

Technical Paper No. 439

**Subsistence Harvests and Uses of Salmon in Tyonek,
2015 and 2016**

by

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and

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February 2018

Alaska Department of Fish and Game

Division of Subsistence



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Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Measures (fisheries)

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

Mathematics, statistics

<i>all standard mathematical signs, symbols and abbreviations</i>	
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 _z , etc.
minute (angular)	'
not significant	NS
null hypothesis	H ₀
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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TABLE OF CONTENTS

	Page
List of Tables	iii
List of Figures	v
List of Appendices	vi
Abstract	vii
1. Introduction	1
Project Background.....	1
Regulatory Context.....	1
Study Objectives.....	2
Research Methods.....	2
Ethical Principles for the Conduct of Research.....	2
Scoping Meeting.....	3
Systematic Household Surveys and Sample Achievement.....	3
Mapping Locations of Subsistence Hunting, Fishing, and Gathering Activities.....	3
Household Survey Implementation.....	5
Key Respondent Interviews.....	5
Participant Observation.....	5
Data Analysis and Review.....	6
Population Estimates and Other Demographic Information.....	7
Map Data Entry and Analysis.....	8
Community Review Meetings.....	8
Final Report Organization.....	8
2. Tyonek	9
Community Background.....	9
History of the Tyonek Subsistence Permit System.....	10
Demography.....	11
3. Salmon harvests and uses	18
Historical Harvests and Uses of Salmon by Tyonek Residents.....	18
Salmon Harvests and Uses in 2015: Harvest Quantities and Composition.....	18

TABLE OF CONTENTS CONTINUED

	Page
Salmon Harvests and Uses in 2016: Harvest Quantities and Composition	22
Permit Participation	24
2015 Harvest Survey and Subsistence Permits.....	24
2016 Harvest Survey and Subsistence Permits.....	28
Historical Tyonek Subdistrict Subsistence Permit Returns	31
Comparing Harvests and Uses in 2015 and 2016 with Previous Years	33
Harvest Assessments.....	33
2015	33
2016	33
Harvest Data	43
Current and Historical Harvest Areas	54
Salmon Harvest Locations (2015 and 2016)/Salmon Harvest Locations from Previous Study Years	54
Access to Fishing Locations	54
Salmon Fishing Methods	65
Recording Harvests	65
Traditional Knowledge: Salmon Processing, Preservation, Storage, and Use	65
Community Fisheries Management, Intergenerational Transmission of Traditional Salmon Knowledge, and Youth Participation in the Subsistence Salmon Fisheries	66
Youth Culture Camps	66
Tyonek Tribal Conservation District	67
4. Discussion.....	68
Objective One	68
Objective Two.....	68
Chinook Salmon Concerns	68
Coho Salmon Concerns	69
Sockeye Salmon Concerns	69
Regulations	69
Objective Three.....	69
Objective Four	69

TABLE OF CONTENTS CONTINUED

	Page
Conclusion	70
Acknowledgments	71
References Cited	72

LIST OF TABLES

Table	Page
1-1.–Estimated households and sample achievement, Tyonek, 2015.....	4
1-2.–Estimated households and sample achievement, Tyonek, 2016.....	4
2-1.–Population estimates, Tyonek, 2010 and 2015.....	12
2-2.–Population estimates, Tyonek, 2010 and 2016.....	12
2-3.–Sample and demographic characteristics, Tyonek, 2015.....	14
2-4.–Sample and demographic characteristics, Tyonek, 2016.....	15
2-5.–Population profile, Tyonek, 2015.....	17
2-6.–Population profile, Tyonek, 2016.....	17
3-1.–Estimated use and harvest of salmon, Tyonek households, 2015.....	19
3-3.–Estimated percentages of salmon harvest in pounds usable weight by gear type, resource, and total salmon harvest, Tyonek households, 2015.....	21
3-2.–Estimated use and harvest of salmon, Tyonek households, 2016.....	21
3-4.–Estimated percentages of salmon harvest in pounds usable weight by gear type, resource, and total salmon harvest, Tyonek households, 2016.....	23
3-5.–Total Tyonek Subdistrict estimated subsistence salmon harvests by community, Tyonek and non-Tyonek residents, 2015.....	24
3-6.–Number of subsistence permits issued and returned, Tyonek households, 2015 and 2016.....	25
3-7.–Reasons surveyed subsistence permit holders did not return permit, Tyonek households, 2015 and 2016.....	25
3-8.–Comparison of fishing and subsistence permit participation patterns, Tyonek households, 2015 and 2016.....	26

LIST OF TABLES CONTINUED

Table	Page
3-9.–Estimated subsistence salmon harvest by subsistence permit returns, Tyonek households, 2015.	26
3-10.–Total Tyonek Subdistrict estimated subsistence salmon harvests by community, Tyonek and non-Tyonek residents, 2016.	28
3-11.–Estimated subsistence salmon harvest by subsistence permit returns, Tyonek households, 2016.	29
3-12.–Changes in household uses of salmon compared to recent years, Tyonek households, 2015.	34
3-13.–Reasons for less household use of salmon compared to recent years, Tyonek households, 2015.	35
3-14.–Reasons for more household use of salmon compared to recent years, Tyonek households, 2016.	36
3-15.–Reported impact to households reporting that they did not get enough salmon, Tyonek households, 2015.	37
3-16.–Things households reported doing differently as the result of not getting enough salmon, Tyonek households, 2015.	37
3-17.–Salmon resources that sampled households reported needing, Tyonek households, 2015.	38
3-18.–Changes in household uses of salmon compared to recent years, Tyonek households, 2016.	39
3-19.–Reasons for less household use of salmon compared to recent years, Tyonek households, 2016.	40
3-20.–Reasons for more household use of salmon compared to recent years, Tyonek households, 2016.	41
3-21.–Reported impact to households reporting that they did not get enough salmon, Tyonek households, 2016.	42
3-22.–Things households reported doing differently as the result of not getting enough salmon, Tyonek households, 2016.	42
3-23.–Salmon resources that sampled households reported needing, Tyonek households, 2016.	43
3-24.–Comparison of historical Tyonek Subdistrict reported and estimated subsistence salmon harvests, Tyonek residents, 1980–2016.	44
3-25.–Comparison of historical Tyonek Subdistrict reported and estimated subsistence salmon harvests, Tyonek and non-Tyonek residents, 1980–2016.	47

LIST OF FIGURES

Figure	Page
2-1.–Historical population estimates, Tyonek, 1960–2016.....	13
2-2.–Population profile, Tyonek, 2015.....	16
2-3.–Population profile, Tyonek, 2016.....	16
3-1.–Composition of salmon harvest in pounds usable weight, Tyonek households, 2015.	20
3-2.–Composition of salmon harvest in pounds usable weight, Tyonek households, 2016.	22
3-3.–Estimated mean subsistence salmon harvest, Tyonek households, 2015.	27
3-4.–Estimated mean subsistence salmon harvest, Tyonek households, 2016.	30
3-5.–Historical rate of returned subsistence permits, Tyonek residents, 1987–2016.	32
3-6.–Historical rate of returned subsistence permits, non-Tyonek residents, 1991–2016.	32
3-7.–Comparison of historical reported and estimated subsistence salmon harvests, Tyonek and non-Tyonek residents 1980–2016, and Tyonek households, 1983, 2013, and 2015–2016.	45
3-8.–Comparison of historical reported and estimated subsistence salmon harvests, Tyonek residents, 1980–2016, and Tyonek households, 1983, 2013, and 2015–2016.	48
3-9.–Comparison of subsistence salmon harvests, reported and estimated permit results, Tyonek residents, 2013, 2015–2016, and reported and estimated survey results, Tyonek households, 2013, 2015–2016.	49
3-10.–Comparison of historical reported and estimated subsistence salmon harvests, total salmon harvests, Tyonek residents, 1980–2016, and Tyonek households, 1983, 2013, and 2015–2016.	50
3-11.–Composition of historical subsistence salmon harvests, Tyonek residents, 1980–2016, and Tyonek households, 1983, 2013, and 2015–2016.....	51
3-12.–Comparison of historical reported and estimated subsistence salmon harvests, Chinook salmon harvests, Tyonek residents, 1980–2016, and Tyonek households, 1983, 2013, and 2015–2016.....	52
3-13.–Comparison of historical reported and estimated subsistence salmon harvests, other salmon harvests, Tyonek residents, 1980–2016, and Tyonek households, 1983, 2013, and 2015–2016.	53
3-14.–Fishing and harvest locations of Chinook salmon, Tyonek households, 2015.....	55
3-15.–Fishing and harvest locations of coho salmon, Tyonek households, 2015.....	56
3-16.–Fishing and harvest locations of sockeye salmon, Tyonek households, 2015.....	57
3-17.–Fishing and harvest locations of Chinook salmon, Tyonek households, 2016.....	58
3-18.–Fishing and harvest locations of coho salmon, Tyonek households, 2016.....	59
3-19.–Fishing and harvest locations of sockeye salmon, Tyonek households, 2016.....	60
3-20.–Fishing and harvest locations of chum salmon, Tyonek households, 2015.....	61
3-21.–Fishing and harvest locations of pink salmon, Tyonek households, 2015.....	62
3-22.–Fishing and harvest locations of chum salmon, Tyonek households, 2016.....	63
3-23.–Fishing and harvest locations of pink salmon, Tyonek households, 2016.....	64

LIST OF APPENDICES

Appendix	Page
A–2015 and 2016 Survey Forms	74
B–2015 and 2016 Conversion Factors.....	88
Table B-1.– Salmon conversion factors, 2015.	89
Table B-2.– Salmon conversion factors, 2016.	89
C–Additional Tables and Figures.....	90
Table C-1.– Comparison of historical Tyonek Subdistrict reported and estimated subsistence salmon harvests, non-Tyonek residents, 1985 and 1991–2016.	91
D–Project Summary.....	95

ABSTRACT

This report provides updated information about the harvests of salmon by the community of Tyonek, Alaska. This report details the results of a household survey administered for the study years of 2015 and 2016 for harvests and uses of wild salmon by Tyonek households. Tyonek is located in upper Cook Inlet of Southcentral Alaska. As in the past, during the 2015 and 2016 study years many residents of the study community relied on fishing for nutrition and to support their way of life. Residents used a variety of salmon species. This study is part of the effort to collect data about the full range of subsistence harvests and uses, and areas of harvest, to understand in all its complexity the importance of salmon as a subsistence resource. The project was funded by the Alaska Sustainable Salmon Fund (AKSSF). This information was collected by research staff of the Division of Subsistence, Alaska Department of Fish and Game.

Key words: subsistence, salmon, Cook Inlet, Southcentral Alaska, Tyonek, Alaska Sustainable Salmon Fund

1. INTRODUCTION

This report summarizes the results of a harvest survey and ethnographic project that investigated the subsistence uses of salmon in the community of Tyonek, which is located in upper Cook Inlet of Southcentral Alaska.

PROJECT BACKGROUND

The funding for this project was awarded by Alaska Sustainable Salmon Fund (AKSSF), in December 2014, as part of the 2014 call for proposals. This project was originally submitted to AKSSF in the 2013 call for proposals. The proposed project passed the 2013 review and scored favorably. The project was recommended for funding; however, sufficient funding was not available at the time. The project was resubmitted and funded in 2014.

For the community of Tyonek, Chinook (king) salmon have historically been the single most important subsistence resource since the Dena'ina Athabascans relocated to the shores of Cook Inlet from Interior Alaska well before European contact (Stanek et al. 2007). In 2011, the Alaska Board of Fisheries (BOF) adopted an amount reasonably necessary for subsistence (ANS) of 700–2,700 Chinook salmon in the Tyonek Subdistrict (5 AAC 01.566(f)). For the residents of Tyonek, Chinook salmon do not simply represent a source of subsistence-harvested food. The role of salmon and the annual traditions associated with salmon harvesting and processing are a significant part of Dena'ina identity (Stanek et al. 2007). The inability of Tyonek residents to obtain an adequate harvest of Chinook salmon has ramifications to their socio-cultural systems, in addition to economic considerations given their remote location. Participating in this fishery has also become an important annual ritual for Tyonek families as well as other community members of the Kenai Peninsula, Matanuska–Susitna Borough, and Anchorage. In addition to the demand for subsistence-caught Chinook salmon in upper Cook Inlet, both commercial and recreational fishing pursuits occur within these waters, furthering the pressure on these salmon stocks.

According to returned subsistence salmon permits, reported fish harvests for the Tyonek Subdistrict have remained below the ANS and in 2011 only 595 Chinook salmon were harvested, despite reports of local Tyonek participants fishing longer into the season to meet household subsistence needs (Fall et al. 2013:9; Holen and Fall 2011:3). In 2012, the reported harvest of 840 Chinook salmon and the 813 harvested from the Tyonek Subdistrict in 2013 were within the ANS range, however, at the low end (Fall et al. 2017).

The goal of this project was to document Chinook salmon subsistence harvests in the Tyonek Subdistrict through household surveys and direct observation, evaluate the current permit program and data, and make recommendations for modification to the permit program to more accurately estimate the harvest of salmon in the Tyonek Subdistrict subsistence fishery. Collecting and analyzing data regarding harvest or other sources of salmon mortality was seen by the Alaska Department of Fish and Game (ADF&G) as a high strategic focus for the Central Region since it leads to a better understanding of the health and sustainability of Cook Inlet's Northern District Chinook salmon stocks. The importance of generating sufficient, statistically-significant Chinook salmon harvest data in upper Cook Inlet requires implementation of a harvest monitoring program that accounts for factors that affect accurate harvest documentation. This report identifies several of those factors specific to the community of Tyonek, whose residents harvest the majority of the subsistence-caught salmon in this fishery, and makes recommendations for their incorporation into the harvest monitoring program for Cook Inlet's Northern District.

REGULATORY CONTEXT

Subsistence salmon fishing regulations for the Tyonek Subdistrict were established by court order in 1980 and subsequently permanently established by the BOF in March 1981. The State of Alaska provides subsistence salmon fishing opportunities for all Alaska residents in the Tyonek Subdistrict subsistence fishery, which is located in the Northern District of the Cook Inlet Area. The subdistrict includes those marine waters of the Northern District within mean low tide from a point 1 mile south of the southern edge of the Chuitna

River south to the easternmost tip of Granite Point (5 AAC 01.555 (b)). Under state regulations, subsistence fishing is open during 2 seasons per year. The early season, which runs from May 15 through June 15, is open for 3 periods per week—Tuesdays, Thursdays, and Fridays—and for 16 hours per period lasting from 4:00 a.m. through 8:00 p.m. During the early season, Tyonek residents target Chinook salmon, the preferred species of salmon for this community. The late season, which runs from June 16 through October 15, is open for 1 period per week—Saturdays—and for 12 hours (from 6:00 a.m. through 6:00 p.m.) (5 AAC 01.560 (b)(1)(A)–(B)). A subsistence fishing permit is required. The permit is a household permit. The total annual possession limit for each permit is 25 salmon per head of household and 10 salmon for each dependent of the household permit holder (5 AAC 01.595 (a)(2)); in addition, Tyonek Subdistrict subsistence salmon fishing permit holders may take 70 Chinook salmon (5 AAC 01.595 (a)(3)). Allowable gear for the Tyonek Subdistrict subsistence salmon fishery is set gillnets not exceeding 10 fathoms in length, no deeper than 45 meshes, and with a stretched mesh size no larger than 6 inches (5 AAC 01.570 (b)(1)). According to regulation, when fishing, permit holders are required to be present at the net site and must mark the salmon by removing both lobes of the tail fin (5 AAC 01.570(l); 5 AAC 01.590). Other standard permit conditions include gear marking requirements, prohibition of fishing within 600 feet of any part of another set gillnet, and prohibition of fishing within 300 feet of a dam, fish ladder, weir, culvert, or other artificial obstruction (5 AAC 01.570; 5 AAC 01.010).

The Alaska Department of Fish and Game (ADF&G) Division of Sport Fish manages the sport fishing opportunities in the west Cook Inlet area. Sport fisheries provide opportunities for harvesting resident freshwater species and salmon by use of rod and reel in certain water systems, as long as a fishing license has been purchased (5 AAC 75.005).

The Tyonek Subdistrict commercial salmon fishery occurs within the Northern District of the Upper Cook Inlet (UCI) Management Area (5 AAC 21.200). This fishery is managed by the Division of Commercial Fisheries. The UCI Management Area consists of that portion of Cook Inlet north of the latitude of the Anchor Point Light and is divided into the Central and Northern districts. Four Chinook salmon directed openers occur in the Northern District. The first opener takes place on or after the Monday after May 25. After the Chinook salmon directed fisheries end, the commercial openers switch from once a week to 2 times per week (Mondays and Thursdays), or as otherwise directed by emergency order.

STUDY OBJECTIVES

This project has the following objectives:

1. Obtain updated harvest information through household harvest surveys for comparison to reported harvests in the Tyonek Subdistrict subsistence fishery.
2. Observe and document harvest recording at subsistence fishing locations to understand how residents record their Chinook salmon subsistence harvests.
3. Compile and update existing harvest data to expand reported harvests from 1980–2016.
4. Make recommendations for a revised harvest monitoring program based on project 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*¹ and by the National Science Foundation, Office of Polar Programs in its *Principles for the Conduct of Research in the Arctic*², the *Ethical Principles for the Conduct of Research in the North*

-
1. Alaska Federation of Natives. 2013. “Alaska Federation of Natives Guidelines for Research,” Alaska Native Knowledge Network, <http://www.ankn.uaf.edu/IKS/afnguide.html> (accessed May 10, 2017).
 2. National Science Foundation Interagency Social Science Task Force. 2012. “Principles for the Conduct of Research in the Arctic,” <http://www.nsf.gov/od/opp/arctic/conduct.jsp> (accessed May 10, 2017).

(Association of Canadian Universities for Northern Studies 2003), as well as the Alaska confidentiality statute (AS 16.05.815). These principles stress community approval of research designs, informed consent, anonymity or confidentiality of study participants, community review of draft study findings, and the provision of study findings to each study community upon completion of the research.

Scoping Meeting

On April 13, 2015, a community meeting was held in Tyonek to introduce this project. The meeting took place the same day that subsistence permits were issued by Division of Subsistence staff at the Native Village of Tyonek (NVT) Tribal Hall. A total of 17 community members attended the meeting, which was led by researcher Bronwyn Jones.

Systematic Household Surveys and Sample Achievement

The primary method for collecting subsistence harvest and use information in this project was a systematic household survey. Following receipt of comments at the scoping meetings, ADF&G finalized the survey instrument in October 2015. A key goal was to structure the survey instrument to collect demographic, resource harvest and use, and other data that are comparable with information collected in other household surveys in Tyonek and other study communities and with data in the Community Subsistence Information System (CSIS³). Appendix A is an example of the survey instrument used in this project.

The objective of this study was to survey all Tyonek households. In order to complete a census survey, Division of Subsistence researchers worked with a combination of local research assistants (LRAs), knowledgeable community members, and tribal administrators to develop a community household list. These efforts established an estimate of 62 eligible households to be surveyed in 2015 and 60 in 2016 (Table 1-1; Table 1-2). During the survey effort, for each residence that researchers attempted to contact, a disposition was applied. The disposition categories included:

- Contains residents who are eligible to participate in the survey based on length of residency (lived in Tyonek for at least 6 months) (survey attempted).
- Vacant (no survey attempted).
- Not a dwelling (commercial building or no dwelling exists) (no survey attempted).

If researchers were initially unsuccessful at making contact with an eligible household, 2 more attempts to survey the household were made. When a reasonable effort was made to survey the household and no contact could be made, this household was assigned a “no contact” disposition.

Of the 62 qualifying households found in 2015, there were 50 successfully surveyed resulting in a sample achievement of 81% (Table 1-1). Two households declined to participate in the study, and 10 households could not be contacted after 3 attempts.

Of the 60 qualifying households found in 2016, there were 49 successfully surveyed resulting in a sample achievement of 82% (Table 1-2). Two households declined to participate in the study, and 9 households could not be contacted after 3 attempts.

During survey administration, permit data were provided and reviewed with households that had previously returned permits, or households returned a permit during the survey to verify and to assist with recall.

Mapping Locations of Subsistence Hunting, Fishing, and Gathering Activities

During household interviews, the researchers asked respondents to indicate the locations of their fishing activities during the study year. In addition, interviewers asked the respondents to indicate the sites of each harvest, the species harvested, the amounts harvested, and the months of harvest. ADF&G staff established a standard mapping method. Points were used to mark harvest locations.

3. ADF&G Community Subsistence Information System: <http://www.adfg.alaska.gov/sb/CSIS/>. Hereinafter cited as CSIS.

Table 1-1.—Estimated households and sample achievement, Tyonek, 2015.

Sample information	Community Tyonek
Number of dwelling units	71
Initial interview goal	71
Households interviewed	50
Households failed to be contacted	10
Households declined to be interviewed	2
Households moved or occupied by nonresident	9
Total households attempted to be interviewed	62
Refusal rate	3.8%
Final estimate of permanent households	62
Percentage of total households interviewed	80.6%
Interview weighting factor	1.24
Sampled population	110
Estimated population	136.4

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

Table 1-2.—Estimated households and sample achievement, Tyonek, 2016.

Sample information	Community Tyonek
Number of dwelling units	62
Initial interview goal	62
Households interviewed	49
Households failed to be contacted	9
Households declined to be interviewed	2
Households moved or occupied by nonresident	2
Total households attempted to be interviewed	60
Refusal rate	3.9%
Final estimate of permanent households	60
Percentage of total households interviewed	81.7%
Interview weighting factor	1.22
Sampled population	125
Estimated population	153.1

Source ADF&G Division of Subsistence household surveys, 2017.

Fishing sites were documented using an application designed on the ArcGIS Runtime SDK for iOS platform; a mapping data collection application for iPad.⁴ The point 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, an attribute box was filled out by the researcher that noted the species harvested, amount, method of access to the resource, and month(s) of harvest. The data were uploaded via Wi-Fi to a server. Once data collection was complete the data were downloaded into an ArcGIS file geodatabase. The application was developed under contract by HDR, Inc., an engineering and environmental research firm located in Anchorage. Paper maps were also available as a reference for respondents and for an LRA to use when an ADF&G researcher was not available for the interview. These maps were 11x17 inches at a scale of 1:250,000 and 1:500,000 and only documented the area within the survey area. Very few paper maps were used for data collection and research staff digitized markings on paper maps using the iPad application.

Once a survey was complete, researchers conducted a quality control exercise by matching the map data to the survey form to ensure all map data had been documented. This was completed in the field before the surveys were submitted to the project's lead researcher. Once the data had been uploaded, researchers also verified that the household data were logged into the server.

At the end of each field season, the geodatabase was turned over to ADF&G. A few remaining paper maps were digitized and then map production began. The data were used to produce maps at the species-specific level.

Household Survey Implementation

For both study years, Bronwyn Jones was the research lead for the project in Tyonek. For the 2015 study year, Jones arrived on February 8, 2016, and trained LRA Gwen Chickalusion in the morning of the same day. Year 1 survey administration occurred until February 13, 2016. Some remaining surveys were left with Chickalusion to complete over the ensuing 2 weeks. These surveys were completed and then mailed to the Anchorage ADF&G office. For the 2016 study year, Jones arrived on November 29, 2016, and trained LRAs Gwen Chickalusion and Leonard Allowan that day. Year 2 survey administration occurred until December 4, 2016. Some remaining surveys were left with Chickalusion and Allowan to complete over the ensuing 2 weeks. These surveys were completed and then mailed to the Anchorage ADF&G office.

Key Respondent Interviews

The purpose of the key respondent interviews (KRIs) was to provide additional context for the quantitative data and also to provide information for writing sections of this report, including the community background section, the harvest methods and uses section, harvest-over-time analysis, harvest recordkeeping practices, and the community comments and concerns section. For this project, 8 formal KRIs were conducted in total. During year 1 of the project, 5 interviews were conducted: 3 interviews occurred during summer fieldwork and 2 during the winter surveys. During year 2 summer fieldwork, 3 more KRIs were conducted with Tyonek residents. Key respondent interviews were semi-structured and directed by a KRI protocol designed specifically for this project by ADF&G researcher Bronwyn Jones in consultation with NVT. Besides gathering qualitative data through the key respondent interview protocol, ADF&G staff took notes during interviews to provide additional context for this report. Jones analyzed key respondent interviews and interview notes in preparation for this report. Key respondents were informed that, to maintain anonymity, their names would not be included in this report.

Participant Observation

Participant observation is an important method for researchers to gain an in-depth understanding of the timing, location, methods, logistical considerations, and social organization that combine to create the

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

subsistence salmon harvest pattern practiced by residents of Tyonek. Participant observation for this project occurred in May and June of both study years. This occurred simultaneously while Jones was in Tyonek working as the lead on a separate, but related, research project: the North Cook Inlet Chinook Genetic Study funded by the Alaska Sustainable Salmon Fund. For participant observation, Jones worked with Tyonek community members to help harvest and process salmon. This involved learning how to set a gillnet in Cook Inlet, becoming familiar with which tides community members prefer to fish, observing how harvests were being recorded on permits, and participating in cutting and processing salmon. Jones also participated in the annual NVT youth culture camp, and gave a presentation to Tyonek youths to demonstrate how to take genetic samples from Chinook salmon.

DATA ANALYSIS AND REVIEW

All household survey data were coded for data entry by Division of Subsistence staff in Anchorage. Surveys were reviewed and coded only by Bronwyn Jones for consistency. As mentioned previously, returned permits were reviewed with respondents during survey administration. In 2016, there were households that had more than one permit holder in residence due, for instance, to residency changes between the time permits were issued and surveys were administered; when surveys were completed, harvests recorded on 2 permits were reflected on a single household survey where appropriate. Survey responses were coded following standardized conventions used by the Division of Subsistence to facilitate data entry.

Information management staff within the Division of Subsistence set up database structures within Microsoft SQL Server at ADF&G in Anchorage to hold the survey data. The database structures included rules, constraints, and referential integrity to ensure that data were entered completely and accurately. Data entry screens were available on a secured internet site. Daily incremental backups of the database occurred, and transaction logs were backed up hourly. Full backups of the database occurred twice weekly. This ensured that no more than 1 hour of data entry would be lost in the unlikely event of a catastrophic failure. All survey data were entered twice and each set compared in order to minimize data entry errors.

Once data were entered and confirmed, information was processed with the use of Statistical Package for the Social Sciences (SPSS) software, version 20. Initial processing included the performance of standardized logic checks of the data. Logic checks are often needed in complex data sets where rules, constraints, and referential integrity do not capture all of the possible inconsistencies that may appear. Harvest data collected as numbers of fish were converted to pounds usable weight using standard factors (see Appendix B for conversion factors).

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

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

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

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

where:

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

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

h_i = the total harvest reported in returned surveys,

n_i = the number of returned surveys, and

S_i = the number of households in a community.

As an interim step, the standard deviation (SD) (or variance [V], which is the SD squared) was also calculated with the raw, unexpanded data. The standard error (SE), or SD of the mean, was also calculated for each community. This was used to estimate the relative precision of the mean, or the likelihood that an unknown value would fall within a certain distance from the mean. In this study, the relative precision of the mean is shown in the tables as a confidence limit (CL), expressed as a percentage. Once SE was calculated, the CL was determined by multiplying the SE by a constant that reflected the level of significance desired, based on a normal distribution. Though there are numerous ways to express the formula below, it contains the components of a SD, V, and SE:

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

where:

s = sample standard deviation,

n = sample size,

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

N = population size, and

$t_{\alpha/2}$ = student's t statistic for alpha level ($\alpha=.95$) with $n-1$ degrees of freedom.

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

The final data from the household survey results will be added to the Division of Subsistence CSIS. This publicly-accessible database includes community-level study findings. Permit results are maintained in a separate database and annual results are published in the Division of Subsistence Technical Paper series; permits completed at the time of survey were returned to the Anchorage Division of Subsistence office to have data entered into the permit database.

Population Estimates and Other Demographic Information

As noted above, a goal of the research was to collect demographic information for all year-round households in Tyonek. For this study, “year-round” was defined as being domiciled in the community when the surveys took place and for at least 6 months during the study years (2015 and 2016). Because not all households were interviewed, population estimates for Tyonek 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.

The population estimates generated during the division’s household survey differ from other demographic data developed by the 2010 federal census (U.S. Census Bureau 2011), the U.S. Census Bureau’s American Community Survey (U.S. Census Bureau n.d.), and the Alaska Department of Labor and Workforce Development (Alaska Department of Labor and Workforce Development 2015). Two possible reasons for the differences may relate to varying sample sizes and factors for expansion, and the time and season of data collection. Differing population estimates may also relate to the criteria agencies used to determine

“full time” residency and eligibility in the particular study. Population estimates are discussed in the section “Demography” in the next report chapter.

Map Data Entry and Analysis

As discussed above, maps were generated based on data collected using an iPad or on 11x17-inch paper maps. All data were entered on the iPad, whether in the field during interviews or by ADF&G research staff while coding survey data. Map features were matched to the survey form to ensure that all harvest data were recorded accurately. Once all data were entered, an ArcGIS file geodatabase was downloaded by ADF&G researchers from the server and, using a standard template for reports, maps were created in ArcGIS 10.4 showing harvest locations for each species.

Community Review Meetings

Bronwyn Jones presented preliminary survey findings and associated search and harvest area maps at a meeting in Tyonek on August 18, 2017. The purpose of the community review meeting was to provide an opportunity for community members to comment on the findings of the study, for researchers to capture concerns that were not documented during the survey but community members felt were important, and to clarify any issues that researchers encountered during analysis.

The LRAs and tribal administrators from NVT were informed about the review meeting. These community members hung flyers and informed residents of the meeting. A total of 9 community members attended the review meeting at the NVT Tribal Hall.

FINAL REPORT ORGANIZATION

This report summarizes the results of systematic household surveys, participant observation, and interviews conducted by staff from ADF&G as well as LRAs, and the report also summarizes resident feedback provided at the community review meeting. The findings are organized as follows:

- Chapter 2 provides community background and demographic information for the 2015 and 2016 study years;
- Chapter 3 is a discussion of historical and contemporary (2015 and 2016) harvests and uses of salmon by Tyonek residents, and also includes a discussion of the Tyonek subsistence permit system, local fisheries knowledge, and intergenerational transmission of traditional salmon knowledge; and
- Chapter 4 presents local comments and concerns, recommendations for harvest monitoring program revisions, and a report conclusion and acknowledgments.

ADF&G provided a short (4-page) summary of the study discussion and conclusions to each household in Tyonek.

2. TYONEK

COMMUNITY BACKGROUND

Tyonek is a mostly Dena'ina Athabascan community located in the upper Cook Inlet region of Southcentral Alaska. Although located fewer than 50 miles from Anchorage, Alaska's largest city, Tyonek remains relatively remote. It is not connected to the Alaska road system; one must travel by air or boat to reach the community. The community is situated on a bluff facing the northwest shore of Cook Inlet, and this position allows for easy access to the beach and offers spectacular views of the numerous surrounding volcanos and mountain ranges. The coastal area includes expansive sandy tidal zones and mudflats, and much of the beach is enclosed by steep, sandy bluffs. To the north of Tyonek, the geography is composed of a mixture of rolling hills, birch and black spruce forests, boggy tundra, and lakes, streams, and rivers that make up the Chuitna River watershed. The broad array of environmental features in this area supports a productive ecosystem that provides habitat for both marine and freshwater aquatic species as well as land mammals and birds.

Tyonek has long been the home of the *Tubughna*, “the beach people” in the Upper Inlet Dena'ina dialect. The current location of the community at *Qaggeyshlat* (“little place between the toes”) dates to 1932, but according to de Laguna (1934:139), Qaggeyshlat was an old Dena'ina village site. There have been 3 communities called Tyonek, all within the area between the Beluga River and Granite Point (Kari and Fall 2016:56). The first inhabited site (*Ch'elehtnu*, or “spawning stream”) was occupied in the late 19th century and was located south of the present community, near Robert's Creek (also called “Old Tyonek Creek”). Due to tidal erosion, in the early 20th century the village was moved north to *Tobona*, or “Second Tyonek.” This site, too, was abandoned because of flooding whereupon Chief Simeon Chickalusion resettled the Tyonek people at the present location of “New Tyonek” in the early 1930s (Kari and Fall 2016:56–68).

President Woodrow Wilson signed Executive Order No. 2141 and created the Tyonek Indian Reserve (also called the “Moquawkie Indian Reserve”) in 1915. The community was incorporated as the Native Village of Tyonek (NVT) under bylaws ratified by its members on November 27, 1939, by the authority of the federal Indian Reorganization Act of 1934 (Fall et al. 1984:29).

The population of Tyonek today consists primarily of the descendants of people originally from several nearby Dena'ina communities, including Susitna Station, Kroto Village, Polly Creek, Kustatan, Kenai, and Old Tyonek. In 1918, many of the Dena'ina at Susitna Station died during the influenza pandemic. Consequently, in 1934, almost all of the remaining Susitna Station Dena'ina moved to Tyonek at the invitation of Chief Chickalusion (Kari and Fall 2016:89–92).

By the 1930s, the Dena'ina at Tyonek had become fully engaged in the Cook Inlet commercial salmon fishery. However, according to Fall et al. (1984) and Braund and Behnke (1980:181), most Tyonek residents describe the 1930s, 1940s, and 1950s as a period of poverty caused by poor commercial fishing prices, low fur prices, and generally scarce subsistence resources. In the 1960s, the community benefited from the sale of oil and gas leases on its lands and the NVT invested in 60 new homes and other public infrastructure (Stanek et al. 2006:86). For additional in-depth background on the history of Tyonek, see *West Cook Inlet Ethnographic Overview and Assessment for Lake Clark National Park and Preserve* by Stanek et al. (2006).

In 2015 and 2016, Tyonek remained a predominately Dena'ina Athabascan community. The community itself consists of 2 parts. The older, core village center has a tribal center and a school with surrounding single-family dwellings, mostly dating to those built in the 1960s. There is also a separate residential subdivision consisting of approximately 35 single-family homes built around 1980. In 2014, the village opened a new health clinic in partnership with Southcentral Foundation.

The NVT council oversees the operation of water and sewer systems and maintains the roads while private companies manage the electrical and telephone systems. Being some distance from Anchorage, many services are provided via entities on the Kenai Peninsula. The Tebughna Elementary/High School, with

around 35 students enrolled and 4 teachers, is run by the Kenai Peninsula School District.¹ As mentioned above, no roads connect Tyonek to the state's highway system. Access to the community is primarily by airplane, and NVT operates a private lighted gravel runway. Located at the Tyonek airstrip is a single fuel tank that is open 2 times per week for residents to purchase fuel. The Tyonek Native Corporation (TNC) owns lands surrounding the community; these lands have a network of gravel roads maintained jointly by TNC and oil and gas companies with developments in the area, including Aurora Gas, LLC, Union Oil Company of California, and Chevron USA. Some of these roads were originally built to extract timber on TNC lands. Tyonek is connected to the communities of Beluga and Shirleyville by this small, unpaved road system.

History of the Tyonek Subsistence Permit System

Subsistence salmon fishing regulations for the Tyonek Subdistrict setnet fishery, in the Northern District of the UCI Management Area, were established by court order in 1980 and subsequently permanently adopted by the BOF following a positive customary and traditional use (C&T) finding in 1981. The BOF has found that salmon in the Tyonek Subdistrict are customarily and traditionally used for subsistence (a "positive" C&T finding) per 5 AAC 01.566.

Between the years of 1980 through 1989, except 1985 and 1986, under state subsistence regulations, only rural residents were eligible to obtain a permit and participate in the Tyonek subsistence salmon fishery. Because of the *Madison et al. vs. Alaska Board of Fisheries* decision, in 1985 and 1986 all Alaska residents qualified as subsistence users, therefore all Alaska residents could obtain a permit to participate in the Tyonek subsistence salmon fishery. Because of the *McDowell vs. State of Alaska* decision in 1989, the "rural" subsistence requirement was removed from state statute, and the Joint Boards of Fisheries and Game ruled that all Alaska residents were considered subsistence users, opening the Tyonek fishery to all Alaskans (Fox and Ruesch 1992).

In a November 1992 administrative finding, the BOF established the following amounts as reasonably necessary for subsistence (ANS): 750–2,750 king salmon, 100–275 sockeye salmon, 50–100 chum salmon, 50–100 pink salmon, and 100–375 coho salmon. These ranges were based on reported harvests from 1980 through 1992. In 2011, the BOF updated its ANS finding in regulation for the Tyonek Subdistrict; the board specified the amounts necessary for subsistence salmon in the Tyonek Subdistrict as 700–2,700 Chinook salmon and 150–500 other salmon.²

Subsistence fishing is open during 2 seasons per year. The early season, which runs from May 15 through June 15, is open for 3 periods per week—Tuesdays, Thursday, and Fridays—and for 16 hours per period, from 4:00 a.m. through 8:00 p.m. The late season, which runs from June 16 through October 15, is open for 1 period per week—Saturdays—and for 12 hours, from 6:00 a.m. to 6:00 p.m.

A subsistence fishing permit is required for this fishery. The permit is a household permit. The total annual possession limit for each permit is 25 salmon per head of household and 10 salmon for each dependent of the household member. In addition, the holder of a Tyonek permit may take 70 additional king salmon, but no more than 4,200 king salmon may be taken from May 15 through June 30. Household permits are issued by the Division of Subsistence prior to fishing and harvests are recorded on the permits.

During the study years, permits were issued in early April by ADF&G Division of Subsistence staff members in Tyonek; the practice of issuing permits in person in Tyonek continued the following year. Division staff members work with NVT staff to advertise the day that they will issue permits in Tyonek via flyers and

1. Tebughna School. n.d. "Tebughna School: Home," <http://tebughnaschool.blogs.kpbsd.k12.ak.us/wpmu/> (accessed April 2015).

2. Alaska Board of Fisheries. 2011. "Upper Cook Inlet Finfish, February 20 – March 5, 2011, Anchorage, Alaska: Preliminary Summary," Alaska Department of Fish and Game, BOF Meeting Information, http://www.adfg.alaska.gov/static-f/regulations/regprocess/fisheriesboard/pdfs/2010_2011/UCI/summofact-uci2011.pdf (accessed January 2018).

social media. Extra blank permits are left with NVT staff to issue to anyone who did not obtain a permit while Division of Subsistence staff were in Tyonek. Additionally, the Division of Subsistence issues Tyonek subsistence permits at the ADF&G office in Anchorage. To return the permits, residents mail them back to the ADF&G Division of Subsistence Anchorage office. The permits are preaddressed and postage-paid. A reminder letter to return permits is sent out in the first week of October after the fishing season ends. A second letter is sent out the first week of November to any remaining permit holders who did not return their permit. Reminder letters were sent out during both years of this study, prior to survey effort.

DEMOGRAPHY

This study found an estimated population for Tyonek in 2015 of 136 individuals, represented by 62 households, and in 2016 the population was estimated to be 153 individuals, represented by 60 households (Table 2-1; Table 2-2). Both these estimates are lower than the 2010 U.S. Census Bureau estimate of 171 individuals represented by 70 households, and the American Community Survey 5-year (2011–2015) average estimate of 214 individuals represented by 68 households. A reason these estimates differ may relate to different criteria used by the agencies to determine full-time residency. The criteria employed in this study required at least 3 consecutive months of occupancy in the community during the study years (2015 and 2016) and self-identification as a full-time resident.

A study conducted by the Division of Subsistence for 2013 found 143 residents in 63 households (Jones et al. 2015). The division's study for the 2005–2006 study year estimated a somewhat higher population than the 2013, 2015, and 2016 findings with 202 people living in 66 permanent households (Stanek et al. 2007), and the division's estimate was higher in January 1984, finding 273 Tyonek residents (Fall et al. 1984). For 4 studies for which subsistence harvest surveys were completed in Tyonek (2005–2006; 2013; and 2015 and 2016), the division found fewer individuals than estimates provided by other agencies. The overall population of Tyonek has declined almost by one-half since 1983–1984, the study year of the first comprehensive survey (Figure 2-1).

The average size of Tyonek households in 2015 was 2.2 individuals; most of the households (98% contained Alaska Native residents (Table 2-3). The average size of Tyonek households in 2016 was 2.6 individuals; of all the households surveyed, 96% contained Alaska Native residents (Table 2-4).

Overall, both the 2015 and 2016 population profiles indicate that the ratio of females versus males is unevenly distributed within many age cohorts in Tyonek (Figure 2-2; Figure 2-3). The 2015 study found the average age of Tyonek residents to be 39 years old with the youngest individual being less than 1 year old and the oldest individual being 76 years old (Table 2-3). The 2016 study found the average age of Tyonek residents to be 37 years old with the youngest individual being less than 1 year old and the oldest individual being 77 years old (Table 2-4). For both study years, the largest female age cohort was between the ages of 35–39; in 2015, the largest male age cohort was between the ages of 55–59, and in 2016 the largest cohort changed to males aged 50–54 (Figure 2-2; Figure 2-3). In both study years, nearly 25% of the population was children (i.e., residents between 0 and 19 years of age) (Table 2-5; Table 2-6).

The 2015 survey found the average length of residency in Tyonek was 29 years; similarly, the 2016 survey found the average to be 27 years. The average length of residency for heads of households in 2015 was 39 years, and in 2016 the average length of residency for heads of households was 38 years (Table 2-3; Table 2-4).

Table 2-1.—Population estimates, Tyonek, 2010 and 2015.

	Census (2010)	5-year American Community Survey (2010–2014)		This study (2015)	
		Estimate	Range ^a	Estimate	Range ^b
Total population					
Households	70	73.0	53 – 93	62.0	
Population	171	226.0	165 – 287	136.4	126 – 146
Alaska Native					
Population	162	212.0	152 – 272	131.4	122 – 141
Percentage	94.7%	93.8%	67.3% – 100%	96.4%	89.3% – 100%

Sources U.S. Census Bureau (2016) for 2010 estimate; U.S. Census Bureau for American Community Survey (ACS) 2014 estimate (5-year average); and ADF&G Division of Subsistence household surveys, 2016, for 2015 estimate.

Note Division of Subsistence household survey eligibility requirements differ from those used by (ACS).

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

b. No range of households is estimated for division surveys.

Table 2-2.—Population estimates, Tyonek, 2010 and 2016.

	Census (2010)	5-year American Community Survey (2011–2015)		This study (2016)	
		Estimate	Range ^a	Estimate	Range ^b
Total population					
Households	70	68.0	48 – 88	60.0	
Population	171	214.0	143 – 285	153.1	142 – 164
Alaska Native					
Population	162	209.0	149 – 269	143.3	133 – 154
Percentage	94.7%	97.7%	69.6% – 100%	93.6%	86.9% – 100%

Sources U.S. Census Bureau (2017) for 2010 estimate; U.S. Census Bureau for American Community Survey (ACS) 2015 estimate (5-year average); and ADF&G Division of Subsistence household surveys, 2017, for 2016 estimate.

Note Division of Subsistence household survey eligibility requirements differ from those used by (ACS).

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

b. No range of households is estimated for division surveys.

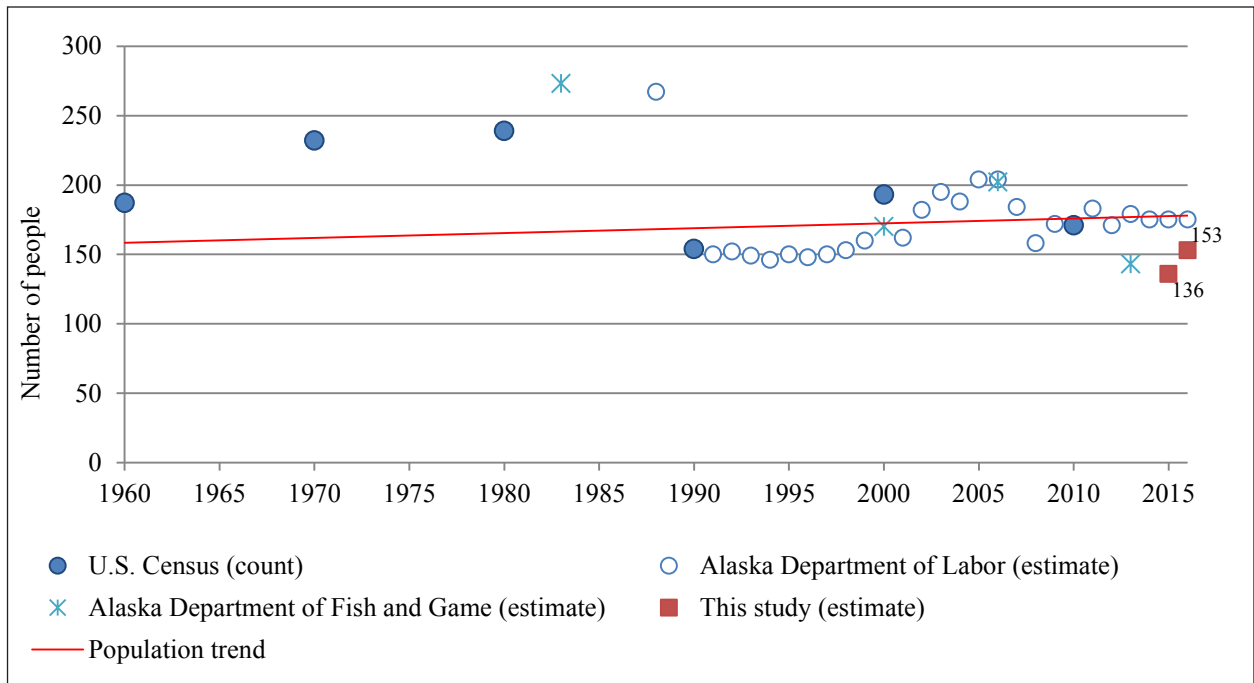


Figure 2-1.—Historical population estimates, Tyonek, 1960–2016.

Table 2-3.—Sample and demographic characteristics, Tyonek, 2015.

Characteristics	Community Tyonek
Sampled households	50
Eligible households	62
Percentage sampled	80.6%
Sampled population	110
Estimated community population	136.4
Household size	
Mean	2.2
Minimum	1
Maximum	6
Age	
Mean	38.9
Minimum ^a	0
Maximum	76
Median	42.5
Length of residency	
Total population	
Mean	29.1
Minimum ^a	0
Maximum	76
Heads of household	
Mean	38.5
Minimum ^a	2
Maximum	71
Alaska Native	
Estimated households ^b	
Number	60.8
Percentage	98.0%
Estimated population	
Number	131.4
Percentage	96.4%

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

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

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

Table 2-4.—Sample and demographic characteristics, Tyonek, 2016.

Characteristics	Community Tyonek
Sampled households	49
Eligible households	60
Percentage sampled	81.7%
Sampled population	125
Estimated community population	153.1
Household size	
Mean	2.6
Minimum	1
Maximum	7
Age	
Mean	37.2
Minimum ^a	0
Maximum	77
Median	40
Length of residency	
Total population	
Mean	27.0
Minimum ^a	0
Maximum	77
Heads of household	
Mean	37.7
Minimum ^a	3
Maximum	75
Alaska Native	
Estimated households ^b	
Number	57.6
Percentage	95.9%
Estimated population	
Number	143.3
Percentage	93.6%

Source ADF&G Division of Subsistence household surveys, 2017.

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

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

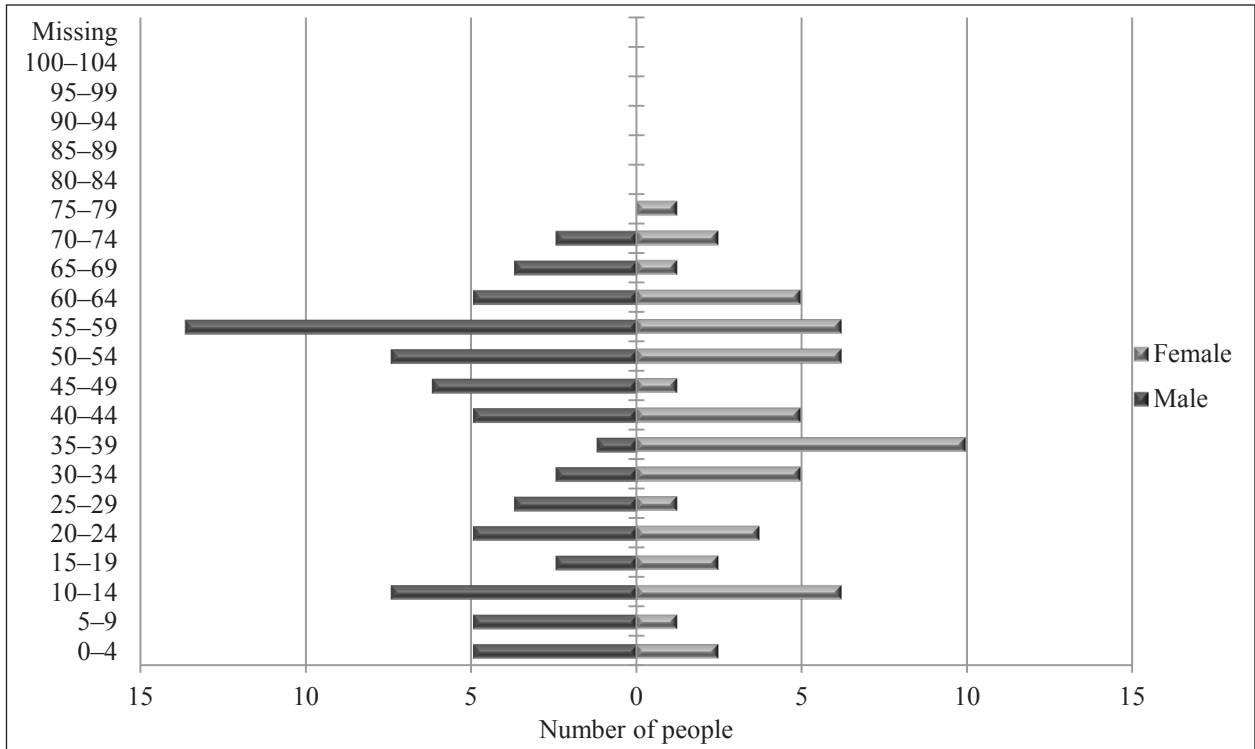


Figure 2-2.—Population profile, Tyonek, 2015.

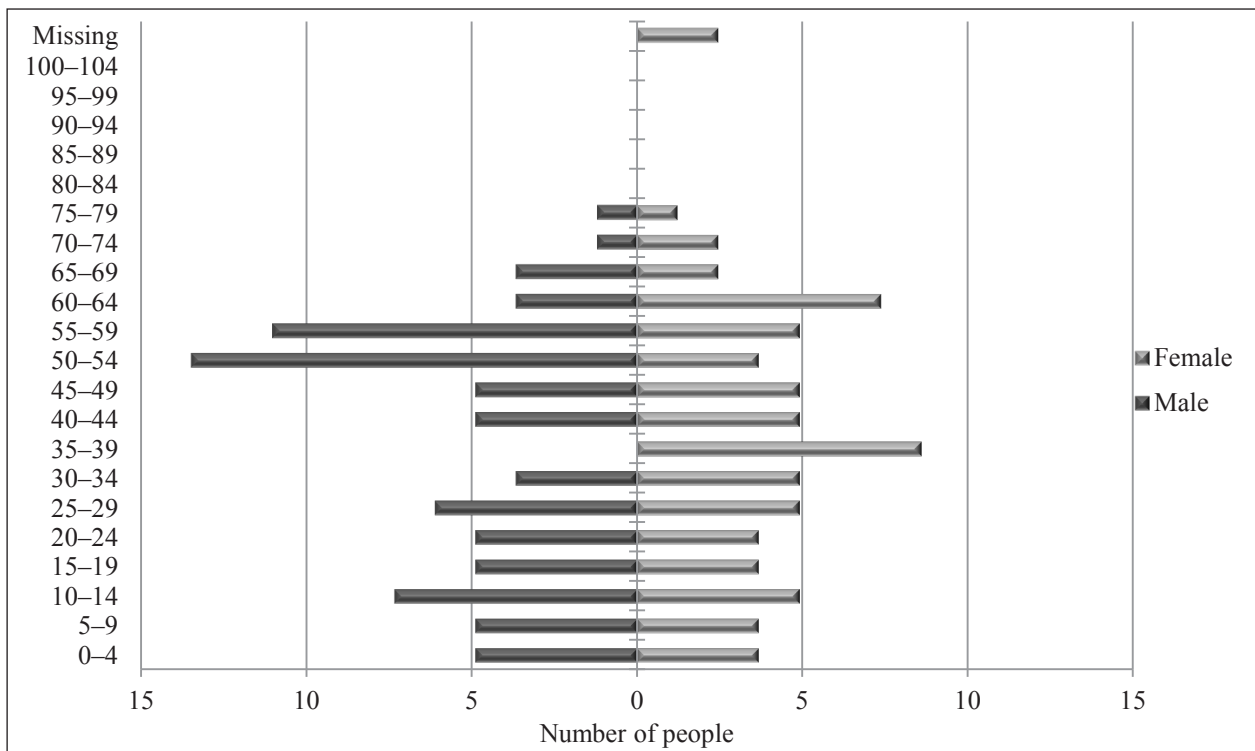


Figure 2-3.—Population profile, Tyonek, 2016.

Table 2-5.—Population profile, Tyonek, 2015.

Age	Male			Female			Total		
	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	5.0	6.6%	6.6%	2.5	4.1%	4.1%	7.4	5.5%	5.5%
5–9	5.0	6.6%	13.1%	1.2	2.0%	6.1%	6.2	4.5%	10.0%
10–14	7.4	9.8%	23.0%	6.2	10.2%	16.3%	13.6	10.0%	20.0%
15–19	2.5	3.3%	26.2%	2.5	4.1%	20.4%	5.0	3.6%	23.6%
20–24	5.0	6.6%	32.8%	3.7	6.1%	26.5%	8.7	6.4%	30.0%
25–29	3.7	4.9%	37.7%	1.2	2.0%	28.6%	5.0	3.6%	33.6%
30–34	2.5	3.3%	41.0%	5.0	8.2%	36.7%	7.4	5.5%	39.1%
35–39	1.2	1.6%	42.6%	9.9	16.3%	53.1%	11.2	8.2%	47.3%
40–44	5.0	6.6%	49.2%	5.0	8.2%	61.2%	9.9	7.3%	54.5%
45–49	6.2	8.2%	57.4%	1.2	2.0%	63.3%	7.4	5.5%	60.0%
50–54	7.4	9.8%	67.2%	6.2	10.2%	73.5%	13.6	10.0%	70.0%
55–59	13.6	18.0%	85.2%	6.2	10.2%	83.7%	19.8	14.5%	84.5%
60–64	5.0	6.6%	91.8%	5.0	8.2%	91.8%	9.9	7.3%	91.8%
65–69	3.7	4.9%	96.7%	1.2	2.0%	93.9%	5.0	3.6%	95.5%
70–74	2.5	3.3%	100.0%	2.5	4.1%	98.0%	5.0	3.6%	99.1%
75–79	0.0	0.0%	100.0%	1.2	2.0%	100.0%	1.2	0.9%	100.0%
80–84	0.0	0.0%	100.0%	0.0	0.0%	100.0%	0.0	0.0%	100.0%
85–89	0.0	0.0%	100.0%	0.0	0.0%	100.0%	0.0	0.0%	100.0%
90–94	0.0	0.0%	100.0%	0.0	0.0%	100.0%	0.0	0.0%	100.0%
95–99	0.0	0.0%	100.0%	0.0	0.0%	100.0%	0.0	0.0%	100.0%
100–104	0.0	0.0%	100.0%	0.0	0.0%	100.0%	0.0	0.0%	100.0%
Missing	0.0	0.0%	100.0%	0.0	0.0%	100.0%	0.0	0.0%	100.0%
Total	75.6	100.0%	100.0%	60.8	100.0%	100.0%	136.4	100.0%	100.0%

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

Table 2-6.—Population profile, Tyonek, 2016.

Age	Male			Female			Total		
	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage	Number	Percentage	Cumulative percentage
0–4	4.9	6.1%	6.1%	3.7	5.1%	5.1%	8.6	5.6%	5.6%
5–9	4.9	6.1%	12.1%	3.7	5.1%	10.2%	8.6	5.6%	11.2%
10–14	7.3	9.1%	21.2%	4.9	6.8%	16.9%	12.2	8.0%	19.2%
15–19	4.9	6.1%	27.3%	3.7	5.1%	22.0%	8.6	5.6%	24.8%
20–24	4.9	6.1%	33.3%	3.7	5.1%	27.1%	8.6	5.6%	30.4%
25–29	6.1	7.6%	40.9%	4.9	6.8%	33.9%	11.0	7.2%	37.6%
30–34	3.7	4.5%	45.5%	4.9	6.8%	40.7%	8.6	5.6%	43.2%
35–39	0.0	0.0%	45.5%	8.6	11.9%	52.5%	8.6	5.6%	48.8%
40–44	4.9	6.1%	51.5%	4.9	6.8%	59.3%	9.8	6.4%	55.2%
45–49	4.9	6.1%	57.6%	4.9	6.8%	66.1%	9.8	6.4%	61.6%
50–54	13.5	16.7%	74.2%	3.7	5.1%	71.2%	17.1	11.2%	72.8%
55–59	11.0	13.6%	87.9%	4.9	6.8%	78.0%	15.9	10.4%	83.2%
60–64	3.7	4.5%	92.4%	7.3	10.2%	88.1%	11.0	7.2%	90.4%
65–69	3.7	4.5%	97.0%	2.4	3.4%	91.5%	6.1	4.0%	94.4%
70–74	1.2	1.5%	98.5%	2.4	3.4%	94.9%	3.7	2.4%	96.8%
75–79	1.2	1.5%	100.0%	1.2	1.7%	96.6%	2.4	1.6%	98.4%
80–84	0.0	0.0%	100.0%	0.0	0.0%	96.6%	0.0	0.0%	98.4%
85–89	0.0	0.0%	100.0%	0.0	0.0%	96.6%	0.0	0.0%	98.4%
90–94	0.0	0.0%	100.0%	0.0	0.0%	96.6%	0.0	0.0%	98.4%
95–99	0.0	0.0%	100.0%	0.0	0.0%	96.6%	0.0	0.0%	98.4%
100–104	0.0	0.0%	100.0%	0.0	0.0%	96.6%	0.0	0.0%	98.4%
Missing	0.0	0.0%	100.0%	2.4	3.4%	100.0%	2.4	1.6%	100.0%
Total	80.8	100.0%	100.0%	72.2	100.0%	100.0%	153.1	100.0%	100.0%

Source ADF&G Division of Subsistence household surveys, 2017.

3. SALMON HARVESTS AND USES

HISTORICAL HARVESTS AND USES OF SALMON BY TYONEK RESIDENTS

In upper Cook Inlet, all 5 species of Pacific salmon pass through the area on their way to freshwater spawning grounds. In this chapter, harvest survey results from this study (2015 and 2016) are first presented and then compared to harvest survey results from previous study years 2013 (Jones et al. 2015), 2005–2006 (Stanek et al. 2007), and 1983–1984 (Fall et al. 1984), and also compared to the subsistence salmon harvest permit data for 1980–2016. The results of the assessment questions from the household survey are then presented. Assessment questions attempt to gauge to what degree salmon harvest and use patterns by the community have changed over time. Following presentation of these data, the results are contextualized with qualitative information obtained from key respondent interviews, participant observation, and literature review from past studies.

SALMON HARVESTS AND USES IN 2015: HARVEST QUANTITIES AND COMPOSITION

In 2015, Tyonek residents harvested an estimated total of 16,304 lb, or 120 lb per capita, of salmon (Table 3-1). In terms of total pounds and percentages harvested, the majority of the harvest was Chinook salmon (10,332 lb, 167 lb per capita, or 64% of the total salmon harvest), followed by coho salmon (4,231 lb, 68 lb per capita, or 26%), sockeye salmon (1,682 lb, 27 lb per capita, or 10%), chum salmon (35 lb, less than 1 lb per capita), and pink salmon (24 lb, less than 1 lb per capita) (Table 3-1; Figure 3-1).

Table 3-2 lists the number and pounds of each salmon species harvested by Tyonek residents in 2015 in percentages by gear type. Tyonek residents harvested most of their salmon by subsistence gillnets (91% of salmon harvest weight); the other 2 methods used to harvest salmon were removals from commercial catches (7% of harvest weight) and rod and reel (2%). The majority (98%) of Chinook salmon was caught using subsistence gillnets and 2% was removed from commercial catches. For coho salmon, 70% of the harvest weight was caught using subsistence gillnets, 23% was removed from commercial catches, and 8% was harvested using rod and reel. All of the sockeye salmon were caught using subsistence gillnets. Chum salmon were harvested using subsistence gillnets (60%) and were removed from commercial catches (40%). Sixty-three percent of the pink salmon harvest weight was caught using subsistence gillnets and the other 37% was harvested through removal from commercial catches.

During 2015, 96% of Tyonek households used salmon, 80% harvested salmon, 76% shared salmon, and 62% received salmon. The majority (92%) of Tyonek households used Chinook salmon during the study year, 76% of households harvested Chinook salmon, 56% shared this salmon species, and 42% received Chinook salmon.

For coho salmon, 62% of Tyonek households used this fish, 50% harvested and shared coho salmon with others, and 30% of Tyonek households received coho salmon. In 2015, a little more than one-half (54%) of Tyonek households used sockeye salmon, 46% harvested this salmon species, 42% gave away sockeye salmon, and 16% of households received sockeye salmon. A smaller number (8%) of households in Tyonek used pink salmon in 2015, and 6% of households used chum salmon during the study year.

Overall, 80% of Tyonek households attempted to harvest salmon and 80% harvested salmon. However, looking at the fishing effort by individual species, all households fishing for Chinook salmon (the most harvested species) were successful and the same is true for pink salmon (the least harvested species). A small proportion of Tyonek households fishing for coho, sockeye, and chum salmon were not successful. For all salmon species, fewer households received salmon than gave away these resources—indicating sharing with community households outside of Tyonek.

Table 3-1.—Estimated use and harvest of salmon, Tyonek households, 2015.

Resource	Percentage of households					Harvest weight (lb)			Harvest amount			95% confidence limit (±) harvest
	Use %	Attempt %	Harvest %	Receive %	Give %	Total	Mean per household	Per capita	Total	Unit	Mean per household	
Salmon	96.0	80.0	80.0	62.0	76.0	16,303.7	263.0	119.5	16,303.7 lb		263.0	12.5
Chum salmon	6.0	8.0	6.0	0.0	2.0	35.0	0.6	0.3	6.2 ind		0.1	52.1
Coho salmon	62.0	54.0	50.0	30.0	50.0	4,230.6	68.2	31.0	698.1 ind		11.3	17.4
Chinook salmon	92.0	76.0	76.0	42.0	56.0	10,331.6	166.6	75.7	811.0 ind		13.1	15.6
Pink salmon	8.0	8.0	8.0	0.0	4.0	24.4	0.4	0.2	9.9 ind		0.2	50.8
Sockeye salmon	54.0	52.0	46.0	16.0	42.0	1,682.1	27.1	12.3	383.2 ind		6.2	21.7

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

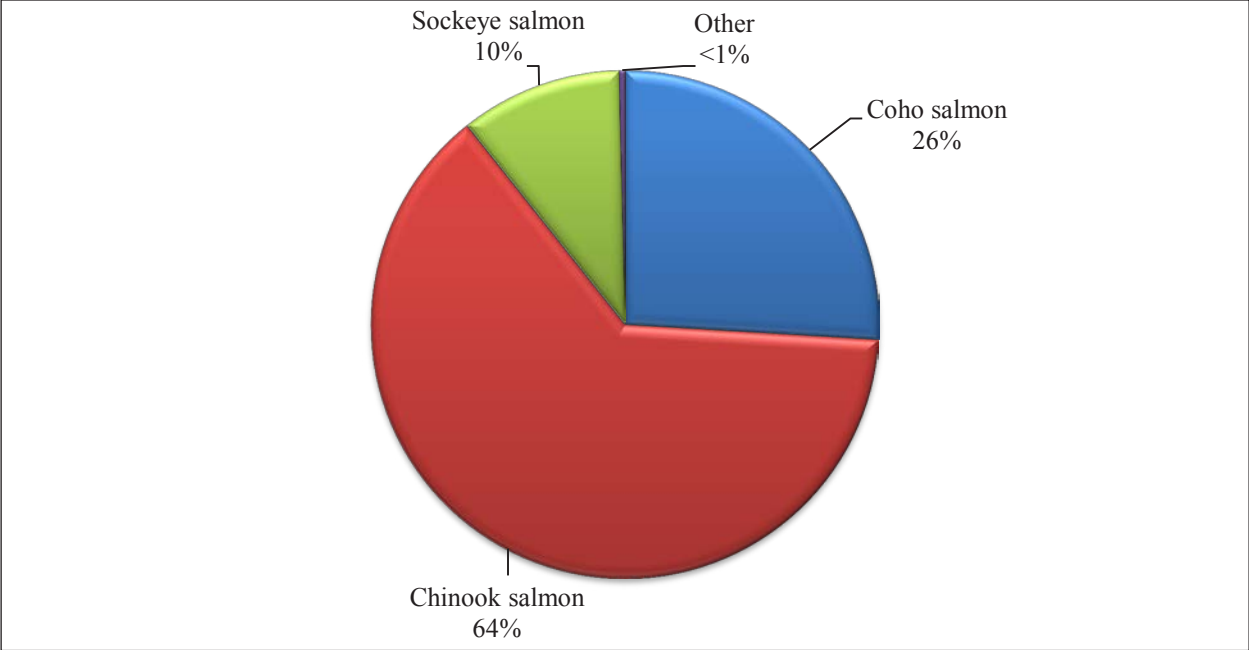


Figure 3-1.—Composition of salmon harvest in pounds usable weight, Tyonek households, 2015.

Table 3-3.—Estimated percentages of salmon harvest in pounds usable weight by gear type, resource, and total salmon harvest, Tyonek households, 2015.

Resource	Percentage base	Subsistence methods													
		Removed from commercial catch				Subsistence gear, any method						Rod and reel		Any method	
		Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds
Salmon	Gear type	100.0%	100.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	Resource	9.4%	7.3%	87.8%	90.8%	0.0%	0.0%	0.0%	0.0%	87.8%	90.8%	2.8%	2.0%	100.0%	100.0%
	Total	9.4%	7.3%	87.8%	90.8%	0.0%	0.0%	0.0%	0.0%	87.8%	90.8%	2.8%	2.0%	100.0%	100.0%
Chum salmon	Gear type	1.4%	1.2%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.2%	0.1%	0.0%	0.0%	0.3%	0.2%
	Resource	40.0%	40.0%	60.0%	60.0%	0.0%	0.0%	0.0%	0.0%	60.0%	60.0%	0.0%	0.0%	100.0%	100.0%
	Total	0.1%	0.1%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.2%	0.1%	0.0%	0.0%	0.3%	0.2%
Coho salmon	Gear type	87.6%	80.7%	29.1%	20.0%	0.0%	0.0%	0.0%	0.0%	29.1%	20.0%	100.0%	100.0%	36.6%	25.9%
	Resource	22.6%	22.6%	69.8%	69.8%	0.0%	0.0%	0.0%	0.0%	69.8%	69.8%	7.6%	7.6%	100.0%	100.0%
	Total	8.3%	5.9%	25.5%	18.1%	0.0%	0.0%	0.0%	0.0%	25.5%	18.1%	2.8%	2.0%	36.6%	25.9%
Chinook salmon	Gear type	9.0%	17.4%	47.4%	68.4%	0.0%	0.0%	0.0%	0.0%	47.4%	68.4%	0.0%	0.0%	42.5%	63.4%
	Resource	2.0%	2.0%	98.0%	98.0%	0.0%	0.0%	0.0%	0.0%	98.0%	98.0%	0.0%	0.0%	100.0%	100.0%
	Total	0.8%	1.3%	41.7%	62.1%	0.0%	0.0%	0.0%	0.0%	41.7%	62.1%	0.0%	0.0%	42.5%	63.4%
Pink salmon	Gear type	2.1%	0.8%	0.4%	0.1%	0.0%	0.0%	0.0%	0.0%	0.4%	0.1%	0.0%	0.0%	0.5%	0.1%
	Resource	37.5%	37.5%	62.5%	62.5%	0.0%	0.0%	0.0%	0.0%	62.5%	62.5%	0.0%	0.0%	100.0%	100.0%
	Total	0.2%	0.1%	0.3%	0.1%	0.0%	0.0%	0.0%	0.0%	0.3%	0.1%	0.0%	0.0%	0.5%	0.1%
Sockeye salmon	Gear type	0.0%	0.0%	22.9%	11.4%	0.0%	0.0%	0.0%	0.0%	22.9%	11.4%	0.0%	0.0%	20.1%	10.3%
	Resource	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	100.0%	100.0%
	Total	0.0%	0.0%	20.1%	10.3%	0.0%	0.0%	0.0%	0.0%	20.1%	10.3%	0.0%	0.0%	20.1%	10.3%

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

Table 3-2.—Estimated use and harvest of salmon, Tyonek households, 2016.

Resource	Percentage of households					Harvest weight (lb)			Harvest amount			95% confidence limit (±) harvest
	Use %	Attempt %	Harvest %	Receive %	Give %	Total	Mean per household	Per capita	Total	Unit	Mean per household	
	Salmon	93.9	77.6	77.6	63.3	79.6	15,629.1	260.5	102.1	15,629.1 lb		
Chum salmon	6.1	10.2	6.1	0.0	2.0	95.1	1.6	0.6	18.4 ind		0.3	49.3
Coho salmon	57.1	46.9	44.9	34.7	40.8	2,250.6	37.5	14.7	476.3 ind		7.9	21.2
Chinook salmon	93.9	73.5	73.5	51.0	67.3	12,005.2	200.1	78.4	936.7 ind		15.6	13.8
Pink salmon	6.1	14.3	6.1	0.0	0.0	99.9	1.7	0.7	31.8 ind		0.5	51.4
Sockeye salmon	46.9	38.8	32.7	20.4	32.7	1,178.2	19.6	7.7	279.2 ind		4.7	23.8

Source ADF&G Division of Subsistence household surveys, 2017.

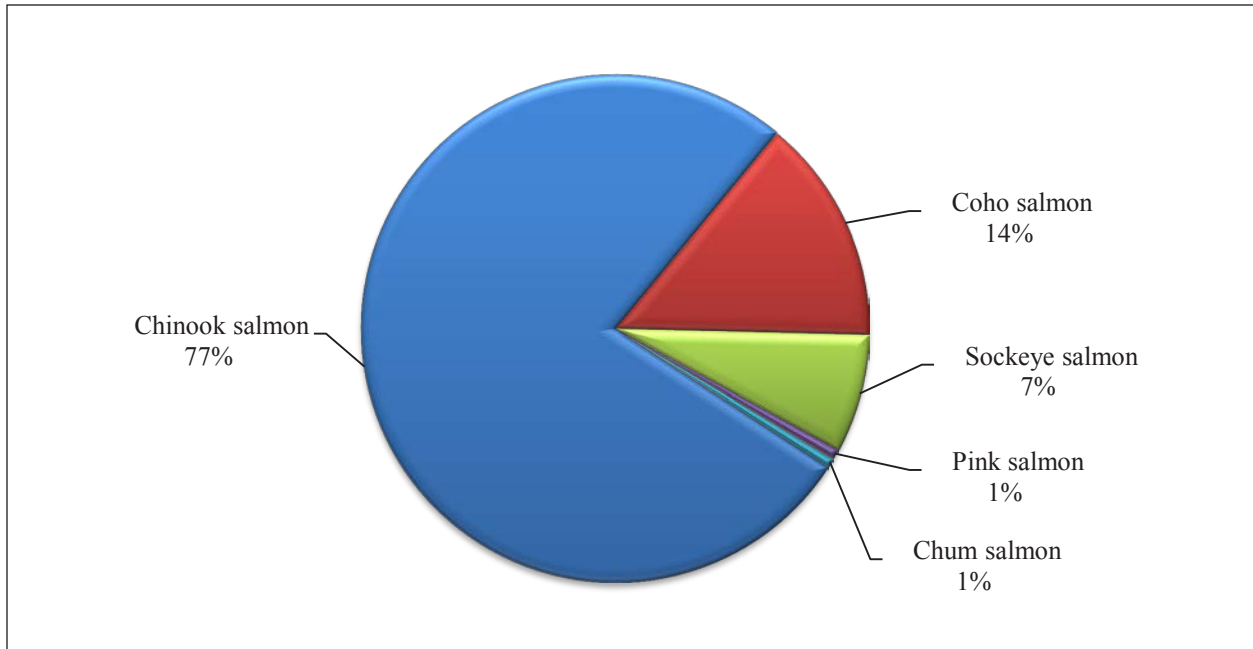


Figure 3-2.—Composition of salmon harvest in pounds usable weight, Tyonek households, 2016.

SALMON HARVESTS AND USES IN 2016: HARVEST QUANTITIES AND COMPOSITION

In 2016, Tyonek residents harvested an estimated total of 15,629 lb, or 102 lb per capita, of salmon (Table 3-3). In terms of total pounds and percentages harvested, the majority of the harvest was Chinook salmon (12,005 lb, 78 lb per capita, or 77% of the total salmon harvest), followed by coho salmon (2,251 lb, 15 lb per capita, or 14%), sockeye salmon (1,178 lb, 8 lb per capita, or 7%), pink salmon (100 lb, less than 1 lb per capita), and chum salmon (95 lb, less than 1 lb per capita) (Table 3-3, Figure 3-2).

Table 3-4 lists the number and pounds of each salmon species harvested by Tyonek residents in 2016 in percentages by gear type. Tyonek residents harvested most of their salmon by subsistence gillnets (91% of salmon harvest weight); the other 2 methods used to harvest salmon were removals from commercial catches (9% of harvest weight) and rod and reel (less than 1%). The majority (96%) of Chinook salmon was caught using subsistence gillnets and 4% was removed from commercial catches. For coho salmon, 71% were caught using subsistence gillnets, 24% were removed from commercial catches, and 5% were harvested using rod and reel. For sockeye salmon, 78% were caught using subsistence gillnets, and the rest (22%) were removed from commercial catches. Most (81%) pink salmon were harvested using subsistence gillnets and 19% were harvested through removals from commercial catches. Chum salmon were harvested using subsistence gillnets (67%) and the remaining 33% were removed from commercial catches.

During 2016, 94% of Tyonek households used salmon, 78% harvested salmon, 80% shared salmon, and 63% received salmon. The majority (94%) of Tyonek households used Chinook salmon during the study year, 74% of households harvested Chinook salmon, 67% shared this salmon species, and 51% received Chinook salmon. For coho salmon, 57% of Tyonek households used this fish, 45% harvested coho salmon, and 41% shared and 35% of Tyonek households received coho salmon. In 2016, approximately one-half (47%) of Tyonek households used sockeye salmon, 33% harvested and shared this salmon species, and 20% of households received sockeye salmon. Only 6% of Tyonek households used chum and pink salmon in 2016. Similarly to the 2015 results, during the 2016 study year more households gave away salmon overall and for each species than received salmon, indicating sharing outside the community of Tyonek.

Table 3-4.—Estimated percentages of salmon harvest in pounds usable weight by gear type, resource, and total salmon harvest, Tyonek households, 2016.

Resource	Percentage base	Subsistence methods													
		Removed from commercial catch				Subsistence gear, any method						Rod and reel			
		Gillnet or seine		Dip net		Other		Subsistence gear, any method		Rod and reel		Any method			
	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	Number	Pounds	
Salmon	Gear type	100.0%	100.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	Resource	13.1%	8.7%	85.7%	90.6%	0.0%	0.0%	0.0%	0.0%	85.7%	90.6%	1.3%	0.7%	100.0%	100.0%
	Total	13.1%	8.7%	85.7%	90.6%	0.0%	0.0%	0.0%	0.0%	85.7%	90.6%	1.3%	0.7%	100.0%	100.0%
Chum salmon	Gear type	2.7%	2.3%	0.8%	0.4%	0.0%	0.0%	0.0%	0.0%	0.8%	0.4%	0.0%	0.0%	1.1%	0.6%
	Resource	33.3%	33.3%	66.7%	66.7%	0.0%	0.0%	0.0%	0.0%	66.7%	66.7%	0.0%	0.0%	100.0%	100.0%
	Total	0.4%	0.2%	0.7%	0.4%	0.0%	0.0%	0.0%	0.0%	0.7%	0.4%	0.0%	0.0%	1.1%	0.6%
Coho salmon	Gear type	50.0%	39.4%	22.8%	11.4%	0.0%	0.0%	0.0%	0.0%	22.8%	11.4%	100.0%	100.0%	27.3%	14.4%
	Resource	23.9%	23.9%	71.5%	71.5%	0.0%	0.0%	0.0%	0.0%	71.5%	71.5%	4.6%	4.6%	100.0%	100.0%
	Total	6.5%	3.4%	19.5%	10.3%	0.0%	0.0%	0.0%	0.0%	19.5%	10.3%	1.3%	0.7%	27.3%	14.4%
Chinook salmon	Gear type	17.7%	37.9%	60.0%	81.1%	0.0%	0.0%	0.0%	0.0%	60.0%	81.1%	0.0%	0.0%	53.8%	76.8%
	Resource	4.3%	4.3%	95.7%	95.7%	0.0%	0.0%	0.0%	0.0%	95.7%	95.7%	0.0%	0.0%	100.0%	100.0%
	Total	2.3%	3.3%	51.4%	73.5%	0.0%	0.0%	0.0%	0.0%	51.4%	73.5%	0.0%	0.0%	53.8%	76.8%
Pink salmon	Gear type	2.7%	1.4%	1.7%	0.6%	0.0%	0.0%	0.0%	0.0%	1.7%	0.6%	0.0%	0.0%	1.8%	0.6%
	Resource	19.2%	19.2%	80.8%	80.8%	0.0%	0.0%	0.0%	0.0%	80.8%	80.8%	0.0%	0.0%	100.0%	100.0%
	Total	0.4%	0.1%	1.5%	0.5%	0.0%	0.0%	0.0%	0.0%	1.5%	0.5%	0.0%	0.0%	1.8%	0.6%
Sockeye salmon	Gear type	26.9%	18.9%	14.6%	6.5%	0.0%	0.0%	0.0%	0.0%	14.6%	6.5%	0.0%	0.0%	16.0%	7.5%
	Resource	21.9%	21.9%	78.1%	78.1%	0.0%	0.0%	0.0%	0.0%	78.1%	78.1%	0.0%	0.0%	100.0%	100.0%
	Total	3.5%	1.7%	12.5%	5.9%	0.0%	0.0%	0.0%	0.0%	12.5%	5.9%	0.0%	0.0%	16.0%	7.5%

Source ADF&G Division of Subsistence household surveys, 2017.

Table 3-5.—Total Tyonek Subdistrict estimated subsistence salmon harvests by community, Tyonek and non-Tyonek residents, 2015.

Community	Permits		Percentage of returned permits	Estimated salmon harvests					Total
	Issued	Returned		Chinook	Sockeye	Coho	Chum	Pink	
Anchorage	14	12	85.7%	147	60	34	0	0	240
Big Lake	3	0	0.0%	0	0	0	0	0	0
Eagle River	2	2	100.0%	0	0	0	0	0	0
Kenai	1	1	100.0%	33	12	12	2	0	59
Nikiski	1	1	100.0%	6	34	0	0	0	40
Palmer	1	1	100.0%	6	5	7	0	0	18
Soldotna	1	1	100.0%	0	0	0	0	0	0
Tyonek	60	54	90.0%	878	394	516	14	6	1,808
Total	83	72	86.7%	1,070	505	568	16	6	2,165

Source ADF&G Division of Subsistence, ASFDB 2016 (ADF&G 2017).

PERMIT PARTICIPATION

2015 Harvest Survey and Subsistence Permits

In 2015, 83 permits were issued for the entire Tyonek Subdistrict subsistence salmon fishery, including 60 permits issued to Tyonek residents (72%) and 23 permits issued to other Alaska residents, including 14 to residents of Anchorage (17%) (Table 3-5). Of the 83 permits issued to both Tyonek residents and non-Tyonek residents, 72 were returned (87% return rate). The following section discusses the pre- and post-survey permit return rate and general permit program participation.

As mentioned previously, a total of 60 Tyonek Subdistrict permits were issued to Tyonek resident households in 2015; overall, 54 of those permits were returned, resulting in a post-survey 90% return rate by permit holders residing in Tyonek for the 2015 subsistence fishing season. In 2015, 36 permits were issued to residents of surveyed Tyonek households, and 19 of those permits were returned prior to the harvest survey (53% return rate) (Table 3-6). Additionally, 9 permits were returned by Tyonek households that were not surveyed in 2015; in total, 28 of 54 Tyonek resident permits were returned prior to the survey effort (52% pre-survey return rate) (Table 3-7). During the survey, 26 permits were collected by ADF&G staff or LRAs. The Tyonek households that obtained a subsistence fishing permit but did not return it prior to the survey were asked the reason why they had not already turned in the permit. Of the respondents who had not returned subsistence permits, 6 stated that they forgot, 5 lost the permit, 1 did not know the reason why the permit was not returned, 2 left the permit at fish camp, and 12 did not provide a response.

During the 2015 household surveys, 40 households reported subsistence fishing and 32 of those households were represented by a household member who obtained a subsistence permit while 8 households did not have their own subsistence permits (Table 3-8). Several of the households that fished but did not have a permit were listed on another household's permit, while others who did not obtain a permit but did fish were issued a permit based on their recall during the survey. The recall data were incorporated into the permit database after the surveys were finished. Additionally, of the 36 surveyed Tyonek households in 2015 that had a subsistence permit, 18 households (50%) fished and returned the permit, 14 households (39%) fished but did not return the permit, 3 households (8%) did not fish and did not return the permit, and 1 household (3%) did not fish and returned the permit. Overall, of the 40 surveyed households that reported fishing, less than one-half (18 households, or 45%) returned a permit.

Table 3-6.—Number of subsistence permits issued and returned, Tyonek households, 2015 and 2016.

Year	Permits issued to residents of surveyed Tyonek households	Surveyed Tyonek households			Tyonek Subdistrict, Tyonek residency		
		Permits issued	Permits returned	Percent of returned permits	Permits issued	Permits returned	Percent of returned permits
2015	36	36	19	52.8%	60	54	90.0%
2016	41	37	28	75.7%	57	53	93.0%

Source ADFG Division of Subsistence household surveys, 2016 and 2017.

Note In 2016, there were surveyed households that received 2 permits due, for instance, to residency changes between the time permits were issued and the time household surveys occurred.

Table 3-7.—Reasons surveyed subsistence permit holders did not return permit, Tyonek households, 2015 and 2016.

Year	Total Tyonek resident permits returned prior to survey	Total permits collected during survey administration	Reason for not returning permit							
			Forgot	Lost	Do not know/ unspecified	Left permit at fish camp	Left permit uncompleted	Permit already returned via mail	Did not fish	No response ^a
2015	28	26	6	5	1	2				12
2016	33	20	4	3	1		1	1	1	9

Source ADFG Division of Subsistence household surveys, 2016 and 2017.

a. Indicates respondent turned in permit during household survey administration; no reason was indicated for why the permit was not previously returned by mail.

Table 3-8.—Comparison of fishing and subsistence permit participation patterns, Tyonek households, 2015 and 2016.

Year	Number of surveyed households that _____.			Surveyed households receiving a Tyonek Subdistrict permit and ...			
	Reported fishing for salmon	Obtained a Tyonek Subdistrict permit	Fished, but did not get a Tyonek Subdistrict permit	Fished, did not return permit	Fished, returned permit	Did not fish, returned permit	Did not fish, did not return permit
2015	40	36	8	14	18	1	3
2016	38	37	5	8	25	0	4

Source ADFG Division of Subsistence household surveys, 2016 and 2017.

Note In 2016, there were surveyed households that received 2 permits due, for instance, to residency changes between the time permits were issued and the time household surveys occurred.

Table 3-9.—Estimated subsistence salmon harvest by subsistence permit returns, Tyonek households, 2015.

Household that _____.	Number of households			Harvest amount (individual fish) ^a				
	Total	Attempting	Harvesting	Reported	Mean per household	Minimum	Maximum	Estimated ^b
Did not get permit	14	8	7	116	8.3	0	32	143.8
Received permit, did not return	17	14	14	443	26.1	0	121	549.3
Returned permit	19	18	18	792	41.7	0	89	982.1
Overall	50	40	39	1,351	27.0	0	121	1,675.2

Source ADF&G Division of Subsistence household surveys 2016.

a. Harvests of all salmon taken with subsistence gear only.

b. Estimated harvest is based on the mean for the community as a whole.

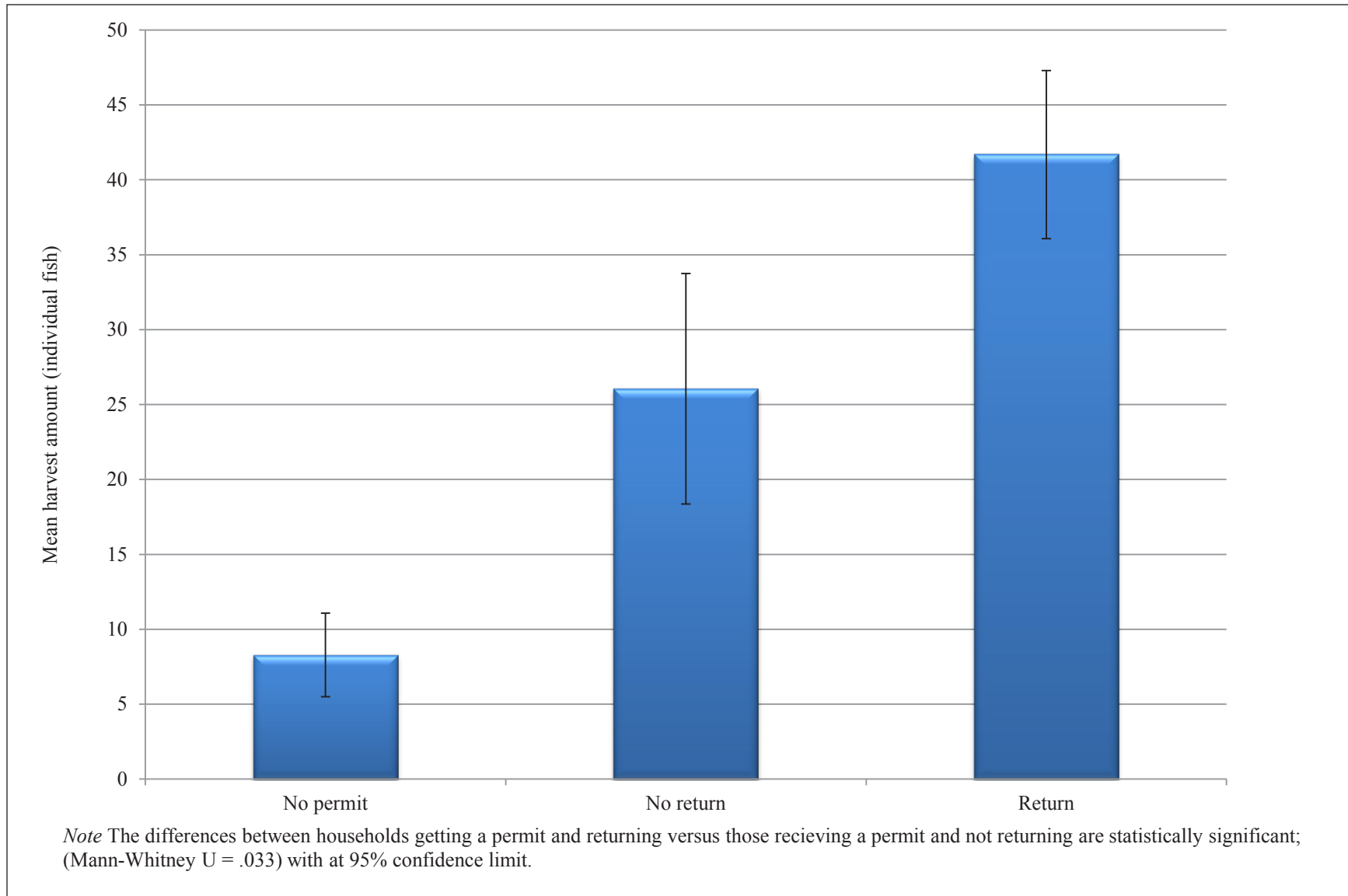


Figure 3-3.—Estimated mean subsistence salmon harvest, Tyonek households, 2015.

Table 3-10.—Total Tyonek Subdistrict estimated subsistence salmon harvests by community, Tyonek and non-Tyonek residents, 2016.

Community	Permits		Percentage of returned permits	Estimated salmon harvests					Total
	Issued	Returned		Chinook	Sockeye	Coho	Chum	Pink	
Anchorage	10	7	70.0%	147	6	21	0	0	174
Big Lake	1	1	100.0%	0	0	0	0	0	0
Kenai	2	1	50.0%	52	14	0	0	0	66
Nikiski	1	1	100.0%	4	24	0	0	0	28
Palmer	1	1	100.0%	2	0	0	0	0	2
Soldotna	2	0	0.0%	0	0	0	0	0	0
Tyonek	57	53	93.0%	825	144	203	8	12	1,192
Total	74	64	86.5%	1,030	188	225	8	12	1,462

Source ADF&G Division of Subsistence, ASFDB 2017 (ADF&G 2018).

According to Table 3-9 and Figure 3-3, in 2015 the households that obtained and returned a subsistence salmon permit accounted for the largest portion (59%) of the estimated subsistence salmon harvest during the study year (18 households harvested 982 salmon). The second largest portion of the subsistence salmon harvest was caught by households that obtained a permit but did not return it (13 households harvested 549 salmon). Lastly, the 7 successful harvesting households that did not obtain their own subsistence permit accounted for 144 salmon harvested.

2016 Harvest Survey and Subsistence Permits

In 2016, 74 permits were issued for the entire Tyonek Subdistrict subsistence salmon fishery, including 57 permits issued to Tyonek residents (77%) and 17 permits issued to other Alaska residents, including 10 to residents of Anchorage (14%) (Table 3-10). Of the 74 permits issued to both Tyonek residents and non-Tyonek residents, 64 were returned (86% return rate). The following section discusses the pre- and post-survey permit return rate and general permit program participation.

As mentioned previously, a total of 57 Tyonek Subdistrict permits were issued in 2016 for Tyonek resident households; 53 of those permits were returned, resulting in a post-survey 93% return rate by permit holders residing in Tyonek for the 2016 subsistence fishing season (Table 3-10). For 2016, there were 41 permits issued to residents of surveyed Tyonek households, although there were surveyed Tyonek households that had more than one permitted resident.¹ As such, overall, there were 37 permitted surveyed households and 28 household permits were returned prior to the survey (76% return rate) (Table 3-6). Additionally, 5 permits were returned by Tyonek households that were not surveyed in 2016; in total, 33 of 53 Tyonek resident permits were returned prior to survey effort (62% pre-survey return rate) (Table 3-7). Twenty individual permits were collected by ADF&G staff or LRAs during the harvest survey. The Tyonek residents who obtained a subsistence fishing permit but did not return it prior to the survey were asked the reason why they had not already turned in their permit. Of the respondents who had not returned subsistence permits, 4 stated that they forgot, 3 lost the permit, 1 did not know the reason, 1 had not filled out the permit, 1 stated that they had already returned the permit, 1 respondent did not fish, and 9 did not provide a response.

According to the 2016 survey, 38 Tyonek households reported subsistence fishing and 33 of those households were represented by a member who obtained a subsistence permit while 5 households did not have their own subsistence permits (Table 3-8). A portion of the households that fished but did not have a permit were listed on another household's permit, while others who did not obtain a permit but did fish were issued a permit based on their recall during the survey. The recall data were incorporated into the permit database after the surveys were finished. Moreover, of the 2016 surveyed Tyonek households with a subsistence

1. Residency changes between the time permits were issued and the time household surveys occurred is one reason why more than one permit was issued to a single surveyed household's residents.

Table 3-11.—Estimated subsistence salmon harvest by subsistence permit returns, Tyonek households, 2016.

Household that _____.	Number of households			Harvest amount (individual fish) ^a				
	Total	Attempting	Harvesting	Reported	Mean per household	Minimum	Maximum	Estimated ^b
Did not get permit	12	5	3	39	3.3	0	30	47.8
Received permit, did not return	12	8	8	290	24.2	0	70	355.1
Returned permit	25	25	25	890	35.6	5	90	1,089.8
Overall	49	38	36	1,219	24.9	0	90	1,492.7

Source ADF&G Division of Subsistence household surveys 2017.

a. Harvests of all salmon taken with subsistence gear only.

b. Estimated harvest is based on the mean for the community as a whole.

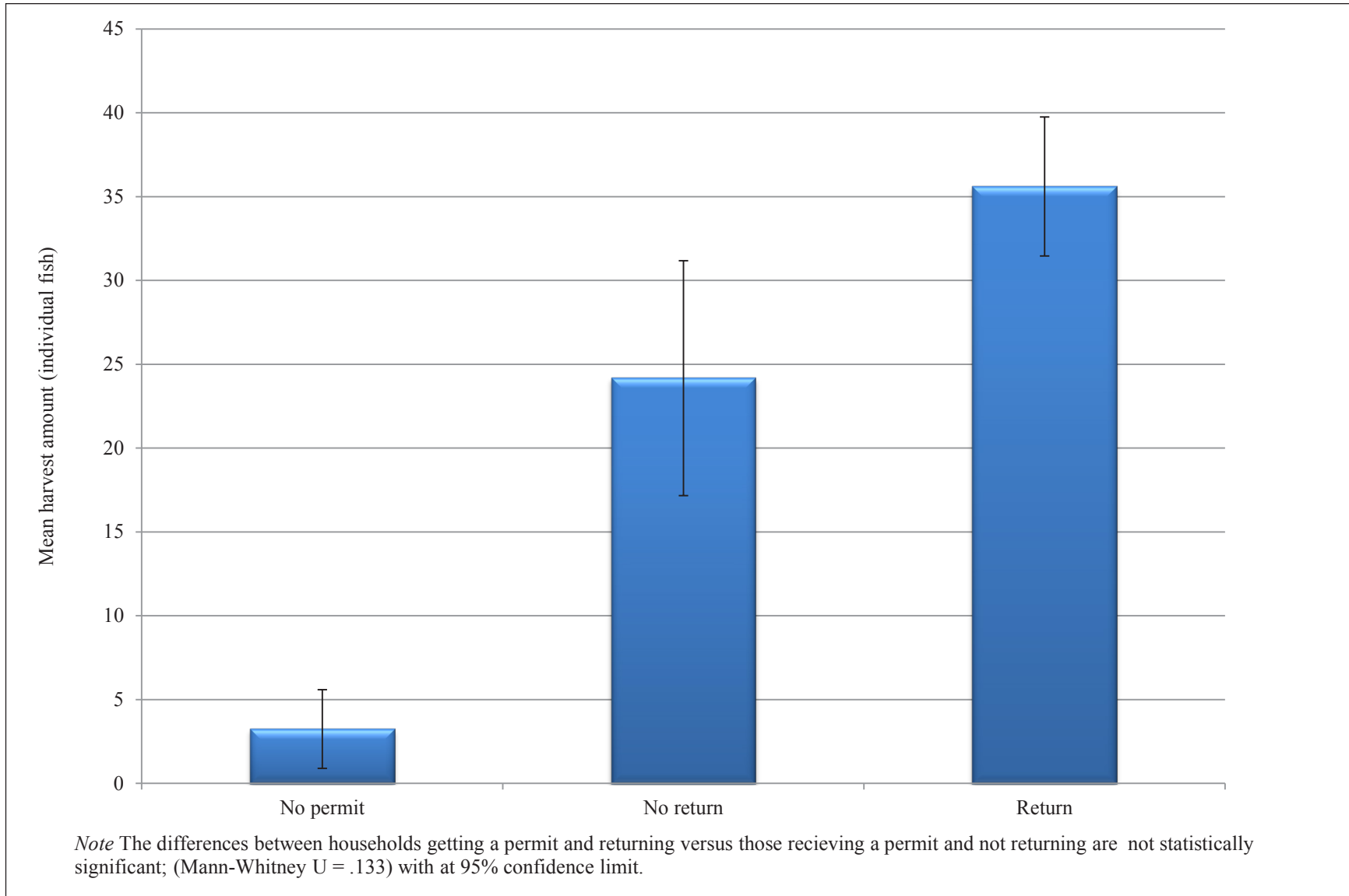


Figure 3-4.—Estimated mean subsistence salmon harvest, Tyonek households, 2016.

permit, 25 households (68%) fished and returned the permit, 8 (22%) fished but did not return the permit, and 4 households did not fish and did not return their permit. Overall, of the 38 surveyed households that reported fishing, 25 households (66%) returned a permit, which is an increase compared to the 2015 study year when only 45% of fishing surveyed households returned a permit.

According to Table 3-11 and Figure 3-4, in 2016 the households that obtained and returned a subsistence salmon permit accounted for the largest portion (73%) of the salmon harvest during the study year (25 households harvested 1,090 salmon). The second largest portion of the subsistence salmon harvest was harvested by those households that obtained a permit but did not return it (8 households harvested 355 salmon). Lastly, the 3 households that did not obtain their own subsistence permit accounted for 48 salmon harvested.

Historical Tyonek Subdistrict Subsistence Permit Returns

In order to discuss trends regarding the Tyonek Subdistrict permit return rates over time it is necessary to understand the history of permit access in this fishery. By regulation, between 1980–1984, only Tyonek residents could obtain a subsistence salmon permit to participate in the Tyonek subsistence salmon fishery. For 2 years (1985 and 1986) the fishery was open to all Alaska residents, though no permits were sought out or issued to non-Tyonek residents for the 1986 fishing season. The eligibility regulations changed back to permitting only Tyonek residents for the next 3 years. From 1990² to today, the subsistence fishery is open to all Alaska residents. The return rates between Tyonek resident permit holders and non-Tyonek resident permit holders demonstrate different trends, therefore requiring 2 different cases of analysis and discussion.

Tyonek resident permit return rates have been relatively high since 1980. From 1980–1984, all subsistence permits were collected by ADF&G staff in season, resulting in a 100% return rate. Between 1987 and 2016, the average return rate was 79%, with 1991 having the highest return rate (98%) and 2013 having the lowest return rate (58%) (Figure 3-5). Study years 2015 and 2016 had high return rates (90% in 2015 and 93% in 2016) in part due to post-season permit collection during household survey efforts.

As mentioned above, since 1990, the Tyonek subsistence salmon fishery has been open to all Alaska state residents. Non-Tyonek resident permit return rates have fluctuated over time. On average, return rates of non-Tyonek permit holders is lower than Tyonek resident return rates. Between 1991 and 2016, the average return rate was 69%, with 1994 having the highest return rate (100%) and 1996 having the lowest return rate (31%) (Figure 3-6).

The number of permits issued to non-Tyonek residents and associated overall subsistence salmon harvest is relatively low in comparison to Tyonek residents. From 1991 through 2016, the average number of non-Tyonek residents acquiring a permit is 21 (Appendix C). On average, only 52% of permits issued to non-Tyonek residents were fished spanning 1991 through 2016. Reflecting the lower level of fishing participation from non-local residents, on average, since 1991, only 17% of the total fish harvested were caught by non-Tyonek residents.

2. Note that all Alaska residents were eligible to obtain a Tyonek Subdistrict subsistence salmon fishing permit in 1990; however, only Tyonek residents obtained a permit for 1990.

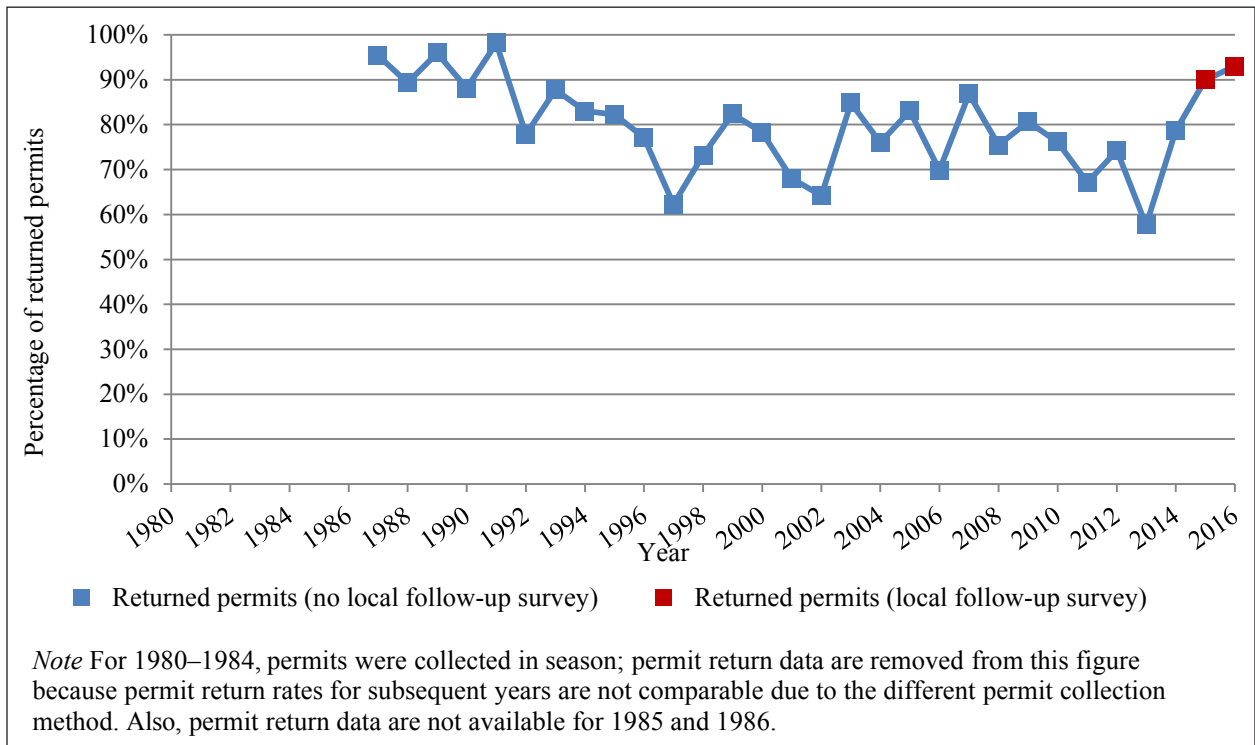


Figure 3-5.—Historical rate of returned subsistence permits, Tyonek residents, 1987–2016.

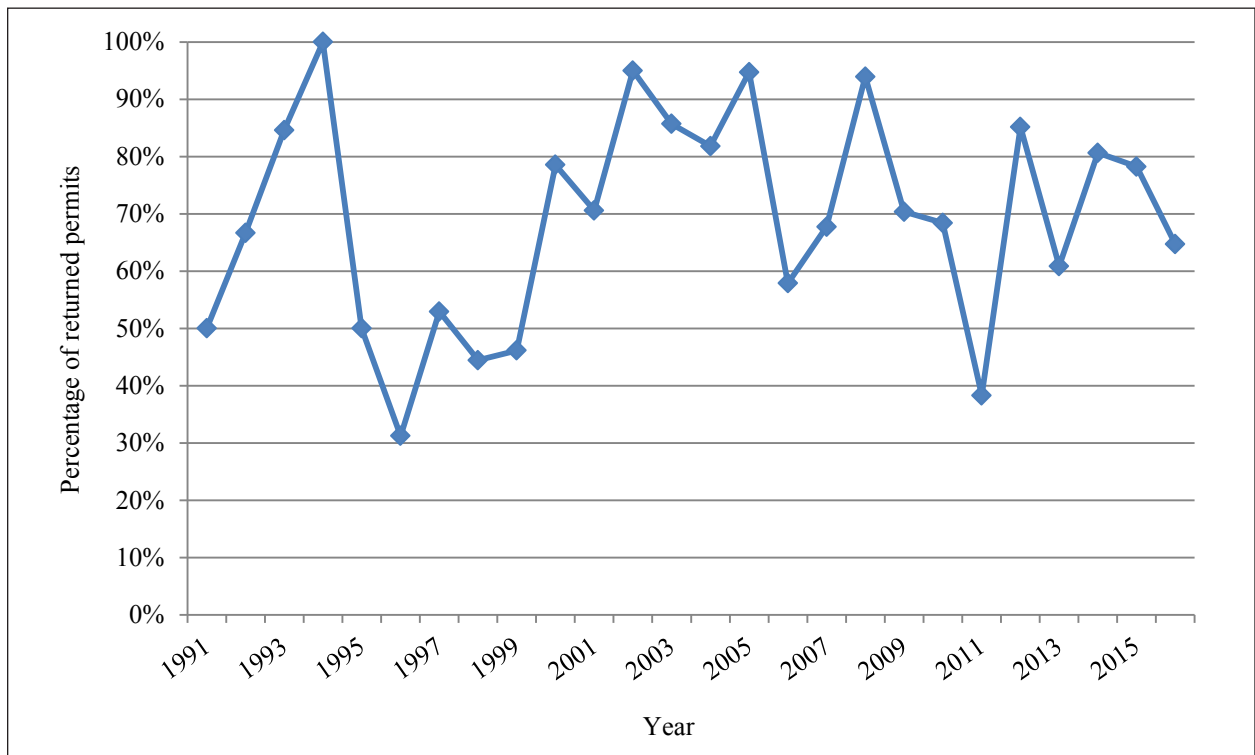


Figure 3-6.—Historical rate of returned subsistence permits, non-Tyonek residents, 1991–2016.

COMPARING HARVESTS AND USES IN 2015 AND 2016 WITH PREVIOUS YEARS

Harvest Assessments

Researchers asked respondents to assess their household harvests in 2 ways: whether they used more, less, or about the same amount of salmon in 2015 and 2016 as in the past 5 years, and whether they got “enough” salmon during that study year. Households also were asked to provide reasons if their use was different or if they were unable to get enough salmon. If they did not get enough, they were asked to evaluate the severity of the impact to their household. This section discusses responses to those questions.

2015

During the 2015 study year, 50 households reported using salmon (Table 3-12). Of those 50 households, 34% (17 households) explained that they used the same amount of salmon in 2015 as they did in previous years, 54% (27 households) reported less use, and 12% (6 households) used more. When asked the reasons why use was less, 22% of respondents cited that the resource was less available, which was the most commonly cited reason (Table 3-13). However, 15% of households indicated less use due each to family/personal reasons, lack of equipment, unsuccessful harvest effort, and weather/environmental causes. Table 3-14 depicts responses for more use of salmon cited by the 6 households that indicated increased resource use; 50% of respondents used more salmon as a result of increased availability in 2015 and 33% had more harvest success during the study year.

When asked if the household got enough salmon, 60% (30 households) indicated that they did not and 50% of these households reported the impact as major, 43% reported the impact as minor, and 7% reported the impact of not getting enough salmon as severe (Table 3-15). When asked what households that did not get enough salmon did as the result of not getting enough, 57% (17 households) indicated using more commercial foods, 20% (6 households) replaced salmon with other subsistence foods, and 17% (5 households) made do without salmon (Table 3-16).

For salmon overall (that is, any species), very few (2) sampled households indicated that they could have used more in 2015 (Table 3-17). However, when addressing needs for a particular salmon species, 51% (26 households) indicated needing more Chinook salmon and 12% (6 households) needed more coho salmon.

2016

During the 2016 study year, 48 households reported using salmon (Table 3-18). Of those 48 households, 20% (10 households) indicated they used the same amount of salmon in 2016 as they did in previous years, 63% (30 households) reported less use, and 17% (8 households) used more. When asked the reasons why use was less, responses included: lack of effort (27%), resources were less available (23%), other reasons (17%), family/personal reasons and lack of equipment (13%), working or no time (10%), and 7% of respondents did not need the resource or cited travel to the resource, unsuccessful harvest effort, weather/environment reasons, and regulations (Table 3-19). Table 3-20 depicts responses for more use of salmon cited by the 8 households that indicated increased resource use; 25% of respondents used more salmon as a result of increased availability, 25% cited more sharing as a reason for increased salmon use, and 25% of respondents had more harvest success during the study year.

When asked if households got enough salmon, 60% (29 households) indicated that they did not and 59% of these households reported the impact as minor, 31% reported the impact as major, and 7% reported the impact of not getting enough salmon as severe (Table 3-21). When asked what households that did not get enough salmon did as the result of not getting enough, 62% (16 households) reported using more commercial foods, 27% (7 households) indicated replacing salmon with other subsistence foods, and 12% (3 households) made do without salmon (Table 3-22).

In 2016, 57% (28 households) of sampled households indicated needing more Chinook salmon, 25% (12 households) needed more coho salmon, and 4% (2 households) reported needing more sockeye salmon during the study year (Table 3-23).

Table 3-12.—Changes in household uses of salmon compared to recent years, Tyonek households, 2015.

Resource category	Sampled households	Valid responses ^a	Households reporting use								Households not using	
			Total households		Less		Same		More			
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Salmon	50	50	50	100.0%	27	54.0%	17	34.0%	6	12.0%	0	0.0%

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

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

Table 3-13.—Reasons for less household use of salmon compared to recent years, Tyonek households, 2015.

Resource category	Valid responses ^a	Households reporting reasons for less use	Family/ personal		Resources less available		Too far to travel		Lack of equipment	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Salmon	50	27	4	14.8%	6	22.2%	1	3.7%	4	14.8%
-continued-										
Resource category	Valid responses ^a	Households reporting reasons for less use	Less sharing		Lack of effort		Unsuccessful		Weather/ environment	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Salmon	50	27	1	3.7%	3	11.1%	4	14.8%	4	14.8%
-continued-										
Resource category	Valid responses ^a	Households reporting reasons for less use	Other reasons		Working/ no time		Regulations		Small/ diseased animals	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Salmon	50	27	0	0.0%	1	3.7%	0	0.0%	3	11.1%
-continued-										
Resource category	Valid responses ^a	Households reporting reasons for less use	Did not get enough		Did not need		Equipment/ fuel expense		Used other resources	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Salmon	50	27	1	3.7%	2	7.4%	0	0.0%	0	0.0%

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

Note Respondents could provide more than one reason for less use, so the percentages may sum to more than 100%.

a. Valid responses do not include households that did not provide any response and households reporting never using the resource.

Table 3-14.—Reasons for more household use of salmon compared to recent years, Tyonek households, 2016.

Resource category	Valid responses ^a	Households reporting reasons for more use	Increased availability		Used other resources		Favorable weather		Received more	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Salmon	50	6	3	50.0%	0	0.0%	1	16.7%	0	0.0%
-continued-										
Resource category	Valid responses ^a	Households reporting reasons for more use	Needed more		Increased effort		Had more help		Other	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Salmon	50	6	0	0.0%	1	16.7%	0	0.0%	0	0.0%
-continued-										
Resource category	Valid responses ^a	Households reporting reasons for more use	Regulations		Traveled farther		More success		Needed less	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Salmon	50	6	0	0.0%	0	0.0%	2	33.3%	1	16.7%
-continued-										
Resource category	Valid responses ^a	Households reporting reasons for more use	Store-bought expense		Got/ fixed equipment					
			Number	Percentage	Number	Percentage				
Salmon	50	6	0	0.0%	0	0.0%				

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

a. Valid responses do not include households that did not provide any response and households reporting never use.

Note Respondents could provide more than one reason for more use, so the percentages may sum to more than 100%.

Table 3-15.—Reported impact to households reporting that they did not get enough salmon, Tyonek households, 2015.

Resource category	Sample households	Households not getting enough				Impact to those not getting enough									
		Valid responses ^a		Did not get enough		No response		Not noticeable		Minor		Major		Severe	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Salmon	50	50	100.0%	30	60.0%	0	0.0%	0	0.0%	13	43.3%	15	50.0%	2	6.7%

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

a. Includes households failing to respond to the question and those households that never used the resource.

37

Table 3-16.—Things households reported doing differently as the result of not getting enough salmon, Tyonek households, 2015.

Resource category	Valid responses ^a	Bought/bartered		Used more commercial foods		Replaced with other subsistence foods		Asked others for help		Made do without	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Salmon	30	0	0.0%	17	56.7%	6	20.0%	3	10.0%	5	16.7%

-continued-

Resource category	Valid responses ^a	Increased effort to harvest		Got a job		Obtained food from other sources		Got public assistance		Other reasons	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Salmon	30	0	0.0%	0	0.0%	1	3.3%	1	3.3%	0	0.0%

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

Note Respondents could provide more than one response, so the percentages may sum to more than 100%.

a. Includes households failing to respond to the question and those households that never used the resource.

Table 3-17.—Salmon resources that sampled households reported needing, Tyonek households, 2015.

Resource	Households needing	Percentage of sampled households
Salmon	2	4.0%
Coho salmon	6	12.0%
Chinook salmon	26	52.0%

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

Note Respondents could indicate more than one resource needed, so the percentages may sum to more than 100%.

Table 3-18.—Changes in household uses of salmon compared to recent years, Tyonek households, 2016.

Resource category	Sampled households	Valid responses ^a	Households reporting use									Households not using	
			Total households		Less		Same		More		Number	Percentage	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage			
Salmon	49	48	48	100.0%	30	62.5%	10	20.8%	8	16.7%	1	2.1%	

Source ADF&G Division of Subsistence household surveys, 2017.

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

Table 3-19.—Reasons for less household use of salmon compared to recent years, Tyonek households, 2016.

Resource category	Valid responses ^a	Households reporting reasons for less use	Family/personal		Resources less available		Too far to travel		Lack of equipment	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Salmon	48	30	4	13.3%	7	23.3%	2	6.7%	4	13.3%
-continued-										
Resource category	Valid responses ^a	Households reporting reasons for less use	Less sharing		Lack of effort		Unsuccessful		Weather/environment	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Salmon	48	30	0	0.0%	8	26.7%	2	6.7%	2	6.7%
-continued-										
Resource category	Valid responses ^a	Households reporting reasons for less use	Other reasons		Working/no time		Regulations		Small/diseased animals	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Salmon	48	30	5	16.7%	3	10.0%	2	6.7%	0	0.0%
-continued-										
Resource category	Valid responses ^a	Households reporting reasons for less use	Did not need		Equipment/fuel expense		Used other resources		Competition	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Salmon	48	30	2	6.7%	1	3.3%	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2017.

Note Respondents could provide more than one reasons for less use, so the percentages may sum to more than 100%.

a. Valid responses do not include households that did not provide any response and households reporting never using the resource.

Table 3-20.—Reasons for more household use of salmon compared to recent years, Tyonek households, 2016.

Resource category	Valid responses ^a	Households reporting reasons for more use	Increased availability		Used other resources		Had more time		Favorable weather	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Salmon	48	8	2	25.0%	0	0.0%	0	0.0%	0	0.0%

-continued-

Resource category	Valid responses ^a	Households reporting reasons for more use	More sharing		Needed more		Increased effort		Other	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Salmon	48	8	2	25.0%	1	12.5%	1	12.5%	0	0.0%

-continued-

Resource category	Valid responses ^a	Households reporting reasons for more use	Regulations		Traveled farther		More success		Store-bought expensive	
			Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Salmon	48	8	0	0.0%	0	0.0%	2	25.0%	0	0.0%

-continued-

Resource category	Valid responses ^a	Households reporting reasons for more use	Got/ fixed equipment		Substitute for unavialable resource	
			Number	Percentage	Number	Percentage
Salmon	48	8	0	0.0%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2017.

Note Respondents could provide more than one reasons for more use, so the percentages may sum to more than 100%.

a. Valid responses do not include households that did not provide any response and households reporting never use.

Table 3-21.—Reported impact to households reporting that they did not get enough salmon, Tyonek households, 2016.

Resource category	Sample households	Households not getting enough				Impact to those not getting enough									
		Valid responses ^a		Did not get enough		No response		Not noticeable		Minor		Major		Severe	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Salmon	49	48	98.0%	29	60.4%	0	0.0%	1	3.4%	17	58.6%	9	31.0%	2	6.9%

Source ADF&G Division of Subsistence household surveys, 2017.

a. Includes households failing to respond to the question and those households that never used the resource.

42

Table 3-22.—Things households reported doing differently as the result of not getting enough salmon, Tyonek households, 2016.

Resource category	Valid responses	Bought/bartered		Used more commercial foods		Replaced with other subsistence foods		Asked others for help		Made do without	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Salmon	26	0	0.0%	16	61.5%	7	26.9%	0	0.0%	3	11.5%

-continued-

Resource category	Valid responses	Increased effort to harvest		Got a job		Obtained food from other sources		Got public assistance		Other reasons	
		Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage	Number	Percentage
Salmon	26	0	0.0%	0	0.0%	0	0.0%	1	3.8%	0	0.0%

Source ADF&G Division of Subsistence household surveys, 2017.

Note Respondents could provide more than one response, so the percentages may sum to more than 100%.

Table 3-23.—Salmon resources that sampled households reported needing, Tyonek households, 2016.

Resource	Households needing	Percentage of sampled households
Coho salmon	12	24.5%
Chinook salmon	28	57.1%
Sockeye salmon	2	4.1%

Source ADF&G Division of Subsistence household surveys, 2017.

Note Respondents could indicate more than one resource needed, so the percentages may sum to more than 100%.

Harvest Data

Changes in salmon harvests by Tyonek residents over time can also be discerned through comparisons with findings from other study years and through data from the subsistence permit database. The permit data collected by the Division of Subsistence dates back to 1980.³ In addition, comprehensive subsistence harvest surveys were conducted in Tyonek in 1983–1984 (Fall et al. 1984), 2005–2006⁴ (Stanek et al. 2007), and 2013 (Jones et al. 2015). During the years for which comprehensive subsistence harvest surveys were administered, Division of Subsistence staff members opportunistically collected unreturned permits from households in Tyonek when unreturned permits were available. The data from unreturned permits were then included in the subsistence permit database. Therefore, for some of the years in which a comprehensive harvest survey occurred in Tyonek, the subsistence salmon harvest totals by Tyonek permit holders appear higher than years when there was no survey. An objective of the 2015 and 2016 household salmon survey was to collect unreturned Tyonek resident subsistence permits. As mentioned above, during the 2 study years, a total of 46 permits were collected as a result of the survey efforts, resulting in much higher Tyonek resident permit return rates than in non-salmon survey years (Table 3-7; Table 3-24; Figure 3-7).

As mentioned above, since 1980, subsistence salmon harvest permits have been issued in Tyonek. For 1987–2016, Tyonek resident permit holders have on average returned 79% of permits; however, the subsistence salmon fishery harvest assessment based on permit returns has never been expanded to account for unreturned permits. Using data gathered through the survey and past permit returns to analyze historical data, the Tyonek Subdistrict harvest estimates were expanded to account for unreturned permits (Table 3-25; Figure 3-8).

As illustrated by Figure 3-9, the reported permit harvest amount is significantly lower than the estimated permit-based amount in 2013, a year with low permit returns (58%), but also a year when a harvest survey occurred. In 2013, the estimated permit-based harvest amount does in fact align with the reported survey harvest amount, demonstrating that the estimated value based on permits is a better measure of harvests in the community than the reported permit data alone. The same trend is found for 2015 and 2016, though to a lesser degree because the amount of permits collected during of the harvest survey increased the overall permit return rate.

Estimates were derived from permits using the same weighted means method described for expansion of harvest survey data. In the case of permits, means were computed for harvests reported on returned permits and applied to all unreturned permits. Similar to the household surveys, estimates were developed per each community of residence. Estimates are summed across communities in order to obtain the total harvest estimate for the fishery.

3. See “History of the Tyonek Subsistence Permit System” section (page 10) for more in-depth historical detail.

4. Note that the survey results are not included in figures in this section because the survey methods differed from the other survey efforts and resulted in a likely overestimation of the harvest, possibly through received salmon being double-counted.

Table 3-24.—Comparison of historical Tyonek Subdistrict reported and estimated subsistence salmon harvests, Tyonek residents, 1980–2016.

Year	Permits		Percentage of returned permits	Reported salmon harvests			Estimated salmon harvests			Percentage of change		
	Issued	Returned		Chinook	Other		Chinook	Other		Chinook	Other	
					salmon	Total		salmon	Total		salmon	Total
1980 ^{a, c}	67	67	100.0%	1,936	262	2,198	1,936	262	2,198			
1981 ^{a, c}	70	70	100.0%	2,002	380	2,382	2,002	380	2,382			
1982 ^{a, c}	69	69	100.0%	1,590	441	2,031	1,590	441	2,031			
1983 ^{a, c}	73	73	100.0%	2,755	335	3,090	2,755	335	3,090			
1984 ^{a, c}	70	70	100.0%	2,364	402	2,766	2,364	402	2,766			
1985 ^b	73	ND	ND	ND	ND	ND	ND	ND	ND			
1986 ^b	ND	ND	ND	ND	ND	ND	ND	ND	ND			
1987 ^c	64	61	95.3%	1,610	349	1,959	1,689	366	2,055	4.7%	4.6%	4.7%
1988 ^c	47	42	89.4%	1,587	364	1,951	1,776	407	2,183	10.6%	10.6%	10.6%
1989 ^c	49	47	95.9%	1,250	201	1,451	1,303	210	1,513	4.1%	4.1%	4.1%
1990	42	37	88.1%	781	450	1,231	886	511	1,397	11.9%	11.9%	11.9%
1991	54	53	98.1%	896	68	964	913	69	982	1.9%	1.9%	1.9%
1992	54	42	77.8%	901	311	1,212	1,158	400	1,558	22.2%	22.2%	22.2%
1993	49	43	87.8%	1,215	154	1,369	1,385	175	1,560	12.2%	12.2%	12.2%
1994	53	44	83.0%	659	201	860	794	242	1,036	17.0%	17.0%	17.0%
1995	62	51	82.3%	1,244	212	1,456	1,512	258	1,770	17.7%	17.7%	17.7%
1996	57	44	77.2%	934	233	1,167	1,210	302	1,512	22.8%	22.8%	22.8%
1997	53	33	62.3%	578	75	653	928	120	1,049	37.7%	37.7%	37.7%
1998	56	41	73.2%	940	67	1,007	1,284	92	1,375	26.8%	26.8%	26.8%
1999	51	42	82.4%	1,119	88	1,207	1,359	107	1,466	17.6%	17.6%	17.6%
2000	46	36	78.3%	1,059	73	1,132	1,353	93	1,446	21.7%	21.7%	21.7%
2001	50	34	68.0%	806	140	946	1,185	206	1,391	32.0%	32.0%	32.0%
2002	81	52	64.2%	948	287	1,235	1,477	447	1,924	35.8%	35.8%	35.8%
2003	66	56	84.8%	1,126	152	1,278	1,327	179	1,506	15.2%	15.2%	15.2%
2004	75	57	76.0%	1,154	195	1,349	1,518	257	1,775	24.0%	24.0%	24.0%
2005	59	49	83.1%	881	115	996	1,061	138	1,199	16.9%	16.9%	16.9%
2006	63	44	69.8%	770	11	781	1,103	16	1,118	30.2%	30.2%	30.2%
2007	53	46	86.8%	1,013	175	1,188	1,167	202	1,369	13.2%	13.2%	13.2%
2008	61	46	75.4%	964	194	1,158	1,278	257	1,536	24.6%	24.6%	24.6%
2009	62	50	80.6%	489	438	927	606	543	1,149	19.4%	19.4%	19.4%
2010	67	51	76.1%	725	337	1,062	952	443	1,395	23.9%	23.9%	23.9%
2011	67	45	67.2%	495	127	622	737	189	926	32.8%	32.8%	32.8%
2012	62	46	74.2%	720	171	891	970	230	1,201	25.8%	25.8%	25.8%
2013	59	34	57.6%	636	206	842	1,104	357	1,461	42.4%	42.4%	42.4%
2014	61	48	78.7%	585	584	1,169	743	742	1,486	21.3%	21.3%	21.3%
2015	60	54	90.0%	790	837	1,627	878	930	1,808	10.0%	10.0%	10.0%
2016	57	53	93.0%	767	341	1,108	825	367	1,192	7.0%	7.0%	7.0%
5-year average (2011-2015)	62	45	73.5%	645	385	1,030	886	490	1,376	26.5%	26.5%	26.5%
10-year average (2006-2015)	62	46	75.6%	719	308	1,027	954	391	1,345	24.4%	24.4%	24.4%
Historical average (1981-2015)	60	49	82.5%	1,104	254	1,358	1,303	303	1,606	20.6%	20.6%	20.6%

Source ADF&G Division of Subsistence, ASFDB 2017 (ADF&G 2018).

Note ND = no data.

a. For 1980–1984, permits were collected in season at fishing locations resulting in a 100% return rate for those years; as such, the estimated harvests are the same as the reported harvests and there is no percentage of change available.

b. Harvest data are excluded because it is unknown which harvests were from Tyonek residents and which were from non-local residents.

c. Only Tyonek residents were eligible to receive a Tyonek Subdistrict subsistence salmon fishing permit.

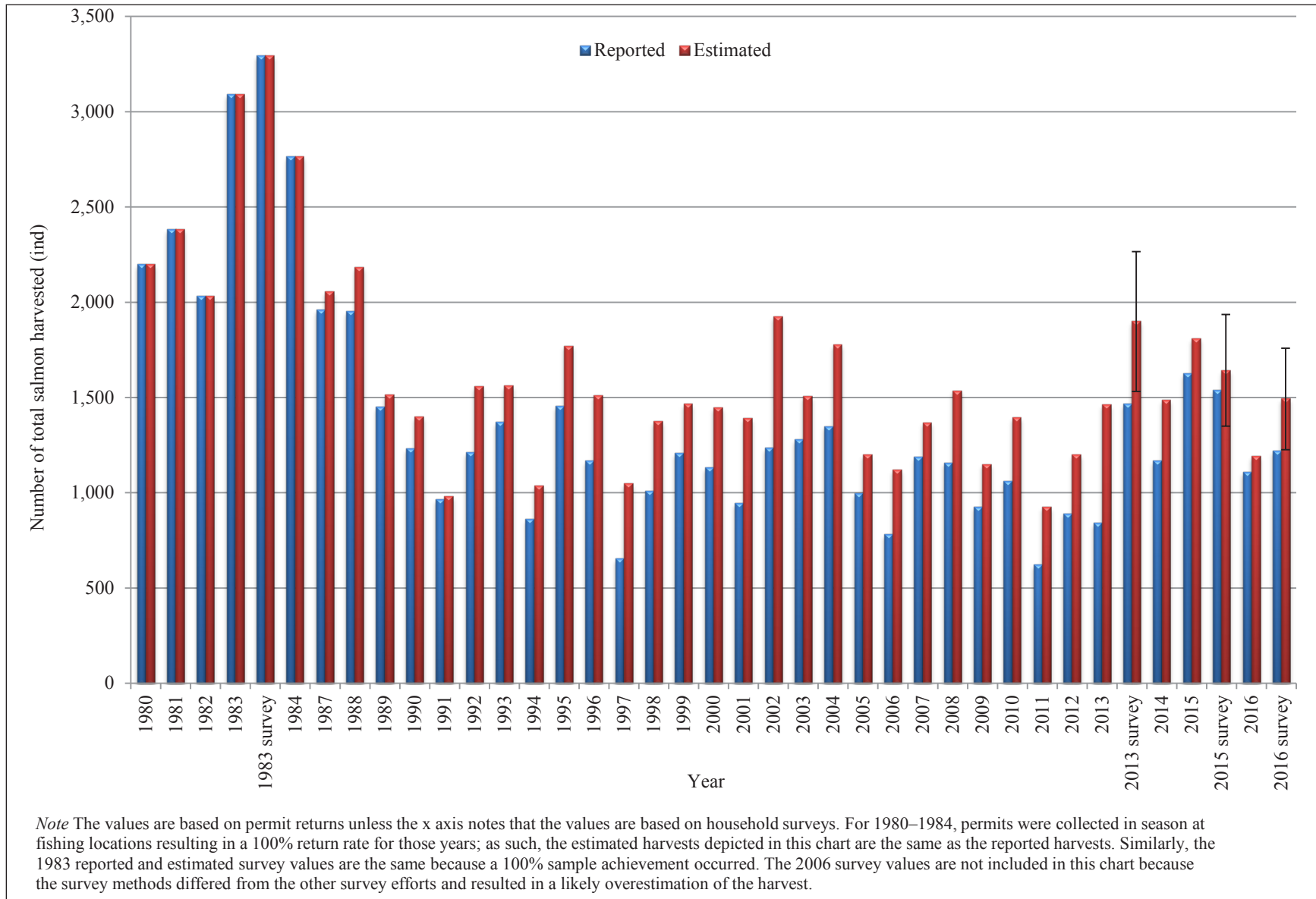


Figure 3-7.—Comparison of historical reported and estimated subsistence salmon harvests, Tyonek and non-Tyonek residents 1980–2016, and Tyonek households, 1983, 2013, and 2015–2016.

Harvest Trends, Tyonek Subdistrict

For the entire Tyonek Subdistrict, since 1980, the reported average annual subsistence salmon harvest is 1,549 salmon, including 1,229 Chinook salmon; the historical estimated harvest is 1,843 salmon, including 1,452 Chinook salmon (Table 3-25; Figure 3-8). The recent reported 5-year (2011 through 2015) average harvest is 1,331 salmon, including 785 Chinook salmon, and the estimated 5-year average is 1,746 salmon, including 1,054 Chinook salmon. The harvest per permit over time has declined for both Chinook salmon and all salmon. Based on reported salmon harvests, the historical average harvest of Chinook salmon per returned permit is 20 fish, and the most recent 5-year average is 12 Chinook salmon. The reported historical average of all salmon harvested per returned permit is 26 salmon, and the most recent 5-year average is 20 salmon. During the surveys and fieldwork for this project, Tyonek residents noted that they have harvested fewer fish for the same number of days fishing compared to the past.

Harvest Trends, Tyonek Residents

For Tyonek residents, the overall harvest amounts of salmon have decreased since 1980 (Figure 3-10). A large portion of the salmon harvest decrease is due to a decline in the harvests of Chinook salmon by Tyonek residents (Figure 3-11). The harvests of Chinook salmon have fluctuated since 1980, but a declining trend in Chinook salmon harvests is apparent in both the estimated and reported salmon harvests overtime (Figure 3-12). For example, in 1987, the reported Chinook salmon harvest was 1,610 fish, the expanded estimate was 1,689 fish, and 5 years later in 1992, the reported Chinook salmon harvest was 901 fish, while the expanded estimate was 1,158 fish. For the 2016 study year, based on permit returns, the reported Chinook salmon harvest was 767 fish and the expanded estimate was 825 fish (Table 3-24 and Figure 3-7).

Although Chinook salmon harvest amounts have decreased over time, the overall harvest of the other species of salmon (sockeye, coho, chum, and pink salmon) has increased over time (Table 3-24). Similarly to the Chinook salmon trends, the harvest amounts of other salmon vary each year, but, according to Figure 3-13, there is a rise in the harvest of other salmon species. This trend may be a result of increased efforts to get enough salmon as the availability and harvest amounts of Chinook salmon decrease.

Table 3-25.—Comparison of historical Tyonek Subdistrict reported and estimated subsistence salmon harvests, Tyonek and non-Tyonek residents, 1980–2016.

Year	Permits		Percentage of returned permits	Reported salmon harvests			Estimated salmon harvests			Percentage of change		
	Issued	Returned		Chinook	Other		Chinook	Other		Chinook	Other	
			salmon		Total	salmon		Total	salmon		Total	
1980	67	67	100.0%	1,936	262	2,198	1,936	262	2,198	0.0%	0.0%	0.0%
1981	70	70	100.0%	2,002	380	2,382	2,002	380	2,382	0.0%	0.0%	0.0%
1982	69	69	100.0%	1,590	441	2,031	1,590	441	2,031	0.0%	0.0%	0.0%
1983	73	73	100.0%	2,755	335	3,090	2,755	335	3,090	0.0%	0.0%	0.0%
1984	70	70	100.0%	2,364	402	2,766	2,364	402	2,766	0.0%	0.0%	0.0%
1985 ^a	176	ND	ND	1,967	264	2,231	1,967	264	2,231	ND	ND	ND
1986 ^a	101	ND	ND	1,674	497	2,171	1,674	497	2,171	ND	ND	ND
1987	64	61	95.3%	1,610	349	1,959	1,689	366	2,055	4.7%	4.6%	4.7%
1988	47	42	89.4%	1,587	364	1,951	1,776	407	2,183	10.6%	10.6%	10.6%
1989	49	47	95.9%	1,250	201	1,451	1,303	210	1,513	4.1%	4.1%	4.1%
1990	42	37	88.1%	781	450	1,231	886	511	1,397	11.9%	11.9%	11.9%
1991	57	54	94.7%	902	78	980	925	89	1,014	2.5%	12.6%	3.4%
1992	57	44	77.2%	907	335	1,242	1,170	424	1,594	22.5%	21.0%	22.1%
1993	62	54	87.1%	1,370	170	1,540	1,566	203	1,769	12.5%	16.2%	13.0%
1994	58	49	84.5%	770	208	978	905	249	1,154	14.9%	16.5%	15.2%
1995	70	55	78.6%	1,317	213	1,530	1,632	259	1,891	19.3%	17.7%	19.1%
1996	73	49	67.1%	1,039	233	1,272	1,615	302	1,917	35.7%	22.8%	33.6%
1997	70	42	60.0%	639	246	885	1,051	454	1,505	39.2%	45.8%	41.2%
1998	74	49	66.2%	1,027	230	1,257	1,430	353	1,783	28.2%	34.8%	29.5%
1999	77	54	70.1%	1,230	281	1,511	1,620	508	2,127	24.1%	44.6%	29.0%
2000	60	47	78.3%	1,157	156	1,313	1,461	188	1,649	20.8%	17.1%	20.4%
2001	84	58	69.0%	976	231	1,207	1,450	340	1,790	32.7%	32.0%	32.6%
2002	101	71	70.3%	1,080	337	1,417	1,609	497	2,106	32.9%	32.2%	32.7%
2003	87	74	85.1%	1,183	172	1,355	1,384	211	1,595	14.5%	18.5%	15.1%
2004	97	75	77.3%	1,345	223	1,568	1,751	289	2,040	23.2%	22.8%	23.1%
2005	78	67	85.9%	982	202	1,184	1,183	226	1,409	17.0%	10.6%	16.0%
2006	82	55	67.1%	943	35	978	1,366	56	1,422	31.0%	37.5%	31.2%
2007	84	67	79.8%	1,281	328	1,609	1,526	420	1,946	16.1%	21.9%	17.3%
2008	94	77	81.9%	1,178	337	1,515	1,492	400	1,892	21.0%	15.8%	19.9%
2009	89	69	77.5%	636	445	1,081	817	552	1,369	22.2%	19.4%	21.0%
2010	105	77	73.3%	843	383	1,226	1,116	510	1,626	24.5%	24.9%	24.6%
2011	114	63	55.3%	595	194	789	851	256	1,107	30.1%	24.2%	28.7%
2012	89	69	77.5%	840	320	1,160	1,102	405	1,507	23.8%	21.0%	23.0%
2013	82	48	58.5%	813	372	1,185	1,352	621	1,973	39.9%	40.1%	39.9%
2014	92	73	79.3%	714	858	1,572	896	1,082	1,978	20.3%	20.7%	20.5%
2015	83	72	86.7%	961	989	1,950	1,070	1,095	2,165	10.2%	9.7%	9.9%
2016	74	64	86.5%	902	391	1,293	1,030	432	1,462	12.4%	9.5%	11.6%
5-year average (2011-2015)	92	65	71.5%	785	547	1,331	1,054	692	1,746	24.8%	23.1%	24.4%
10-year average (2006-2015)	91	67	73.7%	880	426	1,307	1,159	540	1,699	23.9%	23.5%	23.6%
Historical average (1980-2015)	79	60	81.1%	1,229	320	1,549	1,452	391	1,843	17.9%	18.6%	18.0%

Source ADF&G Division of Subsistence, ASFDB 2017 (ADF&G 2018).

Note ND = no data.

a. Harvests were not expanded due to unknown permit returns.

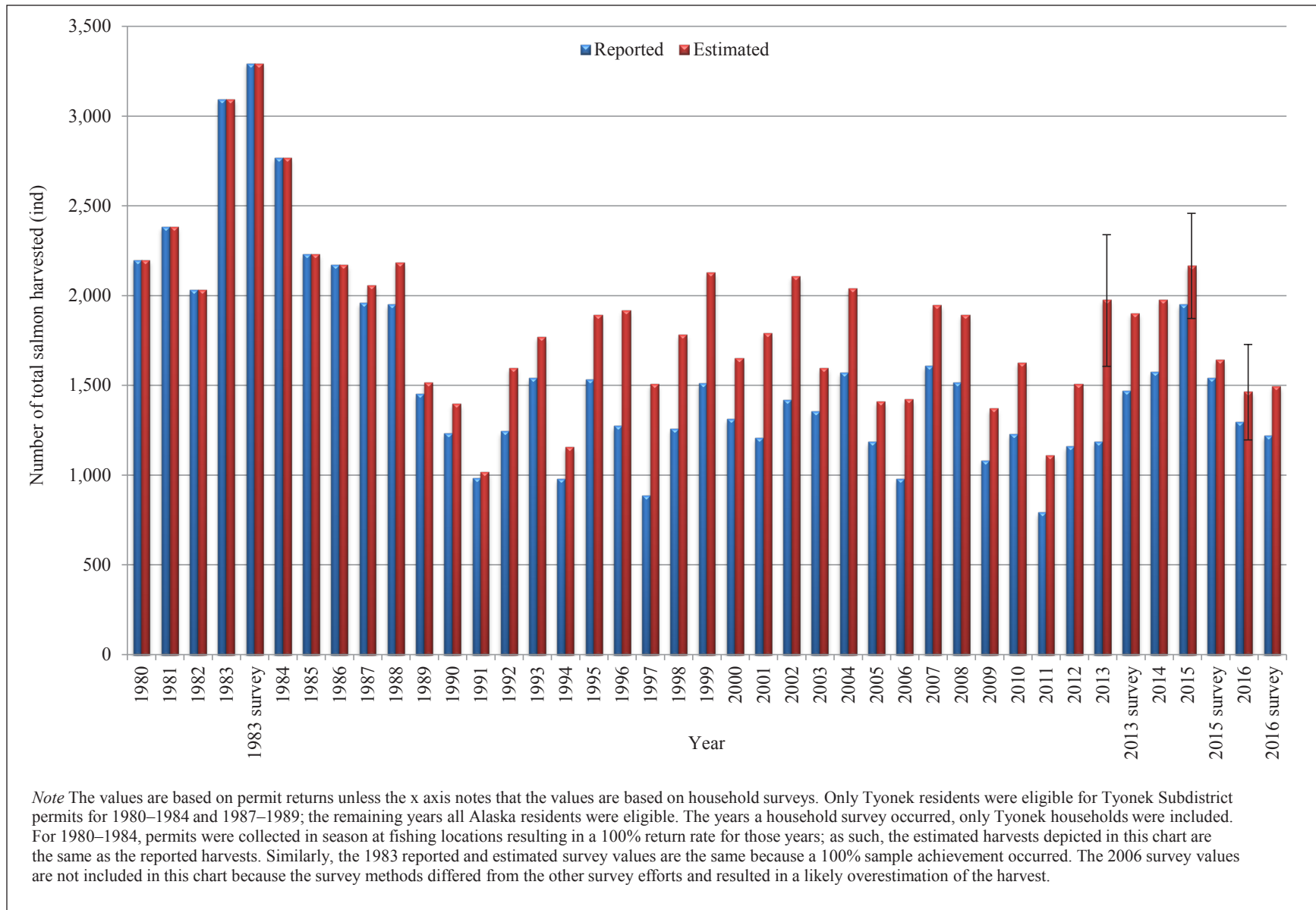


Figure 3-8.—Comparison of historical reported and estimated subsistence salmon harvests, Tyonek residents, 1980–2016, and Tyonek households, 1983, 2013, and 2015–2016.

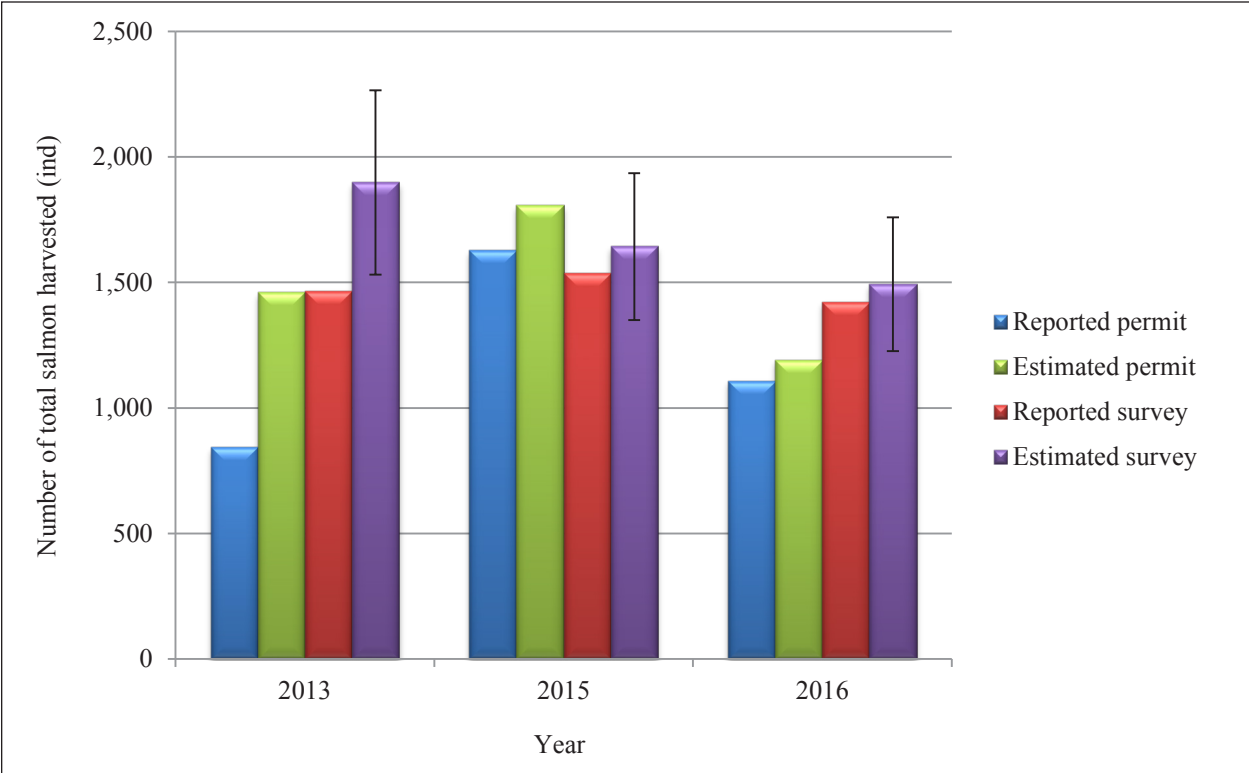


Figure 3-9.—Comparison of subsistence salmon harvests, reported and estimated permit results, Tyonek residents, 2013, 2015–2016, and reported and estimated survey results, Tyonek households, 2013, 2015–2016.

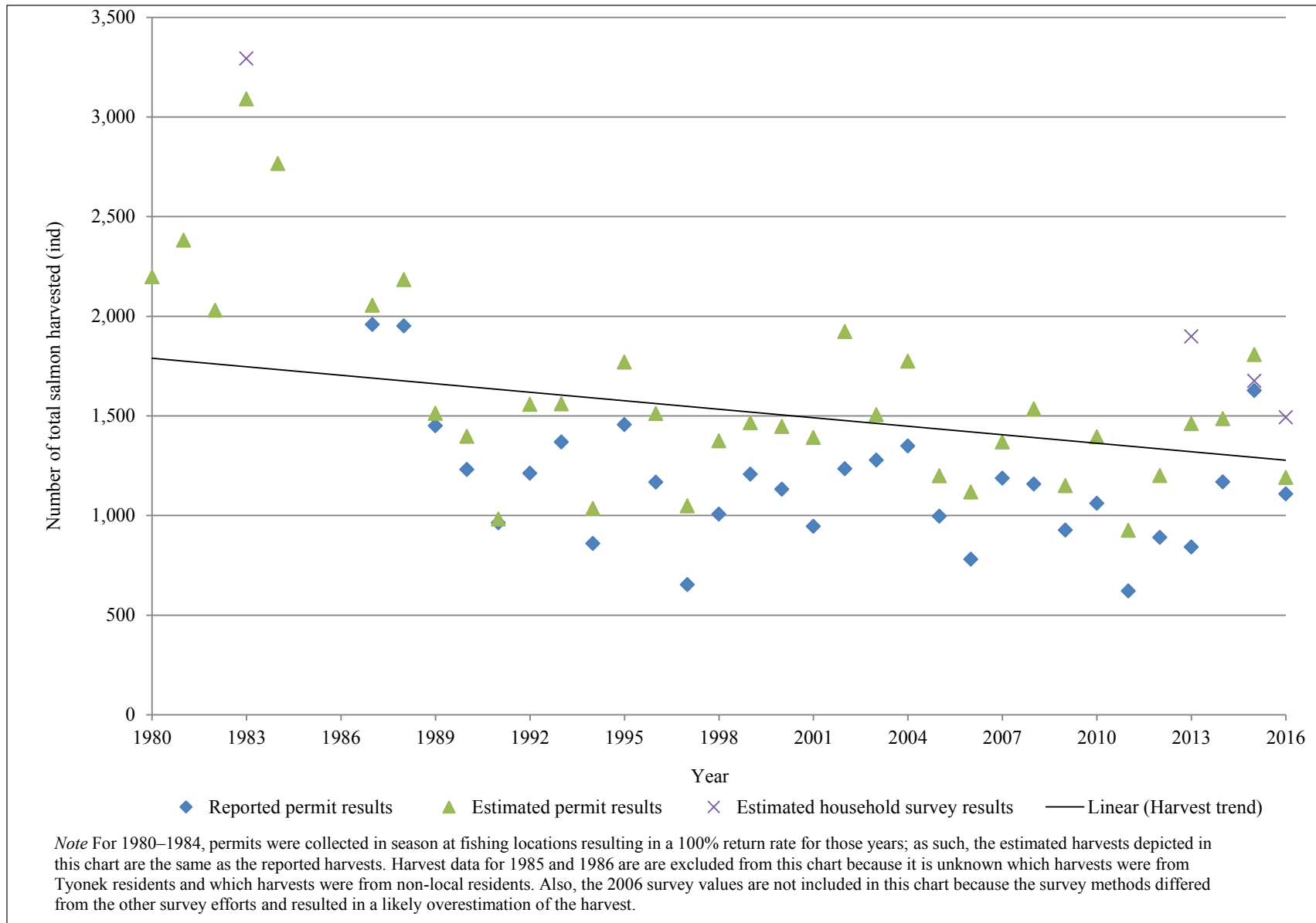
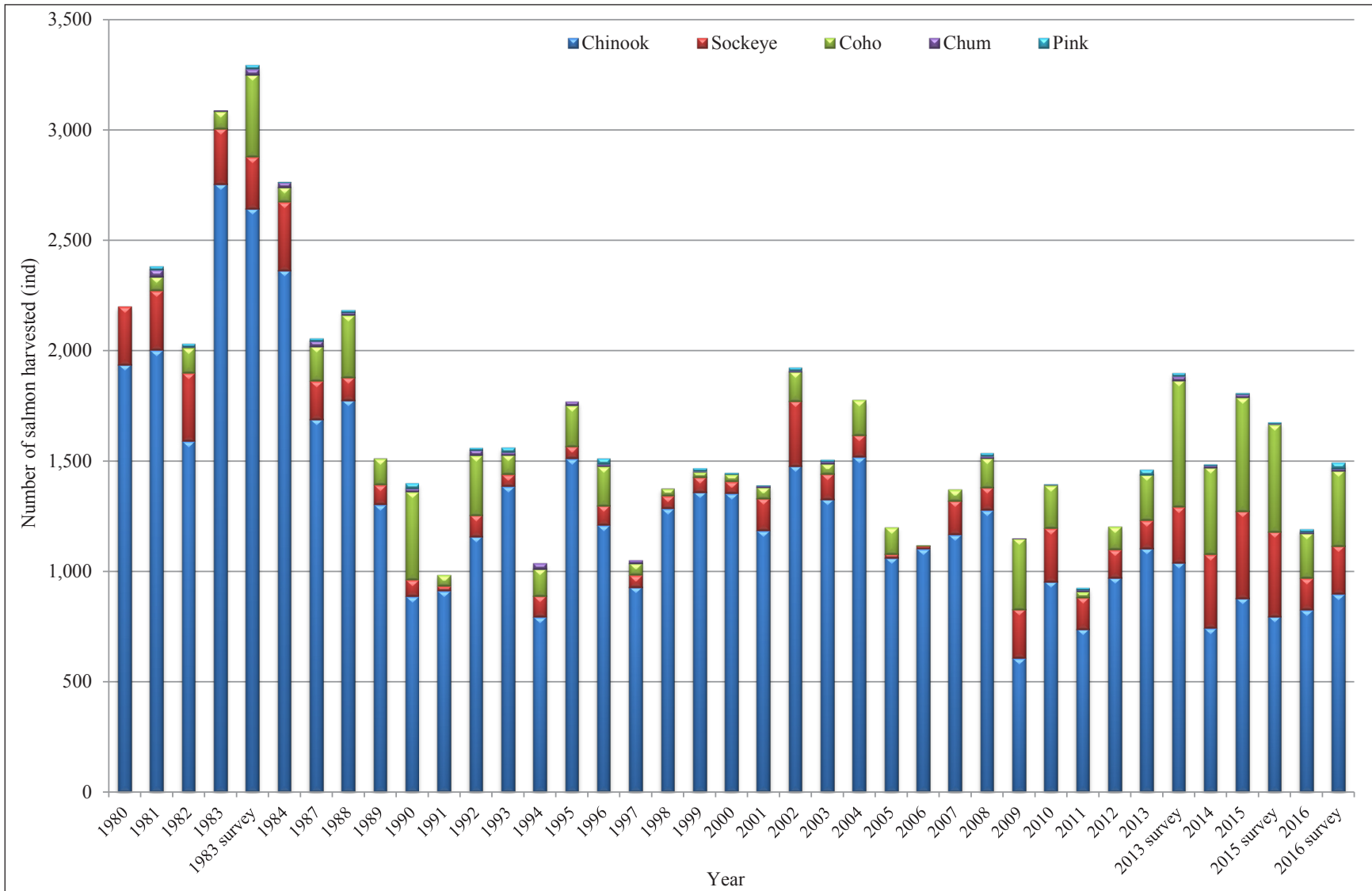


Figure 3-10.—Comparison of historical reported and estimated subsistence salmon harvests, total salmon harvests, Tyonek residents, 1980–2016, and Tyonek households, 1983, 2013, and 2015–2016.



Note The harvest estimates are based on permit returns unless the x axis notes that the values are based on household surveys. Permit return data are not available for 1985 and 1986. Harvest data are available; however, it is unknown which harvests were from Tyonek residents and which harvests were from non-local residents. Also, the 2006 survey values are not included in this chart because the survey methods differed from the other survey efforts and resulted in a likely overestimation of the harvest.

Figure 3-11.—Composition of historical subsistence salmon harvests, Tyonek residents, 1980–2016, and Tyonek households, 1983, 2013, and 2015–2016.

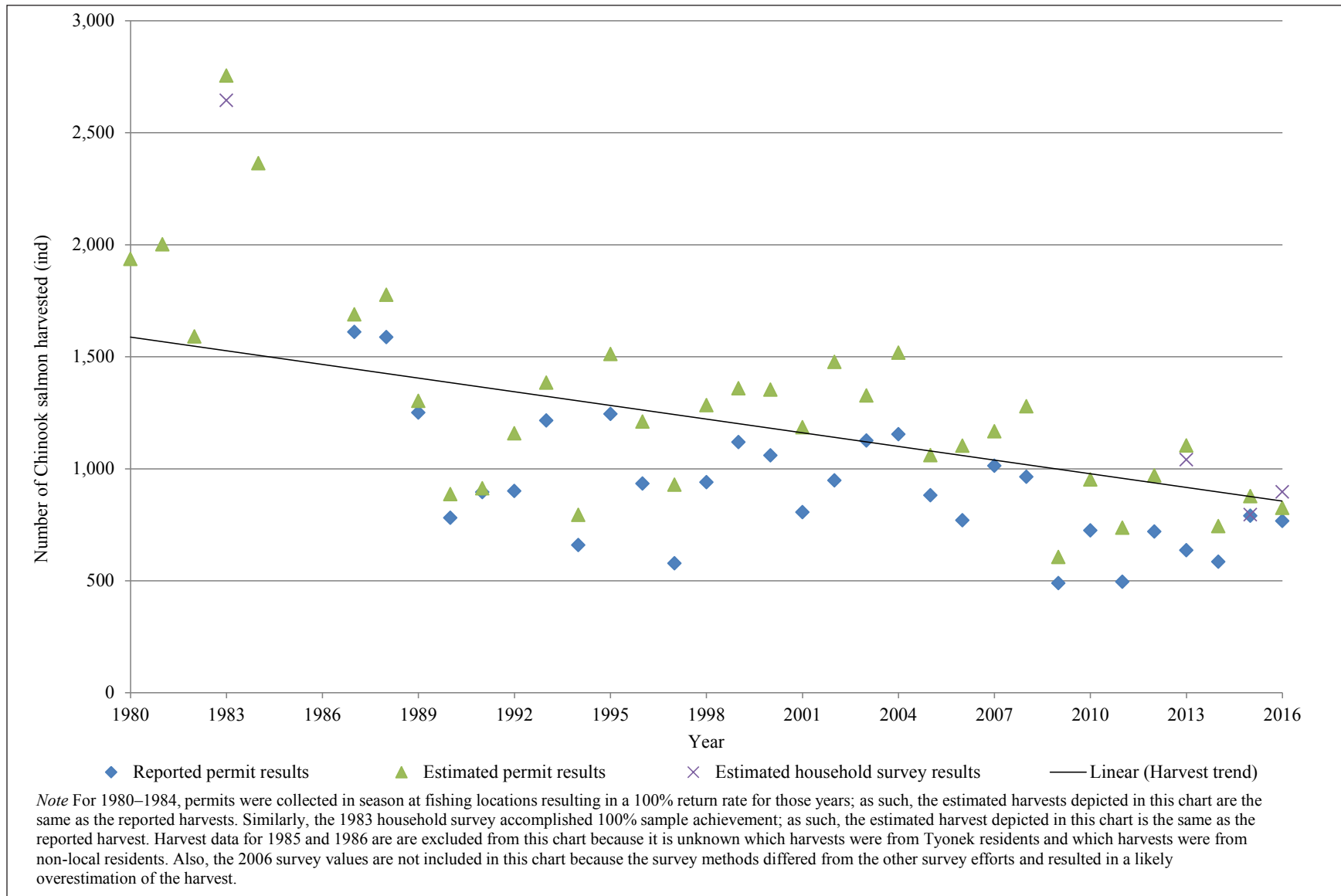


Figure 3-12.—Comparison of historical reported and estimated subsistence salmon harvests, Chinook salmon harvests, Tyonek residents, 1980–2016, and Tyonek households, 1983, 2013, and 2015–2016.

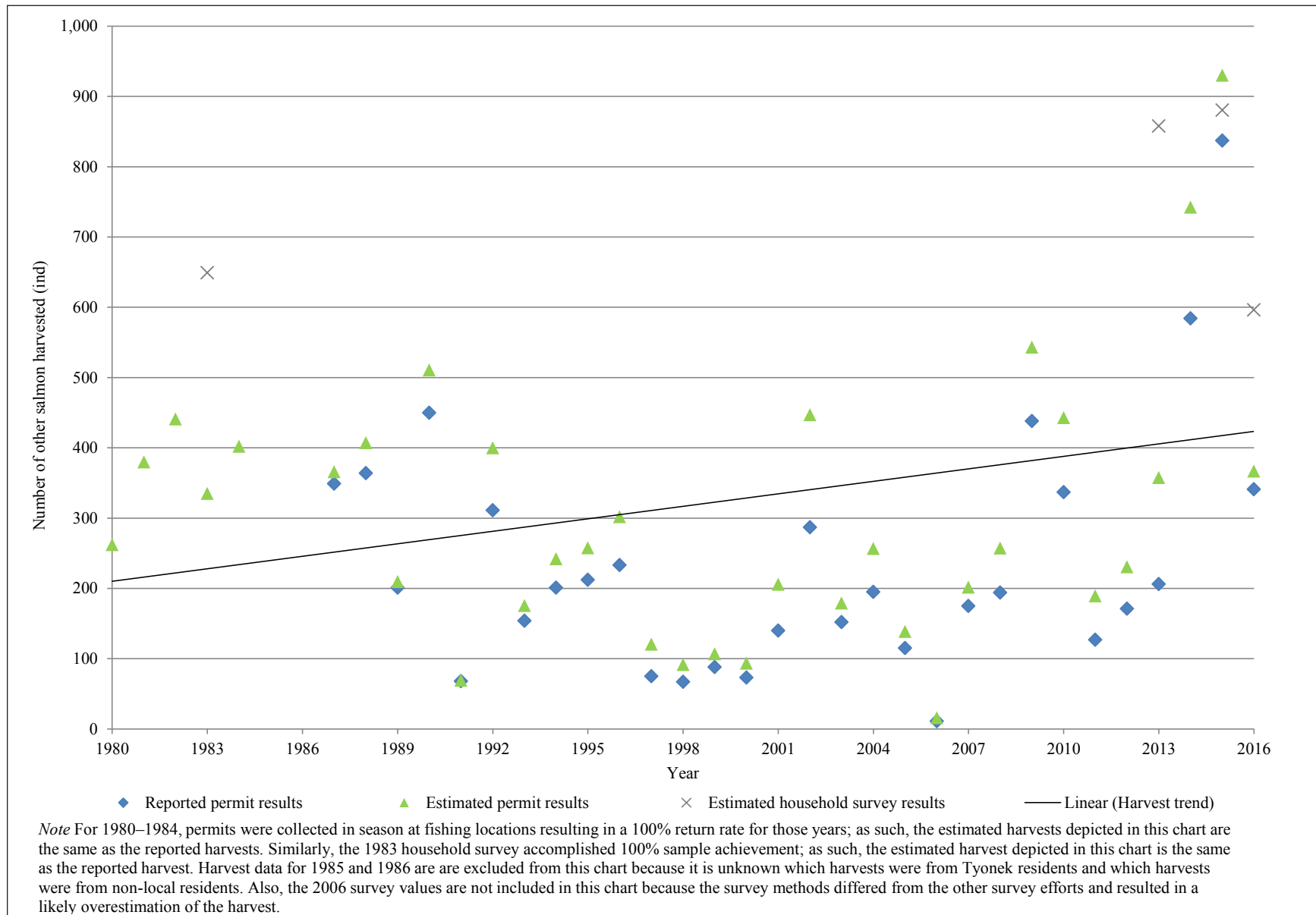


Figure 3-13.—Comparison of historical reported and estimated subsistence salmon harvests, other salmon harvests, Tyonek residents, 1980–2016, and Tyonek households, 1983, 2013, and 2015–2016.

CURRENT AND HISTORICAL HARVEST AREAS

During the 2015 and 2016 surveys, researchers recorded the salmon harvest locations used by Tyonek residents. The 2015 and 2016 mapping results are compared below to mapped data obtained from past studies conducted in Tyonek including Jones et al. (2015), Stanek et al. (2007), and Fall et al. (1984).

Salmon Harvest Locations (2015 and 2016)/Salmon Harvest Locations from Previous Study Years

During both the 2015 and 2016 study years, Tyonek respondents reported setting subsistence gillnets to fish for salmon from their family fish camps and setnet sites along the shore of Cook Inlet. With the exception of 2 coho salmon caught by rod and reel at the mouth of the Chuitna River and in the Lewis River during the 2015 study year, all other reported areas fished during the subsistence and commercial seasons by Tyonek residents for Chinook, coho, and sockeye salmon in 2015 and 2016 were within a 16-mile stretch of beach near the community. Corresponding with the Tyonek Subdistrict boundaries, starting from the west and moving toward the east, the fishing areas encompassed the beach at Granite Point all the way to the mouth of the Chuitna River (figures 3-14 through 3-19). Chum and pink salmon were not as widely targeted as the other 3 species of salmon, therefore these 2 fish species were fished for in a smaller area of the beach: from Beshta Bay to the mouth of the Chuitna River at several discrete locations (figures 3-20 through 3-23).

Access to Fishing Locations

In 2015 and 2016, Tyonek residents accessed salmon harvest locations either by foot, all-terrain vehicle (ATV), or road vehicles. A large portion of Tyonek residents have setnet sites along the beach close to the village. These sites offer the opportunity for community members to participate in subsistence fishing while still maintaining jobs and other duties in the village. People in Tyonek tend to fish in the same location each year, and, in general, Tyonek residents follow the regulations (5 AAC 01.555(b)) and operate their set gillnet sites approximately 600 feet or more from other sites. Several families still use their fish camps to harvest subsistence and commercial fish for the year. The majority of fish camps were built on the same part of the shoreline that was used by Tyonek's ancestors for salmon fishing in the 1930s, 1940s, and 1950s to be used primarily during the spring and summer in association with commercial and subsistence fishing activities. By the 1960s, most fish camps contained structures that were made of wood, and were equipped with beds, stoves, and cooking utensils. According to Division of Subsistence researcher Dan Foster, in 1982, Tyonek had 28 fish camps (Foster 1982:4). For the most part, the 28 fish camps were located in 4 distinct clusters. The 4 sites were in areas with easy access to the beach, sources of fresh water, and commercial fishing sites. The clusters of camps within these sites have grown in size as families expand and build their own camps near relatives. In 2015 and 2016, Tyonek had 31 usable fish camps; however, only about 18 were actively used during the study years. The camps are still arranged in the same 4 distinct clusters noted by Foster (1982).

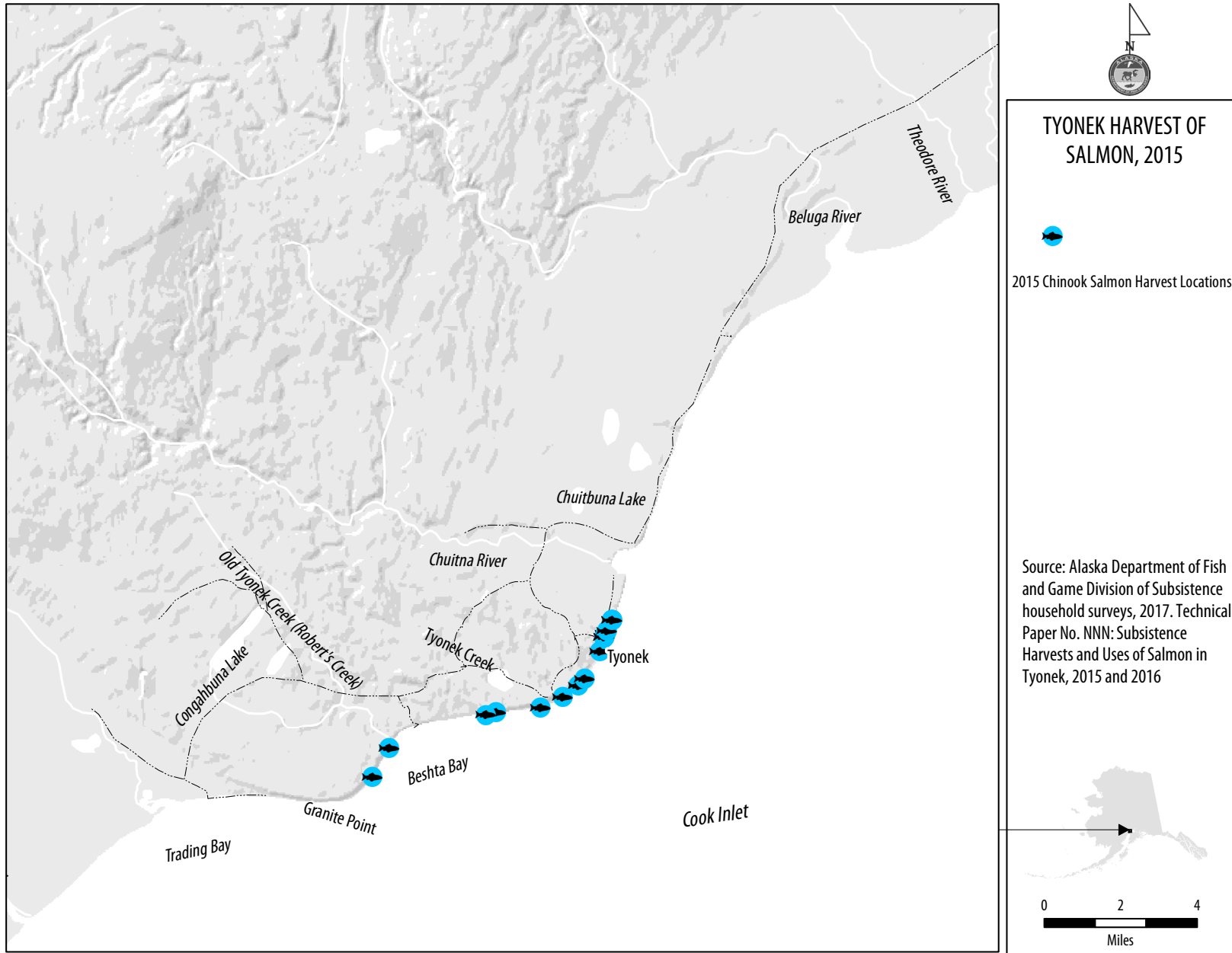


Figure 3-14.—Fishing and harvest locations of Chinook salmon, Tyonek households, 2015.

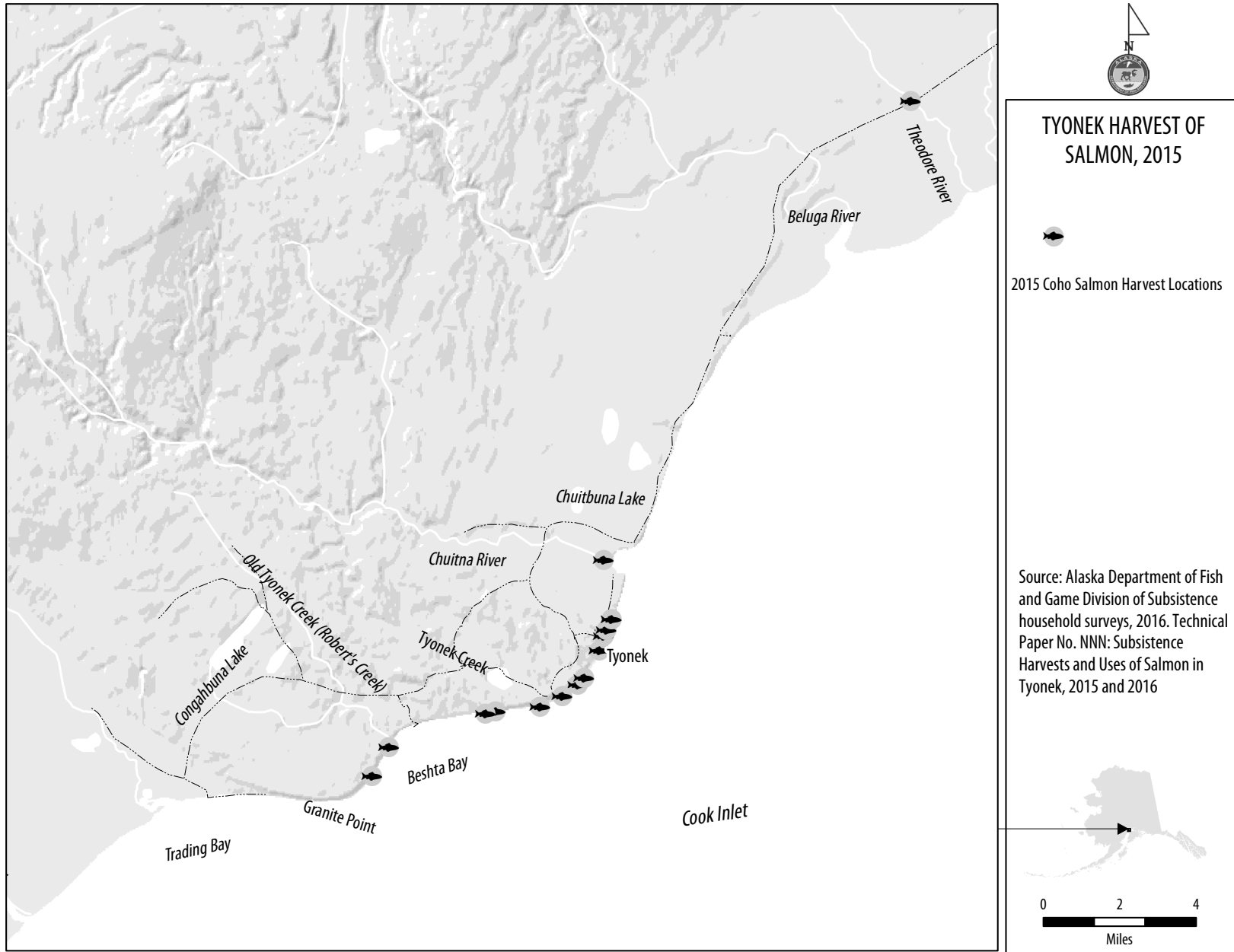


Figure 3-15.—Fishing and harvest locations of coho salmon, Tyonek households, 2015.

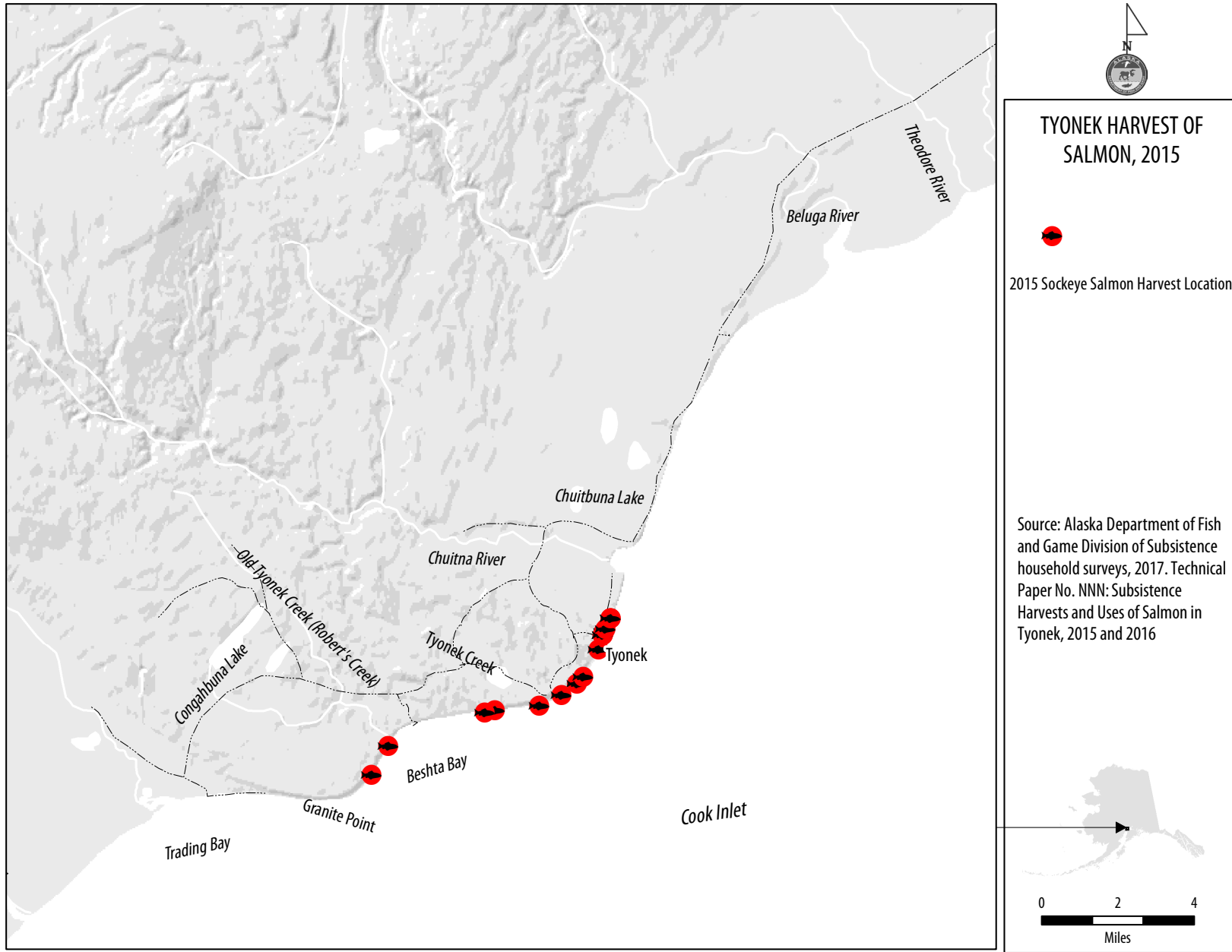


Figure 3-16.—Fishing and harvest locations of sockeye salmon, Tyonek households, 2015.

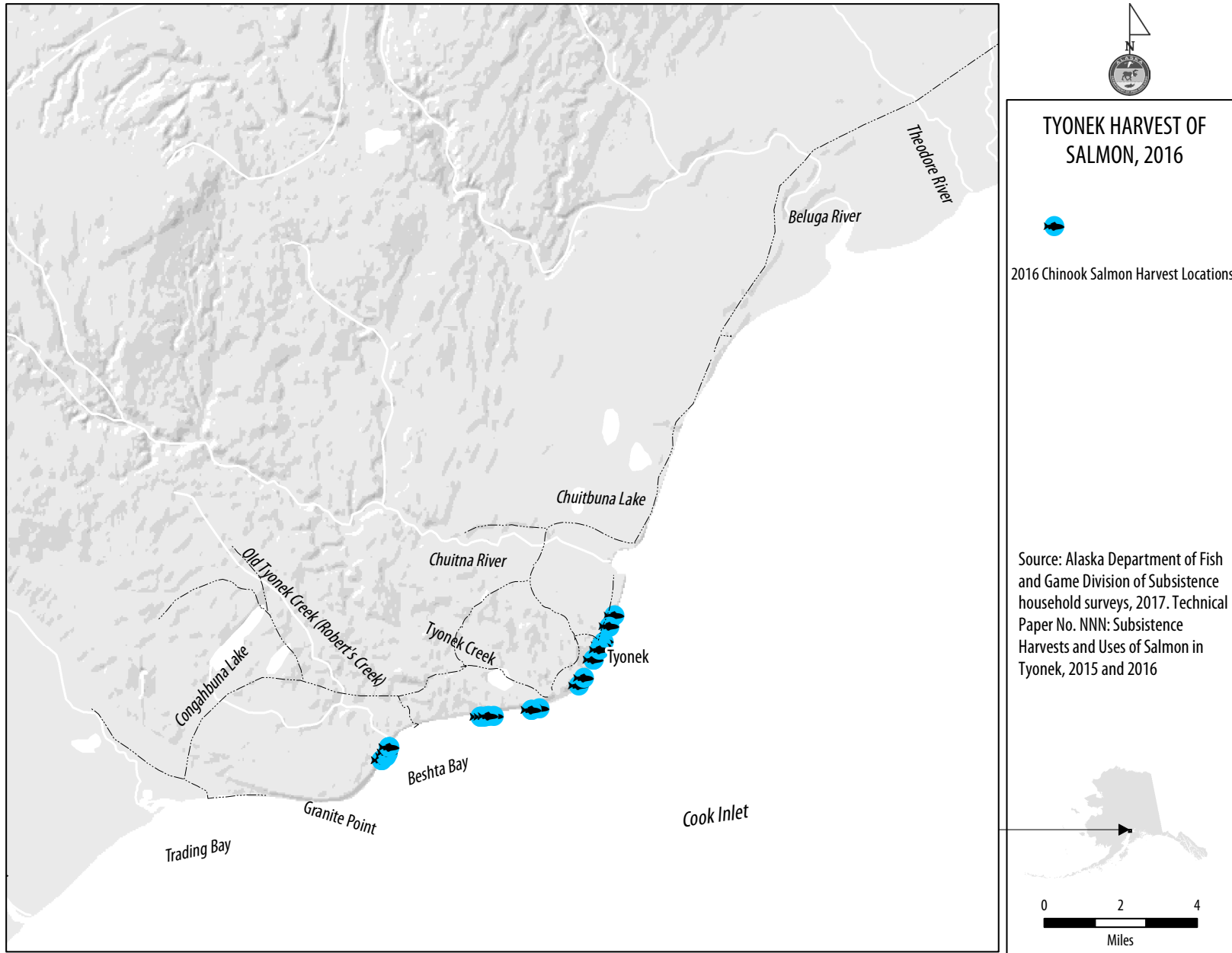


Figure 3-17.—Fishing and harvest locations of Chinook salmon, Tyonek households, 2016.

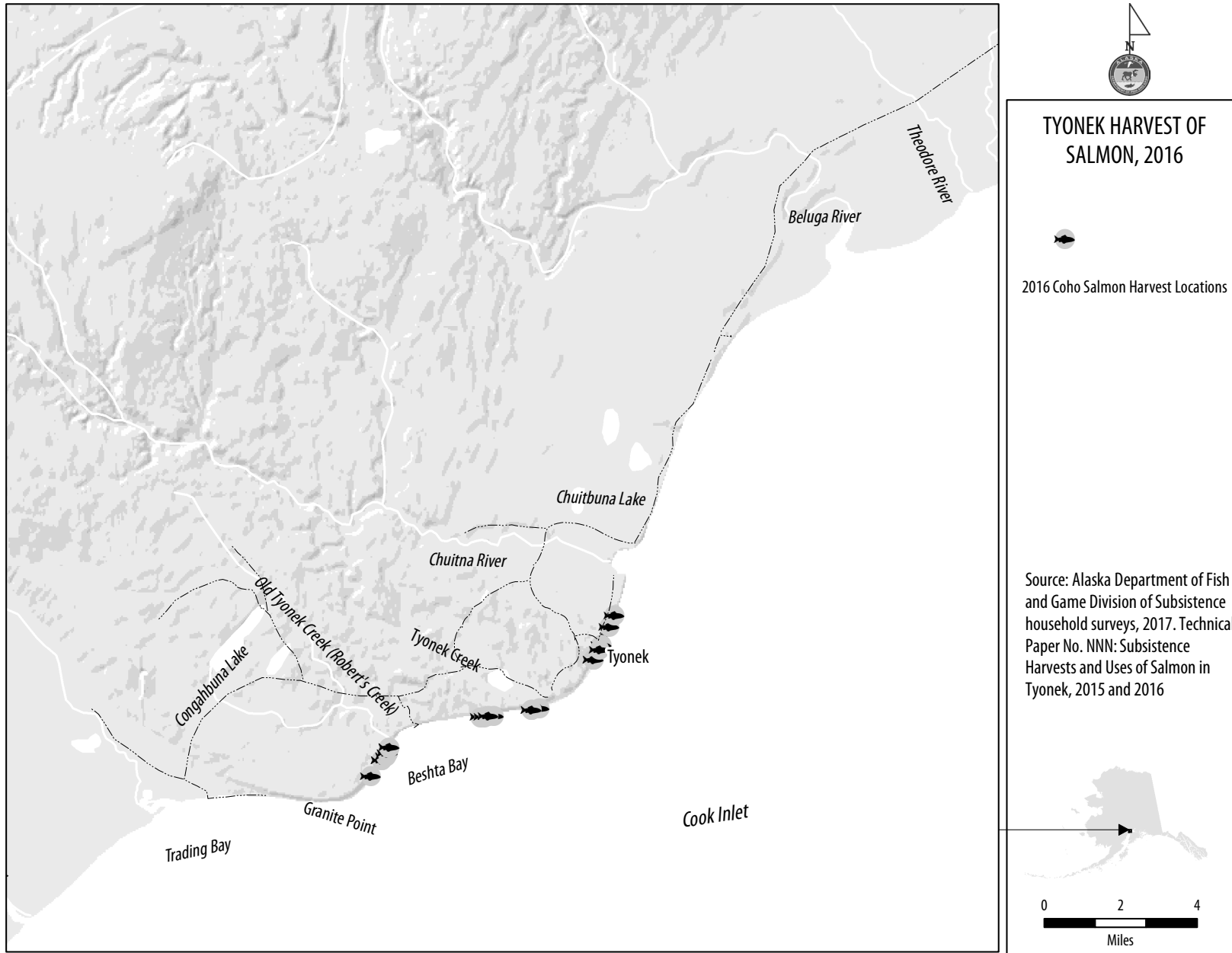


Figure 3-18.—Fishing and harvest locations of coho salmon, Tyonek households, 2016.

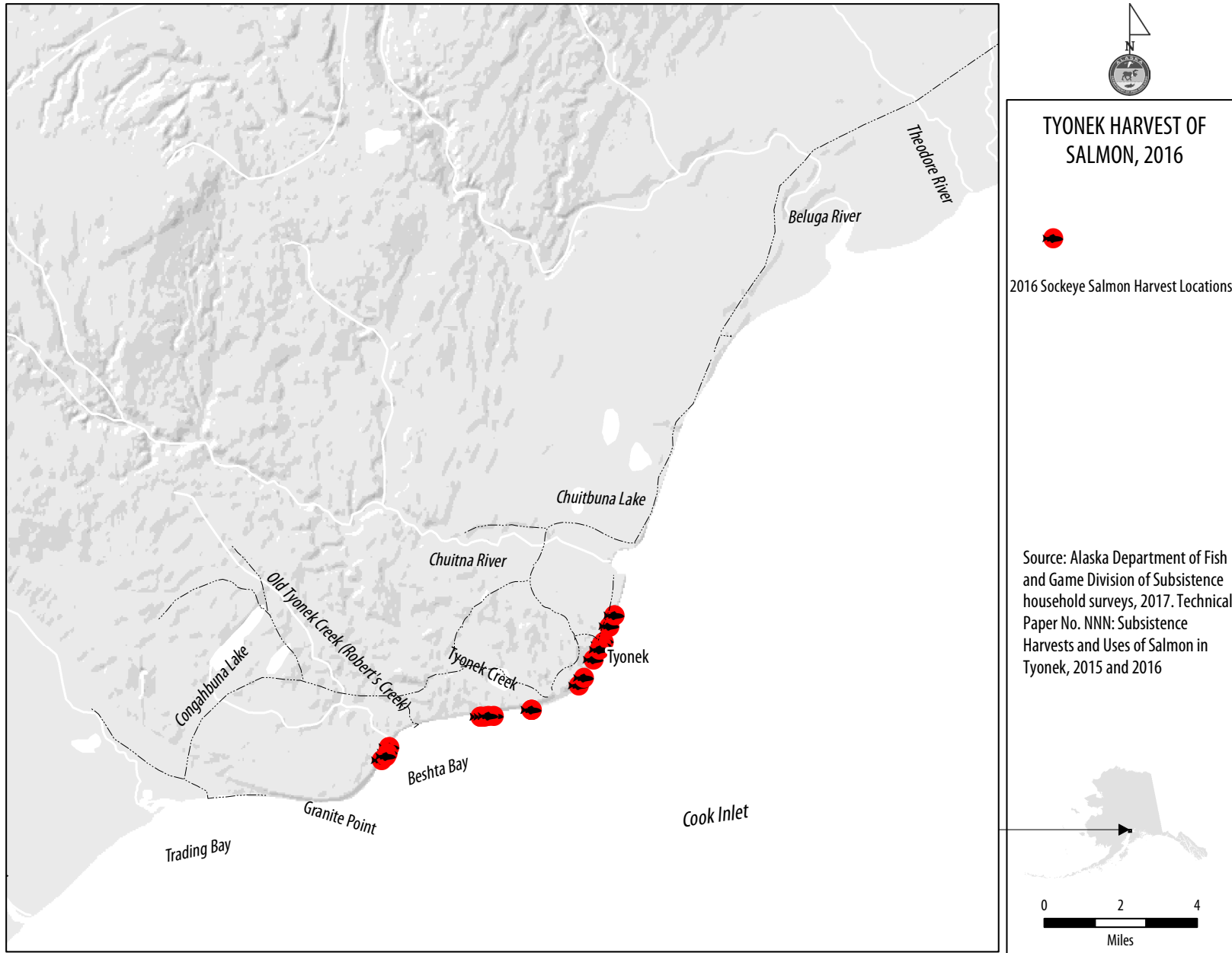


Figure 3-19.—Fishing and harvest locations of sockeye salmon, Tyonek households, 2016.

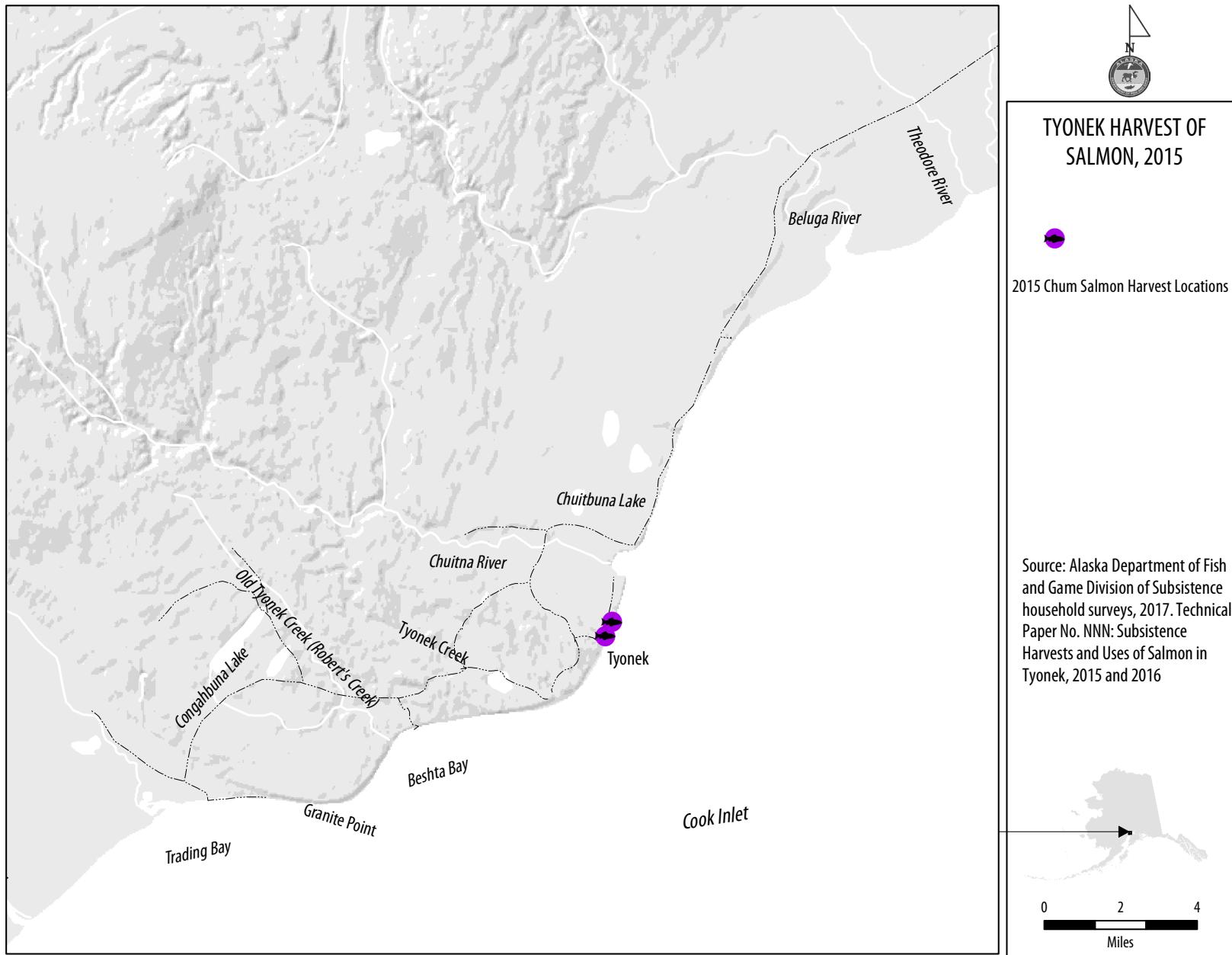


Figure 3-20.—Fishing and harvest locations of chum salmon, Tyonek households, 2015.

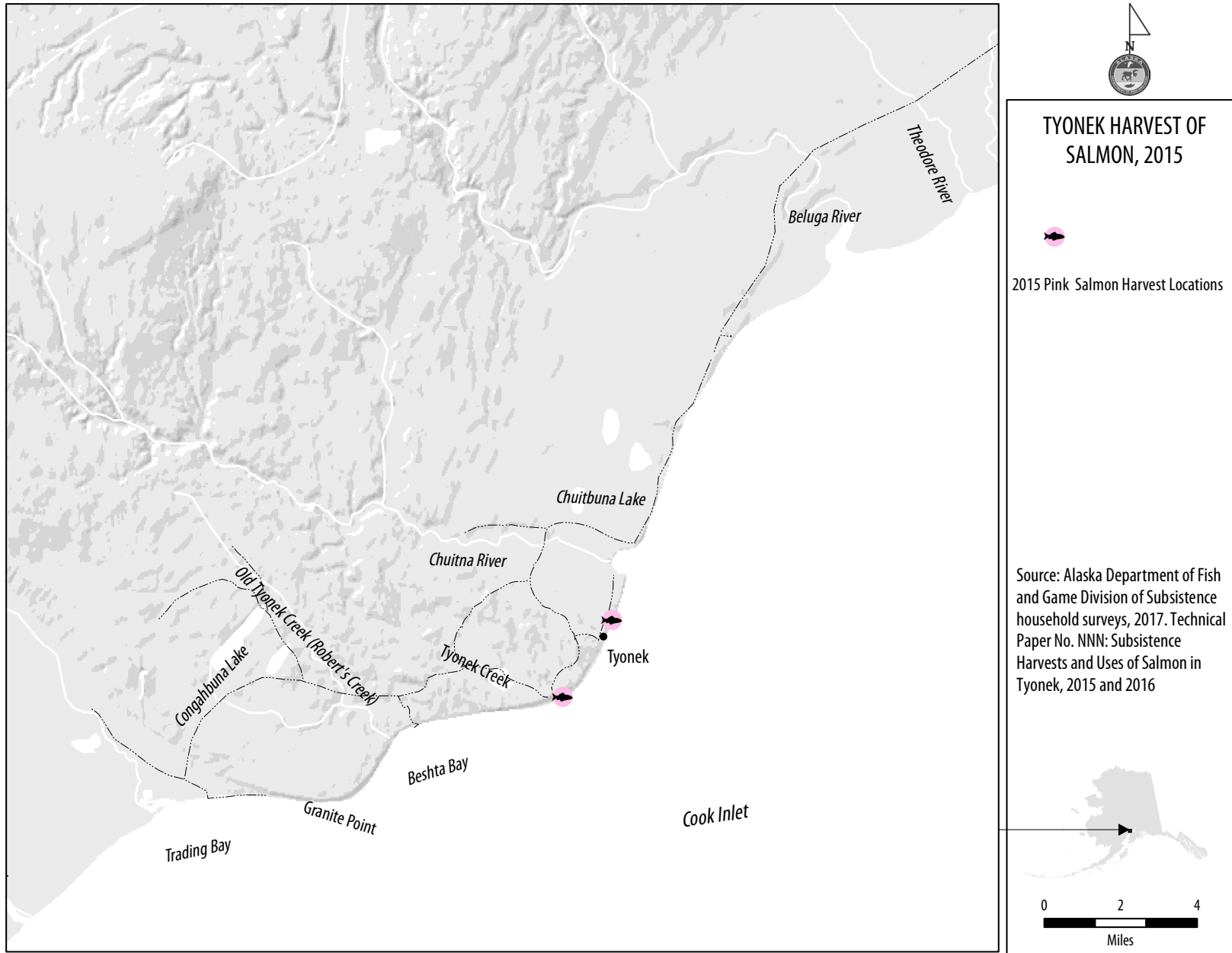


Figure 3-21.—Fishing and harvest locations of pink salmon, Tyonek households, 2015.

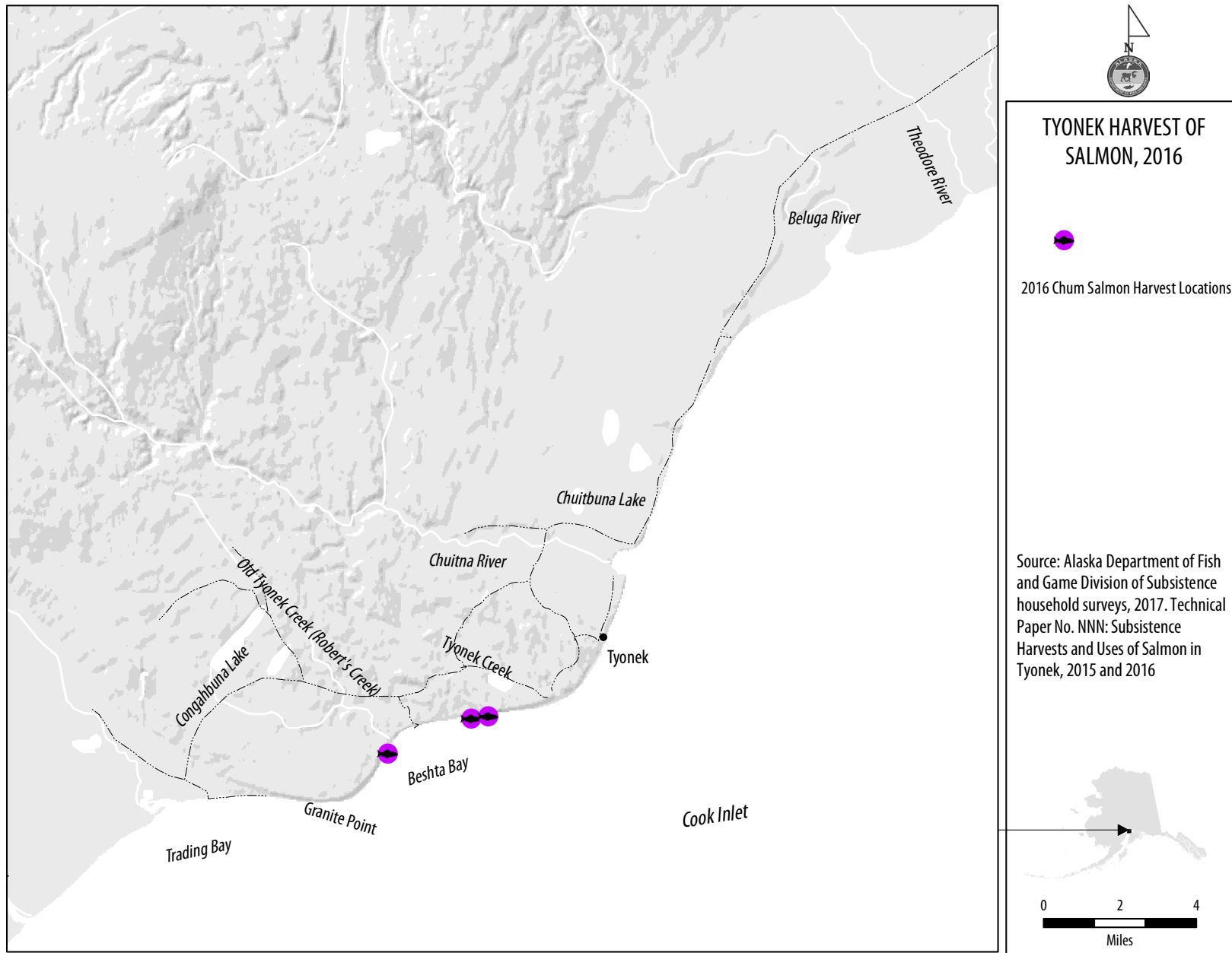


Figure 3-22.—Fishing and harvest locations of chum salmon, Tyonek households, 2016.

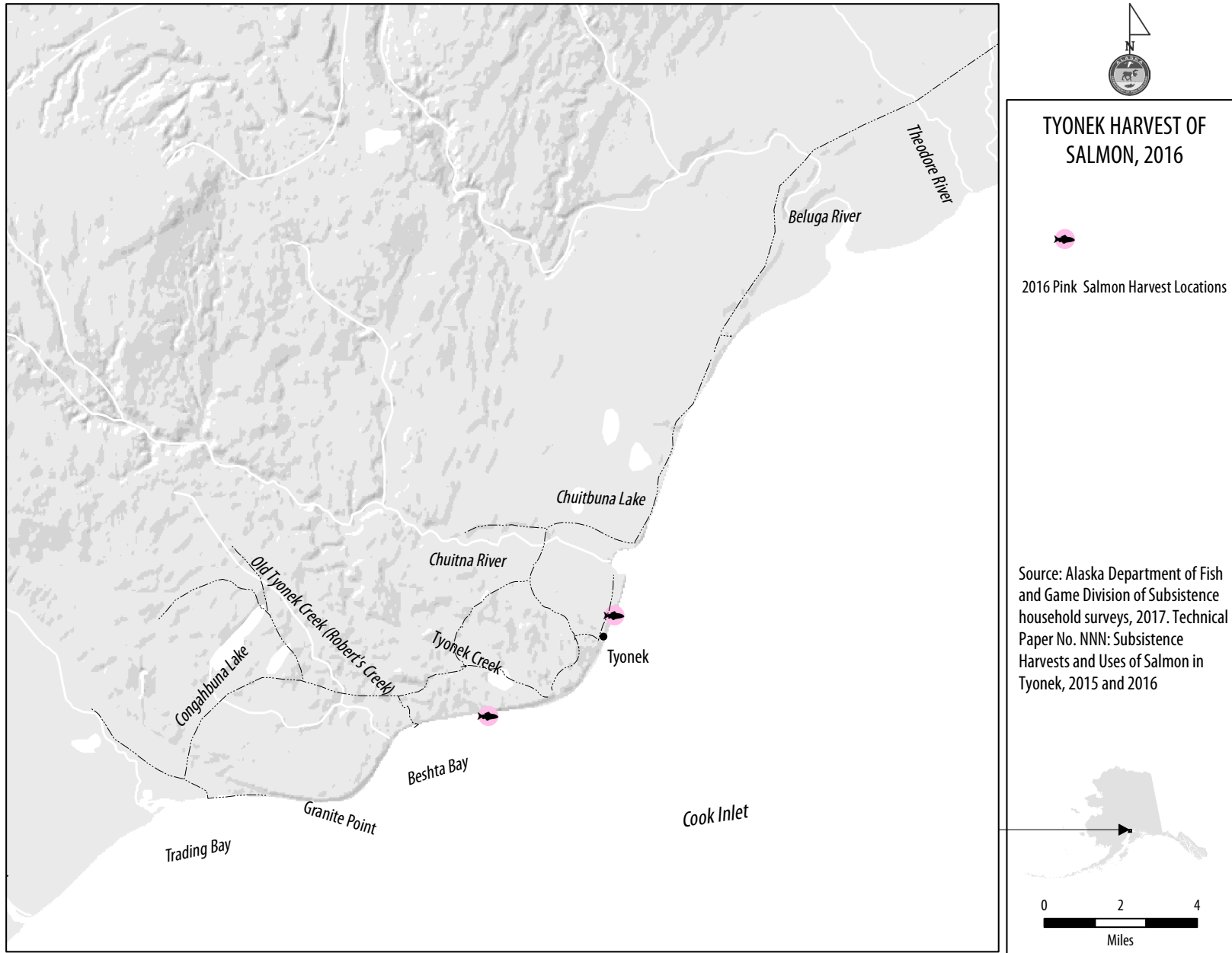


Figure 3-23.—Fishing and harvest locations of pink salmon, Tyonek households, 2016.

SALMON FISHING METHODS

As previously discussed, salmon is a distinct marker of the Dena'ina culture. The general name for salmon in the Dena'ina language is *liq'a*. King (Chinook) salmon is *liq'aka'a*, red (sockeye) salmon translates to *q'uya*, silver (coho) salmon is *nudlegha*, pink salmon is *qughuna*, and dog (chum) salmon is *seyi* (Kari 2007).

In the Dena'ina language, June is *liq'aka'a n'u*, (or “king salmon month”) (Fall 1989). Dating back to at least 500 years, each May and June a great deal of effort was put into harvesting Chinook salmon from the shores of upper Cook Inlet at summer fish camps (Kari 1988). Chinook salmon are valued not only because of their large size, nutritious content, and rich flavor but also because they are the first substantial resource to arrive after the long winter (Fall 1989). Today, each spring, as in the past, Tyonek residents eagerly anticipate the arrival of the Chinook salmon runs. According to a Tyonek resident in 2016, “I have to get kings, it's the preference of our family and the main food source for us, you know we ... can it, freeze it, salt it, we kipper it, we smoke it and eat it fresh on the grill.”

During the 2015 and 2016 study years, preparation for the salmon season began at local setnet sites and fish camps in April. Families began bringing fishing equipment out of storage and spent time repairing nets, smokehouses, and boat motors and resupplying the camps for use.

An important part of this preparation is installing the setnet stake in the Cook Inlet mudflats. This is done annually, during a low tide in April. Setting the stake is a risky endeavor—due to the dangerous nature of the Cook Inlet silt, there are many stories of people becoming stuck in the mud and coming close to drowning as the tide comes in. Setting the stake requires someone to walk out into the mud and hammer a large metal stake deep into the mud. Once the stake is set, running lines from the beach are looped through the end of the stake.

When the fishing season opens, gillnets are attached to the running lines to create a net that can be set into the water by pulling the running line from the beach.

Recording Harvests

Tyonek residents physically document their salmon harvest amounts in different ways. Many residents who fish from their family fish camps record their catches on their permits once they have returned to their camps and processing sites with salmon from their nets. Often permits are kept in a central location at a fish camp such as a windowsill or kitchen table. Tyonek residents who fish closer to the village tend to carry their permits with them to the beach and record their salmon harvest numbers at their setnet sites; however, this is not always the case, and some residents prefer to record their harvests at their home in order to keep their permits clean and dry. In general, if salmon were shared with another household, the Tyonek resident who harvested the salmon usually still recorded their harvest on their subsistence permit. Additionally, as observed during the study years, if two permit holders were working together using a single setnet site, most Tyonek residents only record the portion of the salmon catch that they took home with them or that they planned to give to others, and the other community member claimed the remaining portion of the catch.

TRADITIONAL KNOWLEDGE: SALMON PROCESSING, PRESERVATION, STORAGE, AND USE

Historically in the Dena'ina culture the division of labor while salmon fishing was organized according to age and gender. Typically, men fished for the salmon, and women dealt with all the processing—with assistance from children (Fall 1989). Historically, large quantities of salmon were dried, smoked, rendered, fermented, and later salted. The preserved fish were stored in underground storage pits for winter consumption or trade. Today the division of labor has changed. Both men and women set gillnets to harvest salmon. It is still more common for women to process the fish, but there are many cases in which men assist or lead the salmon processing efforts.

As in the past, most parts of a salmon are used by Tyonek residents. *Baba* is the Dena'ina word to describe a popular way to dry Chinook salmon. For this processing technique, the salmon head is first cut off and the

gills are discarded. Often the eyes, cheeks, and nose meat are saved for soups, but sometimes the head is also dried and smoked to be eaten later. After the head is removed, all the fins are cut off, and the salmon is sliced in half all the way around, meeting at the tail. The entrails and backbone are removed, and the flesh of each half is cut vertically every quarter-inch all the way to the tail. The fish is then hung on a fish rack to dry for several days before being smoked for 1–2 weeks in a smoke house. Salmon eggs are saved and cured with salt to use as bait for ice fishing.

Another important reason to put up fish is to feed dogs. Although they are no longer needed as a means of transportation, most households in Tyonek still keep dogs. Dried fish backbones (*k'iytin*, or “backbones”) are prepared as dog food. The backbones are dried and smoked, similar to *baba*, but lack the filets.

Fish salting techniques were introduced in the 1880s with the arrival of Russians. The Dena'ina quickly adopted salt preserving methods as part of their already existing suite of fish storage options (Gaul 2007). In 2015 and 2016, a large portion of Tyonek households used rock salt purchased from stores in Anchorage to preserve salmon for yearlong consumption.

COMMUNITY FISHERIES MANAGEMENT, INTERGENERATIONAL TRANSMISSION OF TRADITIONAL SALMON KNOWLEDGE, AND YOUTH PARTICIPATION IN THE SUBSISTENCE SALMON FISHERIES

The fishing methods, preservation styles, and local knowledge described above have been passed down through multiple generations of Cook Inlet Dena'ina. Historically, salmon fishing was so important in the Cook Inlet Dena'ina seasonal round that, as some Tyonek respondents explained, 50 years ago it was not uncommon for a person to be born at a fish camp. Most Tyonek residents learned how to fish for salmon from their parents, grandparents, and great grandparents. According to one Tyonek elder, “You just grow up with it [subsistence fishing], you grow up around it.”

Most Tyonek residents indicated the value of salmon is both dietary and cultural. “Fishing is a part of our heritage that can be handed down through generations. Tradition is very important.” Many people in Tyonek still use fish camps to access subsistence fishing sites. Tyonek fish camps offer a place removed from modern conveniences. Most fish camps do not have electric power and are heated by wood stove. Rather than checking emails and going to work as people would normally do while in Tyonek village, daily tasks at fish camp include collecting beach coal to heat the wood stove, making a pot of coffee to share with visitors, and studying the tide book to ensure the setnet is put out in accordance with the tides. When commercial fishing is closed, there is often time to sit around the fire and talk between tides and fish processing. The sound of an approaching ATV signals a friend or relative is coming for a visit.

As one resident stated: “My dad told me, as long as you have your fish in the freezer, you'll never go hungry, if you got a cup of rice, you got a meal. That's the way I grew up, and I pass this ‘long to my kids. I tell them the exact same thing that my dad told me when I was growing up.”

In contemporary Tyonek, many adults worry about the future interest of Tyonek's youth in continuing Dena'ina salmon fishing traditions. Youth culture camps were established as one way to attempt mitigation of these concerns about loss of cultural transmission. Additionally some families encourage youth to become involved with organizations such as the Tyonek Tribal Conservation District (see below).

Youth Culture Camps

Each June NVT hosts a youth culture camp, a week of teaching Tyonek youth about traditional food gathering and processing. During their 4- to 5-day stay, the campers learn about subsistence fishing and processing. They help adults put out and pull in setnets, and participate in cleaning, cutting, brining, and smoking the fish. Some campers choose to help camp hosts prepare traditional fish soups, while some campers choose to spend their time playing tag and other games. The camps are fun and organized, but also allow for free time, so both the youth and the adults can relax.

Many of the organized activities are centered on subsistence foods. For example, during the 2013 culture camp, an Anchorage-based chef came to Tyonek to demonstrate to campers the use of subsistence foods in

modern cooking. The chef visited the culture camp, led a nature walk, and prepared a meal using foods that camp participants obtained through foraging, including beach peas and beach greens.

The camp centers on both traditional and modern food, but there are also other topics that are touched upon during the camp. Various community leaders and guest speakers address serious issues affecting youth such as sobriety, suicide, college, and careers.

Tyonek Tribal Conservation District

In 2005, the Tyonek Tribal Conservation District (TTCD) was formed as the first Tribal Conservation District in Alaska through an agreement between NVT, the Tyonek Native Corporation (TNC), and the U.S. Department of Agriculture. The physical Conservation District covers a total of 6.6 million acres of land, including NVT. Besides setting aside land for conservation, TTCD has started several projects such as conducting a districtwide natural resource assessment, developing a Tyonek Community Garden program, and culvert replacements for fish passage improvement in Tyonek.

TTCD has 3 permanent staff members based in Anchorage; 2 are not Tyonek residents and 1 is a former Tyonek resident. TTCD also hired Tyonek youth to assist on local projects, and in 2015 TTCD hired a local garden manager and 2 local youth interns.

According to its website, protecting fish habitat and improving fish passage has been a major priority for TTCD since its formation.⁵ Since its inception, TTCD has worked with NVT, TNC, the U.S. Fish & Wildlife Service, and ADF&G to remove barriers to fish passage on the west side of Cook Inlet. The organization has developed and implemented a Watershed Action Plan to address other threats to salmon such as northern pike and invasive plants. One of the most successful events to come out of the watershed action plan thus far has been the bi-annual pike fishing derby in Tyonek to help eradicate this invasive fish species. Many families in Tyonek participate in these pike fishing derbies, helping to further engage youth in fishing related activities.

5. Tyonek Tribal Conservation District. 2017. "Habitat Monitoring & Restoration Program," <http://ttcd.org/programs/fish-passage-and-habitat-program/> (accessed May 10, 2017).

4. DISCUSSION

This project had 4 principal objectives. In order to address the project objectives, Division of Subsistence staff worked with the Native Village of Tyonek to conduct household salmon surveys in 2015 and 2016. In addition, researchers engaged in participant observation with local Tyonek subsistence fishers and conducted key respondent interviews to gather additional information about the Tyonek subsistence salmon fishery and permit system. The data gathered from time spent in the community of Tyonek were analyzed by Division of Subsistence staff and have been presented in this report. Each project objective and associated findings will be summarized below.

OBJECTIVE ONE

The first project objective was to obtain updated harvest information through household harvest surveys for comparison to reported harvests in the Tyonek Subdistrict subsistence fishery. This objective was completed for both study years 2015 and 2016. In 2015, 50 Tyonek households were successfully surveyed, resulting in a sample achievement of 81%; in 2016, 49 households were successfully surveyed, resulting in a sample achievement of 82% (Table 1-1; Table 1-2). The data gathered from Objective 1 also helped support finding for Objectives 3 and 4.

OBJECTIVE TWO

The second study objective was to observe and document harvest recording at subsistence fishing locations to understand how residents record their Chinook salmon subsistence harvests. As discussed above, Tyonek residents document their salmon harvest amounts in different ways, but, in general, most households obtain 1 permit and often bring their permit to their fish camps, or, if they are fishing near the community, leave it at home and record their harvests at the end of the day. In addition to learning how Tyonek residents document harvests, this objective also lent to learning about local concerns and comments about subsistence fishing by Tyonek residents. Tyonek residents expressed concerns about the health of the populations of Chinook, coho, and sockeye salmon. Residents noted that they were concerned about salmon harvests by commercial fishing boats in offshore marine waters, and especially the volume of Chinook salmon caught in commercial nets as bycatch. Other concerns focused on the effects of pollution and warming ocean temperatures on salmon.

Chinook Salmon Concerns

Most residents of Tyonek are concerned about the overall health and abundance of Chinook salmon in Cook Inlet. Specifically, respondents reported a significant decrease in overall Chinook salmon returns and many Tyonek households mentioned more “jack” Chinook salmon (immature, non-spawning male salmon) were returning during the study years than in previous years. Respondents commented that they had to take time off from work to fish longer into the season in order to retain enough Chinook salmon for their household’s needs. According to residents, the decrease in Chinook salmon harvest amounts has had noticeable effects for this community. Community members have had to start relying on other salmon species such as sockeye and coho salmon in order to put away enough food for their families. Relying on other salmon is problematic for compounding reasons. As mentioned previously, Chinook salmon are the first species to be harvested following a long winter; their arrival is highly anticipated. Tyonek residents often obtain a subsistence permit in early April, and begin preparing their fish camps several weeks prior to the May 15 subsistence opening. The weather in May and early June is much cooler and typically dryer than it is in late June. The way in which people of Tyonek have historically processed salmon requires these cooler temperatures for drying and smoking salmon. Sockeye salmon do not return until late June, and coho salmon return in August; therefore smoking/drying these later-returning fish is a much different process. Additionally, both sockeye and coho salmon are significantly smaller than Chinook salmon, and have much less fat content, resulting in a different taste and consistency once processed.

Coho Salmon Concerns

Coho salmon have recently become an important species of salmon for the residents of Tyonek. Community members who were unable to obtain enough Chinook salmon during the early fishing season rely upon coho salmon to sustain their subsistence salmon needs. During the 2015 and 2016 study, residents expressed concerns about the uncertainty of coho salmon run strength. Some Tyonek community members further explained that coho runs were becoming unpredictable in regard to timing and abundance.

Sockeye Salmon Concerns

Tyonek residents remarked on the health and appearance of sockeye salmon in 2015 and 2016. The reported number of sockeye salmon with worms increased since the last study in 2013. Tyonek community members have also noted that mutations in sockeye salmon have also increased in the past 10 years. Mutation reports include sockeye salmon with missing or deformed fins, large belly lesions, and missing sections of scales.

Regulations

Since obtaining enough Chinook salmon has become challenging over the past decade, some respondents expressed concerns with the way in which subsistence regulations are set up. According to one Tyonek resident, “The tides are too strong in Tyonek and I can’t catch on the outgoing tide, only on the incoming. The regulations do not take this into consideration, some days the tides don’t cooperate with the times we are allowed to fish.”

These residents feel that the fishing hours/days should be adjusted to better coordinate with the strong Cook Inlet tides. One Tyonek resident suggested: “The fishing periods are not long enough, they should limit the days and instead let us fish for 24 hours.” Tyonek respondents stressed the importance of regulations during interviews, but pointed out that there may be a better way to catch the same amount of fish, while also making it possible for people to keep wage-paying jobs and get their fish in a shorter timeframe. As one interview respondent put it: “I understand the concern about the number of fish we take, but we only take what we need, it is important for our health and livelihoods, regulations are interfering with our ability to get subsistence resources.”

OBJECTIVE THREE

The third project objective was to compile and update existing harvest data to expand reported harvests from 1980–2016. This objective was completed by the Division of Subsistence during data analysis for this project. As discussed throughout this report, expanding the permit data has provided more accurate and representative harvest data for the Tyonek Subdistrict subsistence salmon fishery. As a result of this expansion, estimated harvest data will replace the reported harvest data in the Division of Subsistence annual subsistence and personal use salmon harvest reports beginning with the 2015 report.¹

OBJECTIVE FOUR

The fourth objective was to make recommendations for a revised harvest monitoring program based on project findings. As demonstrated above, the permit data are more accurate when a higher percentage of permits are returned (Figure 3-3; Figure 3-9). In 2015 and 2016, 46 permits were collected by Division of Subsistence staff members and Tyonek LRAs during the household survey administration, improving the reported and estimated harvest data confidence levels significantly.

In 2015, 26 permits were collected during the survey, and in 2016, 20 permits were collected, suggesting that more Tyonek households returned their permits prior to the survey due to the collection effort from the previous year. It would be beneficial for Division of Subsistence staff members to have a permit collection day in Tyonek, structured similarly to the permit issue day discussed in Chapter 1 of this report. Staff members could work with NVT representatives and local residents to collect the permits in Tyonek to increase the percentage of completed and returned permits, though it should be acknowledged that this

1. ADF&G Division of Subsistence Technical Papers are available online: <http://www.adfg.alaska.gov/sf/publications/index.cfm>.

tactic would not improve response rates for non-Tyonek residents, which is often much lower than return rates of Tyonek resident permits.

CONCLUSION

This 2-year study documented the continuing importance of subsistence salmon fishing to the residents in the upper Cook Inlet community of Tyonek. In both study years, almost all households (96% in 2015 and 94% in 2016) used salmon coinciding with a high level of household participation in fishing efforts (80% participation in 2015, and 78% in 2016). In 2015 and 2016, the salmon harvest composition was primarily composed of Chinook, sockeye, and coho salmon, with much smaller amounts of pink and chum salmon harvests. According to interview respondents, the exchange of salmon was of critical importance for this community since many families and individuals were reliant upon salmon shared by other, high-harvesting households and detailed networks of exchange assisted in increasing the diversity and amounts of salmon found in most residences.

Even when subsistence harvest activities were hampered by age, inability, lack of time, and other restricting factors, most residents expressed their preference for obtaining wild salmon compared to food purchased in stores. Tyonek residents expressed that securing enough salmon each season was important for food security and for continuing cultural connections.

According to the survey results and the permit system, there has been a decrease in pounds per capita of Chinook salmon harvested over the past 35 years. Echoing this sentiment, at the end of each survey and during the community review meeting, many participants expressed great concern about the overall health and abundance of Chinook salmon in Cook Inlet. Respondents commented that they had to take time off from work to fish longer into the season in order to retain enough salmon for their household's needs. Given this documented decrease in Chinook salmon harvests, it is not surprising that respondents surveyed in this study expressed concerns about their future opportunities to fish for salmon in a manner consistent with their traditions, their chosen lifestyles, and at levels that meet their harvest goals.

As demonstrated by the study findings, subsistence uses of healthy salmon populations link people to their past, are vital to the present health of Tyonek, and encourage optimism about the future. In addition, providing opportunities for subsistence salmon fishing in Tyonek is a mandate of state law. Tyonek residents desire to continue subsistence activities, not only for themselves, but also for their children and other future generations. The intent of this report has been to provide information that will help Tyonek residents maintain their goal of sustaining their subsistence way of life.

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APPENDIX A–2015 AND 2016 SURVEY FORMS

SUBSISTENCE SALMON SURVEY

TYONEK, ALASKA

From January 1, 2016 to December 31, 2015

TYONEK

PRINTED
2016-01-28

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

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

HOUSEHOLD ID:		
STRATUM ID:		
COMMUNITY ID:	TYONEK	355
INTERVIEWER:		
INTERVIEW DATE:		
START TIME:		
STOP TIME:		
	DATA CODED BY:	
	DATA ENTERED BY:	
	SUPERVISOR:	



COOPERATING ORGANIZATIONS

NATIVE VILLAGE OF TYONEK

B Street
Tyonek, AK 99682
907-583-2201

DIVISION OF SUBSISTENCE

ALASKA DEPARTMENT OF
FISH AND GAME
333 Raspberry Road
Anchorage, AK 99518-1599
907-267-2353

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, 2015, and December 31, 2015, WHO were the head or heads of this household?

Is this person answering questions on this survey?	ID#	circle	How is this person related to HEAD ? <i>relation</i>	Is this person MALE or FEMALE? <i>circle</i>	Is this person an ALASKA NATIVE? <i>circle</i>	In what year was this person born? <i>year</i>	How many years has this person lived in Tyonek? <i>number</i>	In 2015, did this person have...		If permit not returned, WHY?
								A subsistence SALMON permit? <i>circle</i>	<i>return</i>	
HEAD		Y N		M F	Y N			Y N ?	Y N ?	
1										
<i>NEXT enter spouse or partner. If household has a SINGLE HEAD, leave HEAD 2 row BLANK, and move to PERSON 3.</i>										
HEAD		Y N		M F	Y N			Y N ?	Y N ?	
2										
<i>BELOW, enter children (oldest to youngest), grandchildren, grandparents, or anyone else living full-time in this household.</i>										
PERSON 3				M F	Y N			Y N ?	Y N ?	
3		0								
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								
PERSON 11				M F	Y N			Y N ?	Y N ?	
11		0								
PERSON 12				M F	Y N			Y N ?	Y N ?	
12		0								
PERSON 13				M F	Y N			Y N ?	Y N ?	
13		0								
PERSON 14				M F	Y N			Y N ?	Y N ?	
14		0								
PERSON 15				M F	Y N			Y N ?	Y N ?	
15		0								

* "BIRTH HOME" means the place this person's PARENTS WERE LIVING when this person was born.

HOUSEHOLD MEMBER AND PERMIT INFORMATION: 00

TYONEK: 355

RETAINED COMMERCIAL HARVESTS

HOUSEHOLD ID

1. Do you or members of your household USUALLY participate in commercial salmon fisheries?..... Y N
2. During the last year (between JANUARY 1, 2015, AND DECEMBER 31, 2015),
did you or members of your household PARTICIPATE in ANY commercial salmon fishery?..... Y N

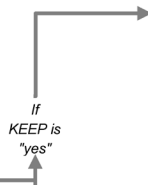
IF the answer to QUESTION 2 is NO, go to the subsistence harvests section.

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 _____?
- B** ... KEEP any _____ from your commercial catch for your own use² or to share?
- C** Was the _____ that you kept INCIDENTAL⁴ catch?



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

Include COMMERCIALY 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		B		C		How many were removed for your OWN USE? ⁵ <i>number</i>	How many were removed for your CREW? ⁵ <i>number</i>	How many were removed to give to OTHERS? <i>number</i>	Person ID from page 2 <i>number</i>	comments
	COM FISH?		KEEP?		INCI?						
CHINOOK SALMON	Y	N	Y	N	Y	N					
KING SALMON											
113,000,001											
SOCKEYE SALMON	Y	N	Y	N	Y	N					
RED SALMON											
115,000,001											
COHO SALMON	Y	N	Y	N	Y	N					
112,000,001											
CHUM SALMON	Y	N	Y	N	Y	N					
DOG SALMON											
111,000,001											
PINK SALMON	Y	N	Y	N	Y	N					
HUMPIES											
114,000,001											

1 Assessments: 66
 2 "USE" includes eating, feeding to dogs, sharing or trading with others, etc.
 3 UNITS will differ by species and situation. Units may be pounds (lbs), individuals (ind), portions of individuals (1/4), buckets, sacks, tubs, etc.
 4 "INCIDENTAL CATCH" means the fish kept was not being commercially fished. For example, a king salmon kept from a chum commerial fishery.
 5 Double counting (captains' removals for crew members and crew members' removal for own uses) is fixed in analysis. Collect both.

SUBSISTENCE HARVESTS: SALMON

HOUSEHOLD ID

1. Do you or members of your household USUALLY fish for salmon for subsistence?..... Y N
2. During the last year (between JANUARY 1, 2016, AND DECEMBER 31, 2016),
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 summary page.

IF the answer is YES, continue on this page...

**During the last year¹,
did you or members of your household....**

- A ...use² ?
- B ...receive _____ from another HH or community?
- C ...give _____ to another HH or community?
- D ...try² to harvest _____ ?
- E ...actually harvest any _____?

Please estimate how many salmon ALL MEMBERS OF YOUR HOUSEHOLD got for subsistence uses during the last year. How many were...

INCLUDE salmon that members of this household gave away, ate fresh, fed to dogs, lost to spoilage, or got by helping others. If fishing with or helping others, report ONLY THIS HOUSEHOLD'S share of the harvest.

How many of THOSE were used for dog food?

Read names below in blanks above	A	B	C	D	E	Caught with a SET GILLNET	Caught with a SEINE NET	Caught with a DIP NET	Caught with a ROD & REEL ³	Caught with OTHER GEAR (specify type)	Units ⁴	How many of THOSE were used for dog food?
	USE?	REC?	GIVE?	TRY?	HAR?	number harvested by each gear type				amount / type	specify	dogfood
CHINOOK SALMON	Y N	Y N	Y N	Y N	Y N					/		
KING SALMON												
113,000,000												
SOCKEYE SALMON	Y N	Y N	Y N	Y N	Y N					/		
RED SALMON												
115,000,000												
COHO SALMON	Y N	Y N	Y N	Y N	Y N					/		
112,000,000												
CHUM SALMON	Y N	Y N	Y N	Y N	Y N					/		
DOG SALMON												
111,000,000												
PINK SALMON	Y N	Y N	Y N	Y N	Y N					/		
HUMPIES												
114,000,000												
SALMON - UNKNOWN	Y N	Y N	Y N	Y N	Y N					/		
119,000,000												
	Y N	Y N	Y N	Y N	Y N					/		
	Y N	Y N	Y N	Y N	Y N					/		
	Y N	Y N	Y N	Y N	Y N					/		

During the last year, did your household use any other kind of salmon?..... Y N

IF YES, enter the name in a blank row above, and answer the questions in that row.

¹ "LAST YEAR" means between JANUARY 1, 2015, and DECEMBER 31, 2015.
² "USE" includes harvesting, processing, eating, trading, feeding to dogs, etc. "TRY" includes looking, hunting, fishing, or any attempt to get.
³ "ROD AND REEL" includes fish caught in open water with a hook and a line attached to a rod or a pole. Jiggling through the ice is "other gear."
⁴ UNITS will differ by species and situation. UNITS may be pounds (lbs), individuals (ind), portions of individuals (1/4), buckets, sacks, tubs, etc.

Non-Commercial Harvests

Household ID

Assessments: Salmon

110,000,000

Between January and December, 2015...

did your household use LESS, the SAME, or MORE salmon than in recent years?.....

X L S M

If LESS or MORE,....

X = do not use

WHY was your use different?.....

1

2

Last year...

did your household GET ENOUGH salmon?.....

Y N

If NO...

What KIND of salmon did you need?.....

How would you describe the impact to your household of not getting salmon last

minor?
(1)

major?
(2)

severe
(3)

Did your household do anything DIFFERENTLY because you did not get ENOUGH salmon?.....

Y N

If YES...

What did your household do differently?.....

1

2

Have you heard of Tyonek Tribal Conservation District (TTCD)? Y N

How do you feel that TTCD is benefitting your community and your natural resources?

How could TTCD further benefit you community?

What is the best way to let you know about upcoming TTCD events and activities? (circle all that apply)

- email Facebook Fliers TTCD Newsletters
 Mail Other

Why is subsistence important to you?

TTCD hosted 2 pike derbies in 2015.

Did you participate?
 Why or why not?

Y N

TTCD has opened up over 20 miles of salmon spawning habitat through culvert replacements in the last three years. Do you have any other suggestions for ways that TTCD can support salmon populations?

What is the most convenient way for you to purchase Tyonek produce?

- Through Volunteer Program I don't purchase Tyonek produce
 If you do not purchase Tyonek produce, please explain why ...

Have you been involved in any gardening trainings or activities with TTCD?
 If so, do you feel you are more prepared to garden yourself?

Y N
 Y N

What garden topics are you interested in learning more about?

If you could ask TTCD to do one project to benefit natural resources for future generations, what would it be?

What suggestions do you have?

SUBSISTENCE SALMON SURVEY

TYONEK, ALASKA

From January 1, 2016 to December 31, 2016

TYONEK SUBDISTRICT
HARVEST ANALYSIS

printed: 2016-11-17

This survey is used to estimate subsistence harvests and to describe the role of subsistence in the local economy of your community. We will publish a short summary report, that will be available to community members. We share this information with the Alaska Department of Fish and Game, the U.S. Fish and Wildlife Service and the National Park Service. We work with the Federal Regional Advisory Councils and with local Fish and Game Advisory Committees to better manage subsistence, and to implement federal and state subsistence priorities.

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

HOUSEHOLD ID:	_____	_____
COMMUNITY ID:	355	355
INTERVIEWER #1:	_____	_____
INTERVIEWER #2:	_____	_____
INTERVIEW DATE:	_____	_____
START TIME:	_____	_____
STOP TIME:	_____	_____
	DATA CODED BY:	_____
	DATA ENTERED BY:	_____
	SUPERVISOR:	_____



Photo by Bronwyn Jones

NATIVE VILLAGE OF TYONEK

B STREET
TYONEK, AK 99682
907-583-2201

ALASKA DEPARTMENT OF FISH AND GAME

333 RASPBERRY RD
ANCHORAGE, AK 99518-1565
907-267-2353

HOUSEHOLD MEMBERS

HOUSEHOLD ID

First, I would like to ask about the people in your household, meaning 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, 2016 and December 31, 2016 WHO were the head or heads of your 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?	How OLD is this person?	Where were parents living when this person was born?	How many years has this person lived in Tyonek?	In 2016 did this person have a subsistence salmon permit?		If permit not returned, why?	
ID #	(circle)	(relation)	(circle)	(circle)	(years)	(AK city or state)	(number)	(circle)	(return)	(describe)
HEAD 1	Y N		M F	Y N				Y N	Y N	
1										
NEXT enter spouse or partner. If a household has a SINGLE HEAD, leave HEAD 2 row BLANK and move to PERSON 3.										
HEAD 2	Y N		M F	Y N				Y N	Y N	
2										
BELOW, enter children (oldest to youngest), grandchildren, grandparents, or anyone else living full-time in this household.										
PERSON 03	Y N		M F	Y N				Y N	Y N	
3										
PERSON 04	Y N		M F	Y N				Y N	Y N	
4										
PERSON 05	Y N		M F	Y N				Y N	Y N	
5										
PERSON 06	Y N		M F	Y N				Y N	Y N	
6										
PERSON 07	Y N		M F	Y N				Y N	Y N	
7										
PERSON 08	Y N		M F	Y N				Y N	Y N	
8										
PERSON 09	Y N		M F	Y N				Y N	Y N	
9										
PERSON 10	Y N		M F	Y N				Y N	Y N	
10										
PERSON 11	Y N		M F	Y N				Y N	Y N	
11										
PERSON 12	Y N		M F	Y N				Y N	Y N	
12										
PERSON 13	Y N		M F	Y N				Y N	Y N	
13										

PERMANENT HH MEMBERS: 01

TYONEK: 355

RETAINED COMMERCIAL HARVESTS: SALMON

HOUSEHOLD ID

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

2. During the last year (between January 1, 2016 and December 31, 2016)
 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 NEXT PAGE.

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 _____?
- B ... KEEP any _____ from your commercial catch for your own use² or to share?

if keep is "yes"

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

Include COMMERCIALLY HARVESTED fish 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		B		How many were removed for your OWN USE? ²	How many were removed to give to OTHERS?	Units ³	comments
	COMM FISH?	KEEP?						
CHINOOK SALMON	Y	N	Y	N				
<i>KING SALMON</i>								
113000001								
SOCKEYE SALMON	Y	N	Y	N				
<i>RED SALMON</i>								
115000001								
COHO SALMON	Y	N	Y	N				
<i>SILVER SALMON</i>								
112000001								
PINK SALMON	Y	N	Y	N				
114000001								
CHUM SALMON	Y	N	Y	N				
<i>DOG SALMON</i>								
111000001								
UNKNOWN SALMON	Y	N	Y	N				
119000001								
	Y	N	Y	N				
	Y	N	Y	N				
	Y	N	Y	N				

1 "LAST YEAR" means between January 1, 2016 and December 31, 2016.
 2 "USE" includes eating, feeding to dogs, sharing or trading with others, etc.
 3 UNITS will differ by species and situation. Units may be pounds (lbs), individuals (ind), portions of individuals (1/4), buckets, sacks, tubs, etc.

COMMERCIAL FISHING: 03

HARVESTS: SALMON HOUSEHOLD ID

1. Do you or members of your household USUALLY fish for salmon?..... Y N
2. During the last year (between January 1, 2016 and December 31, 2016) did you, or members of your household USE or TRY TO HARVEST salmon?..... Y N

IF the answer to QUESTION 2 is NO, go to the *NEXT PAGE*.

IF the answer is YES, continue on this page ...

During the last year,¹ did you or members of your household...

- A ... use² _____?
- B ...receive _____ from another HH or community
- C ...give _____ to another HH or community?
- D ...try² to harvest _____?
- E ...actually harvest any _____?

if
harvest
is "yes"

Please estimate how many salmon ALL MEMBERS OF YOUR HOUSEHOLD got for subsistence uses during the last year. How many were harvested with

INCLUDE salmon that members of this household gave away, are fresh, fed to dogs, lost to spoilage, or got by helping others. If fishing with or helping others, report ONLY THIS HOUSEHOLD'S share of the harvest. DO NOT INCLUDE salmon that were caught and released or retained from commercial catch.

Read names below in blanks above	A	B	C	D	E	SET GILL NET	SEINE NET	FISH WHEEL	ROD & REEL ³	OTHER GEAR (specify type)	Units ⁴	# of those used just for dog food? amt.
	USE	REC	GIVE	TRY	HAR	(number harvested by each gear type)			amount / type	specify		
CHINOOK SALMON	Y N	Y N	Y N	Y N	Y N					/	IND.	
<i>KING SALMON</i>												
113000000												
SOCKEYE SALMON	Y N	Y N	Y N	Y N	Y N					/	IND.	
<i>RED SALMON</i>												
115000000												
COHO SALMON	Y N	Y N	Y N	Y N	Y N					/	IND.	
<i>SILVER SALMON</i>												
112000000												
CHUM SALMON	Y N	Y N	Y N	Y N	Y N					/	IND.	
<i>DOG SALMON</i>												
111000000												
PINK SALMON	Y N	Y N	Y N	Y N	Y N					/	IND.	
114000000												
UNKNOWN SALMON	Y N	Y N	Y N	Y N	Y N					/	IND.	
119000000												
	Y N	Y N	Y N	Y N	Y N					/		

During the last year, did your household use any other kind of Salmon?..... Y N

IF YES, enter the name in a blank row above, and answer the questions in that row.

1 "LAST YEAR" means between January 1, 2016 and December 31, 2016.
 2 "USE" includes harvesting, processing, eating, trading, feeding to dogs, etc. "TRY" includes looking, hunting, fishing, or any attempt to get.
 3 "ROD AND REEL" includes fish caught in open water with a hook and a line attached to a rod or a pole. Jigging through the ice is "other gear."
 4 UNITS will differ by species and situation. Units may be pounds (lbs), individuals (ind), portions of individuals (1/4), buckets, sacks, tubs, etc.

ASSESSMENTS: SALMON

HOUSEHOLD ID

To conclude our salmon section, I am going to ask a few general questions about salmon.

During the last year,¹

... did your household use *LESS, SAME, or MORE* 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 salmon?..... Y N

If NO...

What KIND of salmon did you need?

How would you describe the impact to your household of not getting enough salmon last year?

... *not noticeable?* ... *minor?* ... *major?* ... *Severe?*
(0) (1) (2) (3)

Did your household do anything DIFFERENTLY because you did not get ENOUGH salmon last year?

Y N

If YES...

What did your household do differently?

_____ 1

_____ 2

¹ "LAST YEAR" means between January 1, 2016 and December 31, 2016.

**APPENDIX B–2015 AND 2016 CONVERSION
FACTORS**

Appendix Table B-1.— Salmon conversion factors, 2015.

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 10 individual coho salmon, the quantity would be multiplied by the appropriate conversion factor (in this case 6.06) to show a harvest of 60.6 lb of coho salmon.

Resource name	Reported units	Conversion factor
Chum salmon	Individual	5.64
Coho salmon	Individual	6.06
Chinook salmon	Individual	12.74
Pink salmon	Individual	2.46
Sockeye salmon	Individual	4.39
Unknown salmon	Individual	6.73

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

Appendix Table B-2.— Salmon conversion factors, 2016.

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 10 individual coho salmon, the quantity would be multiplied by the appropriate conversion factor (in this case 6.06) to show a harvest of 60.6 lb of coho salmon.

Resource name	Reported units	Conversion factor
Chum salmon	Individual	5.18
Coho salmon	Individual	4.73
Chinook salmon	Individual	12.82
Pink salmon	Individual	3.14
Sockeye salmon	Individual	4.22
Unknown salmon	Individual	6.73

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

APPENDIX C—ADDITIONAL TABLES AND FIGURES

Appendix Table C-1.— Comparison of historical Tyonek Subdistrict reported and estimated subsistence salmon harvests, non-Tyonek residents, 1985 and 1991–2016.

Year	Community	Permits			Percentage of returned permits	Percentage of fished permits	Estimated salmon harvest					Total
		Issued	Returned	Fished			Chinook	Sockeye	Coho	Chum	Pink	
1985 ^a	Anchorage	82	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Kenai Peninsula residents	21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total, 1985		103	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1991	Beluga	1	0		0.0%		0	0	0	0	0	0
	Eagle River	2	1		50.0%		12	0	20	0	0	32
Total, 1991		2	1	1	50.0%	50.0%	12	0	20	0	0	32
1992	Anchorage	1	1		100.0%		0	0	24	0	0	24
	Eagle River	2	1		50.0%		12	0	0	0	0	12
Total, 1992		3	2	2	66.7%	66.7%	12	0	24	0	0	36
1993	Anchorage	7	6		85.7%		83	2	0	0	0	85
	Beluga	1	1		100.0%		31	0	0	0	0	31
	Eagle River	3	3		100.0%		38	3	0	0	0	41
	Wasilla	2	1		50.0%		30	8	0	12	2	52
Total, 1993		13	11	11	84.6%	84.6%	182	13	0	12	2	209
1994	Anchorage	3	3		100.0%		87	5	0	0	0	92
	Eagle River	2	2		100.0%		24	2	0	0	0	26
Total, 1994		5	5	5	100.0%	100.0%	111	7	0	0	0	118
1995	Anchorage	3	1		33.3%		63	0	0	0	0	63
	Beluga	1	0		0.0%		0	0	0	0	0	0
	Eagle River	2	2		100.0%		47	1	0	0	0	48
	Wasilla	2	1		50.0%		10	0	0	0	0	10
Total, 1995		8	4	4	50.0%	50.0%	120	1	0	0	0	121
1996	Anchorage	13	3		23.1%		390	0	0	0	0	390
	Chugiak	1	0		0.0%		0	0	0	0	0	0
	Eagle River	2	2		100.0%		15	0	0	0	0	15
Total, 1996		16	5	5	31.3%	31.3%	405	0	0	0	0	405
1997	Anchorage	13	6		46.2%		115	145	156	0	0	416
	Beluga	1	1		100.0%		0	0	32	0	0	32
	Chugiak	1	0		0.0%		0	0	0	0	0	0
	Eagle River	2	2		100.0%		8	0	0	0	0	8
Total, 1997		17	9	9	52.9%	52.9%	123	145	188	0	0	456
1998	Anchorage	8	5		62.5%		112	190	66	2	2	371
	Beluga	1	0		0.0%		0	0	0	0	0	0
	Chugiak	1	0		0.0%		0	0	0	0	0	0
	Eagle River	4	2		50.0%		30	2	0	0	0	32
	Palmer	2	1		50.0%		4	0	0	0	0	4
	Sterling	1	0		0.0%		0	0	0	0	0	0
	Willow	1	0		0.0%		0	0	0	0	0	0
Total, 1998		18	8	7	44.4%	38.9%	146	192	66	2	2	407
1999	Anchorage	17	7		41.2%		221	153	61	15	53	503
	Beluga	2	1		50.0%		10	0	82	0	0	92
	Chugiak	2	1		50.0%		6	0	0	0	0	6
	Eagle River	4	2		50.0%		24	2	0	0	0	26
	Wasilla	1	1		100.0%		0	24	9	2	0	35
Total, 1999		26	12	12	46.2%	46.2%	261	179	152	17	53	662
2000	Anchorage	8	7		87.5%		79	24	71	0	0	174
	Beluga	2	2		100.0%		13	0	0	0	0	13
	Big Lake	1	0		0.0%		0	0	0	0	0	0
	Chugiak	1	0		0.0%		0	0	0	0	0	0
	Eagle River	2	2		100.0%		16	0	0	0	0	16
Total, 2000		14	11	11	78.6%	78.6%	108	24	71	0	0	203

-continued-

Appendix Table Page 2 of 4.

Year	Community	Permits			Percentage of returned permits	Percentage of fished permits	Estimated salmon harvest					Total
		Issued	Returned	Fished			Chinook	Sockeye	Coho	Chum	Pink	
2001	Anchorage	19	11		57.9%	219	69	7	0	0	295	
	Beluga	4	3		75.0%	8	27	13	1	3	52	
	Eagle River	5	5		100.0%	19	2	0	0	0	21	
	Palmer	1	1		100.0%	0	0	0	0	0	0	
	Sterling	1	1		100.0%	18	12	0	0	0	30	
	Wasilla	4	3		75.0%	0	0	0	0	0	0	
Total, 2001		34	24	13	70.6%	38.2%	264	110	20	1	3	398
2002	Alexander Creek	2	2		100.0%	0	0	0	0	0	0	
	Anchorage	9	9		100.0%	80	17	3	0	0	100	
	Beluga	2	2		100.0%	2	0	27	0	0	29	
	Eagle River	3	3		100.0%	0	0	0	0	0	0	
	Sterling	1	1		100.0%	50	3	0	0	0	53	
	Unknown	1	0		0.0%	0	0	0	0	0	0	
	Wasilla	2	2		100.0%	0	0	0	0	0	0	
Total, 2002		20	19	10	95.0%	50.0%	132	20	30	0	0	182
2003	Alexander Creek	1	1		100.0%	0	0	0	0	0	0	
	Anchorage	10	10		100.0%	12	0	0	0	0	12	
	Eagle River	1	1		100.0%	9	0	0	0	0	9	
	Kenai	1	1		100.0%	30	2	0	0	0	32	
	Ninilchik	1	1		100.0%	2	0	0	0	0	2	
	Soldotna	1	1		100.0%	4	0	0	0	0	4	
	Unknown	1	0		0.0%	0	0	0	0	0	0	
	Wasilla	5	3		60.0%	0	20	8	0	2	30	
Total, 2003		21	18	6	85.7%	28.6%	57	22	8	0	2	89
2004	Alexander Creek	1	1		100.0%	0	0	0	0	0	0	
	Anchorage	14	10		71.4%	146	15	0	0	0	161	
	Big Lake	1	1		100.0%	0	0	0	0	0	0	
	Eagle River	1	1		100.0%	8	0	0	0	0	8	
	Kenai	1	1		100.0%	61	2	0	0	0	63	
	Palmer	3	3		100.0%	18	0	0	0	0	18	
	Wasilla	1	1		100.0%	0	5	10	0	0	15	
Total, 2004		22	18	14	81.8%	63.6%	233	22	10	0	0	265
2005	Anchorage	10	10		100.0%	36	41	15	0	0	92	
	Eagle River	2	2		100.0%	9	0	0	0	0	9	
	Kenai	1	1		100.0%	35	4	0	0	0	39	
	Palmer	2	2		100.0%	0	0	24	2	0	26	
	Unknown	2	1		50.0%	42	2	0	0	0	44	
	Wasilla	2	2		100.0%	0	0	0	0	0	0	
Total, 2005		19	18	8	94.7%	42.1%	122	47	39	2	0	210
2006	Anchorage	12	7		58.3%	137	12	17	0	0	166	
	Beluga	1	1		100.0%	18	1	0	0	0	19	
	Eagle	1	1		100.0%	10	0	0	0	0	10	
	Kenai	2	1		50.0%	66	8	2	0	0	76	
	Nondalton	1	0		0.0%	0	0	0	0	0	0	
	Unknown	1	0		0.0%	0	0	0	0	0	0	
	Wasilla	1	1		100.0%	32	0	0	1	0	33	
Total, 2006		19	11	7	57.9%	36.8%	263	21	19	1	0	304
2007	Anchorage	20	14		70.0%	267	97	114	3	4	486	
	Big Lake	1	1		100.0%	14	0	0	0	0	14	
	Eagle River	2	1		50.0%	22	0	0	0	0	22	
	Kenai	1	1		100.0%	50	0	0	0	0	50	
	Palmer	2	2		100.0%	6	0	0	0	0	6	
	Soldotna	1	0		0.0%	0	0	0	0	0	0	
	Unknown	2	0		0.0%	0	0	0	0	0	0	

-continued-

Appendix Table Page 3 of 4.

Year	Community	Permits			Percentage of returned permits	Percentage of fished permits	Estimated salmon harvest					Total
		Issued	Returned	Fished			Chinook	Sockeye	Coho	Chum	Pink	
2007	Wasilla	2	2		100.0%		0	0	0	0	0	0
Total, 2007		31	21	15	67.7%	48.4%	359	97	114	3	4	578
2008	Anchorage	18	18		100.0%		132	40	83	2	3	260
	Beluga	2	2		100.0%		2	0	10	0	0	12
	Big Lake	1	1		100.0%		2	1	0	0	0	3
	Chalkyitsik	2	2		100.0%		0	0	0	0	0	0
	Eagle River	4	4		100.0%		20	4	0	0	0	24
	Kenai	1	1		100.0%		58	0	0	0	0	58
	Unknown	3	1		33.3%		0	0	0	0	0	0
	Wasilla	2	2		100.0%		0	0	0	0	0	0
Total, 2008		33	31	20	93.9%	60.6%	214	45	93	2	3	357
2009	Anchorage	19	13		68.4%		151	9	0	0	1	161
	Big Lake	2	1		50.0%		6	0	0	0	0	6
	Eagle River	2	2		100.0%		4	0	0	0	0	4
	Elim	1	1		100.0%		0	0	0	0	0	0
	Kenai	1	1		100.0%		24	0	0	0	0	24
	Palmer	2	1		50.0%		26	0	0	0	0	26
Total, 2009		27	19	13	70.4%	48.1%	211	9	0	0	1	221
2010	Anchorage	27	17		63.0%		111	29	25	0	0	165
	Beluga	2	2		100.0%		3	0	0	0	0	3
	Big Lake	1	1		100.0%		7	4	0	0	0	11
	Chugiak	2	1		50.0%		10	0	0	0	0	10
	Eagle River	4	4		100.0%		9	1	0	0	0	10
	Kenai	1	1		100.0%		24	4	3	0	0	31
	Wasilla	1	0		0.0%		0	0	0	0	0	0
Total, 2010		38	26	15	68.4%	39.5%	164	38	28	0	0	230
2011	Alexander Creek	1	1		100.0%		0	0	0	0	0	0
	Anchorage	11	11		100.0%		61	45	7	0	0	113
	Big Lake	1	1		100.0%		0	8	2	0	1	11
	Eagle River	1	1		100.0%		6	2	0	0	0	8
	Kenai	3	2		66.7%		42	3	0	0	0	45
	Palmer	2	2		100.0%		5	0	0	0	0	5
	Unknown	28	0		0.0%		0	0	0	0	0	0
Total, 2011		47	18	12	38.3%	25.5%	114	58	9	0	1	182
2012	Anchorage	19	15		78.9%		57	68	47	3	5	180
	Eagle River	2	2		100.0%		11	1	0	0	0	12
	Kenai	1	1		100.0%		18	0	0	0	0	18
	Palmer	2	2		100.0%		10	0	0	0	0	10
	Talkeetna	1	1		100.0%		25	26	0	0	0	51
	Wasilla	2	2		100.0%		11	0	25	0	0	36
Total, 2012		27	23	15	85.2%	55.6%	132	95	72	3	5	307
2013	Alexander Creek	1	1		100.0%		0	0	0	0	0	0
	Anchorage	14	8		57.1%		166	121	102	0	7	396
	Beluga	1	0		0.0%		0	0	0	0	0	0
	Big Lake	1	1		100.0%		0	4	1	0	0	5
	Chugiak	1	0		0.0%		0	0	0	0	0	0
	Eagle River	2	2		100.0%		21	0	0	0	0	21
	Glennallen	1	0		0.0%		0	0	0	0	0	0
	Kenai	1	1		100.0%		57	10	0	0	0	67
	Palmer	1	1		100.0%		4	15	4	0	1	24
Total, 2013		23	14	12	60.9%	52.2%	248	150	107	0	8	513
2014	Anchorage	24	18		75.0%		96	125	137	1	0	360
	Big Lake	2	2		100.0%		0	9	29	0	0	38
	Eagle River	1	1		100.0%		5	1	0	0	0	6

-continued-

Appendix Table Page 4 of 4.

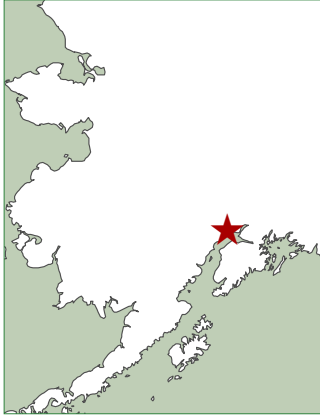
Year	Community	Permits			Percentage of returned permits	Percentage of fished permits	Estimated salmon harvest					
		Issued	Returned	Fished			Chinook	Sockeye	Coho	Chum	Pink	Total
2014	Palmer	1	1		100.0%		3	0	4	0	0	7
	Seward	1	1		100.0%		16	0	0	0	0	16
	Unknown	2	2		100.0%		33	19	12	2	0	66
Total, 2014		31	25	23	80.6%	74.2%	153	154	182	3	0	493
2015	Anchorage	14	12		85.7%		147	60	34	0	0	240
	Big Lake	3	0		0.0%		0	0	0	0	0	0
	Eagle River	2	2		100.0%		0	0	0	0	0	0
	Kenai	1	1		100.0%		33	12	12	2	0	59
	Nikiski	1	1		100.0%		6	34	0	0	0	40
	Palmer	1	1		100.0%		6	5	7	0	0	18
	Soldotna	1	1		100.0%		0	0	0	0	0	0
Total, 2015		23	18	9	78.3%	39.1%	192	111	53	2	0	357
2016	Anchorage	10	7		70.0%		147	6	21	0	0	174
	Big Lake	1	1		100.0%		0	0	0	0	0	0
	Kenai	2	1		50.0%		52	14	0	0	0	66
	Nikiski	1	1		100.0%		4	24	0	0	0	28
	Palmer	1	1		100.0%		2	0	0	0	0	2
	Soldotna	2	0		0.0%		0	0	0	0	0	0
Total, 2016		17	11	9	64.7%	52.9%	205	44	21	0	0	270

Source ADF&G Division of Subsistence, ASFDB 2017 (ADF&G 2018).

Note ND = no data.

a. Permit return data are not available for 1985. Harvest data are available; however, it is unknown which harvests were from Tyonek residents and which harvests were from non-local residents.

APPENDIX D–PROJECT SUMMARY



Tyonek

Subsistence Salmon Harvests/Uses, 2015 and 2016

This project assessed participation in the Tyonek Subdistrict subsistence salmon permit system by evaluating Tyonek households' reported salmon harvests through subsistence permits and household surveys.

Project

The following is a brief overview of research conducted by the Alaska Department of Fish and Game (ADF&G) to provide updated subsistence salmon harvest and use data in Tyonek, Alaska. The study period covers March 2015 through December 2017. Funding for this project was provided by Alaska Sustainable Salmon Fund (AKSSF). The 4 project objectives were:

1. Obtain updated harvest information through household harvest surveys for comparison to reported harvests in the Tyonek Subdistrict subsistence fishery.
2. Observe and document harvest recording at subsistence fishing locations to understand how residents record their Chinook salmon subsistence harvests.
3. Compile and update existing harvest data to expand reported harvests from 1980–2016.
4. Make recommendations for a revised harvest monitoring program based on project findings.

Methods

The primary data gathering method was a systematic household survey. The surveys were conducted face-to-face and mostly in residents' homes and at the Native Village of Tyonek tribal hall. The goal was to survey all Tyonek households. The Division of Subsistence established an estimate of 62 eligible households to be surveyed in 2015 and 60 in 2016. Of the 62 qualifying households found in 2015, 50 were successfully surveyed and of the 60 qualifying households found in 2016, 49 were successfully surveyed. Harvest mapping was also conducted for each household to document harvest locations of salmon, including harvest amount, month of harvest, and how harvesters accessed the resource. Additionally, to understand long-term trends in the area and local knowledge of resources, key respondent interviews with knowledgeable Tyonek residents were conducted and participant observation trips occurred during the fishing season for both study years. The data analysis methods for expanding the harvest data to produce more accurate harvest estimates are described in detail in the technical paper.



Photograph by Bronwyn Jones, ADF&G Division of Subsistence

Subsistence-caught Chinook salmon, Tyonek.

Harvest Findings

This study found an estimated population for Tyonek in 2015 of 136 individuals, represented by 62 households, and in 2016 the population was estimated to be 153 individuals, represented by 60 households. In both study years, almost all households (96% in 2015 and 94% in 2016) used salmon coinciding with a high level of household participation in fishing efforts (80% participation in 2015, and 78% in 2016). In addition to harvesting, a high percentage of households shared salmon with others (76% of households in 2015 and 80% in 2016). For both study years, Tyonek residents harvested most of their salmon by subsistence gillnets (91% of salmon harvest weight); the other 2 methods used to harvest salmon were removals from commercial catches and rod and reel.

2015

In 2015, Tyonek residents harvested an estimated total of 16,304 lb, or 120 lb per capita, of salmon. Figure 1 shows the composition of harvest by salmon species in pounds usable weight for Tyonek in 2015. The majority of the harvest was Chinook salmon (64% of the total salmon harvest), followed by coho salmon (26%), sockeye salmon (10%), chum salmon (<1%), and pink salmon (<1%).

2016

In 2016, Tyonek residents harvested an estimated total of 15,629 lb, or 102 lb per capita, of salmon. Figure 2 shows the composition of harvest by salmon species in pounds usable weight for Tyonek in 2016. The majority of the harvest was Chinook salmon (77% of the total salmon harvest), followed by coho salmon (14%), sockeye salmon (7%), pink salmon (<1%), and chum salmon (<1%).

Permit Participation

In 2015, 83 permits were issued for the entire Tyonek Subdistrict subsistence salmon fishery, including 60 permits issued to Tyonek residents (72%) and 23 permits issued to other Alaska residents. During the Tyonek survey, 26 permits were collected by ADF&G staff or Local Research Assistants (LRAs), lending to the high (90%) return rate by permit

holders residing in Tyonek for the 2015 subsistence fishing season. Overall, for the entire Tyonek Subdistrict, of the 83 permits issued to both Tyonek residents and non-Tyonek residents, 72 were returned (87% return rate). Though residents from other communities obtained subsistence permits and fished the permits, the majority (84%) of the total estimated subsistence salmon harvest was caught by Tyonek residents (Table 1). The Tyonek households that obtained a subsistence fishing permit but did not return it prior to the survey were asked the reason why they had not already turned in the permit. Of the respondents who had not returned subsistence permits, 6 stated that they forgot, 5 lost the permit, 1 did not know the reason why the permit was not returned, 2 left the permit at fish camp, and 12 did not provide a response.

In 2016, 74 permits were issued for the entire Tyonek Subdistrict subsistence salmon fishery, including 57 permits issued to Tyonek residents (77%) and 17 permits issued to other Alaska residents. During the Tyonek survey, 20 permits were collected by ADF&G staff or LRAs, resulting in a 93% return rate by permit holders residing in Tyonek for the 2016 subsistence fishing season. For the entire Tyonek Subdistrict, of the 74 permits issued to both Tyonek residents and non-Tyonek residents, 64 were returned (87% return rate). Similarly to 2016, the majority (82%) of the total salmon harvest was caught by Tyonek residents (Table 2). The Tyonek residents who obtained a subsistence fishing permit but did not return it prior to the survey were asked the reason why they had not already turned in their permit. Of the respondents who had not returned subsistence permits, 4 stated that they forgot, 3 lost the permit, 1 did not know the reason, 1 had not filled out the permit, 1 stated that they had already returned the permit, 1 respondent did not fish, and 9 did not provide a response.

Permit Data Expansion

An objective of this project was to compile and update existing harvest data to expand reported harvests from 1980–2016. Expanding the reported permit amounts has provided more accurate and representative harvest data for the Tyonek Subdistrict subsistence salmon fishery. As Figure 3 demonstrates, expanded harvest estimates take

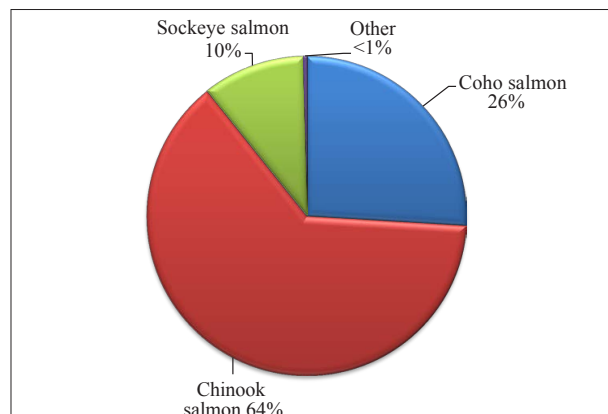


Figure 1.—Composition of salmon harvest, 2015.

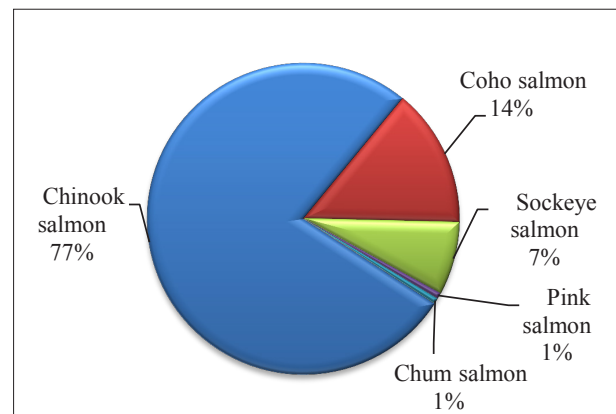


Figure 2.—Composition of salmon harvest, 2016.

Table 1.—Total Tyonek Subdistrict estimated subsistence salmon harvests by community, Tyonek and non-Tyonek residents, 2015.

Community	Permits		Percentage of returned permits	Estimated salmon harvests					Total
	Issued	Returned		Chinook	Sockeye	Coho	Chum	Pink	
Anchorage	14	12	85.7%	147	60	34	0	0	240
Big Lake	3	0	0.0%	0	0	0	0	0	0
Eagle River	2	2	100.0%	0	0	0	0	0	0
Kenai	1	1	100.0%	33	12	12	2	0	59
Nikiski	1	1	100.0%	6	34	0	0	0	40
Palmer	1	1	100.0%	6	5	7	0	0	18
Soldotna	1	1	100.0%	0	0	0	0	0	0
Tyonek	60	54	90.0%	878	394	516	14	6	1,808
Total	83	72	86.7%	1,070	505	568	16	6	2,165

Source ADF&G Division of Subsistence, ASFDB 2016 (ADF&G 2017).

Table 2.—Total Tyonek Subdistrict estimated subsistence salmon harvests by community, Tyonek and non-Tyonek residents, 2016.

Community	Permits		Percentage of returned permits	Estimated salmon harvests					Total
	Issued	Returned		Chinook	Sockeye	Coho	Chum	Pink	
Anchorage	10	7	70.0%	147	6	21	0	0	174
Big Lake	1	1	100.0%	0	0	0	0	0	0
Kenai	2	1	50.0%	52	14	0	0	0	66
Nikiski	1	1	100.0%	4	24	0	0	0	28
Palmer	1	1	100.0%	2	0	0	0	0	2
Soldotna	2	0	0.0%	0	0	0	0	0	0
Tyonek	57	53	93.0%	825	144	203	8	12	1,192
Total	74	64	86.5%	1,030	188	225	8	12	1,462

Source ADF&G Division of Subsistence, ASFDB 2017 (ADF&G 2018).

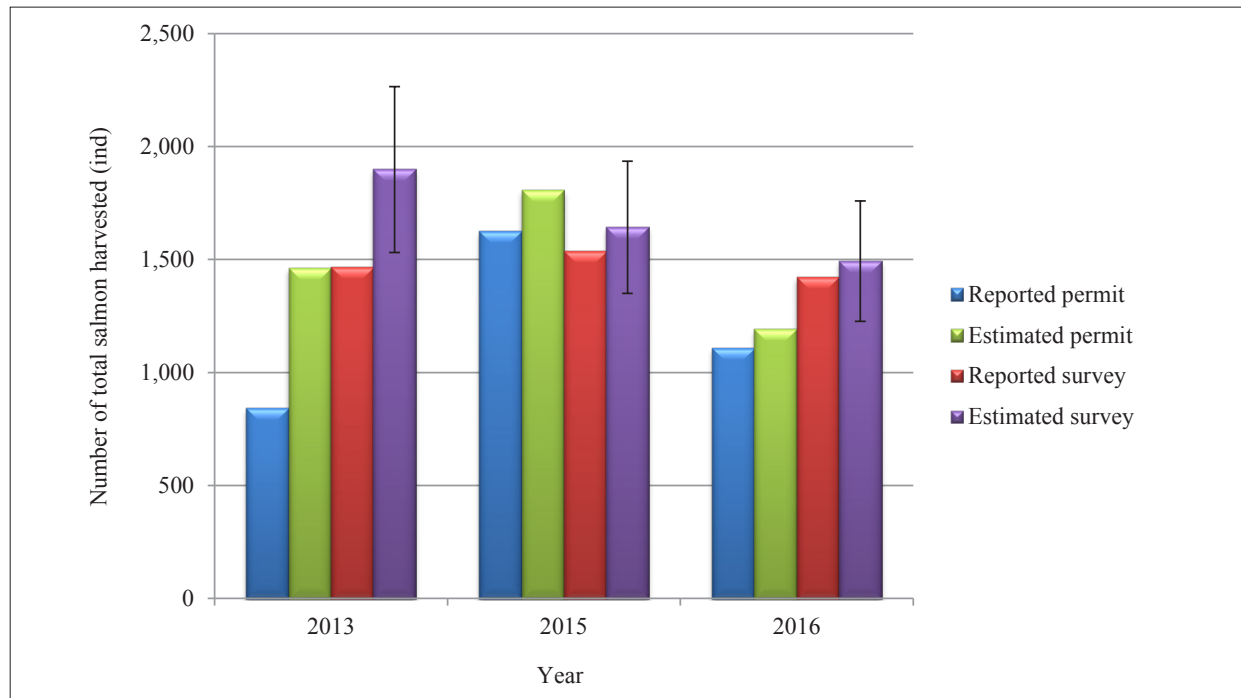


Figure 3.—Comparison of subsistence salmon harvests, reported and estimated permit results, Tyonek residents, 2013, 2015–2016, and reported and estimated survey results, Tyonek households, 2013, 2015–2016.



Photograph by Bronwyn Jones, ADF&G Division of Subsistence

Tyonek smoke house filled with salmon.

into account unreported harvest amounts (unreturned in permits) and more closely resemble the actual harvest amounts, rather than relying solely on reported harvests. As a result of this expansion, estimated harvest data will now replace the reported harvest data in the Division of Subsistence annual subsistence salmon and personal use harvest reports beginning with the 2015 report.

Trends and Conclusions

According to the survey results and the permit system, there has been a decrease in pounds per capita of Chinook salmon harvested over the past 35 years. In 2015 and 2016, when asked if a household got enough salmon, 60% indicated that they did not and more than one-half of these households reported the impact to their household as major. Echoing this sentiment, at the end of each survey and during the community review meeting, many participants expressed concern about the overall health and abundance of salmon stocks in Cook Inlet. Tyonek residents stated that securing enough salmon each season was important for food security and for continuing cultural connections. According to survey and interview respondents, the exchange of salmon is of

critical importance for this community since many families and individuals are reliant upon salmon shared by other, high-harvesting households, and detailed networks of exchange assisted in increasing the diversity and amounts of salmon used by most families.

This survey was conducted by the Division of Subsistence of the Alaska Department of Fish and Game, in cooperation with the Native Village of Tyonek. Local researchers included Gwen Chickalusion and Leonard Allowan.

Source for this information

Jones, B. E. and D. Koster. 2018. Subsistence Harvests and Uses of Salmon in Tyonek, 2015 and 2016. Alaska Department of Fish and Game Division of Subsistence, Technical Paper No. 439, Anchorage.

Electronic copy of this report

<http://www.subsistence.adfg.state.ak.us/TechPap/TP439.pdf>

Community Subsistence Information System (CSIS)

<http://www.subsistence.adfg.state.ak.us/CSIS>



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