those households that did not get enough coho salmon in 2016, 28% said it was due to a lack of effort. For "other salmon"—the combination of Chinook and chum salmon (both of which are often sought using trolling gear)—households that reported not getting enough identified a lack of equipment (38%), a lack of effort (33%), and family/personal reasons as the top contributing reasons to the 2016 shortfalls. In 2017, when the sockeye salmon harvest was about double the previous year, no households cited resource availability as the reason for having not enough fish, for any salmon resource (Table 2-21). Instead, "not enough effort" was the top reason for two of the most-sought species—by 44% of households that did not get enough coho salmon and 33% of households that did not get enough sockeye salmon. For households that did not get enough pink salmon, more households cited family and personal reasons (40%), with "not enough effort" cited by 27%. For the combined category of chum and Chinook salmon, a lack of equipment still ranked highly in 2017 (33% of reporting households), followed by family and personal reasons (19%), and not enough effort (14%); of note, resources were too far and not receiving "other" salmon were also cited by 14% of households that did not have enough. Work conflicts were cited as important reasons for a lack of coho, pink, and sockeye salmon (cited by 20%–22% of households that did not have enough of these respective resources).

Table 2-20.–Reasons households did not have enough resources, Nanwalek, 2016.

		Households not getting enough _____ .				Reasons for not getting enough _____ .					
	Sampled	Valid responses[a]		Did not get enough		Family/personal		Resource availability		Resource too far	
Resource	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	58	31	53.4%	24	77.4%	5	20.8%	1	4.2%	0	0.0%
Coho salmon	58	49	84.5%	32	65.3%	3	9.4%	14	43.8%	0	0.0%
Pink salmon	58	47	81.0%	31	66.0%	3	9.7%	22	71.0%	0	0.0%
Sockeye salmon	58	51	87.9%	42	82.4%	3	7.1%	28	66.7%	0	0.0%

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Table 2-20.–Continued.

		Households not getting enough _____ .				Reasons for not getting enough _____ .					
	Sampled	Valid responses[a]		Did not get enough		Lack of equipment		Did not receive		Not enough effort	
Resource	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	58	31	53.4%	24	77.4%	9	37.5%	1	4.2%	8	33.3%
Coho salmon	58	49	84.5%	32	65.3%	2	6.3%	1	3.1%	9	28.1%
Pink salmon	58	47	81.0%	31	66.0%	1	3.2%	2	6.5%	5	16.1%
Sockeye salmon	58	51	87.9%	42	82.4%	1	2.4%	2	4.8%	7	16.7%

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Table 2-20.–Continued.

		Households not getting enough _____ .				Reasons for not getting enough _____ .					
	Sampled	Valid responses[a]		Did not get enough		Unsuccessful		Weather/environment		Working/no time	
Resource	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	58	31	53.4%	24	77.4%	0	0.0%	0	0.0%	2	8.3%
Coho salmon	58	49	84.5%	32	65.3%	0	0.0%	0	0.0%	2	6.3%
Pink salmon	58	47	81.0%	31	66.0%	0	0.0%	0	0.0%	1	3.2%
Sockeye salmon	58	51	87.9%	42	82.4%	2	4.8%	0	0.0%	1	2.4%

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Table 2-20.–Continued.

		Households not getting enough _____ .				Reasons for not getting enough _____ .					
	Sampled	Valid responses[a]		Did not get enough		Regulations		Other		No reason given	
Resource	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	58	31	53.4%	24	77.4%	0	0.0%	0	0.0%	1	4.2%
Coho salmon	58	49	84.5%	32	65.3%	0	0.0%	1	3.1%	1	3.1%
Pink salmon	58	47	81.0%	31	66.0%	0	0.0%	0	0.0%	0	0.0%
Sockeye salmon	58	51	87.9%	42	82.4%	1	2.4%	2	4.8%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2016.

Note Respondents could provide multiple reasons for not getting enough resources.

a. Valid responses do not include households that did not provide any response to the assessment question asking if the household had enough of a resource.

Table 2-21.–Reasons households did not have enough resources, Nanwalek, 2017.

		Households not getting enough _____ .				Reasons for not getting enough _____ .					
	Sampled	Valid responses[a]		Did not get enough		Family/personal		Resource availability		Resource too far	
Resource	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	53	40	75.5%	21	52.5%	4	19.0%	0	0.0%	3	14.3%
Coho salmon	53	52	98.1%	18	34.6%	4	22.2%	0	0.0%	0	0.0%
Pink salmon	53	49	92.5%	15	30.6%	6	40.0%	0	0.0%	0	0.0%
Sockeye salmon	53	53	100.0%	27	50.9%	4	14.8%	0	0.0%	0	0.0%

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Table 2-21.–Continued.

		Households not getting enough _____ .				Reasons for not getting enough _____ .					
	Sampled	Valid responses[a]		Did not get enough		Lack of equipment		Did not receive		Not enough effort	
Resource	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	53	40	75.5%	21	52.5%	7	33.3%	3	14.3%	3	14.3%
Coho salmon	53	52	98.1%	18	34.6%	4	22.2%	1	5.6%	8	44.4%
Pink salmon	53	49	92.5%	15	30.6%	1	6.7%	0	0.0%	4	26.7%
Sockeye salmon	53	53	100.0%	27	50.9%	3	11.1%	0	0.0%	9	33.3%

-continued-

Table 2-21.–Continued.

		Households not getting enough _____ .				Reasons for not getting enough _____ .					
	Sampled	Valid responses[a]		Did not get enough		Unsuccessful		Weather/environment		Working/no time	
Resource	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	53	40	75.5%	21	52.5%	0	0.0%	1	4.8%	2	9.5%
Coho salmon	53	52	98.1%	18	34.6%	0	0.0%	0	0.0%	4	22.2%
Pink salmon	53	49	92.5%	15	30.6%	0	0.0%	1	6.7%	3	20.0%
Sockeye salmon	53	53	100.0%	27	50.9%	0	0.0%	0	0.0%	6	22.2%

-continued-

Table 2-21.–Continued.

		Households not getting enough _____ .				Reasons for not getting enough _____ .					
	Sampled	Valid responses[a]		Did not get enough		Regulations		Other		No reason given	
Resource	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	53	40	75.5%	21	52.5%	0	0.0%	0	0.0%	1	4.8%
Coho salmon	53	52	98.1%	18	34.6%	0	0.0%	1	5.6%	0	0.0%
Pink salmon	53	49	92.5%	15	30.6%	0	0.0%	0	0.0%	1	6.7%
Sockeye salmon	53	53	100.0%	27	50.9%	1	3.7%	4	14.8%	1	3.7%

Source ADF&G Division of Subsistence household surveys, 2018.

Note Respondents could provide multiple reasons for not getting enough resources.

a. Valid responses do not include households that did not provide any response to the assessment question asking if the household had enough of a resource.

Harvest Data

Changes in the harvest of resources by Nanwalek residents can also be discerned through comparisons with other study years. A baseline study that surveyed households for the harvest and use of all resource categories, including salmon, was completed for 1987. Following EVOS in 1989, regular subsistence surveys were conducted in Cook Inlet communities, contributing to the body of historical harvest information that is currently available for Nanwalek for comparison against this project's salmon household survey results. Comprehensive survey updates for all resource categories occurred for 1989–1993, 1997, 2003, and 2014; the resource harvest and use estimates from these years are published in the CSIS. During that period of record, salmon harvests in Nanwalek have varied widely in both quantity and composition. Per capita estimates account for changes in both population and harvest amount and can be used to assess changes in Nanwalek's harvest over time. Of note, the salmon per capita harvest estimates (in pounds) are based entirely on household survey reporting of both demographics and harvest quantity and cannot be directly compared to harvest data (reported in numbers of fish) gathered through the subsistence permit system. Also, the per capita harvests discussed in this section account for salmon harvested by all types of gear in all fisheries, and includes salmon retained from commercial harvests.

Per capita harvest estimates provide a means to consider harvest levels while controlling for human population changes. Looking at all data years, it is clear that EVOS was a significant and enduring event for salmon harvests by Nanwalek residents. In 1987, the baseline year for Nanwalek, fishers harvested an estimated 109 lb per person (Table 2-22). However, after EVOS, Nanwalek's total per capita harvest dropped to only 60 lb in 1989 and 92 lb in 1990 and then showed a general upward trend in the following decade. From 1991 to 1997, salmon harvests increased to between 122–158 lb per capita. Per capita harvests for the two survey years prior to this project were even higher, with 293 lb per capita harvested in 2003 and 174 lb per capita harvested in 2014.

When considered by species, sockeye salmon has been the most inconsistent component of the overall salmon harvest since 1987. Sockeye salmon accounted for the greatest per capita harvest in 1987 (by a narrow margin) but dropped below both coho and pink salmon in the three study years following EVOS. By 1993, sockeye salmon was again the largest contributor to the per capita harvest, and, except for 1997 and 2016 (when coho salmon contributed slightly more to the overall per capita harvest), this species has maintained that position. Notably, the 2003 spike in the total salmon per capita harvest was mainly driven by an increase in the sockeye salmon harvest that year. In Nanwalek, pink and coho salmon have accounted for roughly the same per capita harvest since 1987 (18–63 lb per capita); chum and Chinook salmon have consistently accounted for less than 20 lb per capita, each.

These variations in both quantity and composition could be tied to changes in the Nanwalek Salmon Enhancement Program (NSEP), though more specific research would be required to verify any relationship. In the early 1990s, when per capita harvests were especially low, sockeye salmon escapement did not meet the minimum sustainable escapement goal of 10,000 fish to the English Bay system until 1994 (Hammarstrom and Dickson 2004:44). Sockeye salmon escapement has been variable since NSEP began, but spanning 1993–2015, the second-highest escapement occurred during the 2003 season (nearly 20,000 sockeye salmon), corresponding to the highest per capita harvests based on household surveys (Hollowell et al. 2017:78).

Table 2-22.–Historical per capita harvests of salmon, Nanwalek, 1987, 1989–1993, 1997, 2003, 2014, and 2016–2017.

	1987		1989		1990		1991		1992		1993	
Resource	Per capita (lb)	95% confidence limit (±) harvest	Per capita (lb)	95% confidence limit (±) harvest	Per capita (lb)	95% confidence limit (±) harvest	Per capita (lb)	95% confidence limit (±) harvest	Per capita (lb)	95% confidence limit (±) harvest	Per capita (lb)	95% confidence limit (±) harvest
Salmon	**109.1**	**10.0**	**60.2**	**16.0**	**91.5**	**12.0**	**125.6**	**13.0**	**121.6**	**12.0**	**149.4**	**10.0**
Chum salmon	2.7	35.0	0.1	50.0	4.7	36.0	3.0	46.0	3.9	32.0	5.4	23.0
Coho salmon	29.2	13.0	34.7	16.0	25.1	14.0	43.5	20.0	49.6	16.0	40.3	9.0
Chinook salmon	2.6	37.0			3.3	30.0	4.9	57.0	5.5	36.0	5.7	21.0
Pink salmon	29.1	15.0	21.6	23.0	35.3	13.0	47.1	16.0	33.7	21.0	40.7	11.0
Sockeye salmon	39.3	12.0	3.9	36.0	18.2	18.0	27.1	22.0	28.9	16.0	57.4	13.0
Spawnouts	6.3	20.0			4.9	27.0						
Landlocked salmon									0.1	93.0		
Unknown salmon												

-continued-

Table 2-22.–Continued.

	1997		2003		2014		2016		2017	
Resource	Per capita (lb)	95% confidence limit (±) harvest	Per capita (lb)	95% confidence limit (±) harvest	Per capita (lb)	95% confidence limit (±) harvest	Per capita (lb)	95% confidence limit (±) harvest	Per capita (lb)	95% confidence limit (±) harvest
Salmon	**157.8**	**18.0**	**292.6**	**43.4**	**173.5**	**10.8**	**88.1**	**10.0**	**145.5**	**12.3**
Chum salmon	9.5	36.0	13.1	50.9	12.2	13.9	0.6	23.3	6.1	17.8
Coho salmon	51.8	21.0	63.2	55.9	48.3	12.1	33.1	14.9	35.3	14.9
Chinook salmon	13.9	71.0	20.2	56.0	2.0	12.1	4.7	33.5	3.0	42.5
Pink salmon	35.2	20.0	51.8	34.8	37.2	7.5	17.6	9.6	45.2	14.9
Sockeye salmon	47.2	20.0	144.2	59.4	73.8	12.4	32.1	9.7	56.0	14.8
Spawnouts										
Landlocked salmon	0.3	0.7			0.01	37.2				
Unknown salmon					0.1	0.0				

Source ADF&G Community Subsistence Information System, or CSIS (accessed October 2023) for 1987–2014; ADF&G Division of Subsistence household surveys, 2017 and 2018.

Note Blank cells indicate no reported harvest of that resource for the study year.

Current and Historical Harvest Areas

Maps were produced from spatial data collected during household surveys to depict salmon harvest and use areas, and assume seasonal timeframes based on salmon availability and regulatory openings. The search and harvest areas used by Nanwalek residents for all salmon were concentrated around English Bay, although in 2017 salmon use areas extended south into Koyuktolik Bay (literally "a place with swans" but locally known as "Dogfish Bay" [Stanek 2000:16]) (figures 2-15 and 2-16). In 2016, salmon were fished for south of English Bay along the coast until Point Bede, while in 2017 that search area stopped north of Point Bede. In 2017, Nanwalek households searched for salmon along the northern mouth of Port Graham Bay and at the headwaters of the bay. Each of these mapped features were tagged by gear type, allowing for the depiction of search areas specific to subsistence methods. In 2017, households reported fishing with subsistence gillnets only in the immediate vicinity of Nanwalek (Appendix D).[5]

The earliest spatial data regarding Nanwalek residents' wild resource harvest and use areas were collected jointly for Nanwalek and Port Graham. Data collection methods differed in additional key ways: spatial data were collected from a select few active harvesters rather than from all surveyed households; use areas were temporally identified as contemporary, used throughout a lifetime, or used in a defined span of decades as opposed to just the study year; and at times researchers asked about the areas used for some resources as a category (or categories were combined) versus defining use areas by individual species. Two early projects offer a broad look at active subsistence use areas: see Stanek (1985:13, 152) and the *Alaska Habitat Management Guide Southcentral Region: Reference Maps—Volume 3: Community Use of Fish, Wildlife, and Plants* (ADF&G 1985). Because of these methodological differences, the earliest spatial data can be used to establish general extents but cannot be directly compared to the resource-specific harvest and use data collected in this report.

Prior to this study, the most recent search and harvest area data specifically for Nanwalek salmon fishing were from the comprehensive surveys conducted for the 2014 study year (Jones and Kostick 2016:239). Spatial data collection methods were nearly identical to the methods in this study and indicate mostly overlapping areas with heaviest use in and immediately surrounding English Bay. Notably, the search and harvest areas in 2016 and 2017 were contracted compared to 2014, with neither the entirety of Port Graham Bay nor the portion of Chugach Passage between Elizabeth Island and the mainland being used by fishers. Additionally, 2014 search and harvest areas included a greater portion of Koyuktolik Bay (figures 2-15 and 2-16; Jones and Kostick [2016:239]). This variation could be due to variations in data notation; in 2016 and 2017 mapping efforts returned more points (specific fishing locations) than polygons (general search and harvest areas). While the 2016 and 2017 points were buffered in visualization, they still fail to account for the complete water bodies indicated in 2014.

5. A map depicting gillnet harvest and use areas was not produced for the 2016 study year due to data being collected from fewer than three households.

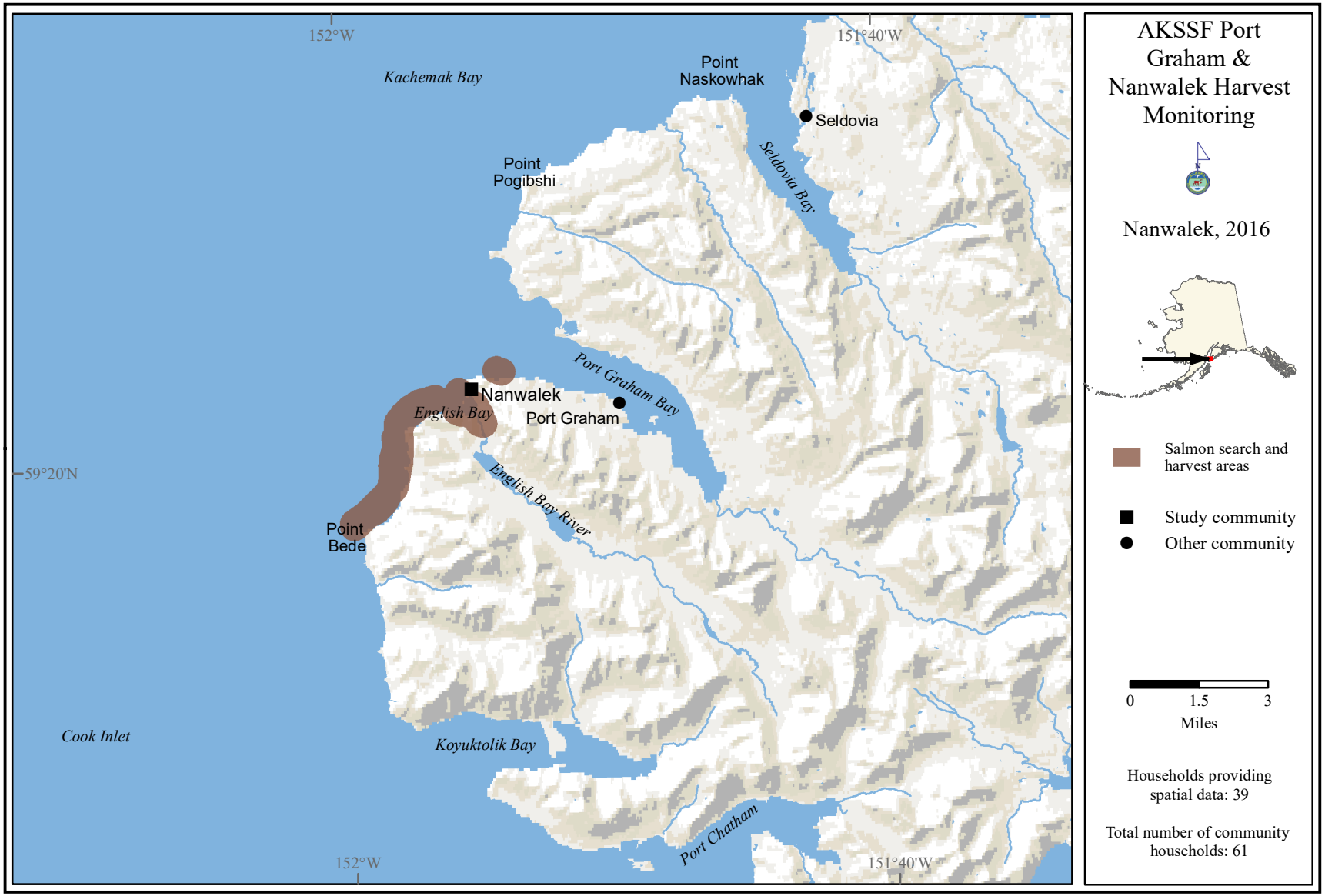


Figure 2-15.–All salmon search and harvest areas, Nanwalek, 2016.

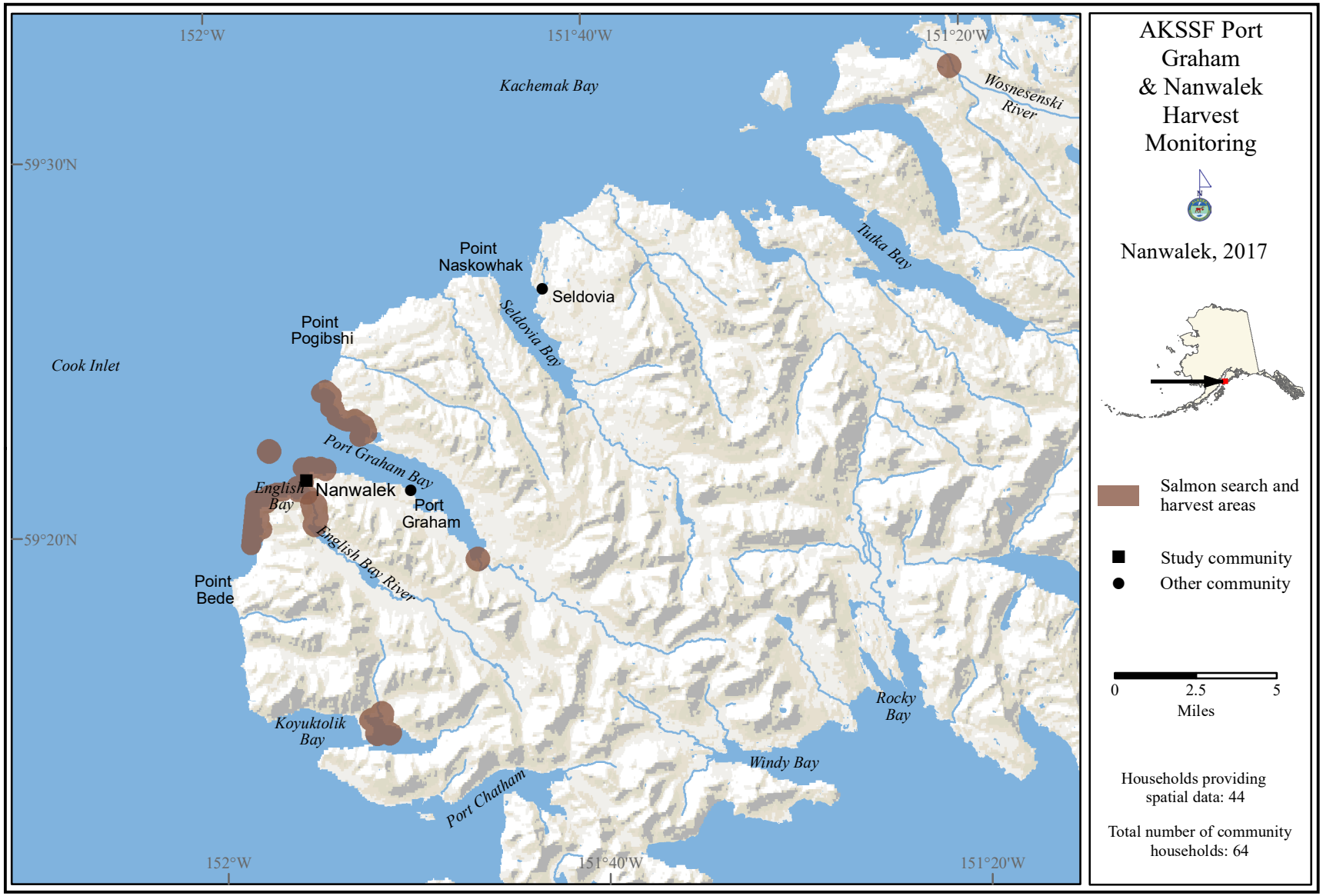


Figure 2-16.–All salmon search and harvest areas, Nanwalek, 2017.

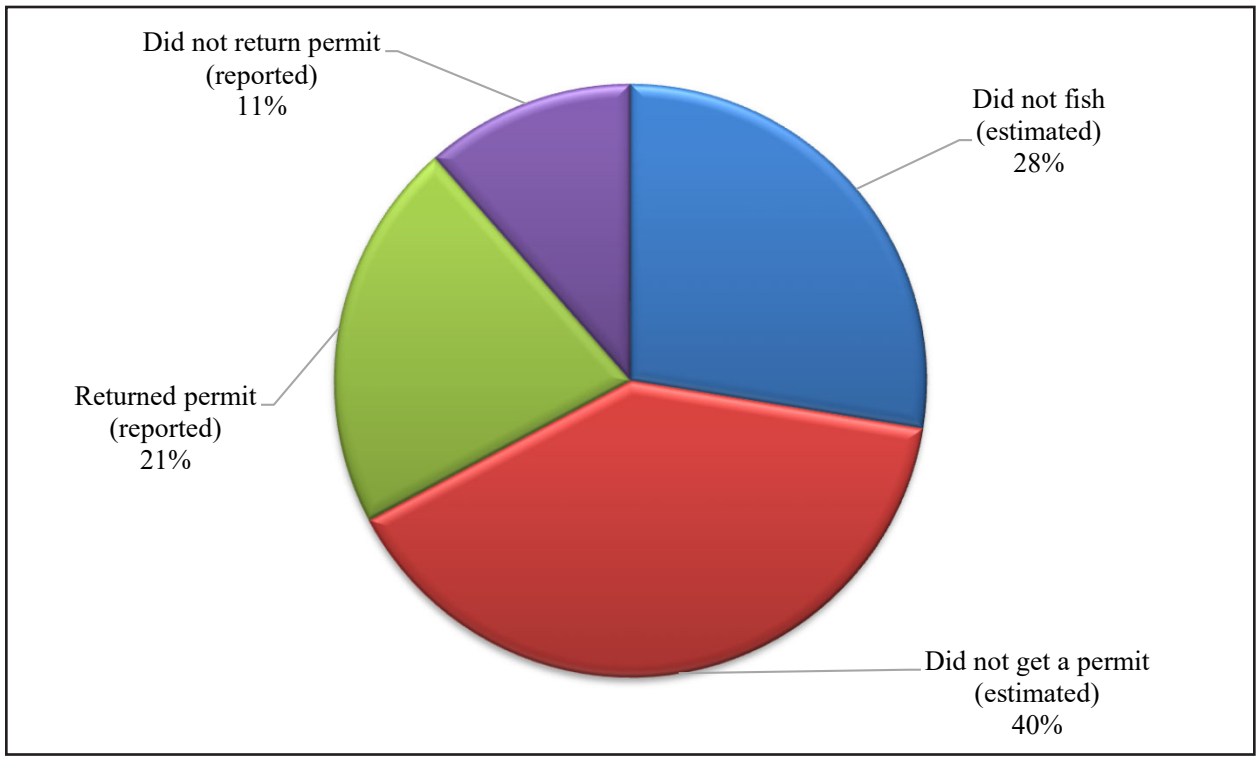


Figure 2-17.–Disposition of reported and estimated fishing and permit participation, Nanwalek, 2016.

Subsistence Permits and Harvest Reporting in Nanwalek

For each of the subdistricts used most heavily by Nanwalek residents, ADF&G's annual harvest values are based on permit returns. Regulatory bodies such as the Alaska Board of Fisheries rely on permit returns to understand the subsistence harvest needs of the community and whether those needs are being met. In line with the study's research objectives, the household survey instrument investigated permit participation—or use and return of permits—by surveyed Nanwalek households. During household surveys, respondents were asked to indicate if they had received a subsistence permit during the study year and whether they had returned that permit. While these data are necessarily partial, they provide useful context for the permit system's efficacy.

In 2016, of the estimated 61 Nanwalek households, 28% (17 households) did not fish (Figure 2-17). An estimated 40% of households (24) fished but did not get a permit. There were 20 surveyed households that reported receiving a permit, indicating that 32% of 61 Nanwalek households fished and also got a permit (Table 2-23; Figure 2-17). Of the 20 households that reported receiving a permit in 2016, 13 said they returned it before being surveyed while seven did not (Table 2-23). As noted previously, more households from Nanwalek fished in 2017 when the sockeye salmon run was stronger: an estimated 10% of households (6 households of the 61 total households) did not fish while 69% of households (42 households) fished but did not get a permit (Figure 2-18). There were 13 surveyed households that reported receiving a permit, indicating that 21% of Nanwalek households fished with a permit (Table 2-23; Figure 2-18). Of the 13 households that reported receiving a permit, two reported returning it in 2017 (Table 2-23). In summary, while household surveys indicate that participation in salmon fishing increased between the two study years, most of that increase occurred in households that fished without a permit. Further, the estimated proportion of community households that fished and reported harvests on a permit that was returned before household surveys occurred decreased from 21% in 2016 to 3% in 2017 (figures 2-17 and 2-18). Because household surveys in 2016 occurred before the reporting deadline of November 30, contact with researchers may have reminded fishers to return their permits. In 2016, 13 of the surveyed households indicated that they had returned a permit; actual permit returns for that year were 20 (see footnote on Table 2-23). The

Table 2-23.–Permit participation, Nanwalek, 2016 and 2017.

Category	2016	2017
Eligible households	61	61
Households surveyed	58	53
Estimated fishing households	44.2	55.3
Households receiving a subsistence salmon permit	20	13
Households returning a subsistence salmon permit[a]	13	2

Sources ADF&G Division of Subsistence household surveys, 2016 and 2018, and ADF&G Division of Sport Fish annual subsistence permits, 2016 and 2017.
Note Households receiving and returning permits are based on actual issued and returned permits in the permit system and estimated fishing households are based on survey responses that include any gear type.
a. Total current responses for 2016 for Nanwalek indicate all 20 permits were returned; prior to conducting fieldwork only 13 permits had been returned.

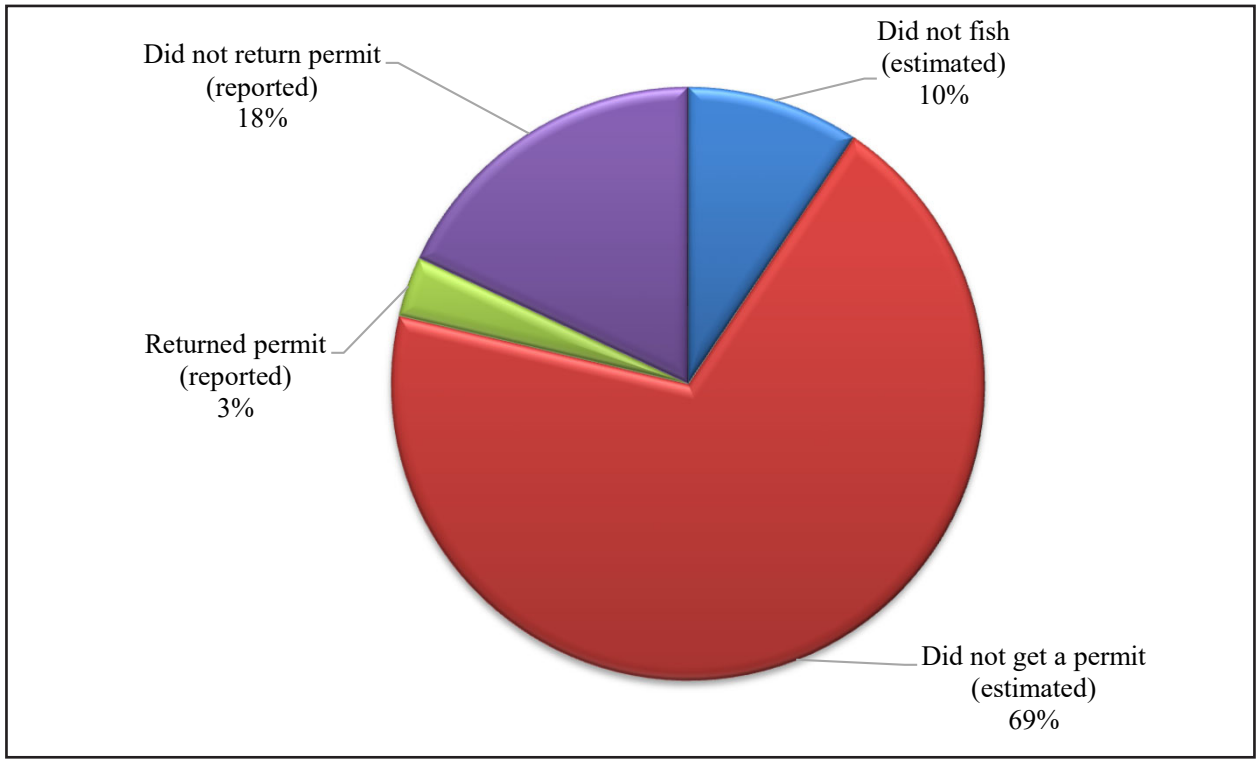
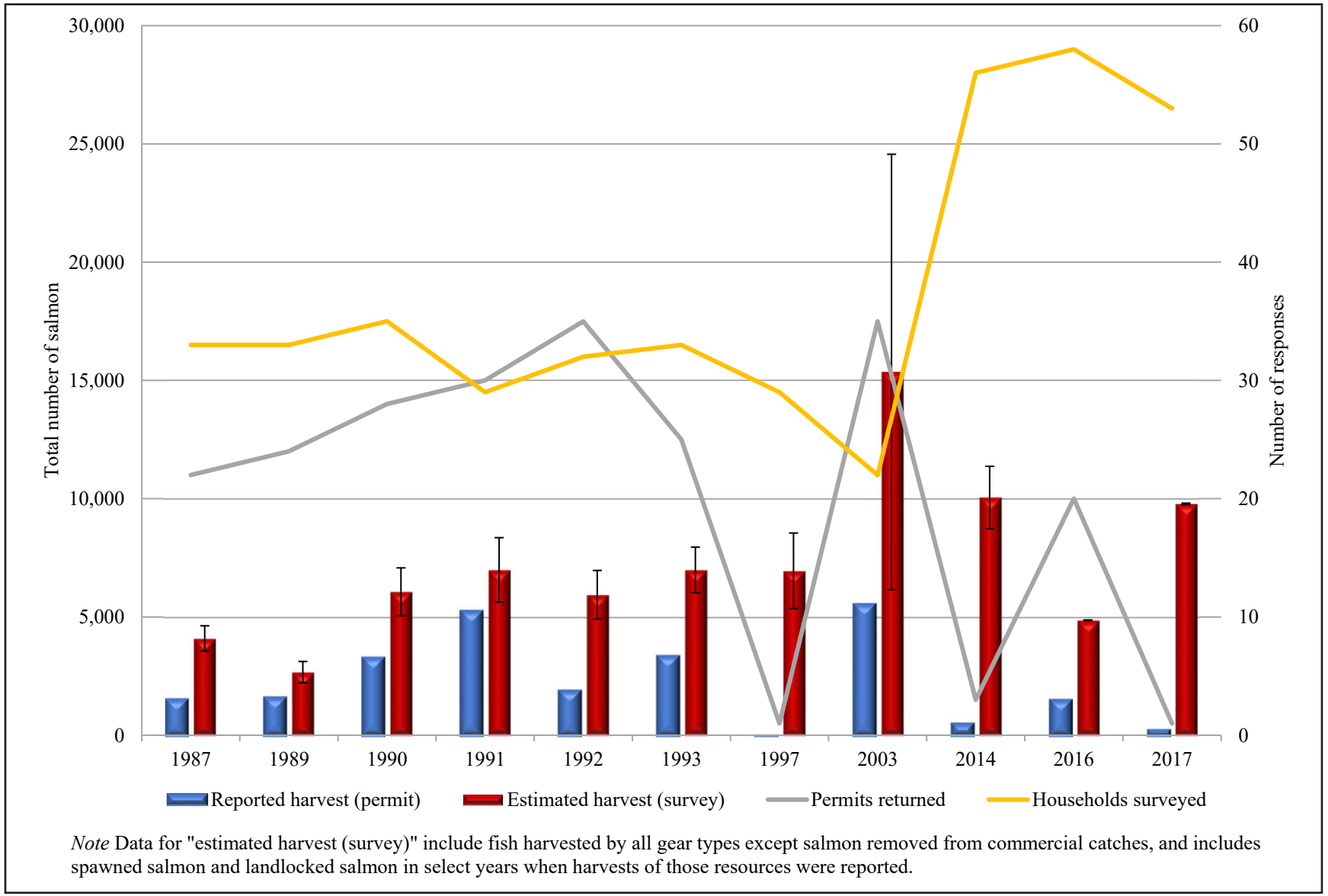


Figure 2-18.–Disposition of reported and estimated fishing and permit participation, Nanwalek, 2017.



Note Data for "estimated harvest (survey)" include fish harvested by all gear types except salmon removed from commercial catches, and includes spawned salmon and landlocked salmon in select years when harvests of those resources were reported.

Figure 2-19.–Salmon harvests as reported in returned permits and estimated from household surveys, Nanwalek, 1987, 1989–1993, 1997, 2003, 2014, and 2016–2017.

Table 2-24.–Salmon harvests based on returned permits and household surveys, Nanwalek, 1987, 1989–1993, 1997, 2003, 2014, and 2016–2017.

	Permits[a]			Household surveys			
Year	Permits issued	Permits returned	Reported salmon harvest (ind)	Total households	Surveyed households	Reported salmon harvest (ind)	Estimated salmon harvest (ind)
1987	–	22	1,550	40	33	3,379	4,097
1989	–	24	1,629	41	33	2,151	2,672
1990	–	28	3,302	41	35	5,180	6,068
1991	–	30	5,279	41	29	4,947	6,995
1992	–	35	1,917	41	32	4,635	5,939
1993	–	25	3,373	37	33	6,239	6,994
1997	–	1	16	38	29	5,306	6,954
2003	–	35	5,565	51	22	6,625	15,358
2014	15	3	527	58	56	9,464	10,051
2016	20	20	1,523	61	58	4,627	4,866
2017	13	1	252	61	53	8,501	9,784

Sources ADF&G Community Subsistence Information System, or CSIS (accessed October 2023), for household surveys, 1987–2014; ADF&G household survey surveys, 2016 and 2018, for household surveys, 2016–2017; Hollowell et al. (2019a:135) for permit data (permits returned and salmon harvest); ADF&G Division of Sport Fish annual subsistence permits, 2014, 2016, and 2017 for permit data (permits issued).

Note The reported and estimated harvest data from "household surveys" include fish harvested by all gear types except salmon removed from commercial catches.

Note The reported and estimated harvest data from "household surveys" include spawned salmon and landlocked salmon in select years when harvests of those resources were reported.

a. No issued permit information available from 1987–2003, as denoted by "–" above.

surveys for study year 2017 occurred after the reporting deadline, and the correspondence between survey respondents reporting having returned a permit (2) and permit returns (1), were much closer (Table 2-23; Fall et al. [2020:186]).

In order to assess the possibility of comparing household survey data with permit returns, a hypothesis test was carried out based on the 2016 study year (the only year in which returns were sufficient to carry out meaningful statistical analysis). All returned permits and all households indicating some attempt to harvest were compared. An F-test ($P(F \leq f) = 0.43$, with degrees of freedom 40 and 18), fails to reject the null hypothesis that the two groups have equal variance; in other words, it can be assumed that there was equal variance between returned permits and households attempting to harvest. Two tailed t-tests, assuming equal variance, were conducted ($P(T \leq t) = 0.38$), indicating that the means of the two groups do not appear to have statistically significant differences. While this finding is limited to a single community and year, it supports the interpretation that differences between the permit system and systematic household surveys are largely a function of permit participation. This assumption is further supported by low permit returns in 2017 and other study years.

As demonstrated in the statistical analysis, inconsistent permit returns also make total harvest comparisons difficult. In 2016, for example, the harvest reported through the permit system was 1,523 salmon, compared with a survey estimate of 4,866 salmon (Figure 2-19; Table 2-24). In 2017, the reported harvest was 252 salmon, compared with a survey estimate of 9,784 salmon. As seen in Figure 2-19, mismatches like these are not uncommon when comparing Nanwalek's historical permit reporting against household survey

harvest estimates. While permit reports often appear to underrepresent harvests, the reports have been as low as 0.2% of survey estimates (in 1997). The second year of this study came in only slightly higher, at 2.5% of the survey estimate. In some years, especially in the early 1990s, harvest reports from permits have more closely approached survey estimates of salmon harvests (approximately 50% or higher in 1989, 1990, and 1993, with a high of 76% in 1991).

Local Comments and Concerns

Following is a summary of local observations of wild resource populations and trends that were recorded during the surveys, key respondent interviews, and participant observation trips, and during the community review meeting of preliminary data. Some households did not offer any additional information during the survey interviews, so not all households are represented in the summary.

In 2016, comments during household surveys focused overwhelmingly on perceptions of low salmon returns. Respondents noted that the run was especially small and came only for a short time; as one household survey respondent noted on the survey form, "fish are not returning." In 2017, concerns related more specifically to the health of fish. Multiple survey respondents identified lesions on, or tumors in, salmon, as well as "mushy" fish. Respondents suggested a variety of causes for these changes including ocean contamination, influence of hatchery fish, and the escape of farmed salmon in Washington. During the community data review, at least one resident suggested that Seldovia fishers intercept the first run of sockeye salmon harvested by Nanwalek residents, and that including Seldovia's harvest data in future reports could provide a more complete picture of the Lower Cook Inlet subsistence fishery.

During participant observation and interviews with key respondents, individuals in Nanwalek reported difficulty with the current harvest recording system. Despite being printed on Rite in the Rain[6] paper, permits deteriorate in wet weather and on fishing boats, as well as at fishing locations, which discourages onsite recording of harvests. During interviews, community meetings, and survey data collection, community members overwhelmingly stated they preferred the prior (pre-2012) practice of issuing a permit as well as a calendar for daily harvest recording. Many requested a return to this record keeping format. As one Nanwalek resident remembered:

> When I used to live with my grandma, she would always have the calendar which had every day of the month and then a spot for every species. All you had to do was mark down what species you caught, on what day, and then you just turn that in at the end of the month. I mean, how much easier does it get than that? … [T]hat, to me, was probably the most simple way to keep track of things. (NW7)

When asked whether harvest reporting would be simplified by a phone app, responses were mixed. Several respondents suggested that electronic permits might work, while one Nanwalek resident noted that for people who choose to "utilize traditional means and apply traditional values to their harvesting," it is important to keep the paper calendar in circulation (NW7). Subsistence permits for all subdistricts are available online as of 2020, and further study is necessary to determine the local perception of online reporting and its efficacy in estimating harvest totals.

Across both years, key respondents were concerned that full harvest reporting might contribute to closures of the subdistricts on which they rely. In 2018, one key respondent noted:

> I think we have always underreported, because we got in trouble… [A]nd then you realize that it's not doing us any good. It's not giving us the numbers that came out of here. (NW6)

The same respondent expressed frustration with management, saying:

6. Fisheries management reports have described permits as being printed on Rite in the Rain paper, including in both study years: see Hollowell et al. (2017; 2019b).

> We don't want to lose, you know, but lot of stuff [is] taken out of our control. And, you know, we are the ones who use it the most, and we know how it works, and everything. But we have always kind of been told, "This is what you get." (NW6)

Whatever the intricacies of closures, allowable gear types, or other management changes, key respondents emphasized that continued communication between ADF&G and the communities is essential. One researcher recorded in field notes that one Nanwalek resident suggested that ADF&G employees could "come down and fish with one of us for two weeks during those times the reds are running." Summer visits might enable managers to see both what is working well and what might be improved upon. In addition to an inseason presence, one key respondent suggested that ADF&G might visit in the spring to distribute permits and to provide pre-season updates:

> It would probably be a good idea to have some kind of education training. … [S]ay, "Look, this is what subsistence regs are," rules and stuff. Yeah, I think it's a great idea. The more you know- they know, then it's easier for them to understand. (NW6)

Survey results from the 2016 and 2017 study years demonstrate consistent levels of household salmon use and an ongoing reliance on salmon resources. At the same time, comparisons with household survey estimates confirm that harvest numbers from permits are not an accurate reflection of salmon harvests. The history of higher permit returns in the communities during periods of more regular ADF&G involvement (including post-season visits to collect permits) indicates that community collaboration helped meet these needs.

3. PORT GRAHAM

Community Background

Port Graham, also known as Paluwik ("Place of Sadness" in Sugt'stun [Stanek 2000]), is located 4 miles east of Nanwalek, inside Port Graham Bay. Coastal rainforest surrounds the community and stretches unevenly up the 2000-foot ridge separating Port Graham from the English Bay Lakes and river system. The community is connected to Nanwalek by a 4-mile foot trail and to Windy Bay by a four-wheel-drive road with logging spurs through the headwaters of the Port Graham River (Figure 1-1).

Like Nanwalek, Port Graham has been the site of dispersed settlements by Sugpiaq people and their forebearers for hundreds of years (see Workman and Workman [1988] for an analysis of lower Kenai Peninsula prehistory, including evidence of the Ocean Bay tradition in the Port Graham area up to 4,000 years before present). In the years before and immediately after Russian contact, many Sugpiat lived in seasonal settlements around the lower Kenai, from Kachemak Bay to outer coast sites like Koyuktolik, Yalik, and Ailik bays (Fall 2006:109). After Russian traders established Fort Alexandrovsk at present-day Nanwalek, they forced Sugpiaq men into the otter hunting industry and resettled local Sugpiaq families nearby. Today, most Port Graham residents trace their heritage to mixed Russian/Sugpiat ancestors (discussed briefly in the previous chapter but treated more completely in Stanek [2000]). According to oral histories collected by Stanek (2000), the first year-round settlement at Port Graham began in 1897, when a group of Sugpiat from Koyuktolik Bay relocated to be closer to the English Bay Orthodox Church.

More concentrated settlement of Port Graham dates to 1910, when the Fidalgo Island Company developed a salmon and herring processing plant at a site previously used by the Alaska Commercial Company (ACC) (Fall 2006). The location, which has seen a number of cannery operations over the past century, is still known locally as "AC Point" (Stanek 2000:37). Initially, the Fidalgo cannery provided only temporary, tent-frame housing for Nanwalek-based workers, but year-round housing was in place by the 1920s (Stanek 2000). Port Graham's first school was established in 1932; by 1950, its estimated population had grown to 92 individuals (Braund and Behnke 1980; Fall 2006; Stanek 2000).

While fishing and processing drove the initial growth of Port Graham, local residents were contracted for only the lowest paying jobs, either at the cannery or nearby fish traps (Stanek 2000). After World War II, the cannery employed Port Graham residents to run company-owned driftnetters and seiners. As noted in Stanek (2000), Port Graham's early reliance on commercial fishing benefited the cash economy but disrupted a seasonal round of subsistence practices. Many Port Graham residents were forced to choose between wage labor and putting up salmon for the winter and, as a cash economy became more prevalent, the community saw a gradual shift away from a traditional seasonal round of subsistence (Stanek 2000).

In this context, Port Graham was poorly prepared for a 1950s decline in commercial fishing. When the Whitney-Fidalgo cannery burned in 1960, many residents moved out of town to find other wage employment (Braund 1982 rev.). While a series of canneries have since operated in Port Graham, commercial fishing never regained its original position in the local economy. A variety of factors—including salmon stocks, cannery economics, and local interest—contributed to this change, but many Port Graham residents mark the 1989 *Exxon Valdez* oil spill (and related cannery closures) as an inflection point. In 1987, just prior to the spill, commercial fishing and fish processing contributed 53% of Port Graham's annual income; by 1993, this figure had dropped to 11% (Stanek 2000:93). While the decline was not as complete as in Nanwalek (where overall commercial fishing and processing income dropped from 24% to 0.4%), in the early 1990s, the cash economy in Port Graham experienced a comparably larger percentage point decrease from commercial fishing.

Partially in order to compensate for commercial fishing declines, the Port Graham Village Council applied for a hatchery permit in 1991. The Port Graham Hatchery Corporation began operation in 1992, seeking to supply pink salmon for a new processing plant. The program, which ultimately handled pink, sockeye, and coho salmon from the Port Graham and English Bay systems, was discontinued beginning in 2007

due to budget constraints (Stopha 2012:10, 13). Cook Inlet Aquaculture Association (CIAA) purchased the hatchery in 2014 and continues to focus on the rehabilitation of pink salmon runs. Escapement levels have remained inconsistent during the hatchery period and, with a history of the unintentional release of diseased fish, several key respondents from Port Graham expressed doubts as to the project's goals and overall success (PG1, PG2, PG4, PG6, PG7, PG8, and Stopha [2012:25]).

Port Graham is an unincorporated census designated place (CDP) in the Kenai Peninsula Borough. The Native Village of Port Graham, a federally recognized tribe, is governed by the Port Graham Tribal Council, which serves the Alutiiq people of Port Graham. In turn, the tribe receives funding from the regional nonprofit, Chugachmiut, and is served by the Chugach Alaska Corporation and the Port Graham Corporation. In the most recent prior study (2014), employment from local government contributed the most income (37%) to the community, followed by Native corporation dividends (17%) and employment from agriculture, forestry, and fishing jobs (17%) (Jones and Kostick 2016:312). During the 2016 and 2017 study years, Port Graham had a K–12 school, a health clinic, and two stores—one privately owned and one operated by the Port Graham Corporation. Two air carriers offered daily passenger and freight service to Homer.

Seasonal Round

Residents of Port Graham harvest a variety of wild resources, including marine mammals, marine invertebrates, and a variety of plants and berries. As noted in the most recent prior comprehensive study (2014), 98% of Port Graham residents used salmon and vegetation, 88% used nonsalmon fish, 81% used marine invertebrates, and 76% used marine mammals (Jones and Kostick 2016). In 2014, blueberries and salmonberries were the top used resources by Port Graham households, followed by coho, pink, and sockeye salmon (Jones and Kostick 2016:324, 334–335). The top harvested and used resources generally reflected the importance of marine resources; in addition to all species of salmon, Pacific halibut, Dolly Varden, and octopus were among the top harvested resources, by weight. As in Nanwalek, access to large land mammals is limited by topography and habitat, so Port Graham's annual subsistence calendar has long revolved around fish and other resources from the sea (Stanek 2000). Port Graham residents harvest all five salmon species of Pacific salmon using a variety of gear types, with substantial reliance on sockeye salmon. In contemporary times, salmon are harvested using both gillnets (under subsistence regulations) and by trolling and using rod and reel (under sport fishing regulations). The bulk of the community's annual salmon harvest occurs during the summer months, starting with the first run of sockeye salmon in late May and June, and transitioning to pink salmon in July. Coho salmon start running into local streams in August and continue into late September. Port Graham residents troll for kings year-round. While all species can be harvested in salt water, large numbers of pink and coho salmon are also taken from local streams using rod and reel gear.

Population Estimates and Demographic Information

For the study years, division researchers estimated Port Graham's population as 158 (2016) and 147 (2017) individuals (Table 3-1). Differences in survey timing (fall for the 2016 study year, winter for the 2017 study year) may have contributed to differing estimates between the first and second study years. Table 3-1 provides a direct comparison of study results with 2010 U.S. Census data; Figure 3-1 provides a long-term comparison of population counts and estimates alongside the division's most recent study year estimates.

Table 3-1.–Sample and demographic characteristics, Port Graham, 2016 and 2017

Characteristics	Port Graham 2016	Port Graham 2017
Sampled households	39	49
Eligible households	61	60
Percentage sampled	63.9%	81.7%
Sampled population	101	120
Estimated community population	158.0	146.9
Household size		
Mean	2.6	2.4
Minimum	1	1
Maximum	9	6
Age		
Mean	32.9	35.3
Minimum[a]	0	0
Maximum	81	82
Median	32	36
Length of residency		
Total population		
Mean	23.1	23.8
Minimum[b]	0	0
Maximum	77	81
Heads of household		
Mean	33.4	31.4
Minimum[b]	0	2
Maximum	77	81
Alaska Native		
Estimated households[c]		
Number	54.6	55.1
Percentage	89.5%	91.8%
Estimated population		
Number	132.2	132.2
Percentage	83.7%	90.0%
U.S. Census 2010		
Households	79	79
Population	177	177
Alaska Native population	160	160
American Community Survey 5-year average		
Households	68	74
Range[d]	47 – 89	53 – 95
Population	197	189
Range[d]	142 – 252	143 – 235
Alaska Native Population	179	166
Range[d]	126 – 232	121 – 211

Sources U.S. Census Bureau (n.d.); U.S. Census Bureau (n.d.) for American Community Survey (ACS) 2016 and 2017 estimates (5-year average for 2012–2016 and 2013–2017); and ADF&G Division of Subsistence household surveys, 2016 and 2018.

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

b. Residency length of 0 (zero) indicates residency of less than 12 months.

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

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

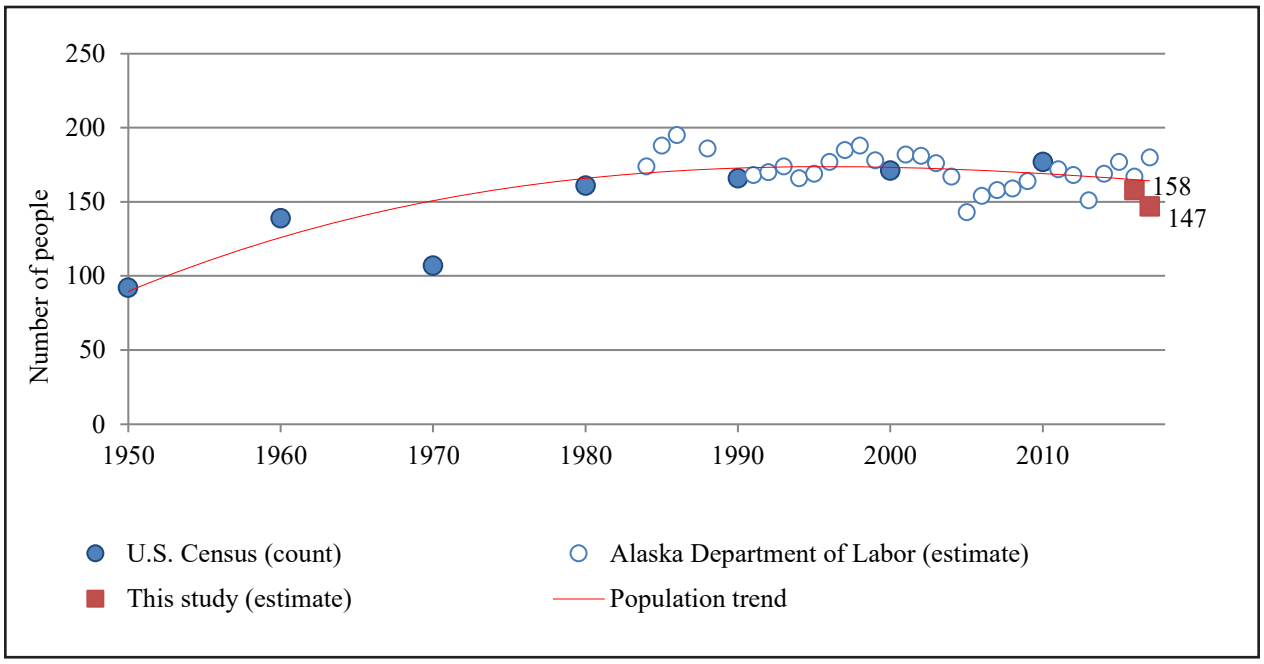


Figure 3-1.–Historical population estimates, Port Graham, 1950–2017.

Long term, Port Graham's population has remained relatively stable. Despite periodic in- and out-migration related to local employment opportunities (Stanek 2000), the population has stayed between 150–200 individuals since about 1980 (Figure 3-1). As expected from a static population, the population pyramid is evenly distributed across age classes (figures 3-2 and 3-3). One noticeable exception was the small population of young adults: less than 3% of the total population was 20–24 years old in both study years (tables 3-2 and 3-3). In the first study year, Port Graham's population was split almost evenly by gender: 80 males and 78 females (Table 3-2). In 2017, and there were fewer females (64) than males (83) (Table 3-3). The median age in Port Graham during the 2016 and 2017 study years were 32 and 36, respectively, and both were slightly lower than the national median (38) (Table 3-1).[1]

Port Graham is a predominately Alaska Native community. Based on division estimates, 90% of 2016 households were Alaska Native, compared with 92% in 2017 (Table 3-1). These estimates are based on personal reporting of ethnicity of household heads. As depicted in Figure 3-4, the U.S. Census and ACS estimates align with this study's estimates that a high proportion of Port Graham's residents identify as Alaska Native.

In Port Graham, survey participation was lower in 2016 (64%) than in 2017 (82%) (Table 3-1). Overall survey participation was lower in Port Graham than in Nanwalek during both study years, reflected by generally wider confidence intervals for estimated data.

1. "Median Age of the Resident Population of the United States from 1960 to 2021," Statista, accessed September 2023, https://www.statista.com/statistics/241494/median-age-of-the-us-population/.

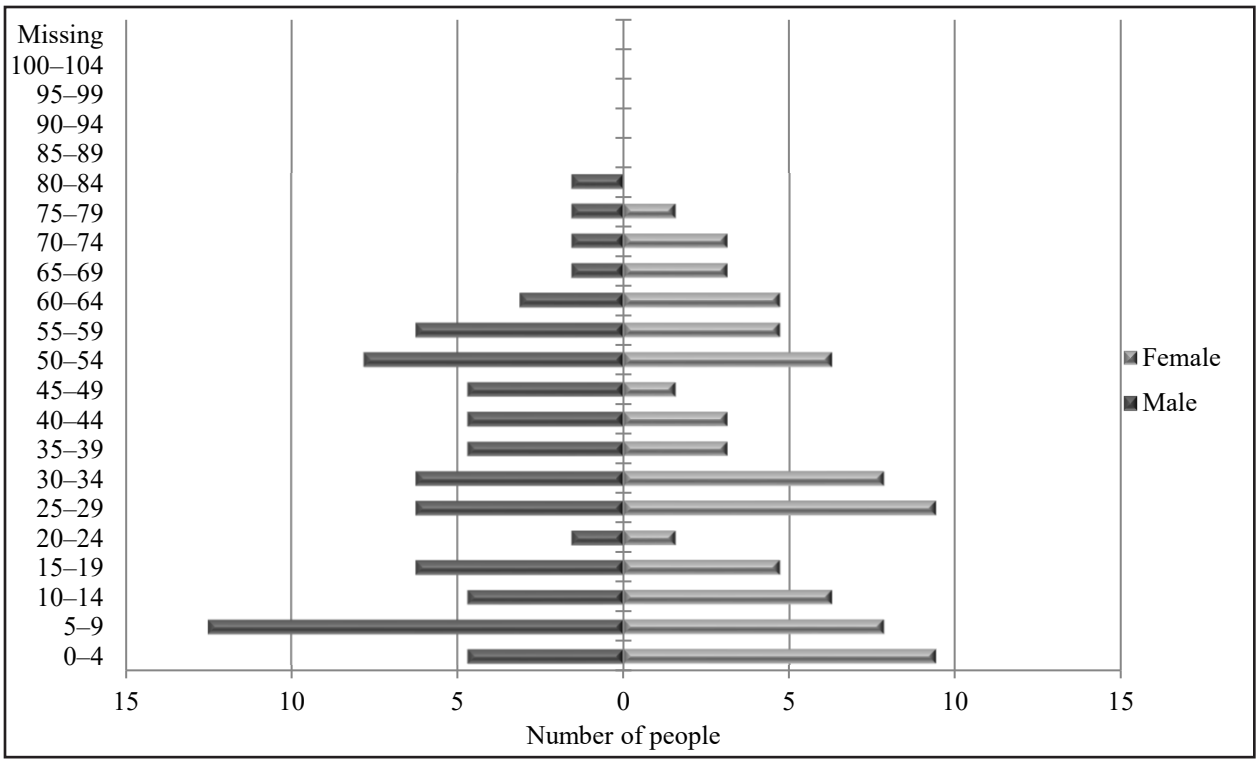


Figure 3-2.–Population profile, Port Graham, 2016.

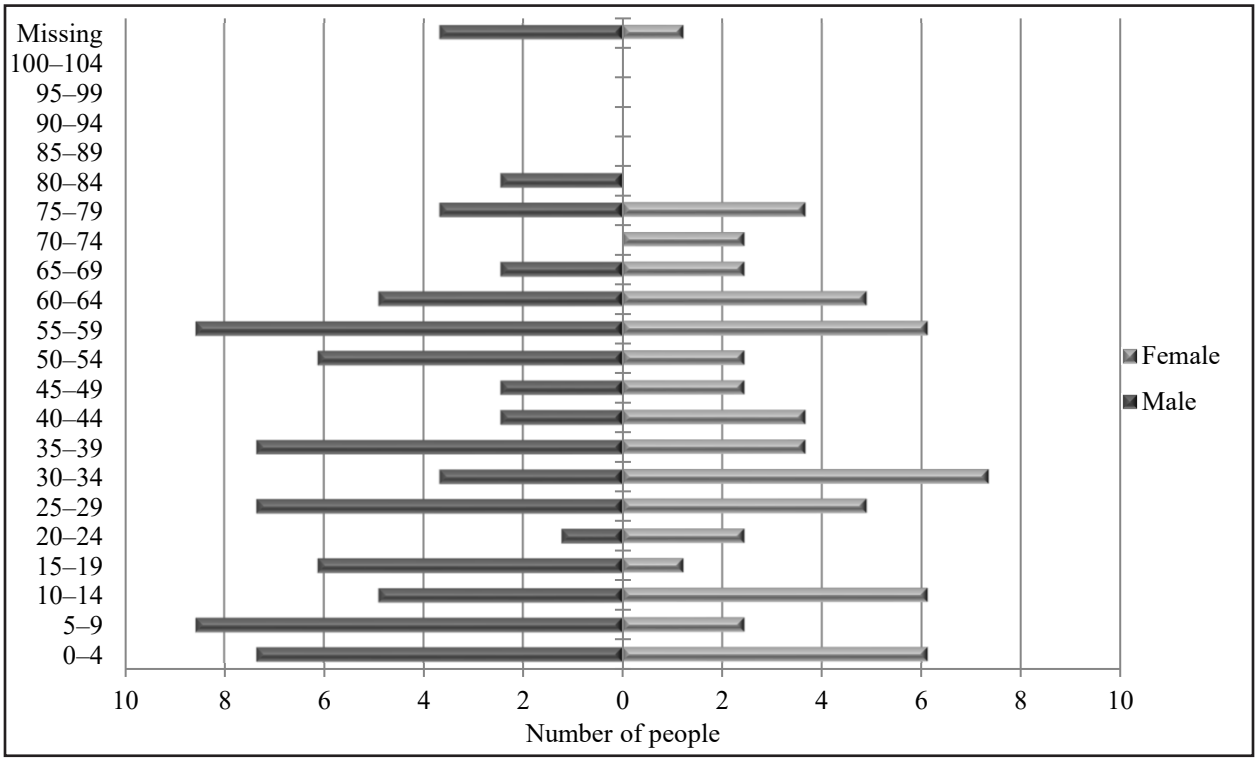


Figure 3-3.–Population profile, Port Graham, 2017.

Table 3-2.–Population profile, Port Graham, 2016.

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	4.7	5.9%	5.9%	9.4	12.0%	12.0%	14.1	8.9%	8.9%
5–9	12.5	15.7%	21.6%	7.8	10.0%	22.0%	20.3	12.9%	21.8%
10–14	4.7	5.9%	27.5%	6.3	8.0%	30.0%	10.9	6.9%	28.7%
15–19	6.3	7.8%	35.3%	4.7	6.0%	36.0%	10.9	6.9%	35.6%
20–24	1.6	2.0%	37.3%	1.6	2.0%	38.0%	3.1	2.0%	37.6%
25–29	6.3	7.8%	45.1%	9.4	12.0%	50.0%	15.6	9.9%	47.5%
30–34	6.3	7.8%	52.9%	7.8	10.0%	60.0%	14.1	8.9%	56.4%
35–39	4.7	5.9%	58.8%	3.1	4.0%	64.0%	7.8	5.0%	61.4%
40–44	4.7	5.9%	64.7%	3.1	4.0%	68.0%	7.8	5.0%	66.3%
45–49	4.7	5.9%	70.6%	1.6	2.0%	70.0%	6.3	4.0%	70.3%
50–54	7.8	9.8%	80.4%	6.3	8.0%	78.0%	14.1	8.9%	79.2%
55–59	6.3	7.8%	88.2%	4.7	6.0%	84.0%	10.9	6.9%	86.1%
60–64	3.1	3.9%	92.2%	4.7	6.0%	90.0%	7.8	5.0%	91.1%
65–69	1.6	2.0%	94.1%	3.1	4.0%	94.0%	4.7	3.0%	94.1%
70–74	1.6	2.0%	96.1%	3.1	4.0%	98.0%	4.7	3.0%	97.0%
75–79	1.6	2.0%	98.0%	1.6	2.0%	100.0%	3.1	2.0%	99.0%
80–84	1.6	2.0%	100.0%	0.0	0.0%	100.0%	1.6	1.0%	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	**79.8**	**100.0%**	**100.0%**	**78.2**	**100.0%**	**100.0%**	**158.0**	**100.0%**	**100.0%**

Source ADF&G Division of Subsistence household surveys, 2016.

Table 3-3.–Population profile, Port Graham, 2017.

	Male			Female			Total		
Age	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	7.3	8.8%	8.8%	6.1	9.6%	9.6%	13.5	9.2%	9.2%
5–9	8.6	10.3%	19.1%	2.4	3.8%	13.5%	11.0	7.5%	16.7%
10–14	4.9	5.9%	25.0%	6.1	9.6%	23.1%	11.0	7.5%	24.2%
15–19	6.1	7.4%	32.4%	1.2	1.9%	25.0%	7.3	5.0%	29.2%
20–24	1.2	1.5%	33.8%	2.4	3.8%	28.8%	3.7	2.5%	31.7%
25–29	7.3	8.8%	42.6%	4.9	7.7%	36.5%	12.2	8.3%	40.0%
30–34	3.7	4.4%	47.1%	7.3	11.5%	48.1%	11.0	7.5%	47.5%
35–39	7.3	8.8%	55.9%	3.7	5.8%	53.8%	11.0	7.5%	55.0%
40–44	2.4	2.9%	58.8%	3.7	5.8%	59.6%	6.1	4.2%	59.2%
45–49	2.4	2.9%	61.8%	2.4	3.8%	63.5%	4.9	3.3%	62.5%
50–54	6.1	7.4%	69.1%	2.4	3.8%	67.3%	8.6	5.8%	68.3%
55–59	8.6	10.3%	79.4%	6.1	9.6%	76.9%	14.7	10.0%	78.3%
60–64	4.9	5.9%	85.3%	4.9	7.7%	84.6%	9.8	6.7%	85.0%
65–69	2.4	2.9%	88.2%	2.4	3.8%	88.5%	4.9	3.3%	88.3%
70–74	0.0	0.0%	88.2%	2.4	3.8%	92.3%	2.4	1.7%	90.0%
75–79	3.7	4.4%	92.6%	3.7	5.8%	98.1%	7.3	5.0%	95.0%
80–84	2.4	2.9%	95.6%	0.0	0.0%	98.1%	2.4	1.7%	96.7%
85–89	0.0	0.0%	95.6%	0.0	0.0%	98.1%	0.0	0.0%	96.7%
90–94	0.0	0.0%	95.6%	0.0	0.0%	98.1%	0.0	0.0%	96.7%
95–99	0.0	0.0%	95.6%	0.0	0.0%	98.1%	0.0	0.0%	96.7%
100–104	0.0	0.0%	95.6%	0.0	0.0%	98.1%	0.0	0.0%	96.7%
Missing	3.7	4.4%	100.0%	1.2	1.9%	100.0%	4.9	3.3%	100.0%
Total	**83.3**	**100.0%**	**100.0%**	**63.7**	**100.0%**	**100.0%**	**146.9**	**100.0%**	**100.0%**

Source ADF&G Division of Subsistence household surveys, 2018.

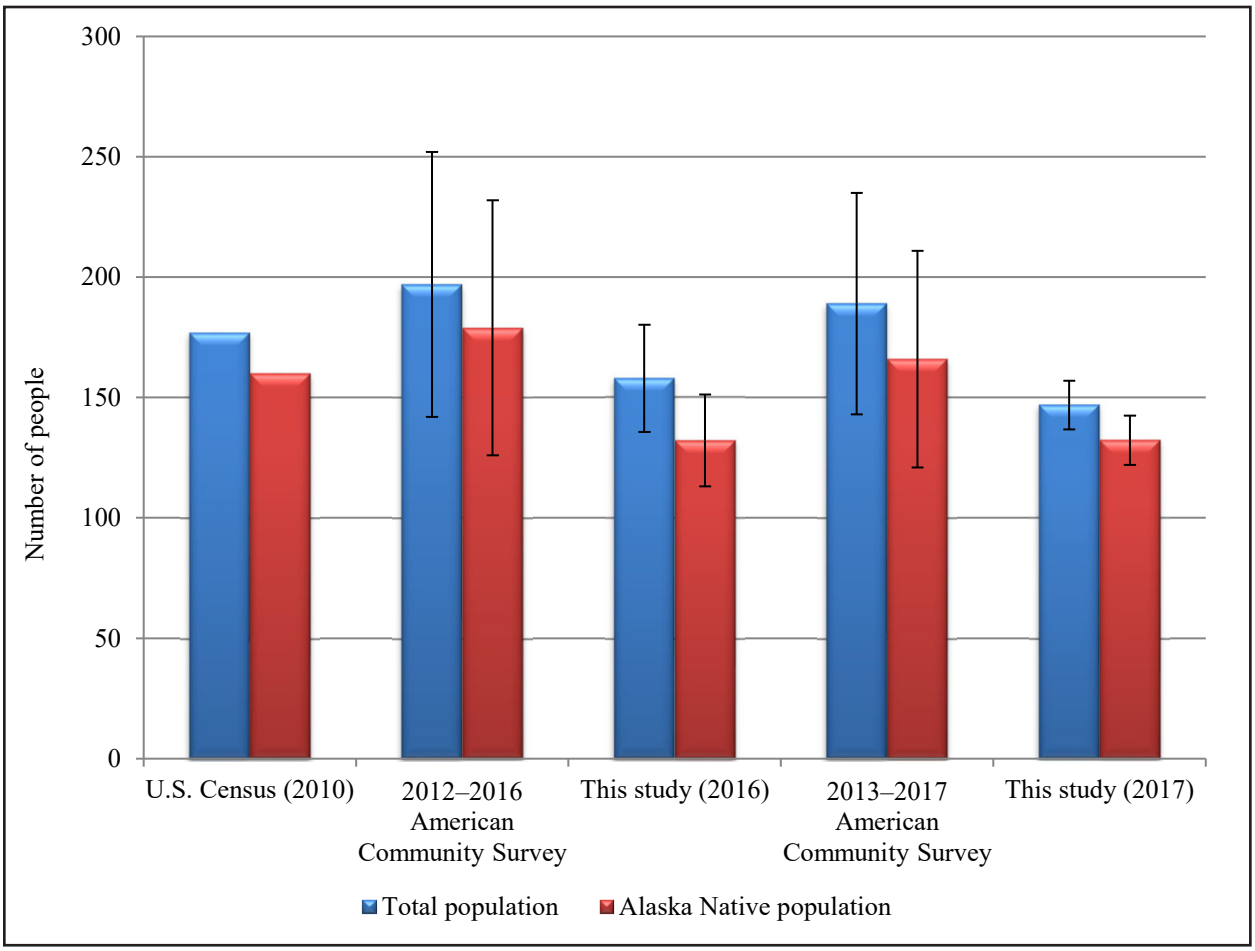


Figure 3-4.–Alaska Native and overall population estimates, Port Graham, 2010, 2016, and 2017.

Summary of Harvest and Use Patterns

Tables 3-4 and 3-5 report estimated salmon harvest and use by Port Graham households in 2016 and 2017. Estimated harvests of salmon are depicted by numbers of salmon and in pounds usable weight (see Appendix C for conversion factors) and account for resources harvested by any member of the surveyed household during the study year. The "use" category includes all salmon taken, given away, or used by a household, and salmon acquired from other harvesters, either as gifts, by barter or trade, or through partnerships. Differences between harvest and use percentages reflect sharing among households, which results in a wider distribution of wild foods.

Port Graham households were more engaged with salmon resources in 2017 than in 2016. Nearly the entire community, or 98%, used salmon during the 2017 study year, up from 92% in 2016 (Figure 3-5). Also, a higher percentage of households fished for salmon in 2017 (71%) than in 2016 (62%). As in Nanwalek, the overall increase in participation and use was likely due to a better sockeye salmon run and more fishing days opened per week (Hollowell et al. 2019b). As noted in Chapter 1, openings in the Port Graham Subdistrict are based on sockeye salmon escapement at the English Bay weir, with below-expected 2016 escapements resulting in a 5-day closure (July 7–11).[2, 3] Higher escapement by mid-June in 2017 resulted in an increase

2. Alaska Department of Fish and Game. 2016. "News Release: Lower Cook Inlet Salmon Fishery News Release #9," accessed October 17, 2023. http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/688989772.pdf
3. Alaska Department of Fish and Game. 2016. "News Release: Lower Cook Inlet Salmon Fishery News Release #10," accessed October 17, 2023. http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/696604671.pdf

Table 3-4.–Estimated use and harvest of salmon, Port Graham, 2016.

	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	**92.3**	**61.5**	**53.8**	**87.2**	**61.5**	**8,803.4**	**144.3**	**55.7**	**8,803.4**	**lb**	**144.3**	**30.3**
Chum salmon	51.3	35.9	30.8	30.8	23.1	1,619.8	26.6	10.3	312.8	ind	5.1	46.8
Coho salmon	74.4	48.7	46.2	51.3	38.5	1,790.0	29.3	11.3	378.5	ind	6.2	31.1
Chinook salmon	59.0	33.3	28.2	43.6	20.5	1,970.8	32.3	12.5	150.2	ind	2.5	51.7
Pink salmon	69.2	43.6	41.0	46.2	38.5	1,652.2	27.1	10.5	519.3	ind	8.5	40.2
Sockeye salmon	84.6	51.3	38.5	71.8	35.9	1,770.7	29.0	11.2	422.3	ind	6.9	46.0

Source ADF&G Division of Subsistence household surveys, 2016.

Table 3-5.–Estimated use and harvest of salmon, Port Graham, 2017.

	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	**98.0**	**71.4**	**67.3**	**85.7**	**73.5**	**19,492.5**	**324.9**	**132.7**	**19,492.5**	**lb**	**324.9**	**30.9**
Chum salmon	53.1	36.7	36.7	24.5	28.6	2,009.9	33.5	13.7	388.2	ind	6.5	29.4
Coho salmon	87.8	59.2	53.1	46.9	49.0	1,887.7	31.5	12.8	399.2	ind	6.7	18.1
Chinook salmon	67.3	40.8	32.7	49.0	36.7	3,069.6	51.2	20.9	233.9	ind	3.9	33.3
Pink salmon	73.5	51.0	51.0	40.8	36.7	3,576.4	59.6	24.3	1,124.1	ind	18.7	35.6
Sockeye salmon	87.8	44.9	44.9	65.3	55.1	8,948.8	149.1	60.9	2,134.3	ind	35.6	40.4

Source ADF&G Division of Subsistence household surveys, 2018.

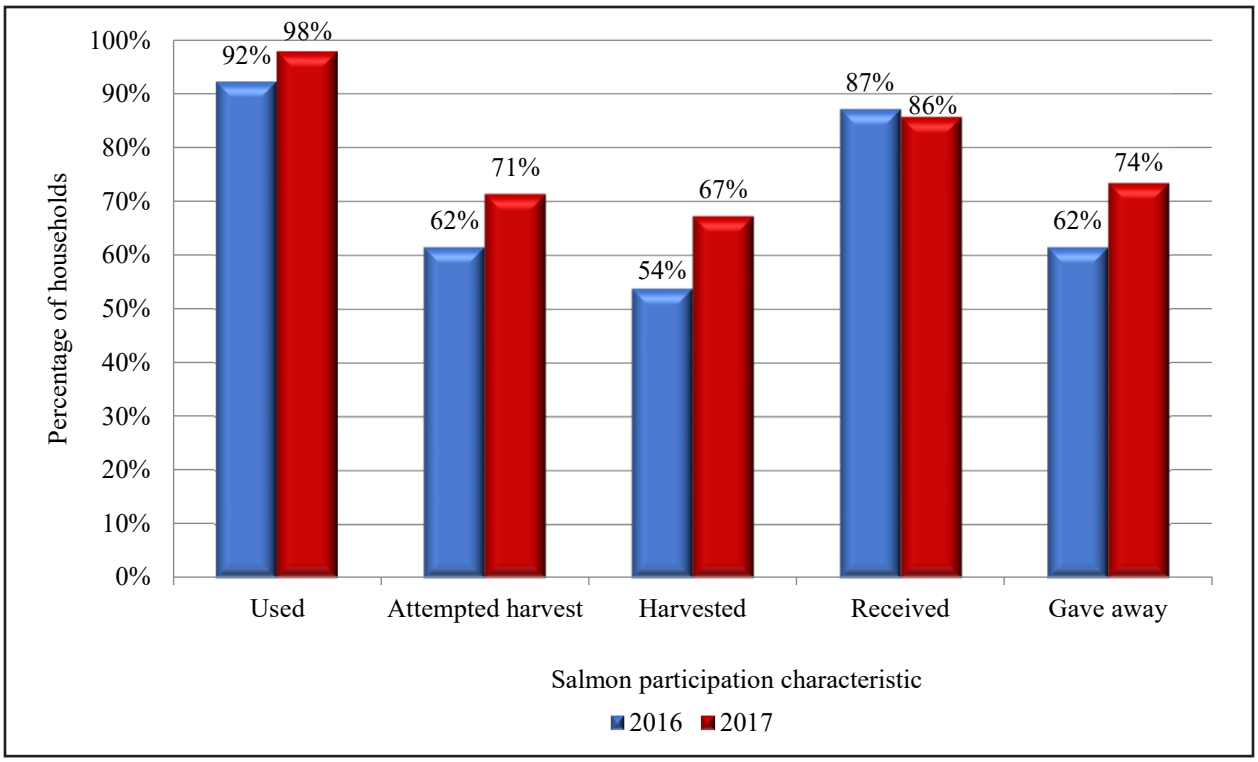


Figure 3-5.–Percentage of households using, attempting to harvest, harvesting, receiving, and giving away salmon, Port Graham, 2016 and 2017.

of the regulatory opening of 5.5 days per week to 6.5 days per week (Hollowell et al. 2019b:18).[4] In study year 2016, less than 9,000 lb usable weight of salmon, or fewer than 1,800 fish, were harvested (Table 3-4). In study year 2017, however, both figures more than doubled, with more than 19,000 lb and more than 4,000 fish harvested (Table 3-5). The harvests equated to approximately 56 lb of salmon harvested per person in 2016 and 133 lb per person in 2017 (tables 3-4 and 3-5).

In 2016, all five species of salmon were harvested and contributed to the total harvest weight about equally (Figure 3-6). In 2017, the harvest composition shifted slightly with sockeye salmon (46% of total harvest weight) being the most harvested species, followed by pink (18%) and Chinook (16%) salmon, and then coho and chum salmon (both 10%) (Figure 3-7).

Salmon were widely shared in both 2016 and 2017; fewer households in both years harvested than used salmon (Figure 3-5). Nearly the same percentage of households received salmon from another household in both 2016 (87%) and 2017 (86%), but more households shared salmon in 2017 (73%) than in 2016 (62%). All five species of salmon were shared in both 2016 and 2017 (tables 3-4 and 3-5). In 2016, coho and pink salmon were the most widely shared (by 39% of households) followed closely by sockeye salmon (36%). In 2017, sockeye salmon was the most widely shared species (by 55% of households).

4. Alaska Department of Fish and Game. 2017. "News Release: Lower Cook Inlet Salmon Fishery News Release #6," accessed October 17, 2023. http://www.adfg.alaska.gov/static/applications/dcfnewsrelease/793222176.pdf

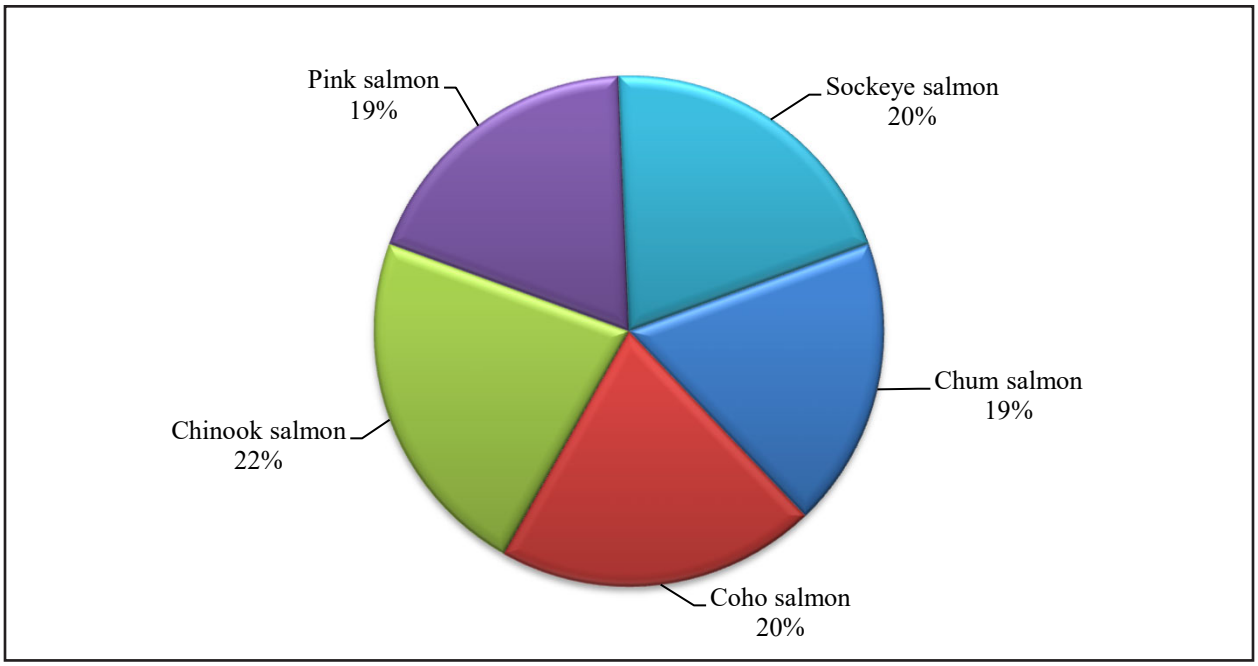


Figure 3-6.–Composition of salmon harvest, in pounds usable weight, Port Graham, 2016.

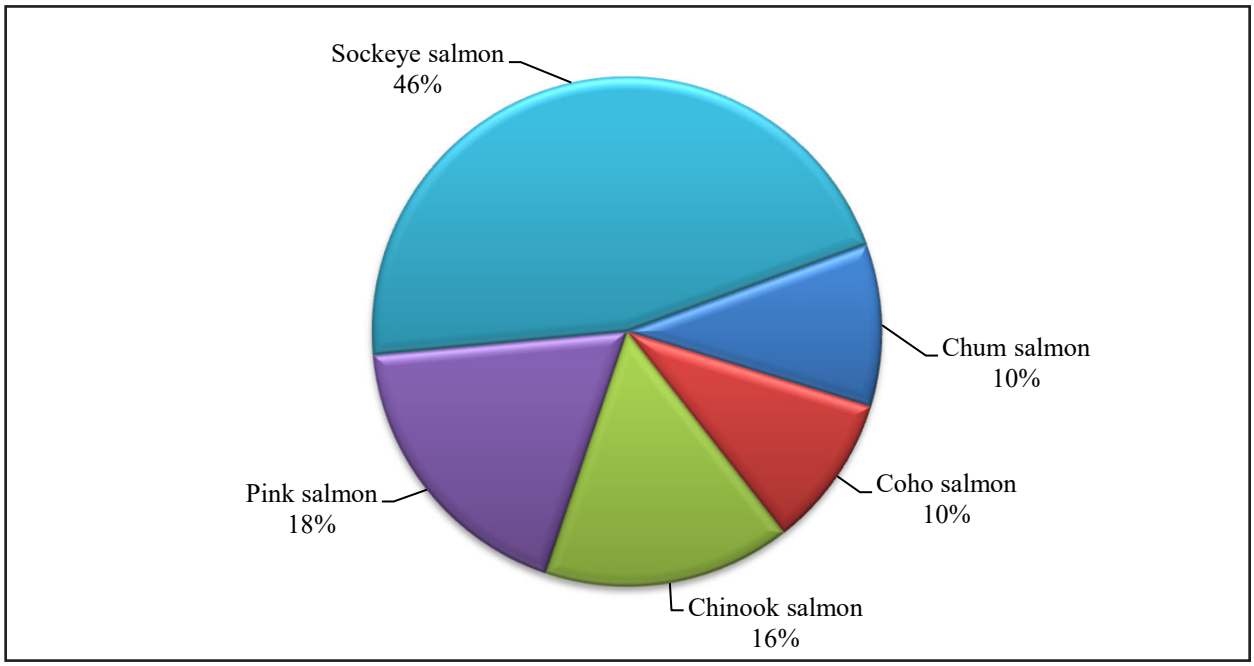


Figure 3-7.–Composition of salmon harvest, in pounds usable weight, Port Graham, 2017.

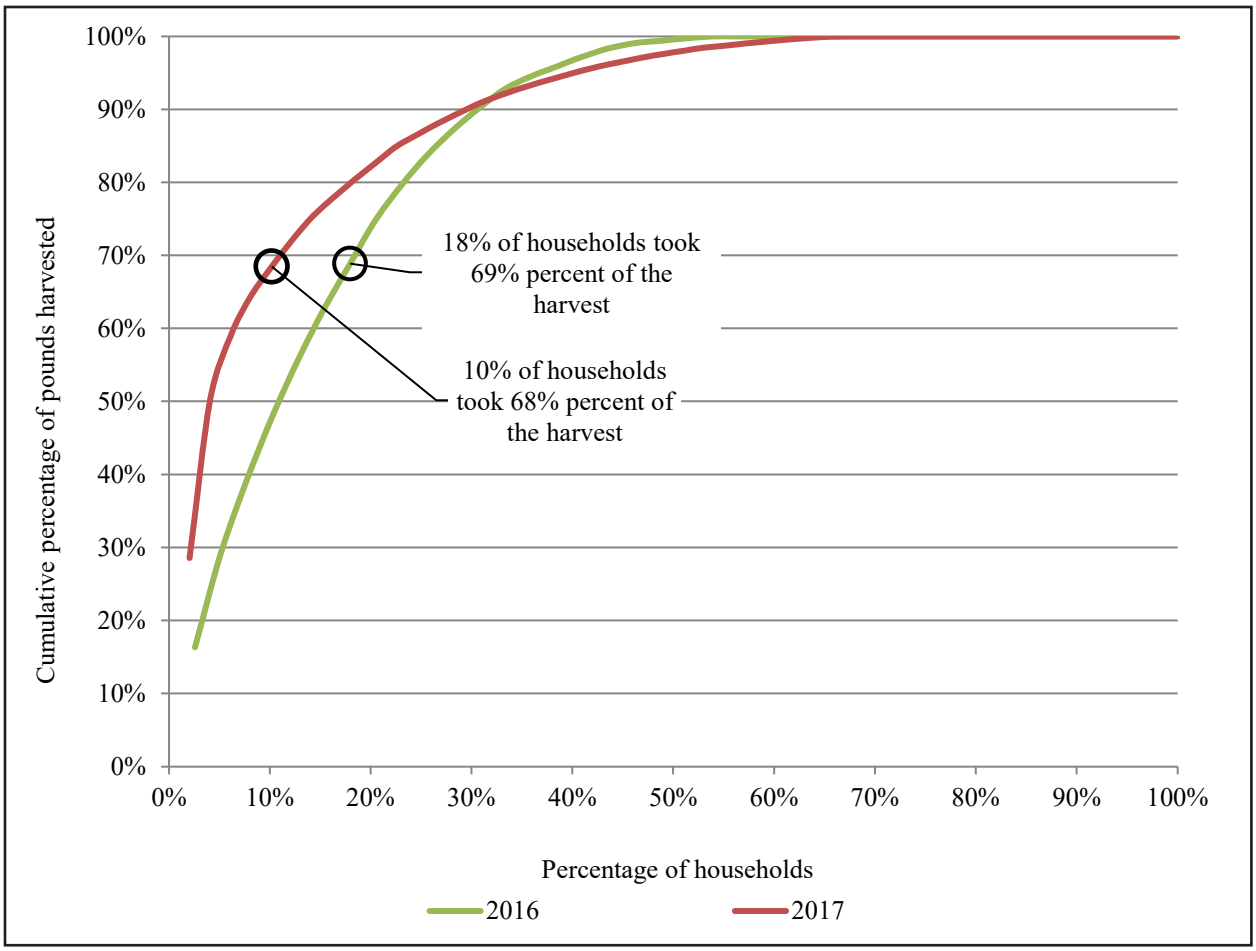


Figure 3-8.–Household specialization, Port Graham, 2016 and 2017.

Household Specialization in Resource Harvesting

Previous studies (Wolfe 1987; Wolfe et al. 2010) have shown that in most rural Alaska communities, a relatively small portion of households produces most of the community's fish and wildlife harvests, which they share with other households. A study of 3,265 households in 66 rural Alaska communities found that about 33% of the households accounted for 76% of subsistence harvests (Wolfe et al. 2010). Although overall the set of very productive households was diverse, factors that were associated with higher levels of subsistence harvests included larger households with a pool of adult male labor, higher wage income, involvement in commercial fishing, and community location.

As shown in Figure 3-8, for the 2016 and 2017 study years, about 69% of Port Graham's salmon (as estimated in pounds usable weight) was harvested by 10%–18% of the community's households. While the harvest of a single resource category is less likely to conform to the overall specialization norm for all resources combined, this is a notably high level of specialization—especially in 2017, when the total harvest weight was about double that of the previous year. It should be noted that in samples this small (and with relatively high refusal and no-contact rates) a few active harvesters can skew specialization curves. Long-term harvest data for Port Graham and new qualitative data collected in this study suggest that there is an increasing trend toward concentrated salmon harvests among a small number of fishers. During a 2016 key respondent interview, a single respondent acknowledged that he provided salmon to "about three-quarters of the village" (PG1). Another Port Graham key respondent indicated that sharing is fundamental to the community's subsistence practice:

> The ratio of people who go out and do stuff and the people that don't, it should add up. So, the people that go out and get all the stuff, then they should come back and provide for those that don't have anything, or those who are always needing food … . [T]hey should be going back to the root of subsistence, where they get the resources and it's spread out throughout the village. (PG5)

The division carried out a longitudinal analysis of household specialization in sockeye salmon for Port Graham in 2020, finding a significant trend toward concentrated harvest starting in 1993. This trend is especially noticeable in the two study years prior to this report (2003 and 2014), with the highest one-third of Port Graham harvesters producing nearly the entirety (97%) of the community's sockeye salmon harvest by 2014 (Keating et al. 2020:20, 22). For an explanation of characteristics associated with highly productive households using data from study years 1987 through 2014, see Keating et al. (2020). Further analysis of the study findings, beyond the scope of this report, might elaborate on current characteristics of the highly productive households in Port Graham.

Salmon Use and Harvest Characteristics by Gear Type

This section discusses salmon harvests by gear types (gillnet, rod and reel, trolling, and other methods, including salmon retained from commercial harvests) and assumes seasonal timeframes based on salmon availability and regulatory openings. Researchers noted during fieldwork that community members indicated that sport fishing equipment is both efficient and reliable for harvesting salmon, and that it can be relatively less expensive and gear intensive than gear used according to legally defined subsistence methods, despite that gear's efficiency. Compared to fishing with a simple rod and reel, for example, a set gillnet requires a skiff, anchors, buoys, net, and complementary equipment for maintaining that gear. Researchers also noted in field notes (October 2016) that Port Graham residents tended to identify their subsistence harvests based on food needs rather than the gear type or method. This sentiment reflects a longstanding local view of subsistence (Braund 1982rev.:76–78).

In 2016, the greatest number of salmon were harvested with stationary rod and reel gear (885 fish), followed by subsistence setnet gear (623), troll gear (147), and removals from commercial catches (78) (Table 3-6; Figure 3-9). Very small harvests using other subsistence and personal use gear, including unspecified gear, dip nets, and fish wheels, contributed another 50 salmon to the total harvest amount. The top-used gear types varied by species, with strong species-specific preferences. As estimated in pounds of salmon, stationary rod and reel gear was the primary gear used to harvest both coho (98% of species harvest weight) and pink (66%) salmon; subsistence setnet gear was used to harvest most of the sockeye (60%) and chum (64%) salmon harvest weight; trolling gear was used to harvest most (90%) of the Chinook salmon harvest weight (Table 3-7).

In 2017, subsistence setnet gear far outstripped other harvest methods, including personal use dip nets and fish wheels (Table 3-8; Figure 3-10). This was especially true for sockeye salmon, for which set gillnets accounted for an estimated 92% of the usable pounds harvested (Table 3-9). Setnet gear also led the harvest of chum salmon (85%) and pink salmon (70%). Stationary rod and reel fishing was the next most-used method (20% of total salmon harvest weight), followed by troll gear (12%). Less than 1% of the total salmon harvest weight came from other subsistence and personal use fishery gear, or removals from commercial catches. Trolling was employed for harvesting the most Chinook salmon in 2017, while stationary rod-and-reel gear was used to harvest the most coho salmon in that year (Table 3-8).

Overall, Port Graham residents rely more heavily on subsistence setnet gear and removals from commercial catches than their neighbors in Nanwalek, possibly due to comparably more substantial involvement with commercial fisheries in years leading up this project (Jones and Kostick 2016:210, 310; Stanek 2000:93). In 2017, Port Graham residents used subsistence setnet gear to harvest all five species of salmon; in 2016 setnet gear was used to harvest all species except coho salmon (tables 3-6 and 3-8). Salmon were removed from commercial catches for home use during both study years, though that harvest was ten times greater in 2016 (312 lb) than in 2017 (31 lb). In 2017, researchers noted during field work that increased non-commercial harvests offset the demand on commercial retention.

Table 3-6.–Estimated harvest of salmon by gear type and resource, Port Graham, 2016.

	Removed from commercial catch		Subsistence and personal use methods									
			Set gillnet		Dip net		Fish wheel		Other		Subsistence gear, any method	
Resource	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Salmon	**78.2**	**312.1**	**622.5**	**2,760.9**	**25.0**	**118.9**	**23.5**	**98.4**	**1.6**	**20.5**	**672.6**	**2,998.7**
Chum salmon	0.0	0.0	200.2	1,036.7	0.0	0.0	0.0	0.0	0.0	0.0	200.2	1,036.7
Coho 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
Chinook salmon	0.0	0.0	12.5	164.2	1.6	20.5	0.0	0.0	1.6	20.5	15.6	205.3
Pink salmon	15.6	49.8	156.4	497.6	0.0	0.0	0.0	0.0	0.0	0.0	156.4	497.6
Sockeye salmon	62.6	262.3	253.4	1,062.4	23.5	98.4	23.5	98.4	0.0	0.0	300.3	1,259.2

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Table 3-6.–Continued.

	Rod and reel		Troll gear		Any method	
Resource	Number	Pounds	Number	Pounds	Number	Pounds
Salmon	**885.3**	**3,672.0**	**147.0**	**1,820.5**	**1,783.1**	**8,803.4**
Chum salmon	111.1	575.0	1.6	8.1	312.8	1,619.8
Coho salmon	370.7	1,753.0	7.8	37.0	378.5	1,790.0
Chinook salmon	0.0	0.0	134.5	1,765.5	150.2	1,970.8
Pink salmon	344.1	1,094.8	3.1	10.0	519.3	1,652.2
Sockeye salmon	59.4	249.2	0.0	0.0	422.3	1,770.7

Source ADF&G Division of Subsistence household surveys, 2016.

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

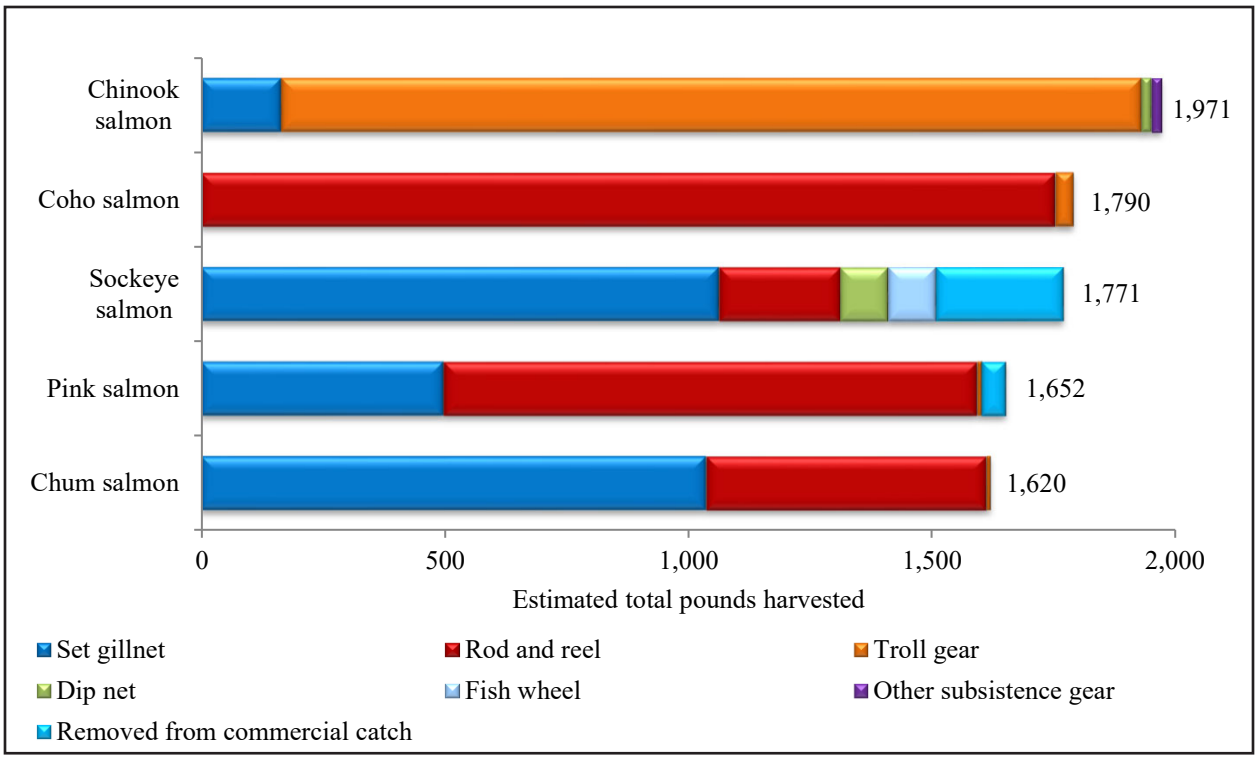

Figure 3-9.–Estimated harvest of salmon in pounds usable weight by gear type and resource, Port Graham, 2016.

Table 3-7.–Estimated percentages of salmon harvested in pounds usable weight by gear type, resource, and total salmon harvest, Port Graham, 2016.

Resource	Percentage base	Removed from commercial catch	Subsistence and personal use methods							
			Set gillnet	Dip net	Fish wheel	Other	Subsistence gear, any method	Rod and reel	Troll gear	Any method
Salmon	**Gear type**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
	Resource	**3.5%**	31.4%	1.4%	**1.1%**	**0.2%**	**34.1%**	**41.7%**	**20.7%**	**100.0%**
	Total	**3.5%**	31.4%	1.4%	**1.1%**	**0.2%**	**34.1%**	**41.7%**	**20.7%**	**100.0%**
Chum salmon	Gear type	0.0%	37.5%	0.0%	0.0%	0.0%	34.6%	15.7%	0.4%	18.4%
	Resource	0.0%	64.0%	0.0%	0.0%	0.0%	64.0%	35.5%	0.5%	100.0%
	Total	0.0%	11.8%	0.0%	0.0%	0.0%	11.8%	6.5%	0.1%	18.4%
Coho salmon	Gear type	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	47.7%	2.0%	20.3%
	Resource	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	97.9%	2.1%	100.0%
	Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	19.9%	0.4%	20.3%
Chinook salmon	Gear type	0.0%	5.9%	17.3%	0.0%	100.0%	6.8%	0.0%	97.0%	22.4%
	Resource	0.0%	8.3%	1.0%	0.0%	1.0%	10.4%	0.0%	89.6%	100.0%
	Total	0.0%	1.9%	0.2%	0.0%	0.2%	2.3%	0.0%	20.1%	22.4%
Pink salmon	Gear type	15.9%	18.0%	0.0%	0.0%	0.0%	16.6%	29.8%	0.5%	18.8%
	Resource	3.0%	30.1%	0.0%	0.0%	0.0%	30.1%	66.3%	0.6%	100.0%
	Total	0.6%	5.7%	0.0%	0.0%	0.0%	5.7%	12.4%	0.1%	18.8%
Sockeye salmon	Gear type	84.1%	38.5%	82.7%	100.0%	0.0%	42.0%	6.8%	0.0%	20.1%
	Resource	14.8%	60.0%	5.6%	5.6%	0.0%	71.1%	14.1%	0.0%	100.0%
	Total	3.0%	12.1%	1.1%	1.1%	0.0%	14.3%	2.8%	0.0%	20.1%

Source ADF&G Division of Subsistence household surveys, 2016.

Table 3-8.–Estimated harvest of salmon by gear type and resource, Port Graham, 2017.

			Subsistence and personal use methods									
	Removed from commercial catch		Set gillnet		Dip net		Fish wheel		Other		Subsistence gear, any method	
Resource	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Salmon	**7.3**	**30.8**	**3,128.6**	**13,166.4**	**14.7**	**61.6**	**12.2**	**51.3**	**13.5**	**42.9**	**3,169.0**	**13,322.2**
Chum salmon	0.0	0.0	329.4	1,705.6	0.0	0.0	0.0	0.0	0.0	0.0	329.4	1,705.6
Coho salmon	0.0	0.0	4.9	23.2	0.0	0.0	0.0	0.0	0.0	0.0	4.9	23.2
Chinook salmon	0.0	0.0	57.6	755.4	0.0	0.0	0.0	0.0	0.0	0.0	57.6	755.4
Pink salmon	0.0	0.0	783.7	2,493.4	0.0	0.0	0.0	0.0	13.5	42.9	797.1	2,536.2
Sockeye salmon	7.3	30.8	1,953.1	8,189.0	14.7	61.6	12.2	51.3	0.0	0.0	1,980.0	8,301.9

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Table 3-8.–Continued.

	Rod and reel		Troll gear		Any method	
Resource	Number	Pounds	Number	Pounds	Number	Pounds
Salmon	**859.6**	**3,830.5**	**243.7**	**2,309.0**	**4,279.6**	**19,492.5**
Chum salmon	52.7	272.6	6.1	31.7	388.2	2,009.9
Coho salmon	315.9	1,494.0	78.4	370.6	399.2	1,887.7
Chinook salmon	35.5	466.1	140.8	1,848.2	233.9	3,069.6
Pink salmon	308.6	981.8	18.4	58.4	1,124.1	3,576.4
Sockeye salmon	146.9	616.1	0.0	0.0	2,134.3	8,948.8

Source ADF&G Division of Subsistence household surveys, 2018.

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

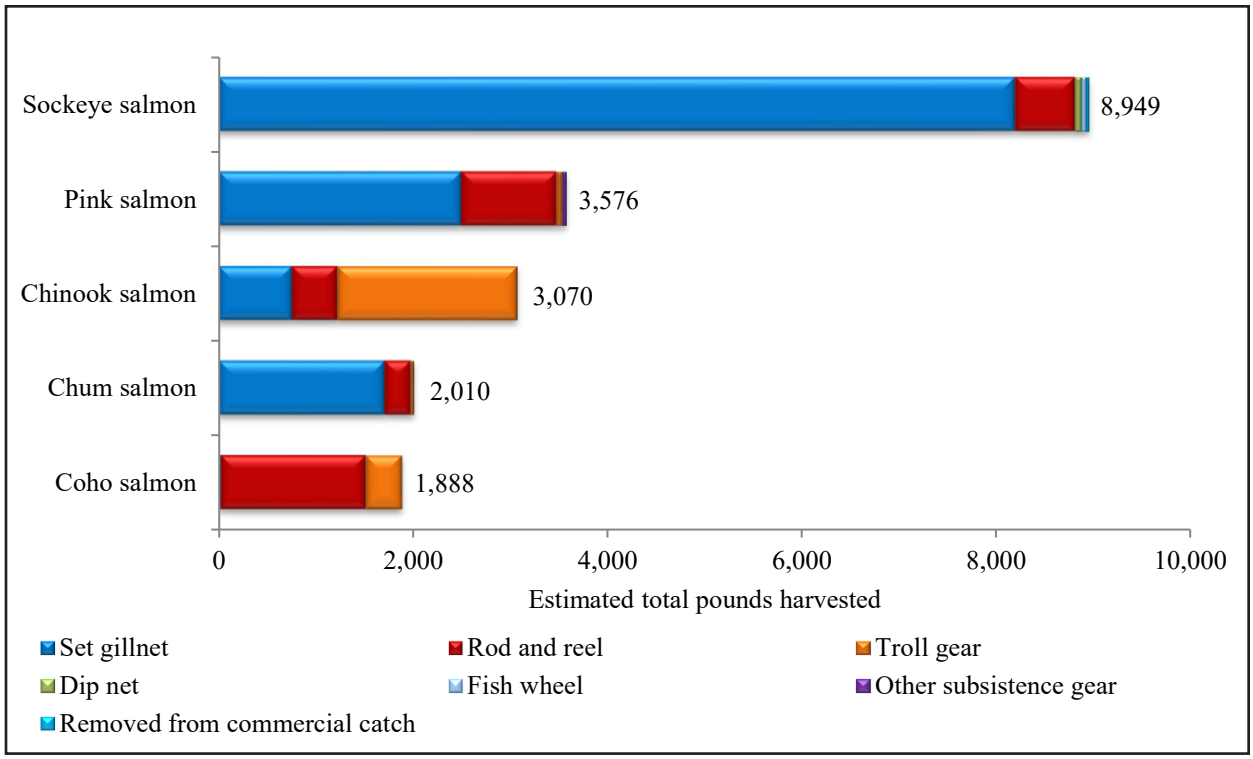

Figure 3-10.–Estimated harvest of salmon in pounds usable weight by gear type and resource, Port Graham, 2017.

Table 3-9.–Estimated percentages of salmon harvested in pounds usable weight by gear type, resource, and total salmon harvest, Port Graham, 2017.

Resource	Percentage base	Removed from commercial catch	Subsistence and personal use methods							
			Set gillnet	Dip net	Fish wheel	Other	Subsistence gear, any method	Rod and reel	Troll gear	Any method
Salmon	**Gear type**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
	Resource	**0.2%**	**67.5%**	**0.3%**	**0.3%**	**0.2%**	**68.3%**	**19.7%**	**11.8%**	**100.0%**
	Total	**0.2%**	**67.5%**	**0.3%**	**0.3%**	**0.2%**	**68.3%**	**19.7%**	**11.8%**	**100.0%**
Chum salmon	Gear type	0.0%	13.0%	0.0%	0.0%	0.0%	12.8%	7.1%	1.4%	10.3%
	Resource	0.0%	84.9%	0.0%	0.0%	0.0%	84.9%	13.6%	1.6%	100.0%
	Total	0.0%	8.7%	0.0%	0.0%	0.0%	8.7%	1.4%	0.2%	10.3%
Coho salmon	Gear type	0.0%	0.2%	0.0%	0.0%	0.0%	0.2%	39.0%	16.1%	9.7%
	Resource	0.0%	1.2%	0.0%	0.0%	0.0%	1.2%	79.1%	19.6%	100.0%
	Total	0.0%	0.1%	0.0%	0.0%	0.0%	0.1%	7.7%	1.9%	9.7%
Chinook salmon	Gear type	0.0%	5.7%	0.0%	0.0%	0.0%	5.7%	12.2%	80.0%	15.7%
	Resource	0.0%	24.6%	0.0%	0.0%	0.0%	24.6%	15.2%	60.2%	100.0%
	Total	0.0%	3.9%	0.0%	0.0%	0.0%	3.9%	2.4%	9.5%	15.7%
Pink salmon	Gear type	0.0%	18.9%	0.0%	0.0%	100.0%	19.0%	25.6%	2.5%	18.3%
	Resource	0.0%	69.7%	0.0%	0.0%	1.2%	70.9%	27.5%	1.6%	100.0%
	Total	0.0%	12.8%	0.0%	0.0%	0.2%	13.0%	5.0%	0.3%	18.3%
Sockeye salmon	Gear type	100.0%	62.2%	100.0%	100.0%	0.0%	62.3%	16.1%	0.0%	45.9%
	Resource	0.3%	91.5%	0.7%	0.6%	0.0%	92.8%	6.9%	0.0%	100.0%
	Total	0.2%	42.0%	0.3%	0.3%	0.0%	42.6%	3.2%	0.0%	45.9%

Source ADF&G Division of Subsistence household surveys, 2018.

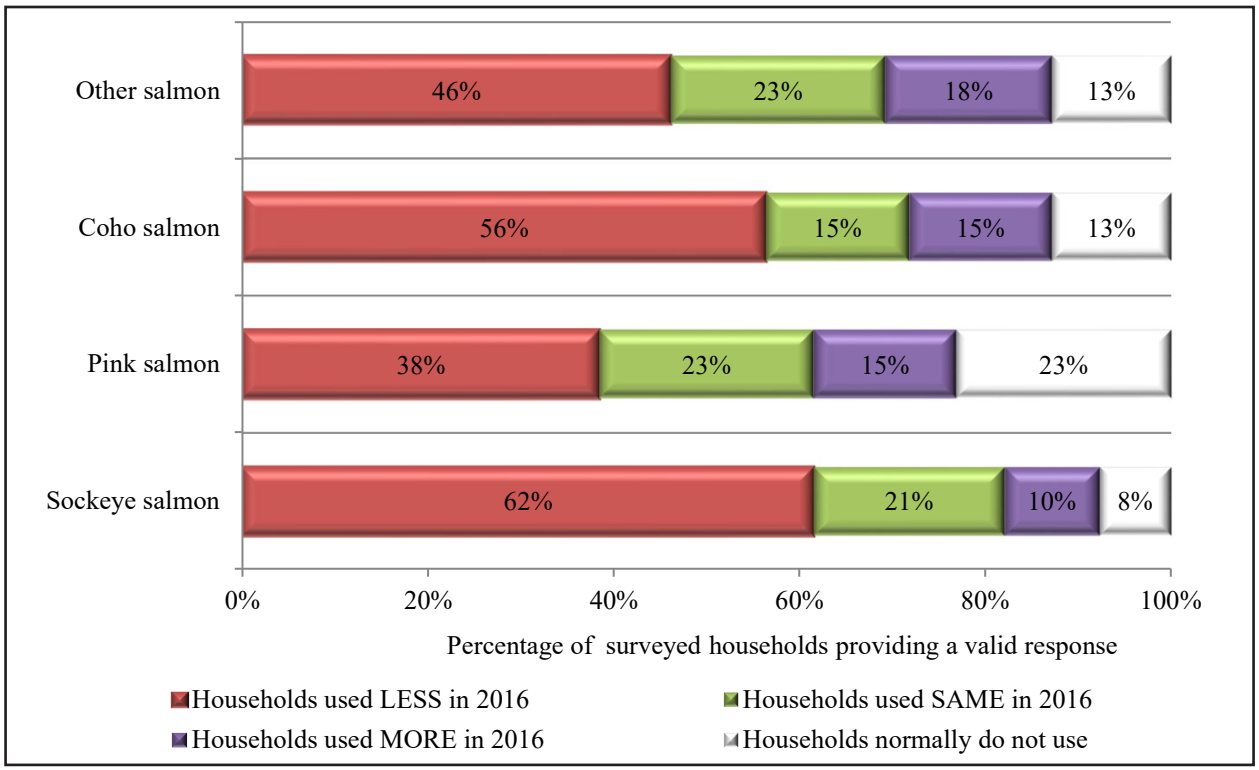

Figure 3-11.–Changes in household use of resources compared to recent years, Port Graham, 2016.

Harvest Assessments

Researchers asked respondents to assess their own harvests in two ways: whether they used more, less, or about the same amount of salmon resources in 2016 and 2017 as in the past five years, and whether they got "enough" resources. Households also were asked to provide reasons if their use was different or if they were unable to get enough of a resource. If they did not get enough of a resource, they were asked to evaluate the severity of the impact on their household as a result of not getting enough, and to identify reasons for the shortfall. They were further asked whether they did anything differently (such as supplement with store-bought food or switch to a different subsistence resource) because they did not get enough. This series of questions was asked about sockeye, pink, and coho salmon, and about chum and Chinook salmon combined, referred to as "other salmon" in the presented survey results. This section discusses responses to those questions. Because not everyone uses all salmon species, some households did not respond to the assessment questions. Additionally, some households that do typically use a resource simply did not answer questions.

In 2016, more Port Graham households indicated using less of all salmon resources than indicated using the same amount or more in comparison to recent years: responses ranged from 38% (households using less pink salmon) to 62% (households using less sockeye salmon) (Figure 3-11; Table 3-10). A minority of households reported using the same amount as in previous years, from a low of 15% for coho salmon to 23% for both pink and "other salmon." Even smaller percentages of households reported using more salmon, from a low of 10% for sockeye salmon to a high of 18% for "other salmon." In 2016, some households also reported that they typically do not use one species or another, from a low of 8% for sockeye salmon to a high of 23% for pink salmon.

Table 3-10.–Changes in household use of resources compared to recent years, Port Graham, 2016.

Resource	Sampled households	Valid responses[a]	Households reporting use: Total households Number	Total households Percentage	Less Number	Less Percentage	Same Number	Same Percentage	More Number	More Percentage	Households not using Number	Households not using Percentage
Other salmon	39	39	34	87.2%	18	46.2%	9	23.1%	7	17.9%	5	12.8%
Coho salmon	39	39	34	87.2%	22	56.4%	6	15.4%	6	15.4%	5	12.8%
Pink salmon	39	39	30	76.9%	15	38.5%	9	23.1%	6	15.4%	9	23.1%
Sockeye salmon	39	39	36	92.3%	24	61.5%	8	20.5%	4	10.3%	3	7.7%

Source ADF&G Division of Subsistence household surveys, 2016.

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

Table 3-11.–Reasons for less household use of resources compared to recent years, Port Graham, 2016.

Resource	Valid responses[a]	Households reporting reasons for less use	Family/ personal Number	Family/ personal Percentage	Resources less available Number	Resources less available Percentage	Lack of equipment Number	Lack of equipment Percentage	Less sharing Number	Less sharing Percentage	Lack of effort Number	Lack of effort Percentage	Too far to travel Number	Too far to travel Percentage	Weather/ environment Number	Weather/ environment Percentage
Other salmon	39	18	1	5.6%	8	44.4%	4	22.2%	3	16.7%	1	5.6%	0	0.0%	0	0.0%
Coho salmon	39	22	2	9.1%	8	36.4%	1	4.5%	7	31.8%	3	13.6%	2	9.1%	1	4.5%
Pink salmon	39	15	2	13.3%	8	53.3%	2	13.3%	3	20.0%	3	20.0%	0	0.0%	0	0.0%
Sockeye salmon	39	24	3	12.5%	11	45.8%	1	4.2%	6	25.0%	3	12.5%	0	0.0%	1	4.2%

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Table 3-11.–Continued.

Resource	Valid responses[a]	Households reporting reasons for less use	Other reasons Number	Other reasons Percentage	Working/ no time Number	Working/ no time Percentage	Regulations Number	Regulations Percentage	Equipment/fuel expensive Number	Equipment/fuel expensive Percentage	Unsuccessful Number	Unsuccessful Percentage	Did not need Number	Did not need Percentage
Other salmon	39	18	1	5.6%	4	22.2%	1	5.6%	1	5.6%	2	11.1%	0	0.0%
Coho salmon	39	22	0	0.0%	6	27.3%	0	0.0%	1	4.5%	1	4.5%	0	0.0%
Pink salmon	39	15	1	6.7%	2	13.3%	0	0.0%	0	0.0%	0	0.0%	2	13.3%
Sockeye salmon	39	24	2	8.3%	2	8.3%	3	12.5%	1	4.2%	2	8.3%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2016.

Note Respondents could provide multiple reasons for less use.

a. Valid responses do not include households that did not provide any response to the less, same, or more use assessment question.

Table 3-12.–Reasons for more household use of resources compared to recent years, Port Graham, 2016.

Resource	Valid responses[a]	Households reporting reasons for more use	Used other resources		Needed more		Increased effort		Received more	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	39	6	0	0.0%	0	0.0%	2	33.3%	2	33.3%
Coho salmon	39	6	2	33.3%	0	0.0%	1	16.7%	2	33.3%
Pink salmon	39	6	2	33.3%	1	16.7%	1	16.7%	2	33.3%
Sockeye salmon	39	4	0	0.0%	0	0.0%	2	50.0%	0	0.0%

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Table 3-12.–Continued.

Resource	Valid responses[a]	Households reporting reasons for more use	More success		Substitute for unavailable resource		Other	
			Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	39	6	0	0.0%	0	0.0%	2	33.3%
Coho salmon	39	6	1	16.7%	1	16.7%	1	16.7%
Pink salmon	39	6	1	16.7%	0	0.0%	0	0.0%
Sockeye salmon	39	4	0	0.0%	0	0.0%	2	50.0%

Source ADF&G Division of Subsistence household surveys, 2016.

Note Respondents could provide multiple reasons for more use.

a. Valid responses do not include households that did not provide any response to the less, same, or more use assessment question.

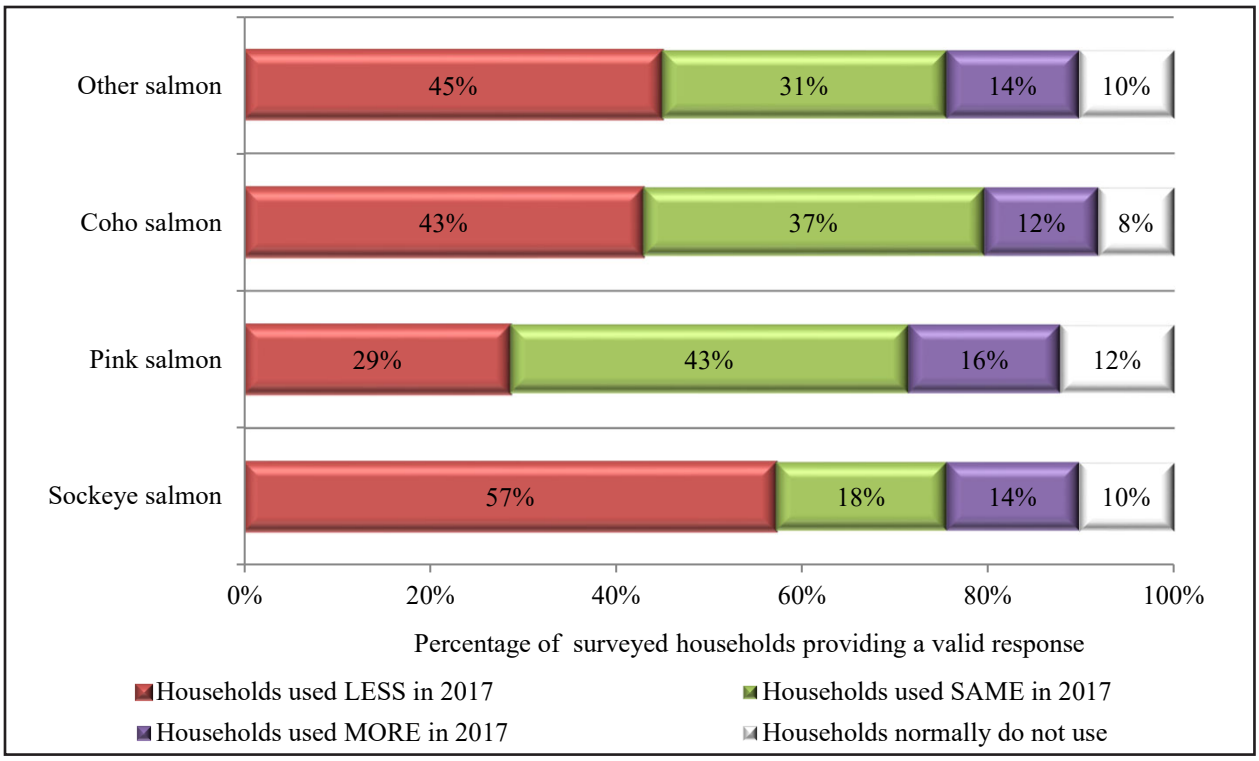

Figure 3-12.–Changes in household use of resources compared to recent years, Port Graham, 2017.

When asked why they used less salmon in 2016, the greatest percentages of households indicated that they did so due to resource availability (36%–53% across resources) (Table 3-11). This assessment matches with the biological evidence gathered in 2016, when poor escapement was documented at the English Bay weir by the end of June. As described in Chapter 1, poor escapement prompted intermittent subsistence fishery closures beginning after the first week of July. Less sharing was cited as the second or third most common reason for less use of the three most-harvested species: cited by 32% of households for coho salmon, 25% for sockeye salmon, and 20% for pink salmon. For chum and Chinook salmon combined, 22% of those households that used less than in the previous five years cited a lack of equipment and work conflicts, while 27% of those households that used less coho salmon attributed the change to work conflicts. For the few households that used more salmon in 2016, two households cited receiving more pink, coho, and "other salmon" from others (Table 3-12). Also, increased effort contributed to more use of each salmon resource.

When asked about recent changes in use for 2017, the majority of Port Graham households still reported using less or the same amount of salmon resources than in the previous five years, despite higher harvests resulting from higher resource abundance and other factors (Figure 3-12). For three salmon resources, the greatest percentage reported using less, including sockeye salmon (57%), "other salmon" (45%), and coho salmon (43%). For pink salmon, the greatest percentage of responding households (43%) reported using the same amount as in the previous five years. While 2017 was better for sockeye salmon escapement than the previous year (Hollowell et al. 2019b), nearly the same percentages of households reported using less, same, and more as in 2016 (tables 3-13 and 3-10). The percentage of households reporting that they normally do not use salmon dropped for all resources except sockeye salmon, which increased slightly from 8% in 2016 to 10% in 2017. Because the response of "normally do not use" may be marked on a survey form by a household to account for a lack of use in the study year, rather than a comparison against a five-year pattern of use, this variation may be related to an increase in number of households surveyed in 2017.

Table 3-13.–Changes in household use of resources compared to recent years, Port Graham, 2017.

Resource	Sampled households	Valid responses[a]	Households reporting use: Total households Number	Total households Percentage	Less Number	Less Percentage	Same Number	Same Percentage	More Number	More Percentage	Households not using Number	Households not using Percentage
Other salmon	49	49	44	89.8%	22	44.9%	15	30.6%	7	14.3%	5	10.2%
Coho salmon	49	49	45	91.8%	21	42.9%	18	36.7%	6	12.2%	4	8.2%
Pink salmon	49	49	43	87.8%	14	28.6%	21	42.9%	8	16.3%	6	12.2%
Sockeye salmon	49	49	44	89.8%	28	57.1%	9	18.4%	7	14.3%	5	10.2%

Source ADF&G Division of Subsistence household surveys, 2018.

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

Table 3-14.–Reasons for less household use of resources compared to recent years, Port Graham, 2017.

Resource	Valid responses[a]	Households reporting reasons for less use	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
Other salmon	49	22	1	4.5%	4	18.2%	1	4.5%	4	18.2%	8	36.4%	2	9.1%	3	13.6%	0	0.0%
Coho salmon	49	21	1	4.8%	8	38.1%	2	9.5%	3	14.3%	3	14.3%	2	9.5%	1	4.8%	2	9.5%
Pink salmon	49	14	2	14.3%	2	14.3%	0	0.0%	0	0.0%	1	7.1%	1	7.1%	0	0.0%	0	0.0%
Sockeye salmon	49	28	7	25.0%	3	10.7%	0	0.0%	2	7.1%	10	35.7%	0	0.0%	3	10.7%	1	3.6%

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Table 3-14.–Continued.

Resource	Valid responses[a]	Households reporting reasons for less use	Working/ no time Number	Working/ no time Percentage	Regulations Number	Regulations Percentage	Small/diseased resource Number	Small/diseased resource Percentage	Did not get enough Number	Did not get enough Percentage	Equipment/fuel too expensive Number	Equipment/fuel too expensive Percentage	Used other resources Number	Used other resources Percentage	Competition Number	Competition Percentage	Other reasons Number	Other reasons Percentage
Other salmon	49	22	2	9.1%	1	4.5%	0	0.0%	0	0.0%	0	0.0%	1	4.5%	0	0.0%	1	4.5%
Coho salmon	49	21	4	19.0%	0	0.0%	0	0.0%	1	4.8%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Pink salmon	49	14	2	14.3%	0	0.0%	0	0.0%	7	50.0%	0	0.0%	2	14.3%	0	0.0%	0	0.0%
Sockeye salmon	49	28	5	17.9%	0	0.0%	0	0.0%	2	7.1%	0	0.0%	1	3.6%	0	0.0%	1	3.6%

Source ADF&G Division of Subsistence household surveys, 2018.

Note Respondents could provide multiple reasons for less use.

a. Valid responses do not include households that did not provide any response to the less, same, or more use assessment question.

Table 3-15.–Reasons for more household use of resources compared to recent years, Port Graham, 2017.

Resource	Valid responses[a]	Households reporting reasons for more use	Increased availability		Weather		Received more		Needed more		Increased effort	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	49	7	2	28.6%	0	0.0%	3	42.9%	0	0.0%	2	28.6%
Coho salmon	49	6	0	0.0%	0	0.0%	3	50.0%	0	0.0%	3	50.0%
Pink salmon	49	8	4	50.0%	0	0.0%	3	37.5%	0	0.0%	1	12.5%
Sockeye salmon	49	7	0	0.0%	1	14.3%	1	14.3%	0	0.0%	5	71.4%

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Table 3-15.–Continued.

Resource	Valid responses[a]	Households reporting reasons for more use	More success		Had more time		Got/fixed equipment		Substitute for unavailable resource		Other reasons	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	49	7	2	28.6%	0	0.0%	1	14.3%	0	0.0%	0	0.0%
Coho salmon	49	6	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Pink salmon	49	8	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Sockeye salmon	49	7	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2018.

Note Respondents could provide multiple reasons for more use.

a. Valid responses do not include households that did not provide any response to the less, same, or more use assessment question.

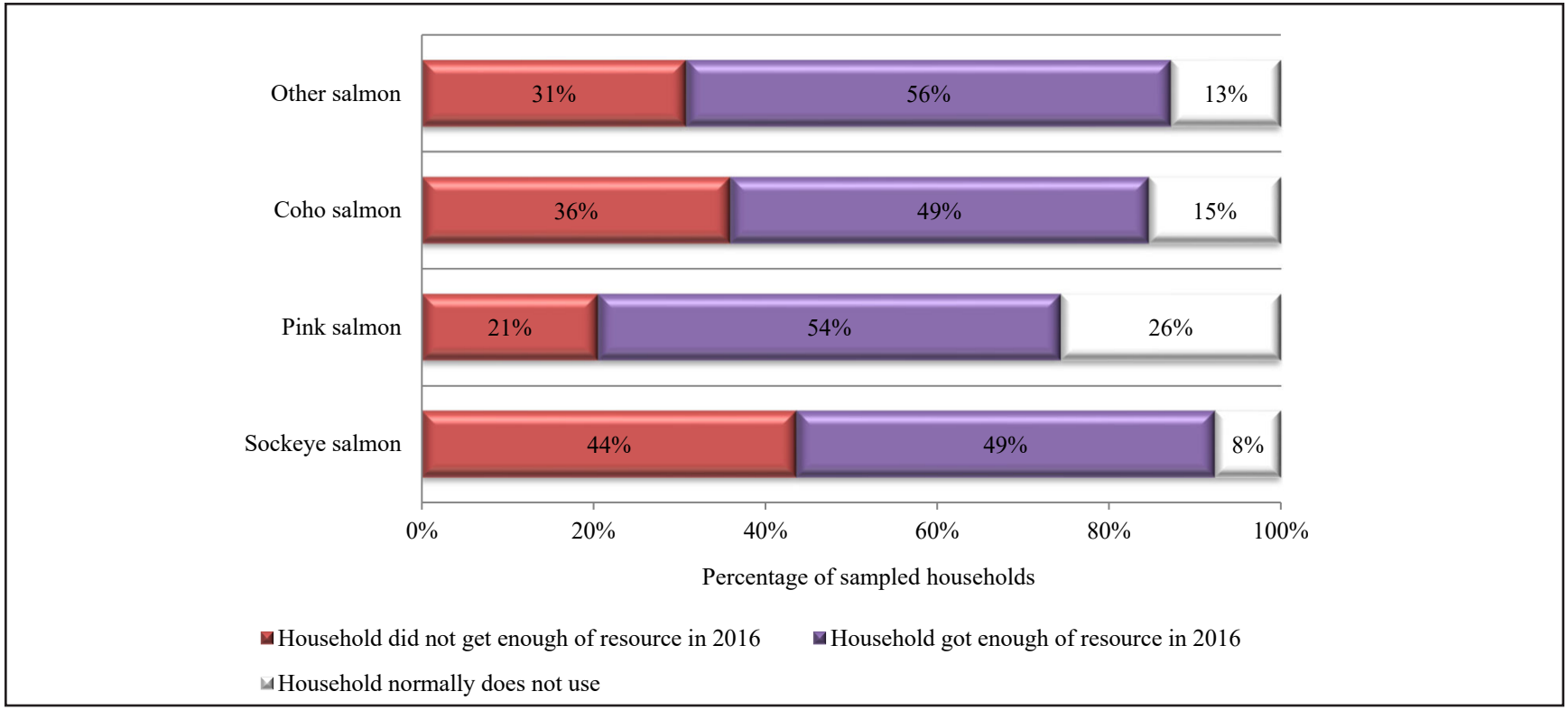

Figure 3-13.–Percentage of sampled households reporting whether they had enough resources, Port Graham, 2016.

Table 3-16.–Reported impact to households reporting that they did not get enough of a type of resource, Port Graham, 2016.

		Households not getting enough _____.				Impact to those not getting enough _____.									
	Sampled	Valid responses[a]		Did not get enough		No response		Not noticeable		Minor		Major		Severe	
Resource	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	39	34	87.2%	12	35.3%	0	0.0%	0	0.0%	3	25.0%	8	66.7%	1	8.3%
Coho salmon	39	33	84.6%	14	42.4%	0	0.0%	1	7.1%	6	42.9%	5	35.7%	2	14.3%
Pink salmon	39	29	74.4%	8	27.6%	0	0.0%	0	0.0%	2	25.0%	4	50.0%	2	25.0%
Sockeye salmon	39	36	92.3%	17	47.2%	0	0.0%	0	0.0%	6	35.3%	9	52.9%	2	11.8%

Source ADF&G Division of Subsistence household surveys, 2016.

a. Does not include households failing to respond to the question and those households that did not use the resource.

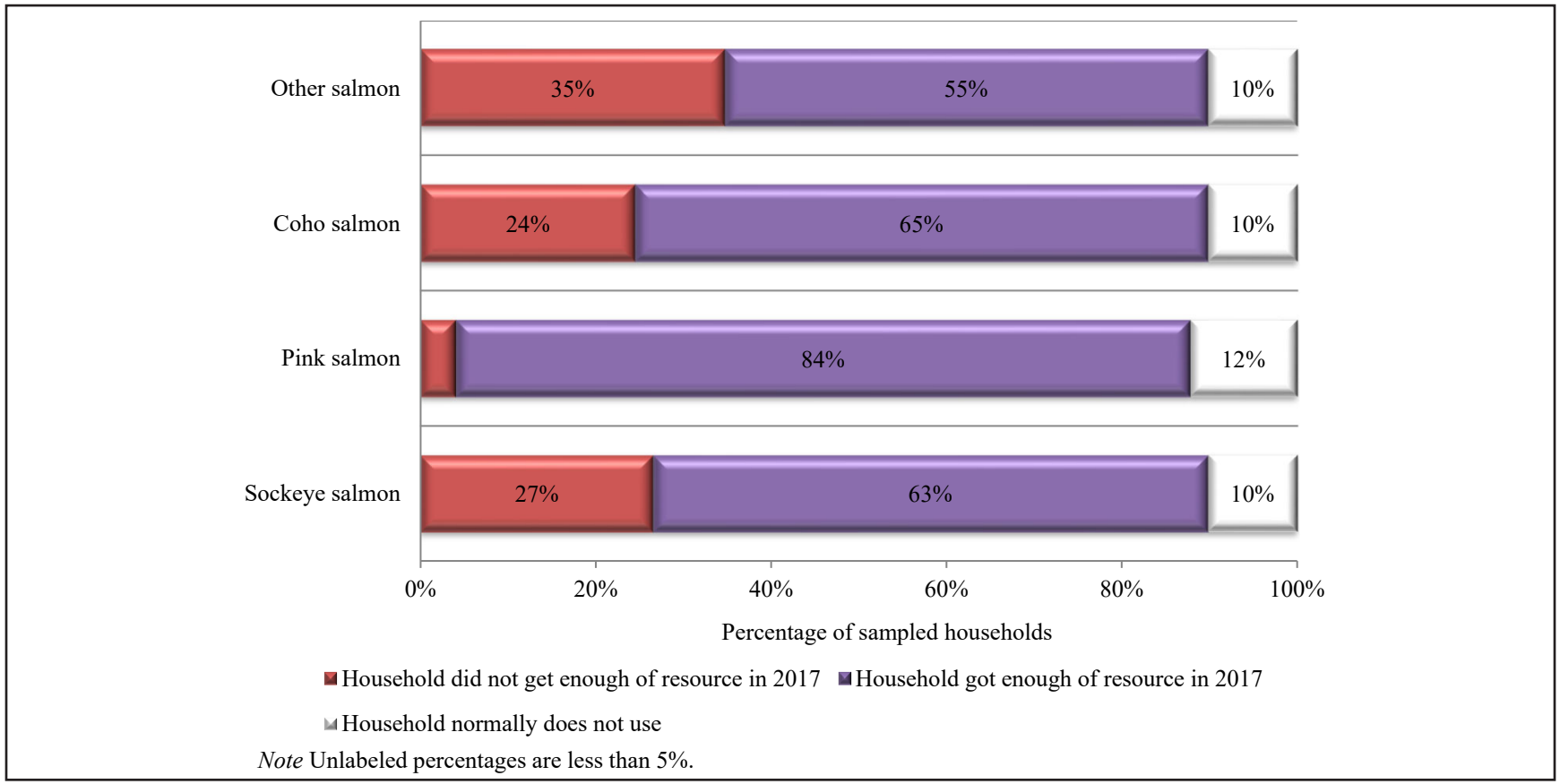

Figure 3-14.–Percentage of sampled households reporting whether they had enough resources, Port Graham, 2017.

Table 3-17.–Reported impact to households reporting that they did not get enough of a type of resource, Port Graham, 2017.

		Households not getting enough _____.				Impact to those not getting enough _____.									
	Sampled	Valid responses[a]		Did not get enough		No response		Not noticeable		Minor		Major		Severe	
Resource	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	49	44	89.8%	17	38.6%	1	5.9%	3	17.6%	6	35.3%	5	29.4%	2	11.8%
Coho salmon	49	44	89.8%	12	27.3%	0	0.0%	0	0.0%	6	50.0%	6	50.0%	0	0.0%
Pink salmon	49	43	87.8%	2	4.7%	0	0.0%	0	0.0%	2	100.0%	0	0.0%	0	0.0%
Sockeye salmon	49	44	89.8%	13	29.5%	0	0.0%	1	7.7%	7	53.8%	3	23.1%	2	15.4%

Source ADF&G Division of Subsistence household surveys, 2018.

a. Does not include households failing to respond to the question and those households that did not use the resource.

Table 3-18.–Things households reported doing differently as the result of not getting enough of a resource, Port Graham, 2016.

Resource	Valid responses[a]	Bought/bartered		Used more commercial foods		Replaced with other subsistence foods		Made do		Obtained food from other sources		Got public assistance	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	9	0	0.0%	6	66.7%	3	33.3%	1	11.1%	0	0.0%	0	0.0%
Coho salmon	9	1	11.1%	7	77.8%	1	11.1%	0	0.0%	1	11.1%	1	11.1%
Pink salmon	6	0	0.0%	4	66.7%	2	33.3%	0	0.0%	0	0.0%	1	16.7%
Sockeye salmon	13	0	0.0%	7	53.8%	7	53.8%	0	0.0%	0	0.0%	1	7.7%

Source ADF&G Division of Subsistence household surveys, 2016.

Note Respondents could provide multiple responses.

a. Does not include households failing to respond to the question and those households that did not use the resource.

Table 3-19.–Things households reported doing differently as the result of not getting enough of a resource, Port Graham, 2017.

Resource	Valid responses[a]	Bought/bartered		Used more commercial foods		Replaced with other subsistence foods		Asked others for help		Made do		Other	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	11	0	0.0%	6	54.5%	6	54.5%	0	0.0%	0	0.0%	0	0.0%
Coho salmon	12	0	0.0%	8	66.7%	6	50.0%	0	0.0%	0	0.0%	1	8.3%
Pink salmon	0	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Sockeye salmon	12	1	8.3%	8	66.7%	4	33.3%	0	0.0%	1	8.3%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2018.

Note Respondents could provide multiple responses.

a. Does not include households failing to respond to the question and those households that did not use the resource.

Table 3-20.–Reasons households did not have enough resources, Port Graham, 2016.

		Households not getting enough _____ .				Reasons for not getting enough _____ .							
	Sampled	Valid responses[a]		Did not get enough		Family/personal		Resource availability		Resource too far		Lack of equipment	
Resource	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	39	34	87.2%	12	35.3%	0	0.0%	5	41.7%	0	0.0%	3	25.0%
Coho salmon	39	33	84.6%	14	42.4%	1	7.1%	5	35.7%	0	0.0%	1	7.1%
Pink salmon	39	29	74.4%	8	27.6%	1	12.5%	5	62.5%	0	0.0%	2	25.0%
Sockeye salmon	39	36	92.3%	17	47.2%	0	0.0%	8	47.1%	0	0.0%	2	11.8%

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Table 3-20.–Continued.

		Households not getting enough _____ .				Reasons for not getting enough _____ .							
	Sampled	Valid responses[a]		Did not get enough		Did not receive		Not enough effort		Unsuccessful		Weather/environment	
Resource	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	39	34	87.2%	12	35.3%	3	25.0%	1	8.3%	1	8.3%	0	0.0%
Coho salmon	39	33	84.6%	14	42.4%	3	21.4%	3	21.4%	0	0.0%	1	7.1%
Pink salmon	39	29	74.4%	8	27.6%	1	12.5%	1	12.5%	0	0.0%	0	0.0%
Sockeye salmon	39	36	92.3%	17	47.2%	5	29.4%	2	11.8%	1	5.9%	1	5.9%

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Table 3-20.–Continued.

		Households not getting enough _____ .				Reasons for not getting enough _____ .					
	Sampled	Valid responses[a]		Did not get enough		Working/no time		Regulations		Gas prices too high	
Resource	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	39	34	87.2%	12	35.3%	3	25.0%	0	0.0%	1	8.3%
Coho salmon	39	33	84.6%	14	42.4%	5	35.7%	0	0.0%	1	7.1%
Pink salmon	39	29	74.4%	8	27.6%	2	25.0%	0	0.0%	0	0.0%
Sockeye salmon	39	36	92.3%	17	47.2%	2	11.8%	3	17.6%	1	5.9%

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Table 3-20.–Continued.

		Households not getting enough _____ .				Reasons for not getting enough _____ .			
	Sampled	Valid responses[a]		Did not get enough		Other		No reason given	
Resource	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	39	34	87.2%	12	35.3%	1	8.3%	0	0.0%
Coho salmon	39	33	84.6%	14	42.4%	1	7.1%	0	0.0%
Pink salmon	39	29	74.4%	8	27.6%	1	12.5%	1	12.5%
Sockeye salmon	39	36	92.3%	17	47.2%	1	5.9%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2016.

Note Respondents could provide multiple reasons for not getting enough resources.

a. Valid responses do not include households that did not provide any response to the assessment question asking if the household had enough of a resource.

Table 3-21.–Reasons households did not have enough resources, Port Graham, 2017.

		Households not getting enough _____ .				Reasons for not getting enough _____ .							
	Sampled	Valid responses[a]		Did not get enough		Family/personal		Resource availability		Resource too far		Lack of equipment	
Resource	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	49	44	89.8%	17	38.6%	0	0.0%	4	23.5%	1	5.9%	1	5.9%
Coho salmon	49	44	89.8%	12	27.3%	0	0.0%	7	58.3%	1	8.3%	1	8.3%
Pink salmon	49	43	87.8%	2	4.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Sockeye salmon	49	44	89.8%	13	29.5%	1	7.7%	2	15.4%	0	0.0%	0	0.0%

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Table 3-21.–Continued.

		Households not getting enough _____ .				Reasons for not getting enough _____ .							
	Sampled	Valid responses[a]		Did not get enough		Did not receive		Not enough effort		Unsuccessful		Weather/environment	
Resource	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	49	44	89.8%	17	38.6%	6	35.3%	1	5.9%	2	11.8%	1	5.9%
Coho salmon	49	44	89.8%	12	27.3%	2	16.7%	1	8.3%	0	0.0%	0	0.0%
Pink salmon	49	43	87.8%	2	4.7%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Sockeye salmon	49	44	89.8%	13	29.5%	6	46.2%	0	0.0%	1	7.7%	0	0.0%

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Table 3-21.–Continued.

		Households not getting enough _____ .				Reasons for not getting enough _____ .					
	Sampled	Valid responses[a]		Did not get enough		Working/no time		Regulations		Gas prices too high	
Resource	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	49	44	89.8%	17	38.6%	2	11.8%	1	5.9%	0	0.0%
Coho salmon	49	44	89.8%	12	27.3%	1	8.3%	0	0.0%	0	0.0%
Pink salmon	49	43	87.8%	2	4.7%	1	50.0%	0	0.0%	0	0.0%
Sockeye salmon	49	44	89.8%	13	29.5%	4	30.8%	0	0.0%	0	0.0%

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Table 3-21.–Continued.

		Households not getting enough _____ .				Reasons for not getting enough _____ .			
	Sampled	Valid responses[a]		Did not get enough		Other		No reason given	
Resource	households	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Other salmon	49	44	89.8%	17	38.6%	1	5.9%	1	5.9%
Coho salmon	49	44	89.8%	12	27.3%	1	8.3%	0	0.0%
Pink salmon	49	43	87.8%	2	4.7%	0	0.0%	1	50.0%
Sockeye salmon	49	44	89.8%	13	29.5%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2018.

Note Respondents could provide multiple reasons for not getting enough resources.

a. Valid responses do not include households that did not provide any response to the assessment question asking if the household had enough of a resource.

When asked why they used less salmon in 2017 than in previous years, respondents continued to cite resource availability, less sharing, and work conflicts across resources (Table 3-14). Resource availability was cited most for less use of coho salmon (by 38% of households), while less sharing was cited by the same percentage of households that used less sockeye salmon and "other salmon" (36% for both resources). Family and personal reasons were the second most cited reason for less use of sockeye salmon (25%). For pink salmon, 50% of responding households indicated merely that they did not get enough. Households that used more salmon in 2017 cited receiving more from others, increased effort, and greater availability as the main reasons (Table 3-15). Especially for sockeye salmon, increased effort contributed to increased use, cited by 71% of households that used more.

In 2016, 21%–44% of surveyed Port Graham households stated that they did not get enough salmon, depending on species (Figure 3-13). For each salmon resource, nearly one-half or more of surveyed households stated they got enough of the resource. The greatest percentage of households did not get enough sockeye salmon. When asked to rate the impact of a resource shortfall, the greatest percentage of responding households (36%–67% across species) called it major (Table 3-16). Between 25%–43% called the impact minor, and 8%–25% called it severe.

A greater percentage of surveyed households thought they got enough salmon in 2017 as compared to 2016 results, although 27% of surveyed households still noted shortfalls in sockeye salmon and 35% noted a lack of "other salmon" (figures 3-14 and 3-13). In 2017, assessments regarding the impact to the household shifted toward lower severity, with most responses for all species in the minor category (Table 3-17). Even so, 50% of households reported that the shortfall of coho salmon had a major impact on their household in 2017. In both years, households that did not get enough salmon mainly adapted by supplementing with other foods, both subsistence and commercial (tables 3-18 and 3-19).

In 2016, resource availability was the most-cited reason for shortfalls in all salmon resources: 63% of households that did not have enough said there were not enough pink salmon, 47% said the same of sockeye salmon, 42% for "other salmon," and 36% said there were not enough coho salmon (Table 3-20). Lack of equipment and work conflicts were each cited by one-quarter of households as the reason for a lack of both "other" and pink salmon. For coho salmon, 36% of households that did not get enough cited work conflicts or a lack of time for fishing.

For both sockeye and "other" salmon, households that did not have enough said that they received less fish from others—46% said they received less sockeye salmon and 35% said they did not receive enough "other salmon" (Table 3-21). Resource availability was still highly cited (by 58% of households) for a lack of coho salmon.

Harvest Data

Changes in the harvest of resources by Port Graham residents can also be discerned through comparisons with findings from other study years. The division has conducted subsistence harvest surveys in Port Graham for multiple study years, with results for salmon harvests dating back to 1987 when the baseline comprehensive survey was administered. These data were then updated every year between 1989–1993 in response to EVOS and then again in 1997 (Fall and Utermohle 1999) and 2003 (Fall 2006). Comprehensive resource surveys were carried out most recently in 2014 (Jones and Kostick 2016). In addition to the ADF&G Division of Subsistence Technical Papers cited above, all data from each study year are available through the CSIS.

During that period of record, salmon harvests in Port Graham have varied widely in both quantity and composition. Per capita estimates account for changes in both population and harvest and can be used to assess changes in Port Graham's harvest over time. Of note, the salmon per capita harvest estimates (in pounds) are based entirely on household survey reporting of both demographics and harvest quantity and cannot be directly compared against harvest data (reported in numbers of fish) gathered through the subsistence permit system. Also, the per capita harvests discussed in this section account for salmon harvested by all types of gear in all fisheries, and includes salmon retained from commercial harvests.

Port Graham's total per capita harvest was lowest in the year of the *Exxon Valdez* oil spill (40 lb per capita in 1989), with a general upward trend in the following decade (Table 3-22). In 1990–1997, salmon harvests increased to 95–144 lb per capita. Harvests reached a high point in 2003, at 264 lb per capita, before dropping back to 108 lb per capita in 2014. In the first study year of this project, Port Graham's estimated per capita harvest was the lowest it had been since EVOS, at 56 lb per capita. In the second year, harvests rebounded to 132 lb per capita.

When considered by species, volatility in sockeye salmon harvests has been the most significant driver in recent changes of overall per capita harvests. Prior to 2003, coho salmon contributed the most to per capita harvests in all study years, with sockeye at or near the bottom of per capita contributions. In 2003, however, the species composition shifted drastically, with sockeye salmon making up 46% of the total salmon harvest weight. While per capita harvest of all species dropped in 2014, sockeye salmon harvests remained high, at 50% of the total per capita harvest. In 2016, all species contributed about equally to the total per capita harvest. By 2017, sockeye salmon was back up to 46% of the total per capita harvest. These swings in the sockeye salmon harvest (and their influence on the total per capita salmon harvest) may be partially attributed to changes in the Nanwalek Salmon Enhancement Program (NSEP). In the early 1990s, when Port Graham's per capita sockeye salmon harvests were especially low, sockeye salmon escapement at the English Bay weir did not met the sustainable escapement goal of 10,000 fish until 1994 (Hammarstrom and Dickson 2004:44). Spanning 1993–2015, the second-highest sockeye salmon escapement at the English Bay weir occurred during the 2003 season (nearly 20,000 sockeye salmon), corresponding to the highest per capita harvests based on household surveys (Hollowell et al. 2017:78). However, because Port Graham fishers also catch sockeye salmon bound for streams other than the Nanwalek system (PG 2, PG7), the specifics of this correlation would require further research.

Table 3-22.–Historical per capita harvests of salmon, Port Graham, 1987, 1989–1993, 1997, 2003, 2014, and 2016–2017.

	1987		1989		1990		1991		1992		1993	
Resource	Per capita (lb)	95% confidence limit (±) harvest	Per capita (lb)	95% confidence limit (±) harvest	Per capita (lb)	95% confidence limit (±) harvest	Per capita (lb)	95% confidence limit (±) harvest	Per capita (lb)	95% confidence limit (±) harvest	Per capita (lb)	95% confidence limit (±) harvest
Salmon	**96.4**	**12.0**	**39.9**	**16.0**	**95.0**	**12.0**	**132.6**	**11.0**	**106.8**	**9.0**	**97.4**	**22.0**
Chum salmon	14.2	14.0	3.2	30.0	5.8	18.0	22.0	11.0	18.4	14.0	14.8	18.0
Coho salmon	36.9	14.0	15.3	18.0	37.6	16.0	48.1	16.0	35.1	11.0	25.2	14.0
Chinook salmon	7.5	20.0	4.1	78.0	16.0	19.0	19.1	15.0	14.4	15.0	24.6	17.0
Pink salmon	20.8	14.0	14.2	18.0	20.9	17.0	32.6	12.0	26.0	12.0	20.8	11.0
Sockeye salmon	16.3	20.0	3.1	38.0	13.0	28.0	10.8	15.0	12.9	18.0	11.9	17.0
Spawnouts	0.7	38.0			1.7	29.0						
Landlocked salmon												
Unknown salmon											0.1	50.0

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Table 3-22.–Continued.

	1997		2003		2014		2016		2017	
Resource	Per capita (lb)	95% confidence limit (±) harvest	Per capita (lb)	95% confidence limit (±) harvest	Per capita (lb)	95% confidence limit (±) harvest	Per capita (lb)	95% confidence limit (±) harvest	Per capita (lb)	95% confidence limit (±) harvest
Salmon	**144.2**	**19.0**	**264.4**	**23.1**	**107.5**	**32.3**	**55.7**	**30.3**	**132.7**	**30.9**
Chum salmon	24.4	23.0	30.1	26.6	17.5	41.4	10.3	46.8	13.7	29.4
Coho salmon	42.7	19.0	32.9	17.2	11.5	25.0	11.3	31.1	12.8	18.1
Chinook salmon	37.1	24.0	56.7	35.7	8.0	32.8	12.5	51.7	20.9	33.3
Pink salmon	22.8	26.0	22.9	16.6	17.1	38.9	10.5	40.2	24.3	35.6
Sockeye salmon	17.2	24.0	121.6	36.0	53.5	43.0	11.2	46.0	60.9	40.4
Spawnouts										
Landlocked salmon			0.1	1.1						
Unknown salmon										

Source ADF&G Community Subsistence Information System, or CSIS (accessed October 2023) for 1987–2014; ADF&G Division of Subsistence household surveys, 2017 and 2018.

Note Blank cells indicate no reported harvest of that resource for the study year.

Current and Historical Harvest Areas

Maps were produced from spatial data collection during household surveys to depict salmon harvest and use areas, and assume seasonal timeframes based on salmon availability and regulatory openings. In the 2016 and 2017 study years, Port Graham's search and harvest areas for all salmon species were centered around Port Graham Bay (figures 3-15 and 3-16). Port Graham residents reported a greater extent of search and harvest areas than their neighbors in Nanwalek, including in the Koyuktolik, Port Chatham, and Windy Bay subdistricts (figures 3-15 and 3-16; figures 2-15 and 2-16). Salmon use areas extended around the northern headland to Point Pogibshi in 2016 and in 2017 to Point Naskowhak located opposite Seldovia. In pursuit of salmon, Port Graham residents went south into Koyuktolik Bay in 2016, and past the mouth of Koyuktolik Bay in 2017, across the mouth of Port Chatham to Chugach Passage. While there is substantial overlap with the Nanwalek search and harvest areas, Port Graham respondents did not indicate fishing in English Bay directly adjacent to the community of Nanwalek. In Port Graham, search and harvest areas were largely similar between the two study years, with wider-ranging areas in 2017, including the head of Windy Bay.

While recording the locations of fishing areas, researchers also tagged each feature by gear type, allowing for the depiction of search areas specific to subsistence methods. As depicted in maps in Appendix D, gillnet fishing areas expanded considerably from 2016 to 2017. In the first study year, gillnet fishing was recorded only at the mouth of Port Graham Bay, on both the north and south shores. In 2017, all of those sites were fished, in addition to several sites closer to the community. More than double the number of households provided spatial data in 2017 than in 2016, providing a more comprehensive depiction of gillnet sites used by the community.

The earliest spatial data collected regarding Port Graham residents' wild resource harvest and use areas were collected jointly for Port Graham and Nanwalek. Data collection methods differed in additional key ways: spatial data were collected from a selection of active harvesters rather than from all surveyed households; use areas were temporally identified as contemporary, used throughout a lifetime, or used in a defined span of decades as opposed to just the study year; and at times researchers asked about the areas used for some resources as a category (or categories were combined) versus defining use areas by individual species. Two early projects offer a broad look at active subsistence use areas: see Stanek (1985:13, 152) and the *Alaska Habitat Management Guide Southcentral Region: Reference Maps—Volume 3: Community Use of Fish, Wildlife, and Plants* (ADF&G 1985). Because of these methodological differences, the earliest spatial data can be used to establish general extents but cannot be directly compared to the resource-specific harvest and use data collected in this report.

Prior to this study, the most recent harvest and search area data specifically for Port Graham salmon fishing come from the comprehensive harvest survey project conducted for the 2014 study year (Jones and Kostick 2016:339). Spatial data collection methods were nearly identical to the methods used in this study and indicate mostly overlapping areas, with polygons filling much of Port Graham Bay in both studies. Nearly all salmon search and harvest areas from 2014 continued to be used by Port Graham residents during the 2016–2017 study, except for English Bay and Rocky Bay (figures 3-15 and 3-16; Jones and Kostick [2016:339]). Spatial data published for 2014 include thin lines for certain search areas, while results for this study buffers similar search and harvest areas more thickly. The 2016–2017 maps also indicate several fishing locations that do not appear in the earlier report, including points in Seldovia, at the head of Tutka Bay, and on the English Bay River. The 2016–2017 maps also extend search areas across the mouth of Seldovia Bay.

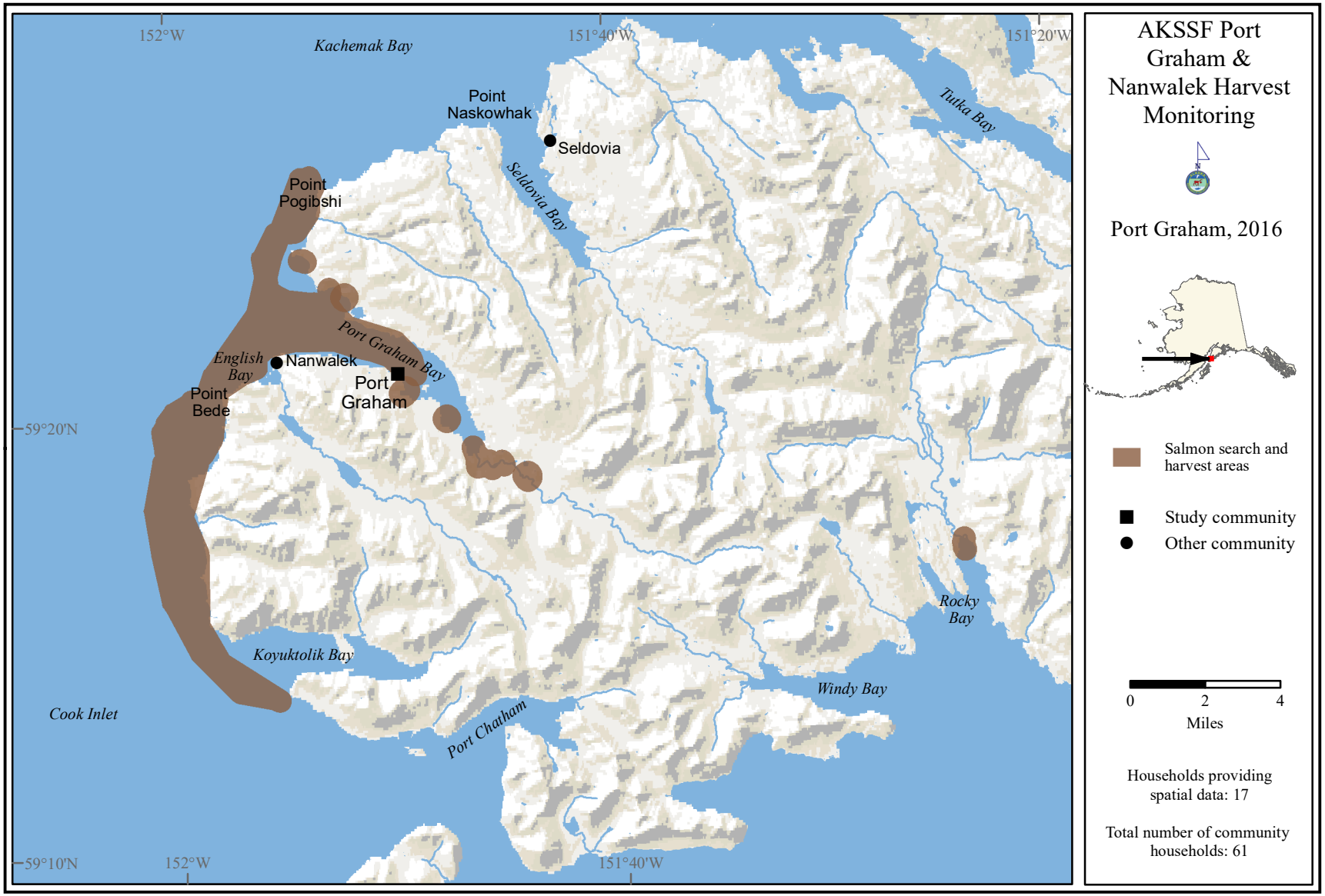

Figure 3-15.–All salmon search and harvest areas, Port Graham, 2016.

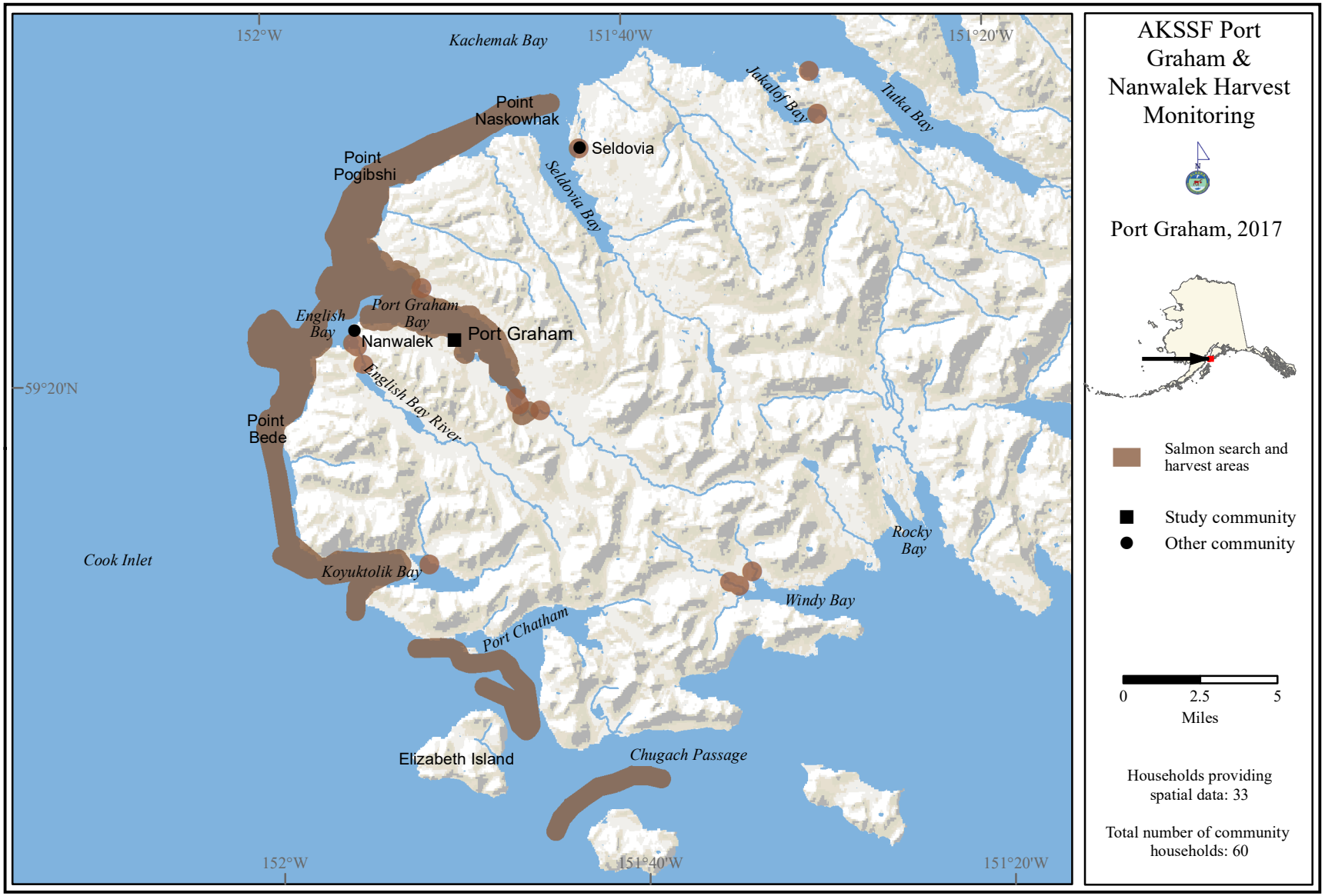

Figure 3-16.–All salmon search and harvest areas, Port Graham, 2017.

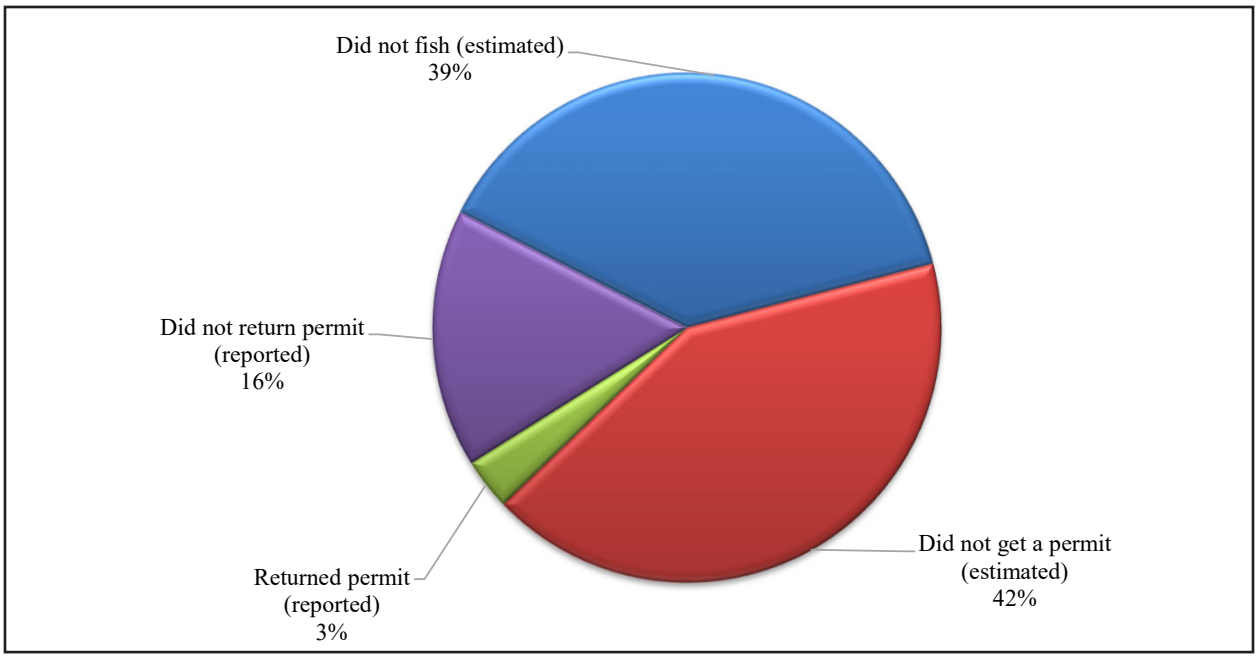

Figure 3-17.–Disposition of reported and estimated fishing and permit participation, Port Graham, 2016.

Subsistence Permits and Harvest Reporting in Port Graham

For each of the subsistence subdistricts used most heavily by Port Graham residents, ADF&G's annual harvest values are based on permit returns. Regulatory bodies such as the Alaska Board of Fisheries rely on permit returns to understand the subsistence harvest needs of the community and whether those needs are being met. In line with the study's research objectives, the household survey instrument investigated permit participation—or use and return of permits—by Port Graham households. During household surveys, respondents were asked to indicate if they had received a subsistence permit during the study year and whether they had returned that permit. While these data are necessarily partial because not all Port Graham households were surveyed each year, they provide useful context for the permit system's efficacy.

In 2016, of the estimated 61 Port Graham households, 39% (24 households) did not fish (Figure 3-17). An estimated 42% of households (26) fished but did not get a permit. There were 12 surveyed households that reported receiving a permit, indicating that 19% of the 61 Port Graham households fished and also got a permit (Table 3-23; Figure 3-17). Of the 12 households that reported receiving a permit in 2016, two said they returned it before being surveyed while 10 did not (Table 3-23). In 2017, a lower percentage of households did not fish (29%, or 17 of 60 eligible households), while 51% of households (31) fished but did not get a permit (Figure 3-18). There were 12 surveyed households that reported receiving a permit, indicating that 20% of Port Graham households fished with a permit in 2017 (Table 3-23; Figure 3-17). Of the 12 households that reported receiving a permit in 2017, three reported returning it before household surveys were conducted while nine did not (Table 3-23). In summary, while more households fished without a permit in 2017, those households that reported receiving permits also reported returning them before the survey occurred at about the same low rate as in 2016 (figures 3-17 and 3-18; Table 3-23). As in Nanwalek, survey timing likely contributed to the number of permits ultimately returned. In 2016, surveys were conducted before the reporting deadline of November 30, and contact with researchers may have reminded fishers to return their permits. While only two households said that they had returned permits during household surveys in 2016, 12 permits were ultimately returned to the Homer office (see footnote on Table 2-23). For the 2017 study year, household surveys occurred after the reporting deadline, and, as in Nanwalek, the correspondence between reported permit participation during surveys and returned permits was higher—three permits were reported returned by surveyed households and three were ultimately

Table 3-23.–Permit participation, Port Graham, 2016 and 2017.

Category	2016	2017
Eligible households	61	60
Households surveyed	39	49
Estimated fishing households	37.5	42.9
Households receiving a subsistence salmon permit	12	12
Households returning a subsistence salmon permit[a]	2	3

Sources ADF&G Division of Subsistence household surveys, 2016 and 2018, and ADF&G Division of Sport Fish annual subsistence permits, 2016 and 2017.
Note Households receiving and returning permits are based on actual issued and returned permits in the permit system and estimated fishing households are based on survey responses that include any gear type.
a. Total current responses for 2016 for Port Graham indicate 12 returned permits; prior to conducting fieldwork only 2 permits had been returned.

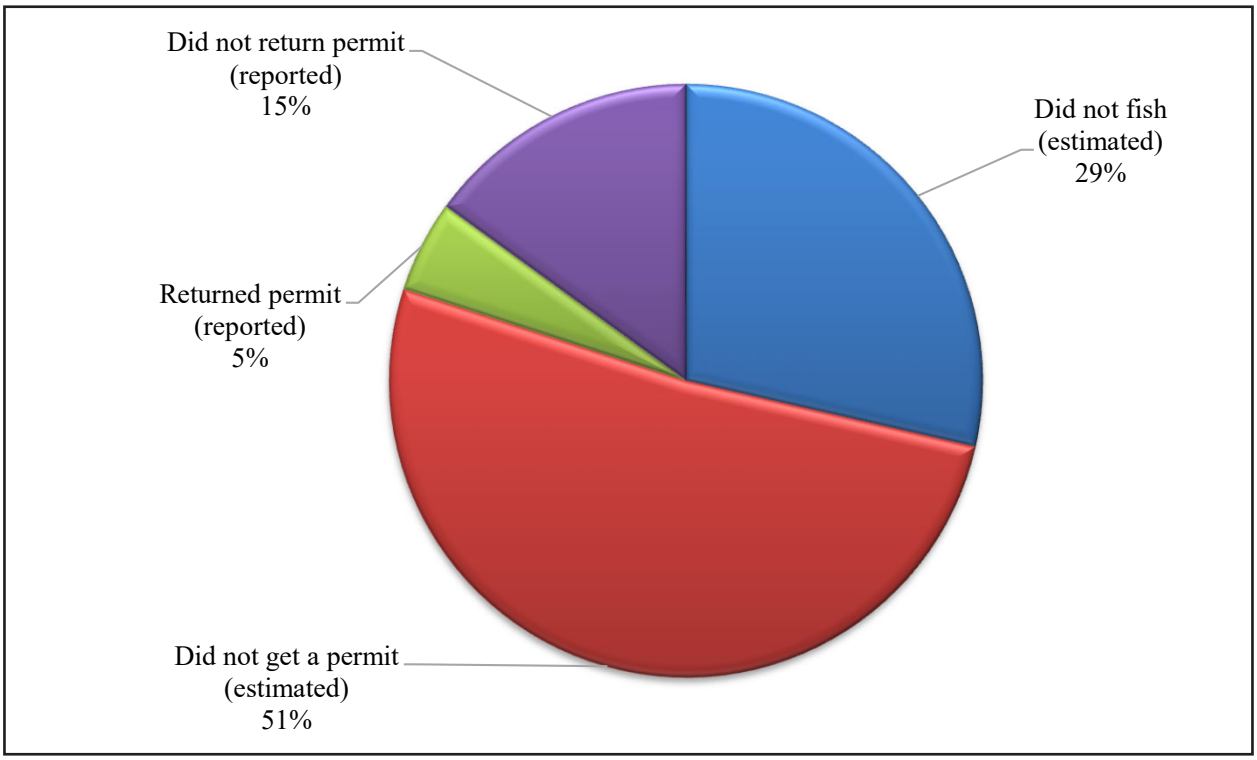

Figure 3-18.–Disposition of reported and estimated fishing and permit participation, Port Graham, 2017.

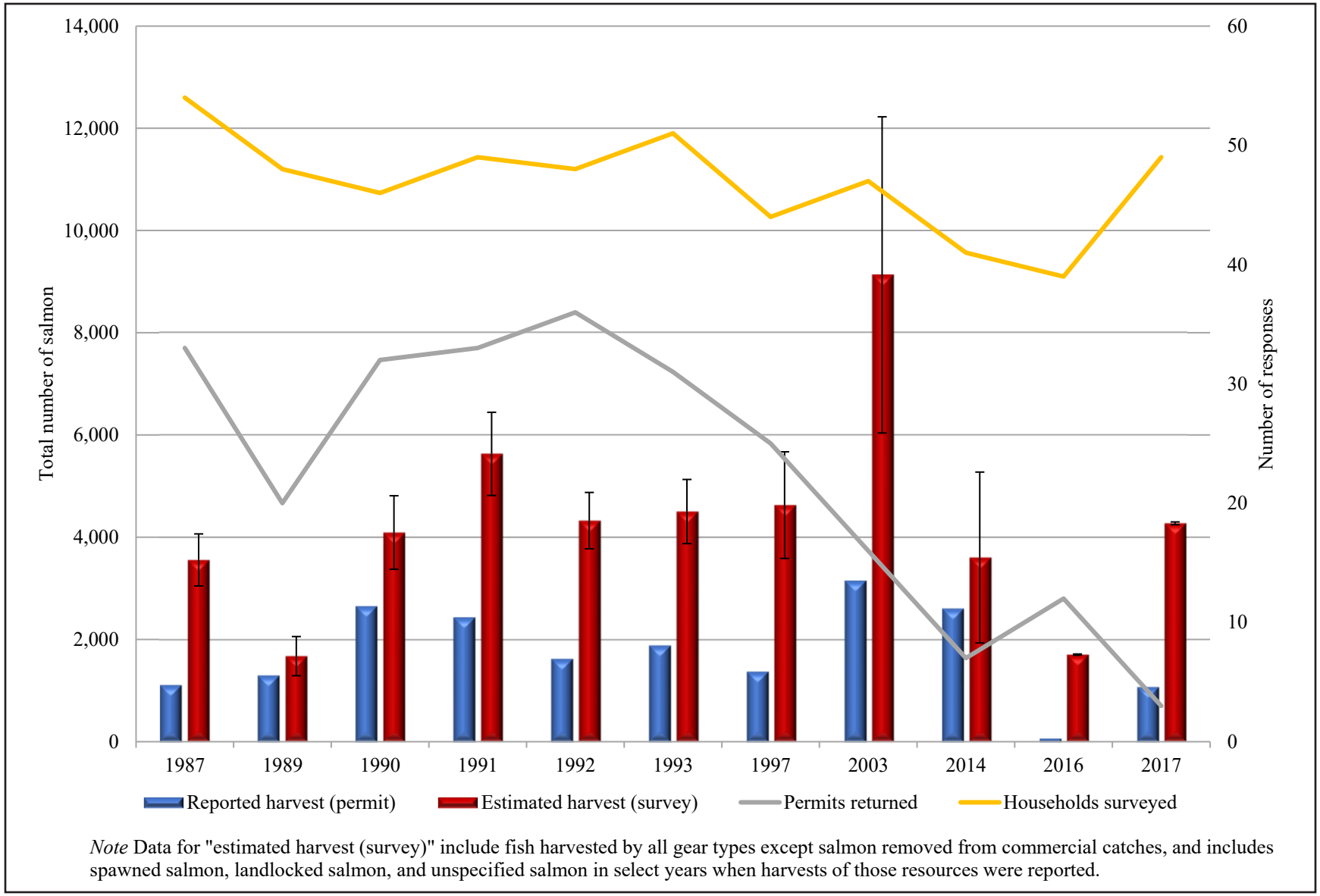

Figure 3-19.–Salmon harvests as reported in returned permits and estimated from household surveys, Port Graham, 1987, 1989–1993, 1997, 2003, 2014, and 2016–2017.

Table 3-24.–Salmon harvests based on returned permits and household surveys, Port Graham, 1987, 1989–1993, 1997, 2003, 2014, and 2016–2017.

	Permits[a]			Household surveys			
Year	Permits issued	Permits returned	Reported salmon harvest (ind)	Total households	Surveyed households	Reported salmon harvest (ind)	Estimated salmon harvest (ind)
1987	–	33	1,114	63	54	3,047	3,556
1989	–	20	1,303	61	48	1,319	1,675
1990	–	32	2,653	55	46	3,422	4,093
1991	–	33	2,433	58	49	4,758	5,631
1992	–	36	1,625	58	48	3,578	4,324
1993	–	31	1,885	61	51	3,766	4,502
1997	–	25	1,378	63	44	3,234	4,629
2003	–	16	3,153	65	47	6,581	9,131
2014	18	7	2,606	58	41	2,516	3,603
2016	12	12	72	61	39	1,089	1,705
2017	12	3	1,076	60	49	3,489	4,272

Sources ADF&G Community Subsistence Information System, or CSIS (accessed October 2023), for household surveys, 1987–2014; ADF&G household survey surveys, 2016 and 2018, for household surveys, 2016–2017; Hollowell et al. (2019a:134) for permit data (permits returned and salmon harvest); ADF&G Division of Sport Fish annual subsistence permits, 2014, 2016, and 2017 for permit data (permits issued).

Note The reported and estimated harvest data from "household surveys" include fish harvested by all gear types except salmon removed from commercial catches.

Note The reported and estimated harvest data from "household surveys" include spawned salmon, landlocked salmon, and unspecified salmon in select years when harvests of those resources were reported.

a. No issued permit information available from 1987–2003, as denoted by "–" above.

returned. In both years, too few households in Port Graham returned permits for the division to carry out meaningful statistical comparisons (such as t-tests) between households that indicated that they had returned the permit and households that did return a permit to the Homer office. Due to low permit returns in both study years, it is also difficult to meaningfully compare total harvests as estimated from household surveys with reported harvests gathered through the permit system. In general, though, estimates based on household surveys are substantially higher than the number of harvested fish reported on returned permits. In 2016, for example, 72 salmon were harvested by Port Graham households according to the subsistence permit system, which accounts for 4% of the 1,705 total salmon harvested in that year as estimated from household surveys (Figure 3-19; Table 3-24). In 2017, permit data show 1,076 fish were harvested, or 25% of the estimated 4,265 salmon harvested in that year. As seen in Figure 3-19, mismatches like these are not uncommon in Port Graham's historical permit reporting in comparison to the household survey estimates. Permit monitoring for Port Graham began in 1981, and household surveys with estimated harvest amounts are available for comparison in 11 years, dating back to 1987. The relationship between reported and estimated harvests has varied: except for an anomalously low correspondence between reported harvests and survey estimates in 2016, reported harvests accounted for 25%–77% of the estimated harvests. As in Nanwalek, Port Graham's total number of returned permits has dropped over time. In the 1990s, for example, between 25 and 36 permits were returned during every year for which survey estimates are also available (Table 3-24). In contrast, 12 or fewer permits were returned during the most recent three study years: 7 in 2014, 12 in 2016, and 3 in 2017. This decline in participation corresponds with the 2012 changes

to the permit daily harvest record tools and limited in-person involvement from Division of Subsistence staff, but could also be a reflection of more concentrated fishing activities, where a smaller number of fishers provide the majority of salmon for the community.

Local Comments and Concerns

Following is a summary of local observations of wild resource populations and trends that were recorded during the surveys, key respondent interviews, and participant observation trips, and during the community review meeting of preliminary data. Some households did not offer any additional information during the surveys, so not all households are represented in the summary.

Researchers completed several trips to the study communities to conduct informal and formal interviews to better understand subsistence salmon needs, harvests, and permit concerns in each community. Researchers conducted eight KRIs in Port Graham over the two study years. An interview protocol developed for year two of the project study period guided a majority of the interviews and provided information tailored to the research objectives (Appendix B). Researchers also observed rod and reel fishing in Port Graham and traveled to fishing locations at Koyuktolik (Dogfish) Bay.

During participant observation and KRIs, individuals in Port Graham reported difficulty with the current harvest recording system. Despite being printed on Rite in the Rain[5] paper, permits deteriorate in wet weather and on fishing boats, as well as at fishing locations, which discourages onsite recording of harvests. During KRIs, community meetings, and survey data collection, community members overwhelmingly stated they preferred the prior (pre-2012) practice of issuing a permit as well as a calendar for daily harvest recording. Many requested a return to this record keeping format. As one Port Graham key respondent said:

> I think calendars would be the best for everybody, I do. … I just hope they make a new calendar for us, you know. I really want that more than anything and I know a lot of people do, but I just don't want them to ever shut us down. (PG2)

In both 2016 and 2017, several Port Graham residents expressed concern that the two sections of the Port Graham subsistence subdistrict (Nanwalek section in the south, Port Graham section in the north) have been subject to the same emergency closures, even while they perceive that fish in the two sections belong to separate stocks (PG2, PG7, PG8). These respondents visually distinguished sockeye salmon returning to the Port Graham section from those returning to Nanwalek, and demonstrated long-term, observational experience with fish movement, weather patterns, and availability. Speaking to this familiarity with local runs, one respondent indicated the separation on a map:

> Our traditional knowledge said, you know, this is the extent of the Nanwalek [run], and some over here, but not as many as this one, up and down this side. So, if they wanted to protect the Nanwalek run they could shut the Nanwalek portion down and leave this. (PG2)

Expressing a similar frustration, another respondent noted that "if they decide that the run's not enough in Nanwalek they don't just shut down Nanwalek, they shut down everything, the whole [subdistrict]" (PG8). A third Port Graham resident noted that while maintaining escapement levels is important for fisheries management, managers sometimes make sectional closures based on what the respondent believed to be irrelevant escapement counts. "Really," they said, "that [count] is somewhere in a different location [English Bay weir] that doesn't really pertain to us, you know, that's like, the other side of the bay or somewhere else" (PG7). Further research, including genetic testing of salmon caught in each community, could be compared with local methods for distinguishing salmon from each stream system and suggest ways to incorporate local knowledge of those differences into management practices.

Port Graham residents also recognized positive aspects of management of the subsistence fishery, such as regular closures occurring mid-week (see 5 AAC 01.560) so that people can harvest salmon on the

5. Fisheries management reports have described permits as being printed on Rite in the Rain paper, including in both study years: see Hollowell et al. (2017; 2019b).

weekends. At the same time, respondents noted that further improvements are possible, such as leaving subsistence fisheries open all week, "Just so we can catch them when they are running … and work with the weather" (PG2).

When asked whether harvest reporting would be simplified by online reporting, responses were mixed. Subsistence permits for all subdistricts have been available online (as of 2020), and further study is necessary to determine the local perception of online reporting and its efficacy in supporting estimation of harvest totals.

As noted earlier in the report, many Port Graham residents meet their yearly salmon needs with a mix of gillnetting, trolling, and rod-and-reel fishing. Responses during the KRIs suggest that residents support a reconsideration of subsistence methods for salmon fishing. As one Port Graham key respondent stated, distinctions between subsistence and sport gear tries "…to determine that this gear type is not subsistence- because we [the managers] wanna keep it like what they did a hundred years ago- to not let them get into commercial types of thinking" (PG2). Instead, he said, subsistence should be defined by: "'What do you need for the summer?', 'What do you need for your family?', 'What do you need to share?' And that's a finite number, I think."

When considering the continuation of the subsistence salmon fishery, Port Graham residents emphasized that subsistence practices provide more than just food security. "I think back to when it was survival of the community relying on these things," said one resident (PG5). This resident continued:

> Back then, it was more or less based on real survival needs, for everyone to eat. But I think we are facing a different type of survival, where it is a cultural survival of the village. (PG5)

Whatever the regulatory changes, respondents indicated that communication and trust with ADF&G could be improved (PG8). As noted by one respondent, "I think the biggest problem that we have now is the impression that Fish and Game uses [permit data] to close us down" (PG2). The community engagement facilitated by this study may provide groundwork for effective, two-way communication between ADF&G and subsistence users in Port Graham.

> Right now, there should be people [being] open and honest about the way our lifestyle- our fishing- is. And the way it's heading, the road it's going down. Because without opening our minds, our hearts, and our thoughts, and giving them, then nothing is going to get done. … [B]y telling you the way things are going, maybe you can help me find a way to help my people to save their fish, their way of life, the way we eat. We need our food. (PG4)

4. DISCUSSION AND CONCLUSIONS

Overview of Findings for Nanwalek and Port Graham, 2016–2017

The household surveys conducted as part of this study provide updated information on the harvest and use of all salmon species in Nanwalek and Port Graham, with special attention to asking households about subsistence permit participation and reporting. As the updated quantitative and qualitative data show, salmon remains an important component of daily life in both communities. Even with variable runs, environmental and regulatory impediments to fishing, and large-scale changes to local economy and demographics, residents continue to identify subsistence salmon harvests as essential to both food security and cultural inheritance.

In order to understand and provide for these social, cultural, and food security needs, fisheries managers require reliable, annual estimates of harvest and use. At present, the subsistence permit system provides the only annual harvest monitoring data for salmon in Lower Cook Inlet subdistricts. However, because permit returns have never been expanded, they provide only a partial measure of the annual total harvest. Permit-based expansions would be both convenient and cost-effective, as well as provide information to managers within actionable timescales.

However, several factors continue to make such expansions difficult. First, as noted in the chapters presenting community-specific results, permit participation has dropped substantially since 2012 when changes to the daily catch records occurred. There is also considerable variability in permit return rates and harvest reporting, resulting in a poor relationship between reported salmon harvests and actual salmon harvests to the extent that modeling harvest estimates based on returned permits is problematic. For both communities, permit monitoring has been in place since 1981. Household surveys with estimated harvest amounts are available for comparison in 11 years, stretching back to 1987. Over that time, Port Graham's permit reports have fluctuated between 4%–78% of the estimated total salmon harvest based on division surveys, with some of the highest and lowest correspondences occurring in recent study years: permit reports were 72% of the estimated harvest in 2014 and 4% of estimated harvest in 2016. Across the same period of record in Nanwalek, permit reports have been as low as 0.2% of estimated harvest (1997) and as high as 76% (1991). In 2014, permit reports were 5% of survey estimates; in 2016, they rose to 31%, then dropped to 3% of survey estimates by 2017.

While this report addresses permit data through 2017, three more years of permit records were available at the time of this publication. These data suggest a continuing trend toward low permit participation, with no more than six permits returned annually between both communities (Brown et al. 2023:190). Nanwalek did not return any subsistence salmon permits in 2020 (Brown et al. 2023:191). Household surveys indicated that participation in salmon fishing increased between the two study years in both communities, with increased run abundance in 2017 a likely factor to increased fishing activity; however, most of that increase occurred in households that fished without a permit. Of note, the number of surveyed fishing households that had a permit and returned the permit was increased in 2016 in both study communities compared to 2017 (tables 2-23 and 3-23). One factor may be that surveys were conducted before permits were due back to the ADF&G Homer office, which may have contributed to increased participation in returning permits. In 2017, significantly fewer permits were returned for both communities.

Recommendations

The ADF&G Division of Subsistence recommends the following changes to the current subsistence salmon permit system administered by the ADF&G Division of Commercial Fisheries:

- Implement a dual system of subsistence permit distribution that issues permits for subsistence fishing activities alongside a monthly harvest calendar (similar to those previously used in both communities before 2012 and currently used in salmon systems such as the Yukon and

Kuskokwim rivers) to be used as a data recording tool for harvests by all gear types in order to meet both community and department harvest recording needs.

- Divisions of Subsistence and Commercial Fisheries staff work with the communities' local tribal councils each spring to: a) conduct a collaborative in-person community outreach campaign to display informational posters, distribute outreach materials, and disseminate fisheries information from the prior year; b) issue subsistence fishing permits and harvest calendars in-person; and c) collect the previous winter's Chinook salmon harvest data in person.
- Divisions of Subsistence and Commercial Fisheries staff work collaboratively with the communities' tribal councils to: a) conduct mid-season visits to listen to community concerns, local knowledge, and observations about the fisheries; b) discuss use of harvest calendars; and c) provide in-season fisheries information to the communities through efforts at the tribal council offices and by visiting households in the communities.
- Divisions of Subsistence and Commercial Fisheries staff work collaboratively with the communities' tribal councils to collect permits and harvest calendars at the end of the subsistence season after the coho salmon harvests are complete.
- Incorporate local Alaska Native language on permits, harvest recording tools (i.e., monthly harvest calendar), and outreach materials.
- Divisions of Subsistence and Commercial Fisheries staff work collaboratively with individual community tribal councils, city governments, and other stakeholders to implement a Lower Cook Inlet/Prince William Sound region-wide campaign tailored to the needs of each community.
- Division of Subsistence staff collaborate with the Chugach Regional Resources Commission (CRRC) fisheries biologist for concentrated outreach efforts on regulations, fish runs, and permit participation.

Each of these improvements, or a combination of several, may support two-way communication of fisheries information or improve harvest data collection through permit issuance and returns, harvest calendars, and other community-specific mechanisms. Note that the permit system has undergone another recent change since this study was conducted: starting in 2020, fishers have the option of obtaining a subsistence permit online and reporting harvests online. As such, the division recommends the administration of a user survey to measure fishers' experience with and perspective on the new online system of obtaining subsistence salmon permits and reporting harvest data.

Conclusions

Alongside specific recommendations for the permit system, this study identifies several areas for ongoing research. The spatial data from this report demonstrated that search and harvest areas for both communities have remained largely consistent since the most recent (2014) mapping effort, with a notable, but not fully understood contraction of search areas by Nanwalek households. Further mapping and ethnographic interviewing efforts might elucidate the rich understanding that residents of Nanwalek and Port Graham have for fish movements, the distribution of fish within the water column, and changes in those patterns over time.

As in many other coastal Alaska communities, commercial and subsistence fishing in Port Graham and Nanwalek have a complex relationship. While commercial fisheries participation has declined in both communities since EVOS, further research could identify the ways in which skills, equipment, and attitudes gleaned from commercial fishing may influence community participation in subsistence harvests. Studying

the variation in commercial permits held and fished between the two communities may provide further insight into these topics.

Research on community harvest and permit participation is ongoing, with household surveys planned for winter 2024. This upcoming survey effort also intends to make a more directed assessment of the new (2020) online harvest reporting platform, as well as consider trends toward increasing specialization in both communities.

ACKNOWLEDGMENTS

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REFERENCES CITED

ACUNS (Association of Canadian Universities for Northern Studies). 2003. *Ethical principles for the conduct of research in the North*. The Association = L'Association: Ottawa. ISBN 0-921421-10-9 https://acuns.ca/wp-content/uploads/2010/09/EthicsEnglishmarch2003.pdf

ADF&G (Alaska Department of Fish and Game). 1985. *Alaska habitat management guide, Southcentral region: reference maps—volume III: community use of fish, wildlife, and plants*. Alaska Department of Fish and Game Division of Habitat: Juneau. http://www.arlis.org/docs/vol1/C/AHMG/index.html

Braund, S.R. 1982rev. *[1980] Cook Inlet subsistence salmon fishery*. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 54. http://www.adfg.alaska.gov/techpap/tp054.pdf

Braund, S.R. and S.R. Behnke. 1980. *Lower Cook Inlet petroleum development scenarios sociocultural systems analysis*. Alaska OCS Socioeconomic Studies Program, Technical Report No. 47. Prepared for the Bureau of Land Management, Alaska Outer Continental Shelf Office: Anchorage. http://www.boem.gov/BOEM-Newsroom/Library/Publications/1980/80_TR47.aspx

Brown, C.L., T. Bembenic, M. Brown, H. Cold, J. Coleman, E. Donaldson, J. Egelhoff, B. Jones, J.M. Keating, L.A. Sill, M. Urquia, C. Wilcox, and T. Barnett. 2023. *Alaska Subsistence and Personal Use Salmon Fisheries 2020 Annual Report*. Alaska Department of Fish and Game Division of Subsistence, Technical Paper No. 494: Anchorage. http://www.adfg.alaska.gov/techpap/TP494.pdf

Cochran, W.G. 1977. *Sampling techniques*. 3rd edition. John Wiley & Sons: New York.

Cook Inlet Regional Planning Team. 2007. *Cook Inlet Regional Salmon Enhancement Planning Phase II Plan: 2006–2025*. Alaska Department of Fish and Game Division of Commercial Fisheries: n.p. https://www.adfg.alaska.gov/static/fishing/PDFs/hatcheries/plans/ci_salmonenhancement_p2_2006-2025.pdf

Csoba DeHass, M. 2007. *Daily negotiation of traditions in a Russian Orthodox Suqpiaq village in Alaska*. Ethnology 46(3), pages 205–216.

Fall, J.A. 2006. *Update of the status of subsistence uses in* Exxon Valdez *oil spill area communities, 2003*. Alaska Department of Fish and Game Division of Subsistence, Technical Paper No. 312: Juneau. http://www.adfg.alaska.gov/techpap/tp312.pdf

———. 2013. *Report on proposed changes to nonsubsistence areas*. Alaska Department of Fish and Game Division of Subsistence, Technical Paper No. 386: Anchorage. http://www.adfg.alaska.gov/techpap/TP386.pdf

Fall, J.A., N.M. Braem, S.S. Evans, L. Hutchinson-Scarbrough, B. Jones, R. La Vine, T. Lemons, M.A. Marchioni, E. Mikow, J.T. Ream, and L.A. Sill. 2014. *Alaska subsistence and personal use salmon fisheries 2012 annual report*. Alaska Department of Fish and Game Division of Subsistence, Technical Paper No. 406: Anchorage. http://www.adfg.alaska.gov/techpap/tp406.pdf

Fall, J.A., C.L. Brown, D. Caylor, S. Georgette, T. Krauthoefer, and A.W. Paige. 2003. *Alaska subsistence fisheries 2002 annual report*. Alaska Department of Fish and Game Division of Subsistence, Technical Paper No. 315: Juneau. http://www.adfg.alaska.gov/techpap/tp315.pdf

Fall, J.A., C.L. Brown, S.S. Evans, R.A. Grant, H. Ikuta, L. Hutchinson-Scarbrough, B. Jones, M.A. Marchioni, E. Mikow, J.T. Ream, L.A. Sill, and T. Lemons. 2015. *Alaska subsistence and personal use salmon fisheries, 2013 Annual Report*. Alaska Department of Fish and Game Division of Subsistence, Technical Paper No. 413: Anchorage. http://www.adfg.alaska.gov/techpap/TP413.pdf

Fall, J.A., A. Godduhn, G. Halas, L. Hutchinson-Scarbrough, B. Jones, B. McDavid, E. Mikow, L.A. Sill, and T. Lemons. 2020. *Alaska subsistence and personal use salmon fisheries 2017 annual report*. Alaska Department of Fish and Game Division of Subsistence, Technical Paper No. 451: Anchorage. http://www.adfg.alaska.gov/techpap/TP451.pdf

Fall, J.A., M.F. Turek, N.M. Braem, J.J. Simon, W.E. Simeone, D.L. Holen, L.C. Naves, L. Hutchinson-Scarbrough, T. Lemons, V. Ciccione, T.M. Krieg, and D.S. Koster. 2009. *Alaska subsistence salmon fisheries 2007 annual report*. Alaska Department of Fish and Game Division of Subsistence, Technical Paper No. 346: Anchorage. http://www.subsistence.adfg.state.ak.us/techpap/TP346.pdf

Fall, J.A. and C. Utermohle. 1999. *Subsistence harvests and uses in eight communities ten years after the* Exxon Valdez *oil spill*. Division of Subsistence, Alaska Department of Fish and Game: Juneau, AK.

Goldsman, D. and P. Goldsman. 2021. *A first course in probability and statistics*. Self-published (Lulu Press, Inc.): Atlanta, GA; Syracuse, NY.

Hammarstrom, L.F. and M.S. Dickson. 2003. *2002 Lower Cook Inlet annual finfish management report*. Alaska Department of Fish and Game Division of Commercial Fisheries, Regional Information Report No. 2A03-04: Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/RIR.2A.2003.04.pdf

———. 2004. *2003 Lower Cook Inlet annual finfish management report*. Alaska Department of Fish and Game Division of Commercial Fisheries, Regional Information Report No. 2A04-01: Anchorage. http://www.sf.adfg.state.ak.us/fedaidpdfs/RIR.2A.2004.01.pdf

———. 2006. *2005 Lower Cook Inlet annual finfish management report*. Alaska Department of Fish and Game, Fishery Management Report No. 06-35: Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/fmr06-35.pdf

Hollowell, G., E.O. Otis, and E. Ford. 2014. *2013 Lower Cook Inlet area finfish management report*. Alaska Department of Fish and Game, Fishery Management Report No. 14-30: Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR14-30.pdf

———. 2017. *2016 Lower Cook Inlet Area finfish management report*. Alaska Department of Fish and Game, Fishery Management Report No. 17-26: Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR17-26.pdf

———. 2019a. *2018 Lower Cook Inlet Area finfish management report*. Alaska Department of Fish and Game, Fishery Management Report No. 19-23: Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR19-23.pdf

———. 2019b. *2017 Lower Cook Inlet Area finfish management report*. Alaska Department of Fish and Game, Fishery Management Report No. 19-08: Anchorage. www.adfg.alaska.gov/FedAidPDFs/FMR19-08.pdf

Hollowell, G., T. Otis, and E. Ford. 2013. *2012 Lower Cook Inlet area finfish management report*. Alaska Department of Fish and Game, Fishery Management Report No. 13-36: Anchorage. https://www.adfg.alaska.gov/FedAidPDFs/FMR13-36.pdf

Jones, B. and M.L. Kostick, eds. 2016. *The harvest and use of wild resources in Nikiski, Seldovia, Nanwalek, and Port Graham, Alaska, 2014*. Alaska Department of Fish and Game Division of Subsistence, Technical Paper No. 420: Anchorage. http://www.adfg.alaska.gov/techpap/TP420.pdf

Keating, J.M., D. Koster, and J.M. Van Lanen. 2020. *Recovery of a subsistence way of life: assessments of resource harvests in Cordova, Chenega, Tatitlek, Port Graham, and Nanwalek, Alaska since the* Exxon Valdez *oil spill*. Alaska Department of Fish and Game Division of Subsistence, Technical Paper No. 471: Anchorage. http://www.adfg.alaska.gov/techpap/TP471.pdf

Salomon, A., N. Tanape, and H. Huntington. 2011. *Imam cimiucia =: Our changing sea*. Alaska Sea Grant College Program: Fairbanks, Alaska. ISBN 978-1-56612-159-0

Social Science Task Force, U.S. Interagency Arctic Research Policy Committee. 1995. *Principles for the conduct of research in the Arctic*. Arctic Research of the United States Vol 9(Spring), pages 56–57, https://www.iarpccollaborations.org/uploads/cms/documents/arotus-9.1995-spring.pdf.

Stanek, R.T. 1981. *Preliminary harvest data: Port Graham/English Bay subsistence set net fishery.* Alaska Department of Fish and Game Division of Subsistence, Technical Paper No. 29. http://www.adfg.alaska.gov/techpap/tp029.pdf

Stanek, R.T. 1985. *Patterns of wild resource use in English Bay and Port Graham, Alaska*. Alaska Department of Fish and Game Division of Subsistence, Technical Paper No. 104. http://www.adfg.alaska.gov/techpap/tp104.pdf

Stanek, R.T. 2000. *Ethnographic overview and assessment for Nanwalek and Port Graham*. Alaska Department of Fish and Game Technical Memorandum No. 8. Submitted to U.S. Department of the Interior, Minerals Management Service, Cooperative Agreement No. 14-35-0001-30788: Anchorage.

Stopha, M. 2012. *An evaluation of the Port Graham salmon hatchery for consistency with statewide policies and prescribed management practices*. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 5J12-28: Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/RIR.5J.2012.28.pdf

U.S. Census Bureau. n.d. *2010 Decennial Census and American Community Survey data*. U.S. Department of Commerce, Bureau of the Census, Explore Census Data Homepage: Washington, D.C. https://data.census.gov/cedsci/

Wolfe, R.J. 1987. *The super-household: specialization in subsistence economies*. Paper presented at the 14th annual meeting of the Alaska Anthropological Association, March 1987, Anchorage, Alaska. Alaska Department of Fish and Game Division of Subsistence: Juneau.

Wolfe, R.J., C.L. Scott, W.E. Simeone, C.J. Utermohle, and M.C. Pete. 2010. *The "super-household" in Alaska Native subsistence economies*. Final Report to the National Science Foundation, Project ARC 0352611.

Workman, W.B. and K.W. Workman. 1988. "*The Last 1300 Years of Prehistory in Kachemak Bay: Where Later is Less*" [in] R.D. Shaw, R.K. Harritt, and D.E. Dumond, eds. *The Late Prehistoric Development of Alaska's Native People*. Alaska Anthropological Association Monograph Number 4: Aurora.

APPENDIX A—SURVEY FORM SAMPLE (STUDY YEAR 2017)

Lower Cook Inlet Management Area, Port Graham & Nanwalek subsistence fisheries

From January 1st, 2017 to December 31st, 2017

This survey is used to estimate subsistence harvests and uses in Nanwalek for 2017. Additional questions will be asked to compare your household's use and harvest of salmon in previous years. We share this information with the Alaska Department of Fish and Game, the U.S. Fish and Wildlife Service, the National Park Service, the Alaska Board of Fisheries, and the Federal Subsistence Board. We work with local Fish and Game Advisory Committees and the Federal Regional Advisory Councils 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:		129
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

NANWALEK VILLAGE IRA
PO BOX 8028
NANWALEK, AK 99603
907-281-2274

HOUSEHOLD MEMBERS

HOUSEHOLD ID

First, I would like to ask about the people in your household, permanent members of your household who sleep at your house. This includes students who return home every summer. I am NOT interested in people who lived with you temporarily, even if they stayed several months.

Last year, that is, between January 1, 2017, and December 31, 2017, WHO were the head or heads of this household?

Is this person answering questions on this survey?		How is this person related to HEAD 1?	Is this person MALE or FEMALE?	Is this person an ALASKA NATIVE?	In what year was this person born?	How many years has this person lived in Nanwalek?	In 2017, were you able to get a subsistence SALMON permit? Did you return your permit?		
ID#	*circle*	*relation*	*circle*	*circle*	*year*	*number*	*circle*	*notes*	*return*
HEAD	Y N		M F	Y N			Y N ?		Y N ?
1		*1*							
NEXT enter spouse or partner. If household has a SINGLE HEAD, leave HEAD 2 row BLANK, and move to PERSON 3.									
HEAD	Y N		M F	Y N			Y N ?		Y N ?
2		*2*							
BELOW, enter children (oldest to youngest), grandchildren, grandparents, or anyone else living full-time in this household.									
PERSON 3	Y N		M F	Y N			Y N ?		Y N ?
3									
PERSON 4			M F	Y N			Y N ?		Y N ?
4	0								
PERSON 5			M F	Y N			Y N ?		Y N ?
5	0								
PERSON 6			M F	Y N			Y N ?		Y N ?
6	0								
PERSON 7			M F	Y N			Y N ?		Y N ?
7	0								
PERSON 8			M F	Y N			Y N ?		Y N ?
8	0								
PERSON 9			M F	Y N			Y N ?		Y N ?
9	0								
PERSON 10			M F	Y N			Y N ?		Y N ?
10	0								

Permit/demographic notes:

HOUSEHOLD MEMBERS: 01 **NANWALEK: 129**

RETAINED COMMERCIAL HARVESTS

HOUSEHOLD ID

1. Do you or members of your household USUALLY participate in commercial salmon fisheries?..... Y N

2. Between JANUARY 1, 2017 AND DECEMBER 31, 2017
....did you or members of your household PARTICIPATE in a commercial salmon fishery?..... Y N

IF the answer to QUESTION 2 is NO, go to the subsistence harvests section.

IF the answer is YES, continue on this page…

During the last year[1] did you or members of your household….

A …FISH commercially for salmon?

B …KEEP any salmon from your commercial catch for your own use[2] or to share?

If KEEP is "yes"

Please estimate how many salmon ALL MEMBERS OF YOUR HOUSEHOLD removed from commercial harvests for personal use during the last year.

Include COMMERCIALLY HARVESTED salmon that members of this household gave away, ate fresh, fed to dogs, lost to spoilage, or got by helping others. If helping others, report ONLY THIS HOUSEHOLD'S share.

Read names below in blanks above	A COM FISH?	B KEEP?	How many were removed for your OWN USE?[1]	How many were removed for your CREW?	How many were removed to give to OTHERS?	Units	Person ID from page 2	Comments
			number	*number*	*number*	*specify*	*number*	*comments*
CHINOOK SALMON *KING SALMON*	Y N	Y N						
113,000,001								
SOCKEYE SALMON *RED SALMON*	Y N	Y N						
115,000,001								
COHO SALMON	Y N	Y N						
112,000,001								
CHUM SALMON *DOG SALMON*	Y N	Y N						
111,000,001								
PINK SALMON *HUMPIES*	Y N	Y N						
114,000,001								
	Y N	Y N						
	Y N	Y N						
	Y N	Y N						
	Y N	Y N						
	Y N	Y N						

RETAINED COMMERCIAL HARVESTS continued on next page…

1 *"LAST YEAR" means between January 1, 2017 and December 31, 2017.*

2 *"USE" includes eating, feeding to dogs, sharing or trading with others, etc.*

COMMERCIALLY HARVESTED RESOURCES: 03 **NANWALEK: 129**

Subsistence Harvests: Salmon

Household ID

1. Do you, or members of your household USUALLY harvest salmon?..... Y N ?

2. Between JANUARY 1, 2017 AND DECEMBER 31, 2017 did you or members of your household USE or TRY to fish for salmon?.... Y N ?

If the answer to question 2 is NO, go to the SALMON assessment questions page.

If the answer to both questions are YES, continue on this page…

During the last year[1], did you, or members of your household,…

A: Use[2] _____ salmon?
B: Try to harvest _____ salmon?
C: Harvest (catch) _____ salmon?
D: Receive _____ salmon from another household?
E: Give _____ salmon to another household?

If the answer to the harvest question (D.) is yes, please estimate how many salmon all members of your household harvested for subsistence uses during the last year. Record salmon taken from commercial catch while commercial fishing, on previous page.

Read the species names below in the blanks above.

Include salmon that members of this household gave away, ate fresh, fed to dogs, lost to spoilage, or got by helping others. Report only this household's share of the harvest.

	A Use	B Try	C Harv	D Rec	E Give	Date	Location	Harvest	Gear type	Units
	circle one					*mm / dd*	*name*	*number*	*(NOT commercial)*	*specify*
SOCKEYE	Y N	Y N	Y N	Y N	Y N					
115 000 000										

	Use	Try	Harv	Rec	Give	Date	Location	Harvest	Gear type	Units
	circle one					*mm / dd*	*name*	*number*	*(NOT commercial)*	*specify*
CHINOOK	Y N	Y N	Y N	Y N	Y N					
113 000 000										

1 *"LAST YEAR" means between January 1, 2017 and December 31, 2017.*

2 *"USE" includes eating, feeding to dogs, sharing or trading with others, etc.*

SUBSISTENCE SALMON HARVEST: 04 **NANWALEK: 129**

Subsistence Harvests: Salmon continued…

Household ID

If the answer to the harvest question (D.) is yes, please estimate how many salmon all members of your household harvested for subsistence uses during the last year. Record salmon taken from commercial catch

Read the species names below in the blanks above.

Include salmon that members of this household gave away, ate fresh, fed to dogs, lost to spoilage, or got by helping others. Report only this household's share of the harvest.

	A Use	B Try	C Harv	D Rec	E Give	Date	Location	Harvest	Gear type	Units
	circle one					*mm / dd*	*name*	*number*	*(NOT commercial)*	*specify*
COHO	Y N	Y N	Y N	Y N	Y N					
112 000 000										

	Use	Try	Harv	Rec	Give	Date	Location	Harvest	Gear type	Units
	circle one					*mm / dd*	*name*	*number*	*(NOT commercial)*	*specify*
CHUM	Y N	Y N	Y N	Y N	Y N					
111 000 000										

	Use	Try	Har	Rec	Giv	Date	Location	Harvest	Gear type	Units
	circle one					*mm / dd*	*name*	*number*	*(NOT commercial)*	*specify*
PINK	Y N	Y N	Y N	Y N	Y N					
114 000 000										

1 *"LAST YEAR" means between January 1, 2017 and December 31, 2017.*

2 *"USE" includes eating, feeding to dogs, sharing or trading with others, etc.*

SUBSISTENCE SALMON HARVEST: 04 **NANWALEK: 129**

SUBSISTENCE SUMMARY:

HOUSEHOLD ID

ASSESSMENTS: SOCKEYE (RED) SALMON 115,000,000

During the last year,[1]
…did your household use LESS, SAME, or MORE Sockeye (red) salmon than in recent years?..... X L S M

If LESS or MORE… *X = do not use*

WHY was your use different?..... 1 _____
2 _____
_____

During the last year,[1]
…did your household GET ENOUGH Sockeye (red) salmon?..... Y N

If NO…

WHY did your household NOT get enough Sockeye (red) salmon?..... 1 _____
2 _____
_____

How would you describe the impact to your household
of not getting enough Sockeye (red) salmon last year?..... not noticable? (0) minor? (1) major? (2) severe? (3)

Did your household do anything DIFFERENTLY because you did NOT get enough Sockeye (red) salmon?..... Y N

IF YES…
What did your household do differently?..... 1 _____
2 _____
_____

Do you have any other comments or concerns about Sockeye (red) salmon?

1 *"LAST YEAR" means between January 1, 2017 and December 31, 2017.*

ASSESSMENTS OF SOCKEYE (RED) SALMON: 66 **NANWALEK: 129**

SUBSISTENCE SUMMARY: PINK SALMON

HOUSEHOLD ID

ASSESSMENTS: PINK SALMON 114,000,000

During the last year,[1]
…did your household use LESS, SAME, or MORE Pink salmon than in recent years? X L S M
If LESS or MORE… *X = do not use*
WHY was your use different? _____ 1
_____ 2
_____

During the last year,[1]
…did your household GET ENOUGH Pink salmon? Y N
If NO…
WHY did your household NOT get enough Pink salmon? _____ 1
_____ 2
_____

How would you describe the impact to your household
of not getting enough Pink salmon last year? not noticable? (0) minor? (1) major? (2) severe? (3)

Did your household do anything DIFFERENTLY because you did NOT get enough Pink salmon? Y N
IF YES…
What did your household do differently? _____ 1
_____ 2
_____

Do you have any other comments or concerns about Pink salmon?

1 *"LAST YEAR" means between January 1, 2017 and December 31, 2017.*

ASSESSMENTS OF PINK SALMON: 66 **NANWALEK: 129**

SUBSISTENCE SUMMARY: COHO (SILVER) SALMON

HOUSEHOLD ID

ASSESSMENTS: COHO (SILVER) SALMON 112,000,000

During the last year,[1]
…did your household use LESS, SAME, or MORE Coho (silver) salmon than in recent years? X L S M
If LESS or MORE… *X = do not use*
WHY was your use different? _____ 1
_____ 2
_____

During the last year,[1]
…did your household GET ENOUGH Coho (silver) salmon? Y N
If NO…
WHY did your household NOT get enough Coho (silver) salmon? _____ 1
_____ 2
_____

How would you describe the impact to your household
of not getting enough Coho (silver) salmon last year? not noticable? (0) minor? (1) major? (2) severe? (3)

Did your household do anything DIFFERENTLY because you did NOT get enough Coho (silver) salmon? Y N
IF YES…
What did your household do differently? _____ 1
_____ 2
_____

Do you have any other comments or concerns about Coho (silver) salmon?

1 *"LAST YEAR" means between January 1, 2017 and December 31, 2017.*

ASSESSMENTS OF COHO (SILVER) SALMON: 66 **NANWALEK: 129**

SUBSISTENCE SUMMARY: OTHER SALMON

HOUSEHOLD ID

ASSESSMENTS: OTHER SALMON (CHUM, CHINOOK)

110,000,000

During the last year,[1]
...did your household use LESS, SAME, or MORE Other salmon than in recent years?..... X L S M
If LESS or MORE... *X = do not use*
WHY was your use different?..... 1 2

During the last year,[1]
...did your household GET ENOUGH Other salmon?..... Y N
If NO...
WHY did your household NOT get enough Other salmon?..... 1 2

How would you describe the impact to your household
of not getting enough Other salmon last year?..... not noticable? (0) minor? (1) major? (2) severe? (3)

Did your household do anything DIFFERENTLY because you did NOT get enough Other salmon?..... Y N
IF YES...
What did your household do differently?..... 1 2

Do you have any other comments or concerns about Other salmon?

1 *"LAST YEAR" means between January 1, 2017 and December 31, 2017.*

ASSESSMENTS OF OTHER SALMON: 66 **NANWALEK: 129**

COMMENTS & SUMMARY

HOUSEHOLD ID

QUESTIONS, COMMENTS, CONCERNS

Do you have any questions, comments, or concerns?

INTERVIEW SUMMARY

Use this space for interviewer's comments about survey, especially factors that might have affected the household's responses.

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

INTERVIEW SUMMARY: 300 **NANWALEK: 129**

APPENDIX B—KEY RESPONDENT INTERVIEW PROTOCOL (STUDY YEAR 2017)

KRI Protocol
Nanwalek
2/7/18 (Project Year Two)

1. **Primary issues of Concern for Nanwalek right now?**
   - Now?
   - In the past?
   - What's better?
   - What's worse?

2. **Silvers**
   - How was run this year
   - How has it been over the years
   - Concerns of over harvesting—tell me more

3. **Thoughts on Permits**
   - What to do to improve permit returns
   - Trust issues

4. **Thoughts on regulations**
   - Impacts
   - Experience with BOF

5. **Commercial Fishing**
   - Scoop—why not more
   - Why used to?
   - Conflicts between user groups?

6. **Winter king salmon**
   - When
   - Where

7. **Hatchery fish**
   - Impacts to Nanwalek fishery
   - Opinions

8. **Changes over time (general)**
   - What's changing?

9. **Other?**
   -

KRI Protocol
Port Graham
2/7/18 (Project Year Two)

1. **Primary issues of Concern for P Graham right now?**
   - Now?
   - In the past?
   - What's better?
   - What's worse?

2. **Silvers**
   - How was run this year
   - How has it been over the years
   - Concerns of over harvesting—tell me more

3. **Thoughts on Permits**
   - What to do to improve permit returns
   - Trust issues

4. **Thoughts on regulations**
   - E.g., Net size for kings
   - Impacts
   - Experience with BOF

5. **Commercial Fishing**
   - Scoop—why not more
   - Why used to?
   - Conflicts between user groups?

6. **Winter king salmon**
   - When
   - Where

7. **Hatchery fish**
   - Impacts to P Graham fishery
   - Opinions

8. **Changes over time (general)**
   - What's changing?

9. **Other?**
   -

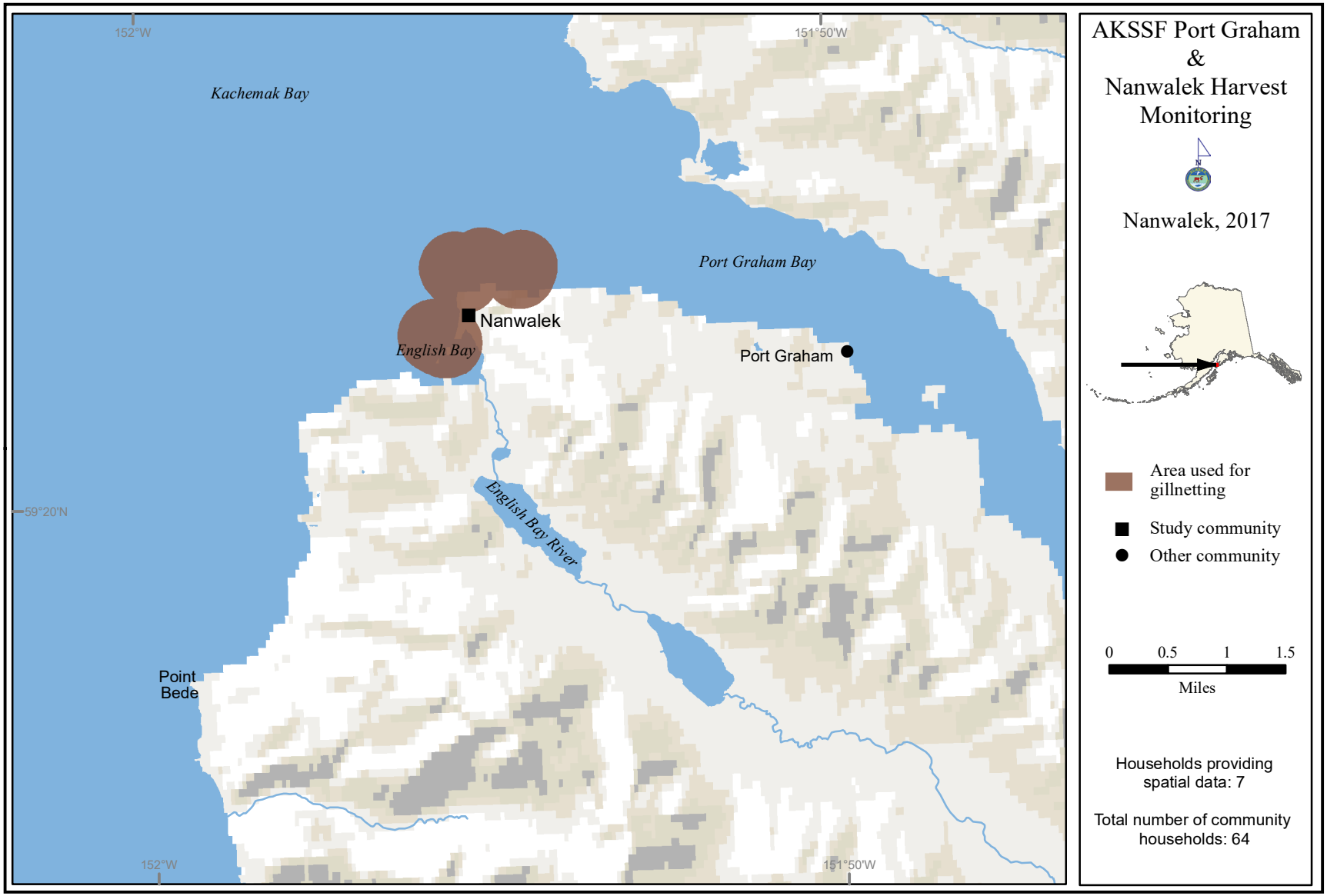
APPENDIX C—CONVERSION FACTORS (STUDY YEARS 2016 AND 2017)

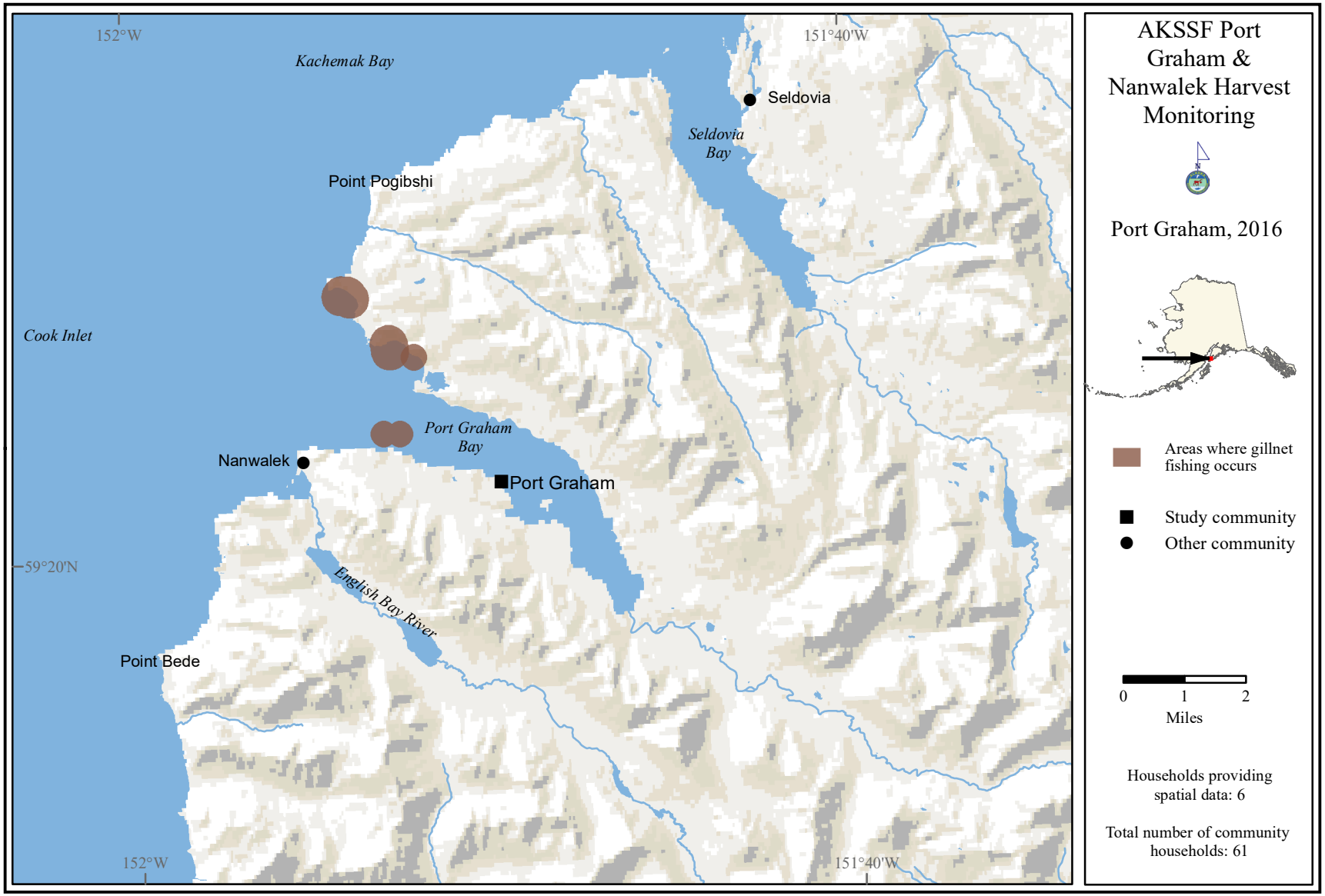
The following table presents the conversion factors used in determining how many pounds were harvested of each resource surveyed. For instance, if respondents reported harvesting 3 individual pink salmon, the quantity would be multiplied by the appropriate conversion factor (in this case 3.1816) to show a harvest of 9.54 lb of pink salmon.

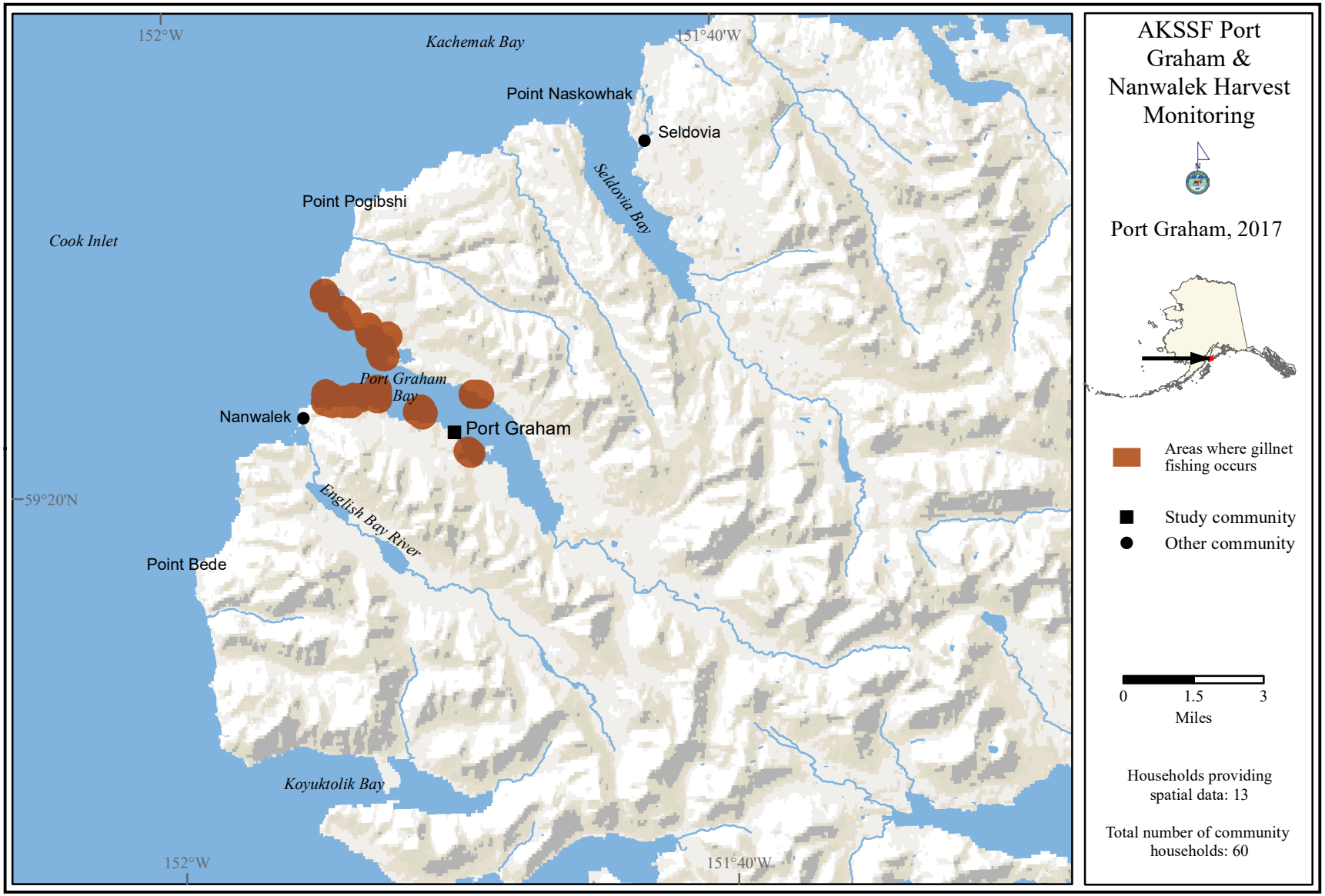
Resource name	Reported units	Conversion factor
Chum salmon	Individual	5.1780
Chum salmon	Pounds	1.0000
Chum salmon [CF retention]	Individual	5.1780
Chum salmon [CF retention]	Pounds	1.0000
Coho salmon	Individual	4.7290
Coho salmon	Pounds	1.0000
Coho salmon [CF retention]	Individual	4.7290
Coho salmon [CF retention]	Pounds	1.0000
Chinook salmon	Individual	13.1250
Chinook salmon	Pounds	1.0000
Chinook salmon [CF retention]	Individual	13.1250
Chinook salmon [CF retention]	Pounds	1.0000
Pink salmon	Individual	3.1816
Pink salmon	Pounds	1.0000
Pink salmon [CF retention]	Individual	3.1816
Pink salmon [CF retention]	Pounds	1.0000
Sockeye salmon	Individual	4.1929
Sockeye salmon	Pounds	1.0000
Sockeye salmon [CF retention]	Individual	4.1929
Sockeye salmon [CF retention]	Pounds	1.0000

Source ADF&G Division of Subsistence household surveys, 2016 and 2018.

APPENDIX D—SALMON HARVEST AREAS BY GILLNET


152°W
151°50'W
Kachemak Bay
Port Graham Bay
Nanwalek
English Bay
Port Graham
English Bay River
59°20'N
Point
Bede
152°W
151°50'W
AKSSF Port Graham
&
Nanwalek Harvest
Monitoring
Nanwalek, 2017
Area used for
gillnetting
Study community
Other community
0
0.5
1
1.5
Miles
Households providing
spatial data: 7
Total number of community
households: 64


AKSSF Port Graham & Nanwalek Harvest Monitoring
Port Graham, 2016
Areas where gillnet fishing occurs
Study community
Other community
0
1
2
Miles
Households providing spatial data: 6
Total number of community households: 61
152°W
151°40'W
59°20'N
Kachemak Bay
Seldovia
Seldovia Bay
Point Pogibshi
Cook Inlet
Port Graham Bay
Nanwalek
Port Graham
English Bay River
Point Bede


152°W
Kachemak Bay
151°40'W
Point Naskowhak
Seldovia
Seldovia Bay
Point Pogibshi
Cook Inlet
Port Graham Bay
Nanwalek
Port Graham
59°20'N
English Bay River
Point Bede
Koyuktolik Bay
152°W
151°40'W
AKSSF Port Graham & Nanwalek Harvest Monitoring
Port Graham, 2017
Areas where gillnet fishing occurs
Study community
Other community
0
1.5
3
Miles
Households providing spatial data: 13
Total number of community households: 60