Fishery Management Report No. 22-21

Fishery Management Report for Sport Fisheries in the Yukon Management Area, 2021

by

Lisa Stuby

October 2022

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Mathematics, statistics

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

FISHERY MANAGEMENT REPORT NO. 22-21

FISHERY MANAGEMENT REPORT FOR SPORT FISHERIES IN THE YUKON MANAGEMENT AREA, 2021

by
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The Fishery Management Reports series was established in 1989 by the Division of Sport Fish for the publication of an overview of management activities and goals in a specific geographic area, and became a joint divisional series in 2004 with the Division of Commercial Fisheries. Fishery Management Reports are intended for fishery and other technical professionals, as well as lay persons. Fishery Management Reports are available through the Alaska State Library and on the Internet: http://www.adfg.alaska.gov/sf/publications/. This publication has undergone regional peer review.

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ABSTRACT

Information specific to sport fisheries in the Yukon Management Area in 2021 and preliminary information for 2022 is presented. Estimates of fishing effort and total harvest and catch are summarized through the 2021 season. This information is provided to the Alaska Board of Fisheries (BOF), as well as to the general public and other interested parties. Major fisheries within the area are detailed, including descriptions of the performance of these fisheries, regulatory actions by the BOF, social and biological issues, and descriptions of ongoing research and management activities. During the Arctic-Yukon-Kuskokwim BOF cycle, details of major fisheries in this report are limited to those species that are being addressed in the regulatory proposal(s).

Keywords: Yukon River, Anvik River, Andreafsky River, Chinook salmon, chum salmon, coho salmon, sport fisheries, sport fishery management, fisheries management plans

EXECUTIVE SUMMARY

This document provides a wide array of information specific to sport fishing opportunities within the Yukon Management Area (YMA). The YMA encompasses the entire Yukon River drainage, excluding the Tanana River, which makes up a separate management area. Information specific to the proposals that the Alaska Board of Fisheries (BOF) will address at its 14–18 January 2023 meeting are contained within this report. To assist BOF members in acquiring information in a timely manner, Appendix A has been constructed. This appendix table guides the reader to specific information contained within the text, tables, and figures that will be useful in evaluating regulatory proposals.

INTRODUCTION

This report provides information for the YMA and is one in a series of reports annually updating fisheries management information within Region III. The report is provided for the BOF, Fish and Game Advisory Committees (ACs), the general public, and other interested parties. It presents a description of area fisheries, summary of the fisheries effort, harvest and catch, fisheries assessment information, and the management strategies that are developed from that information.

The mission of the Division of Sport Fish (DSF) of the Alaska Department of Fish and Game (ADF&G) is to protect and improve the State of Alaska fishery resources. This is achieved by managing for sustainable yield of wild stocks of sport fish, providing diverse sport fishing opportunities, and providing information to assist the BOF in optimizing social and economic benefits from sport fisheries. In order to implement these goals, the DSF has a fisheries management process in place.

A regional review is conducted annually, during which the status of important area fisheries is considered and research needs are identified. Fisheries stock assessment and research projects are developed, scheduled, and implemented to meet information needs identified by fisheries managers. Projects are planned within a formal operational planning process. Biological information gathered from these research projects is combined with effort information and input from user groups to assess the need for and development of fisheries management plans, and to propose regulatory strategies.

Many of the DSF management and research activities are funded by Fish and Game and Federal Aid in Fisheries Restoration funds. Fish and Game funds are derived from the sale of state sport fishing licenses. Federal Aid funds are derived from federal taxes on fishing tackle and equipment established by the Federal Aid in Sport Fish Restoration Act (also referred to as the Dingell-Johnson Act or D-J Act). The D-J funds are provided to the states at a match of up to 3-to-1 with

the Fish and Game funds. Additional funding specified for providing, protecting, and managing access to fish and game is provided through a tax on boat gas and equipment established by the Wallop-Breaux Act. Other peripheral funding sources may include contracts with various government agencies and the private sector or, in a few cases, State of Alaska general funds.

This area management report provides information regarding the YMA and its fisheries for 2021, with preliminary information from the 2022 season. This report is organized into 2 primary sections: a management area overview, including a description of the management area and a summary of effort, harvest, and catch for the area; and a section on significant area fisheries, including specific harvest and catch by species and geographical region or drainage.

Sport fishing effort and harvest of sport fish species in Alaska have been estimated and reported annually since 1977 using a mail survey. The Alaska Sport Fishing Survey (commonly referred to as the Statewide Harvest Survey [SWHS]) is designed to provide estimates of effort, harvest, and catch on a site-by-site basis. It is not designed to provide estimates of effort directed toward a single species. Species-specific catch-per-unit-effort (CPUE) information can seldom be derived from the survey data. A questionnaire is mailed to a stratified random sample of households containing at least one individual with a valid fishing license (resident or nonresident). Currently, information gathered from the survey includes participation (number of anglers and days fished), number of fish caught, and number harvested by species and site for guided and unguided fishing. These surveys estimate the number of angler-days of fishing effort expended by sport anglers fishing Alaskan waters as well as the sport harvest. Survey results for each year are not available until the following year; hence, the results for 2021 were not available until fall 2022. Additionally, for some management areas, creel surveys have been selectively used to verify the mail survey for fisheries of interest or for fisheries that require more detailed information or inseason management.

The utility of SWHS estimates depends on the number of responses received for a given site (Mills and Howe 1992). In general, estimates from smaller fisheries with low participation are less precise than those of larger fisheries with high participation. Therefore, the following guidelines were implemented for evaluating survey data:

1. Estimates based on fewer than 12 responses should not be used other than to document that sport fishing occurred;
2. Estimates based on 12 to 29 responses can be useful in indicating relative orders of magnitude and for assessing long-term trends; and
3. Estimates based on 30 or more responses are generally representative of levels of fishing effort, catch, and harvest.

More recently, SWHS estimates were compared to onsite creel surveys for estimates from 1996 to 2006, and using coefficient of variation (CV) of harvest estimates was recommended to determine precision of estimates (Clark 2009). CVs of harvest estimates from the SWHS should be 0.30 or less before using the estimates for evaluating long-term trends, and CVs should be 0.20 or less before use in stock assessments.

SECTION I: YUKON MANAGEMENT AREA OVERVIEW

YUKON MANAGEMENT AREA DESCRIPTION

The YMA is part of DSF Region III, which encompasses approximately 80% of the landmass of the State of Alaska (Figure 1). The region contains over 442,500 mi^2 (1,146,000 km^2) of land,

some of the state's largest river systems (Yukon, Kuskokwim, Colville, Noatak, and the Upper Copper and Upper Susitna River drainages), thousands of lakes and streams, and thousands of miles of coastline. Regional coastline boundaries extend from Cape Newenham in the southwest, around all of western, northwestern, and northern Alaska to the Canadian border on the Arctic Ocean. Demographically, Region III is sparsely populated, with the most densely populated center located in the Tanana River Valley with Fairbanks as the largest community.

Region III DSF is divided into 5 fisheries management areas (Figure 1):

- Northwestern/North Slope Management Area (Norton Sound, Seward Peninsula, Kotzebue Sound, and North Slope drainages)
- Yukon Management Area (the Yukon River drainage excluding the Tanana River drainage; Figure 2)
- Upper Copper/Upper Susitna Management Area (the Copper River drainage upstream of Canyon Creek and Haley Creek, and the Susitna River drainage above the Oshetna River)
- Tanana River Management Area (the Tanana River drainage)
- Kuskokwim–Goodnews Management Area (the entire Kuskokwim River drainage and Kuskokwim Bay drainages).

The YMA includes all of the Yukon River drainage in the United States (Figure 2) except for the Tanana River drainage, which is managed separately in the Tanana River Management Area (TRMA). The YMA consists of approximately 157,475 square miles (407,858 km^2) of extremely varied topography, climate, and zoogeography. The Yukon River is the largest river in Alaska, and its drainage is the 5th largest in North America. The YMA is sparsely populated, and communities are invariably located near water because of the importance of fish and/or marine mammals as a food source.

Access to most of the area is limited to water or air travel. Sport fisheries occur throughout the YMA but are especially concentrated in accessible streams off of 3 major road systems. Road access to the Yukon River is provided by the Dalton Highway, which ends at Prudhoe Bay; Steese Highway, which ends at Circle; and Taylor Highway (no winter maintenance), which ends at Eagle. The Elliott Highway is not within the YMA but connects Fairbanks to the Dalton Highway, and similarly the Alaska Highway connects Fairbanks to the Taylor Highway.

Land ownership and jurisdictions fragment the YMA into a complex mosaic. The federal government is the major land manager through its jurisdiction over lands in 3 National Parks and Preserves (Yukon-Charley, Gates of the Arctic, and Wrangell-St. Elias), 5 National Wildlife Refuges (Yukon Flats, Kanuti, Koyukuk, Nowitna, and Innoko), the White Mountains National Recreation Area, the Steese National Conservation Area, and 8 Wild and Scenic Rivers (Alatna, Andreafsky, Charley, Fortymile, John, and Koyukuk Rivers, and Beaver and Birch Creeks), as well as lands managed by the federal Bureau of Land Management (BLM). Lands held by the State of Alaska, Native corporations, and other private landowners make up the remaining landmass.

FISHERY RESOURCES

Virtually all freshwater and migratory fish species sought by anglers in Alaska are available in the YMA. All populations are wild because there is presently no enhancement of fish populations in the YMA. Five species of Pacific salmon are available in tributaries of the Yukon River: Chinook

(king) *Oncorhynchus tshawytscha*, coho *O. kisutch*, chum *O. keta*, sockeye *O. nerka*, and pink salmon *O. gorbuscha*.

Unique opportunities to fish for freshwater resident species in remote wilderness settings exist throughout the YMA. Exceptionally large northern pike *Esox lucius* and sheefish (inconnu) *Stenodus leucichthys* are available throughout the drainage but more specifically targeted in the Innoko, Dall, and Nowitna River drainages and at the mouths of major tributaries that drain into the Yukon River. The most popular fisheries in the YMA target Arctic grayling *Thymallus arcticus* and northern pike. Smaller fisheries target Dolly Varden *Salvelinus malma*, burbot *Lota lota*, lake trout *Salvelinus namaycush*, and whitefish *Coregonus* spp.

Residents of rural communities harvest a substantial number of fish and game resources for subsistence use, and fishing is usually conducted with more efficient gear types such as fish wheels and gillnets. Sport fishing with hook and line is practiced to some extent by rural residents, especially where it is legal subsistence gear, but it is often done as an extension of subsistence activities and less for recreational purposes. Consequently, harvest estimates of sport-caught fish from rural Alaska are generally low because local residents usually fish under subsistence regulations. Subsistence fishers target all of the resident and salmon species targeted by sport fishers.

Other User Groups–Subsistence and Commercial Fisheries

The BOF identifies fish stocks or portions of stocks or populations that are customarily and traditionally taken or used for subsistence. Under Alaska's subsistence statute, the BOF identifies fish stocks that support subsistence fisheries and, if there is a harvestable surplus of these stocks, adopts regulations that provide reasonable opportunities for these subsistence uses to take place. Whenever it is necessary to restrict harvests, subsistence fisheries have a preference over other uses of the stock(s) (AS 16.05.258).

Commercial fisheries have provided an economic base for income and employment in many local communities, particularly those in the Lower Yukon River. Prior to 2021, most of these fisheries focused on summer and fall chum and coho salmon (Estensen et al. 2021). Commercial harvests in the Alaska portion of the Yukon River for summer and fall chum and coho salmon exceeded 1 million fish during 2014–2018 (JTC 2021). However, with the low runs of summer and fall chum and coho salmon during 2021 and 2022, the commercial fisheries have been closed. Currently, there are small commercial fisheries for whitefish and lamprey *Lampetra camtschatica* in the Lower Yukon River. The only personal use (nonsubsistence) fishery in the Yukon River drainage is located near Fairbanks on the Tanana River (JTC 2021). There has not been a directed commercial fishery on Chinook salmon since 2007 and any harvest has been incidental (Estensen et al. 2021).

Salmon, especially Chinook salmon, are an important subsistence resource throughout the Yukon River drainage. The current amounts necessary for subsistence (ANS) of Chinook salmon in the Alaska portion of the Yukon River drainage was designated by the BOF in January 2013 to be 45,500–66,704 Chinook salmon (5 AAC 01.236). During 2011–2020, Chinook salmon harvests have been consistently below the ANS because of poor run sizes and subsequent restrictions to fishing opportunities in order to meet drainagewide escapement goals (Appendices C1–C3). Since 2003, ANS was met during 2003–2008 and 2019 (Appendix C2). Due to fishing restrictions and/or closures on Chinook salmon during years of poor runs, summer and fall chum and coho salmon have provided the largest subsistence harvest of salmon. However, during 2021 and 2022,

subsistence harvest on these species was restricted and/or closed due to historic run returns (Appendix C1). Although present in the lower part of the drainage, pink and sockeye salmon are normally not targeted to a great extent in subsistence fisheries; however, with the recent chum and coho closure, they have taken on more importance in achieving ANS. Resident species are also targeted throughout the Yukon River by subsistence fishers at much smaller amounts compared to salmon.

ESTABLISHED MANAGEMENT PLANS AND POLICIES

Regulations governing fisheries in the YMA are found in 5 AAC 73.005 through 5 AAC 73.065 (sport fishing), in 5 AAC 01.200 through 5 AAC 01.249 (subsistence fishing), and in 5 AAC 05.001 through 5 AAC 05.380 (commercial fishing).

Statewide salmon proposals that were adopted by the BOF also pertain to the YMA such as the *Policy for the management of sustainable salmon fisheries* (5 AAC 39.222), the *Policy for statewide salmon escapement goals* (5 AAC 39.223), and the *ADF&G Genetic Policy (06/11/1985).*

Two management plans for resident fishes apply to the entire YMA. These are the *Yukon River Area Wild Lake Trout Management Plan* (5 AAC 70.040, 2007) that was adopted for the remainder of the AYK region by the BOF in February 2007 (Burr 2006), and the *Yukon River Area Wild Arctic Grayling Management Plan* (5 AAC 73.055, Burr 2006). Revision of existing plans, as well as development of additional fisheries management plans, will occur as needed in response to changes in use patterns as new quantitative information becomes available.

MAJOR ISSUES

1. Ambler Road corridor: This proposed road corridor would connect the Dalton Highway to the Ambler Mining District located in the drainages of the Koyukuk and Kobuk Rivers. Water bodies affected within the YMA would include the Koyukuk, John, and Alatna Rivers, and numerous smaller streams and lakes. Some baseline fisheries assessment has been conducted on these water bodies from ADF&G Division of Sport Fish and Division of Habitat personnel (Scannell 2015, Wuttig et al. 2015, and Giefer and Johnson 2018). The area that the road would encompass is vast and the potential for fish habitat degradation due to road construction and mine traffic is not well understood. Concerns have been expressed from ACs and Federal Regional Advisory Councils (RACs) regarding increased fishing pressure due to easier access to remote locations as a result of the new road. Currently, the proposed Ambler Road would be for industrial use only, but concerns have been expressed that these restrictions will be eased over time similar to what happened for the Dalton Highway in 1994;
2. Hook and line subsistence: In 2000 and 2019, hook and line fishing gear was added to the types of legal subsistence fishing gear in the lower portion of the Yukon River drainage up to and including the Nulato River. Because all Alaskans qualify for subsistence, resident anglers could choose to fish with hook and line in these areas under subsistence regulations instead of sport fish regulations. This is of particular concern to sport fish managers because subsistence fishing does not require a sport fish license and therefore subsistence-caught fish are excluded from the SWHS. Also, subsistence fishers using hook and line are not subject to the bag and possession limits that sport fishers are obligated to obey. Fewer fishing licenses issued in this area of the Yukon River has resulted in fewer than 12 responses during

some years as well as for individual streams. For the January 2023 BOF meeting, Proposal 83 (HQ-F21-001) will extend this reach to include the Koyukuk River if adopted by the BOF;

3. Rural resentment of sport fishing: At public meetings pertaining to the YMA, local residents sometimes express resentment toward sport fishers who come into remote areas traditionally used by local people for subsistence hunting or fishing. There is a particular dislike of catch-and-release fishing and culturally it has been viewed as "playing" with food resources. Also, YMA residents view catch-and-release fishing as potentially hurting or killing the fish and leading to unnecessary waste. As a reflection of this resentment, proposals to the BOF have looked to restrict or eliminate catch-and-release in some fisheries;

4. Federal fishery management for subsistence in Alaska's navigable waters: In October 1999, federal fishery managers assumed responsibility for ensuring a rural subsistence priority on navigable waters adjacent to, or within, the boundaries of federal conservation units. There is continued concern that a result of this action will be reduced opportunity for sport fishing throughout the state. Because of the large amount of federal public land within the YMA and because of the high proportion of subsistence users, this potential loss of opportunity remains a continual concern for sport fishers in the area. With the inception of Federal subsistence management in 1999, many federal subsistence regulations were kept in line with SOA regulations, including subsistence closures and management of salmon resources. However, the Eastern and Western Interior RACs have recently expressed their dismay at allowing sport fishing when subsistence fishing is closed. Some examples are Nome Creek, which is accessed from the Steese Highway, and Jim and Kanuti Rivers and Bonanza Creek, which are accessed from the Dalton Highway. These RACs plan to submit proposals to the Federal Subsistence Board (FSB) to allow for subsistence harvest. In addition, during 2022 the FSB adopted Temporary Special Action FSA22-01, which closed Federal public waters of the Yukon River to the harvest of Chinook, summer and fall chum, and coho salmon except by Federally qualified subsistence users. Therefore, it can be anticipated that future federal and SOA regulations may conflict;

5. Concerns about climate change adversely affecting streams and fisheries: Fishers in the YMA have expressed concerns about very warm and/or high water in the mainstem Yukon River and tributaries over the past couple of years. During 2019, record warm water was assumed to have caused mortality in a large number of summer chum salmon, especially in the Koyukuk River. During 2019–2021, the number of Chinook salmon that was forecasted to cross the Canadian border fell short by 30,000–40,000 fish. Water temperatures during 2020–2021 were not as high as 2019, but water levels were high throughout much of the summer. It is unknown if these factors contributed to the disappearance of Chinook salmon. Also, residents of rural communities have noted increased seasonal flooding and increased turbidity of clearwater creeks; and

6. Below-average Chinook, chum, and coho salmon runs: The Chinook salmon sport fishery in the YMA has had restrictions or closures every year since 2011. Per the *Yukon River King Salmon Management Plan* (5 AAC 05.360), when there are restrictions to subsistence fishing, the sport fishery will close. Even if the preseason forecast indicated that the Yukon River Chinook salmon run may be at or above average, preseason restrictions to the subsistence fishery are made to ensure adequate escapement in order to meet treaty obligations for Canadian origin fish. Therefore, since 2012, the sport fishery for Chinook salmon has been closed prior to the season opening. If inseason stock assessment information

indicates that escapement goals and subsistence needs will be met, then these restrictions will be relaxed commensurate with run strength. Similarly, due to poor run strengths, chum and coho salmon sport and subsistence fisheries were closed or restricted.

SPORT FISHING EFFORT, HARVEST, AND CATCH

Effort, harvest, and catch statistics for YMA sport fisheries have been reported in the SWHS under the primary heading of "Yukon River drainages" (Area Y)[1]. This area is further broken into 3 sections: Downstream from the Koyukuk River (Lower), Koyukuk River to Fort Yukon (Middle), and Upstream of Fort Yukon to Canadian Border (Upper, Figure 2). The 2021 estimate of 10,060 angler-days was similar to 2020 (10,142), and above the last 10-year (2011–2020) and 5-year (2016–2020) estimates of 9,185 and 8,282 angler-days, respectively (Table 1). During these time periods the total number of SWHS responses have decreased from an average of 92 anglers during 2011–2020 to 82 during 2016–2020 (Table 2). For 2021, an 11-year low of 63 responses was recorded, which has been part of a lowering trend over the past 25 years (Figure 3). Normally at least 12 responses have been reported for the 3 main YMA sections (Table 2). However, for 2021, the area Upstream of Fort Yukon to Canadian Border had only 3 responses. Because the Upper YMA encompasses a very large area, summing this with the Middle YMA could be misleading. Therefore, these sections for 2021 and previous years were still broken down and the values given in the tables in bold, which reference the low number of respondents. During 2021, all response values for individual streams and lakes were below 12. However, these estimates were still presented in bold to document that sport fishing occurred and for comparison to previous years and locations when responses were at least 12.

Sport harvest of all species combined from the YMA averaged more than 12,000 fish until the early 1990s, with the peak harvest of 14,720 in 1989 (Burr 2004). Since that time, annual harvests have declined. Sport harvests have averaged less than 5,000 fish in the most recent 10- and 5-year periods of 4,038 and 3,653, respectively, and the 2021 estimate (3,574) is similar (Table 1). The harvest in the YMA has been dominated by freshwater resident species, primarily Arctic grayling and northern pike. In 2021, Pacific salmon (all species combined) were 0.4% of the total sport harvest in the YMA, and resident species made up the remaining 99.6%.

Sport catch of all species in the YMA has been estimated since 1990. Numbers reported as catch include fish that are caught and kept (harvested), and those that are caught and released. During the most recent 10-year and 5-year periods, 89% and 88%, respectively, of all fish caught in the YMA were released (Table 1). For 2021, resident species made up 96% of the total catch and salmon the remaining 4% in the YMA.

SECTION II: FISHERIES

Waters within the YMA offer some of the most remote and diverse sport fishing opportunities in Alaska. Opportunities exist to catch trophy northern pike, sheefish, and Arctic grayling within wilderness settings. Sport fishing opportunities for salmon are currently not as well developed as in other management areas and recent poor runs have restricted or closed Chinook, chum, and coho salmon sport fisheries. Marine sport fisheries within the boundaries of the YMA are rare and generally do not show up in the SWHS.

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[1] Alaska Sport Fishing Survey database [Internet]. 2011–2021. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 23, 2022). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/

This section provides a summary of significant sport fisheries by species in the YMA in 2021 and 2022. Discussion of each fishery will include (1) background and historical perspective; (2) specific management objectives, management plans, and recent actions by the BOF; (3) recent fishery performance and stock status; (4) current issues; and (5) ongoing and recommended management and research activities. Information regarding the 2022 season will be included as available, but estimates of sport effort and harvest will not be available until 2023. A summary of recent sport fish harvests by species are provided for reference and recent fishery performance in this report will focus on data from 2021 with 10- and 5-year average comparisons of 2011–2020 and 2016–2020. For a list of sport harvest and catch prior to 2011, see the SWHS or earlier YMA fishery management reports (FMRs).

During a BOF year, the BOF has requested the department reduce the number of reports or pages that BOF members must read. As a result, these FMRs address only fisheries and species for which there are proposals submitted in order to minimize report length. Therefore, this FMR contains information relevant to Proposal 86 (HQ-F22-002) *Require retention of sport caught salmon, if removed from the water, in the Yukon River Area*. Except for the Table 1 harvest and catch summary for the YMA, further details for resident species fisheries are not given. These details will be summarized in future FMRs that are outside of the BOF cycle.

YUKON RIVER DRAINAGE SALMON

Yukon River drainage commercial, subsistence, and personal use (Tanana River near Fairbanks) fisheries are managed by the Division of Commercial Fisheries (DCF). Chinook, chum, and coho salmon are important subsistence and commercial species in the Yukon River drainage. Harvest by sport anglers has, to date, been minimal in comparison (Table 1, Appendix C2).

Fishery Description

Chinook salmon are found throughout the Yukon River drainage. Chum salmon, composed of summer and fall runs, are numerically the most abundant species and are distributed throughout the drainage. Coho salmon are less abundant and spawn in large numbers in only a few identified streams (Burr 2015). Pink salmon spawn in an odd and even year cycle of which one year may be more abundant that the next (Augerot 2005). Pink salmon are typically less abundant upstream of the Anvik River (approximately 300 river miles from the Bering Sea). Sockeye salmon are present as well, but relatively few fish are taken annually in commercial, subsistence, or sport harvests (Figure 1).

Sport catch and harvests of salmon in the Yukon River drainage have historically been, and continue to be, primarily from streams of the Tanana River drainage where primarily Chinook and coho salmon are targeted. Recent sport fisheries in TRMA are discussed within the *Fishery Management Report for Recreational Fisheries in the Tanana River Management Area, 2019* (Scannell and Baker 2021). The majority of salmon sport harvests in the YMA have been primarily reported from the Andreafsky and Anvik Rivers (Tables 3–5). Approximately 12,400 people live within the YMA (U.S. Census Bureau 2020). Most of these residents depend on salmon for livelihood, subsistence, or both. Rural residents customarily use high-yield fishing methods, such as gillnets and fish wheels, where a larger volume harvest can be taken in the turbid mainstem of Yukon River. Hook and line fishing for salmon is practiced in clearwater tributaries of the Yukon River drainage by some rural residents, nonlocal residents who visit for the purpose of sport fishing, or as legal subsistence gear in the Lower Yukon River at and below the Nulato River

(Figure 2). Consequently, the few sport harvest responses from this area do not accurately reflect the total harvest of salmon.

Sport fishing effort for wild salmon in the Yukon River drainage used to be directed primarily at Chinook, chum, and coho salmon (Figure 4). However, for more than a decade Chinook salmon stocks have experienced periods of low productivity. As a result, restrictions and closures for sport fishing opportunity have been implemented in the YMA and TRMA as conservation measures as subsistence fishing opportunities have similarly been restricted or closed. During 2010–2022, restrictions and/or closures to the sport fishery occurred each year in the YMA, with the exception of 2010 (Appendix B). The only recorded Chinook salmon sport fish harvest during 2014–2021 was 19 in 2019 (Table 3). Similarly, subsistence harvests in the YMA have decreased since 2003 from a high of 54,814 in 2003 to a low of 1,995 in 2021 (Appendix C2). A directed commercial fishery on Chinook salmon has not taken place since 2007 (Estensen et al. 2021). Given the trend in past years, it can be anticipated that similar restrictions or closures will be implemented in future years. With restrictions and closures to the Chinook salmon sport fishery, other salmon species have been targeted instead.

Two genetically distinct subspecies of chum salmon spawn in the Yukon River drainage: summer and fall chum salmon. The summer chum salmon are usually the most abundant (approximately ⅔ of all Yukon River chum salmon) and primarily enter the Yukon River before July 16; most do not migrate upstream of the Tanana River. Most fall chum salmon begin to enter the Yukon River during mid-July, and the majority spawn above the Tanana River and into Canada (~25%). All chum salmon harvested in the sport fishery are categorized as summer chum salmon because these fish were primarily caught incidental to Chinook salmon during mid-summer in clearwater tributaries—that is, during years when Chinook salmon could be targeted. Some harvest of fall chum salmon entering clearwater tributaries occurs after Chinook salmon spawning concludes but is considered negligible relative to summer chum salmon harvests.

A period of increased variability in run strength of Yukon River Chinook and chum salmon began in 1998 with runs in 2000 being the lowest on record up to that time for both species. In September 2000, the BOF classified the Yukon River Chinook salmon as a stock of yield concern, Yukon River summer chum salmon as a stock of management concern, and most of the Yukon River drainage fall chum salmon stock as a stock of yield concern. Fall chum salmon stocks in the Toklat River in TRMA and the Fishing Branch River in Canada (Figure 5) were classified as management concerns. The *Policy for the Management of Sustainable Salmon Fisheries* (5 AAC 39.222) defines a yield concern as an inability to maintain expected yields or harvestable surpluses above the stock's escapement needs, despite the use of specific management measures. A management concern is defined as the chronic inability to meet existing escapement goals for the stock. From 2002 to 2006, Chinook and chum salmon runs improved over the very poor runs of 1998–2001. In 2007 continuing through 2016, the number of Chinook salmon returning to the Yukon River drainage was less than the historical averages (JTC 2021). The Chinook salmon returns were above the historical average during 2017 and 2019 but below in 2018. These numbers are reflected in the subsistence harvest values in relation to the ANS of 45,500–66,704 for Chinook salmon (Appendix C2) and in recent and historical escapement estimates past the Pilot Station and Eagle sonars, which represent an index of drainagewide and Canadian-bound total run estimates (Appendix C1). However, a downward trend of very poor returns for Chinook and summer and fall chum salmon began again in 2020 with historically low values in 2021 and 2022.

The poor Chinook, chum, and coho salmon runs of 2021 and 2022 created hardships for subsistence users who often could not harvest salmon and have their subsistence needs met, and as a result the sport fisheries were closed. Closures for Chinook salmon in 2021 and 2022 and chum salmon in 2022 took place prior to the fish entering the Yukon River based on preseason forecasts for low returns. For sport fishers, having a level of fishing opportunity throughout the season is critical for local economic benefits that can accrue from guiding services and lodges, and closures of key fisheries can be an economic burden. In the Lower Yukon River, pink and sockeye salmon were targeted in these fisheries because there was no management concern, but this did little to ensure ANS of salmon for residents in the Middle and Upper Yukon River. The number of sockeye and pink salmon that are captured and harvested in the YMA sport fishery have been so low that yearly SWHS numbers are listed in Table 1 of this report, but no details of harvest and catch per area and drainages within the YMA are presented.

Fishery Management Objectives

Salmon resources within the State of Alaska are governed by the *Policy for the Management of Sustainable Salmon Fisheries* (5 AAC 39.222). The goal of this policy is to ensure conservation of salmon in the freshwater and marine habitat, protection of customary and traditional subsistence uses and other uses, and the sustained economic health of Alaska's fishing communities. In addition, because Chinook, fall chum, and coho salmon also spawn across the border into Canada, these species are also managed through the Alaska/Canada *Yukon River Salmon Agreement*, which represents an international commitment to the restoration, conservation, and management of Yukon River salmon. Approximately 40–50% of Yukon River Chinook salmon spawn in Canada (Eiler et al. 2014). Per this treaty, an Interim Management Escapement Goal (IMEG) has been established to manage for 42,500–55,000 Chinook salmon to cross the border into Canada. Salmon escapements at the U.S./Canada border are estimated by a sonar near Eagle, Alaska (Figure 5). The IMEG for fall chum salmon is 70,000–104,000 and for those crossing into Canada farther north through the Porcupine River and into the Fishing Branch River in Canada is 22,000–49,000 (Figure 5, Appendix C3). Currently no IMEG exists for coho salmon, and the relative proportion of Canadian-bound fish is poorly understood.

Chinook salmon are managed within the Alaska portion of the Yukon River drainage by the *Yukon River King Salmon Management Plan* (5 AAC 05.360), which provides guidelines to manage Yukon River Chinook salmon for sustained yield and guides all management decisions for subsistence, commercial, and sport fish uses. The sport fishery in the Yukon River drainage is managed to coordinate with the commercial and subsistence fisheries. Restrictions to sport fishing for Chinook salmon for conservation purposes correspond to abundance levels that are based on preseason estimates and inseason daily counts from the Pilot Station sonar and are designed to achieve the IMEG across the Canadian border.

Summer and fall chum salmon are managed within the Yukon River drainage with the *Yukon River Summer Chum Salmon Management Plan* (5 AAC 05.362) and *Yukon River Fall Chum Salmon Guideline Harvest Ranges* (5 AAC 05.365). Inseason run size projections for fall chum salmon are based on the historical run size estimates of summer chum salmon, which is 1/3 of the run strength of the summer chum salmon (Estensen et al. 2021).

Coho salmon usually enter the Yukon River in mid-to-late July and are primarily targeted in the fall. Yukon River coho salmon are managed with the *Yukon River Coho Salmon Management Plan*

(5 AAC 05.369). The primary goal of this plan is to provide for the management of directed commercial coho salmon fishing in the Yukon River.

Recent Fishery Performance

Chinook Salmon

The preseason outlook for 2021 was for a run size of 102,000 to 189,000 Chinook salmon, which would be smaller than the 2020 outlook and potentially as small as the low runs from 2012 and 2013 (Appendix C1). Because of the poor projected run size, a cautious management approach was taken for the subsistence fisheries, which began with the season closed. Similarly, the YMA sport fishery was closed on 10 May 2021 due to the preseason closure to the subsistence fishing schedule (Appendix B). The Chinook salmon sport fishery also closed in TRMA on 24 June 2021. Far fewer Chinook salmon passed by the Pilot Station sonar (124,845) than was recorded the previous year, and the run was smaller than the 2012 and 2013 runs (Appendices C1 and C3). The inseason projection was for approximately 59,000 Chinook salmon to cross the Canadian border. However, the Eagle sonar estimated passage of 31,796 Chinook salmon, which was the lowest on record since its inception in 2005. Harvest of Canadian-origin fish in Alaska was 38 and 306 in Canada, for a total Canadian-origin run of 31,452, which was well below the IMEG of 42,500–55,000. Because of these historically low numbers, the subsistence and sport fisheries remained closed for the remainder of the season. Also, for 2019 and 2020, border passage was also approximately 30% to 40% below what was predicted from Pilot Station sonar estimates of Canadian-origin Chinook salmon. For the YMA sport fishery, during 2021, there was a harvest of 0 Chinook salmon and a catch of 218. The estimated catch represented Chinook salmon that were captured incidentally and released immediately because these fish could not be targeted. These values are similar to the last 10- (2020–2020) and 5-year (2016–2020) estimates of 51 and 4, respectively, and 380 and 229 for catch, respectively.

The Chinook salmon run in 2022 was the lowest on record. Similar to 2021, the Chinook salmon fishery began closed for both subsistence and sport fishing (May 1) due to an outlook that predicted a drainagewide run size of 99,000 to 150,000 fish. Preliminary estimates of Chinook salmon that were estimated by the Pilot Station and Eagle sonars were 44,581 and 12,025, respectively. These estimates were well below the pre-season forecast and well below the IMEG of 42,500–55,000 for Canadian-origin fish. The sport fishery in TRMA closed on 20 June 2022.

Chum salmon

Summer and fall chum salmon runs in 2021 were the lowest on record. Despite closures to the subsistence and sport fisheries early in the run (July 1 for both YMA and TRMA), no escapement goals were met. The drainagewide outlook for summer chum salmon was for approximately 1.2 million and that for fall chum salmon was 652,000, which were below average, but still anticipated to provide for subsistence and commercial harvests and meet escapement goals. However, the number of summer chum salmon that was estimated by the Pilot Station sonar was 153,718 and 146,197 for fall chum salmon (Appendix C1). These values were well below the escapement goals of 500,000–1,200,00 for summer chum salmon and 300,000–600,000 for fall chum salmon (Appendix C3). Fall chum salmon were estimated at 23,170 by the Eagle sonar, which was well below the IMEG of 70,000–104,000. For the sport fishery, 0 chum salmon were harvested and 655 were caught and released in 2021. These numbers were well below the last 10- (2011–2020) and 5-year (2016–2020) harvest estimates of 469 and 466, respectively, and 2,311 and 1,422 for catch,

respectively. The low harvest and catch numbers in 2021 reflected the fishery closure that occurred approximately midway in the run.

The drainagewide summer chum salmon outlook for 2022 was for a run size of approximately 333,000 fish and that for fall chum salmon approximately 110,000 fish. Because these run size estimates were below the escapement goals set for chum salmon passage past Pilot Station sonar, the season began closed for both subsistence and sport fisheries. The sport fisheries for the YMA closed on May 1 and June 20 for TRMA. The summer chum salmon run was the second lowest on record after 2021, with an estimate of 437,032 counted at Pilot Station sonar. The fall chum salmon run was also low with a preliminary estimate of 236,953 fish estimated by the Pilot Station sonar and a preliminary count of 22,075 for fall chum salmon by the Eagle sonar. So, both the subsistence and sport fisheries remained closed throughout the rest of 2022.

Coho salmon

The 2021 coho salmon outlook was for an average run size of 240,000 fish. The Pilot Station sonar operated through 7 September 2021 and recorded an incomplete inriver estimate of 37,255 coho salmon, which was well below the historical average of 147,000 fish for this date. The peak boat survey on the Delta Clearwater River in early November estimated 913 coho salmon, which was well below the escapement goal of 5,200–17,000 fish. Because of the very poor 2021 coho salmon run, sport fishing for coho salmon in the YMA and TRMA closed on 26 August 2021. Before closure of the sport fishery, 13 coho salmon were harvested and 33 were caught and released in 2021. These numbers were well below the last 10- (2011–2020) and 5-year (2016–2020) harvest estimates of 381 and 281, respectively, and 1,581 and 380 for catch, respectively. These numbers reflect the recent trend of restrictions and closures to salmon fisheries in the YMA (Figure 4, Table 5).

In 2022, the coho salmon run was forecasted to be below average. Similar to the previous year, the Pilot Station sonar ceased operations on 7 September 2022 and recorded an incomplete inriver estimate of 92,101 (Appendix C1). This value was larger than that recorded in 2021 but still well below the historical cumulative median of 145,378 and historical run size of 234,000 fish. Therefore, the sport fisheries for coho salmon in the YMA and TRMA were closed on 8 September 2022 to ensure adequate spawning escapement.

Research and Management Activities

During 2021 and 2022, several salmon enumeration projects were conducted within the Alaskan and Canadian portions of the Yukon River (Figure 5). In the lowermost Yukon River, set and drift net test fisheries (late May to mid-September) were conducted by ADF&G DCF to assess daily catch per unit effort. This data was used to inform managers and users of probable future run size and timing of immigrating salmon. Further upriver, the Mountain Village Drift Gillnet Test Fishery primarily focused on enumerating fall chum and coho salmon (mid-July to mid-September). On the mainstem Yukon River, ADF&G DCF assessed upriver migrating salmon with the Pilot Station sonar (122 miles [196 km]), which typically operates from late May until early September. At the nearby Andreafsky River weir, located downriver from Pilot Station and above St. Mary's, the United States Fish and Wildlife Service (USFWS) operated a weir that primarily enumerated Chinook and summer chum salmon (Figure 5). Above Pilot Station and on the Anvik River, ADF&G DCF operated a sonar that primarily enumerated summer chum salmon. On the Middle Koyukuk River, the Gisasa River weir was operated by the USFWS, and further up the drainage, the Tanana Chiefs Conference (TCC) operated the Henshaw Creek weir (both early to late July);

both weirs primarily enumerated Chinook and summer chum salmon. The Gisasa River weir did not operate in 2021. Further up the Yukon River, the Teedriinjik (Chandalar) River sonar was operated by USFWS to count fall chum salmon (early August to mid-October). Lastly, Eagle Sonar primarily enumerated Chinook and fall chum salmon and operated from early July until mid-to-late October. Chinook and chum salmon counts for the projects contained in the YMA are presented in Appendix C3 along with the escapement goals where applicable. Other salmon counts within the entire Yukon River drainage outside of the YMA and in Canada can be found at: https://www.adfg.alaska.gov/index.cfm?adfg=commercialbyareayukon.salmon_escapement

During 2022, ADF&G Alaska Freshwater Fish Inventory (AFFI) conducted surveys on fish presence/absence in YMA streams in the Middle Yukon River. Fish were primarily sampled with electroshocking equipment. Collected anadromous fish (primarily salmon) were used to nominate waters to the State of Alaska's Catalog of Waters Important for the Spawning, Rearing or Migration of Anadromous Fishes (commonly called the Anadromous Waters Catalog, or AWC), to update fish life stage information for waters already listed in the AWC, or to list nonanadromous resident species for the AFFI online mapping catalog. Habitat characteristics and water quality of each stream sampled were also noted.

The ADF&G DCF, USFWS, and the Yukon Delta Fisheries Development Association are conducting a cooperative drainagewide radiotelemetry project on coho salmon in 2022 to better understand movements and run timing and to document spawning locations. A total of 350 radio transmitters were deployed in the Lower Yukon River and the project is currently ongoing. Because of recent poor returns of Chinook and chum salmon, coho salmon have become more important as a subsistence resource, so locating and documenting spawning locations and later nominating them to the AWC will be important for future protection of habitats in critical spawning areas.

Research projects are being planned and have been implemented to try to better understand the 3-year discrepancy (2019–2021) between the Canadian-origin salmon counted by the Pilot Station sonar and the much-lower-than-expected passage at the border. During 2022, multiple agencies, including ADF&G DCF, collected tissue samples from Chinook salmon in different locations from the Lower to Upper portions of the Yukon River to test for the presence of *Ichthyophonus* in an effort to see if this disease may be a trigger for the lower-than-anticipated number of Chinook salmon reaching Canada in recent years. In 2023, ADF&G DCF will be implementing a radiotelemetry project on Chinook salmon as an additional tool to better understand this discrepancy. Approximately 500 Chinook salmon will be systematically radiotagged in the Lower Yukon River and tracked throughout the drainage. This project is slated to operate for 3 seasons (2023–2026).

Multiple agencies have been deploying temperature data loggers in different locations of the Yukon River drainage and a central database has been created. The water temperatures during 2020–2022 were not as high as recorded in 2019 where temperatures above 72ºF (22ºC) were recorded during 14–19 July 2019 in the Lower Yukon River near Emmonak (Stuby 2021). Migrating adult Pacific salmon are sensitive to warm water (>18ºC) with a range of consequences from decreased spawning success to early mortality (von Biela et al. 2020). Water temperatures above 70°F for prolonged periods can cause salmon mortality (McCullough et al. 2011). Heat stress was a factor during 2019 when thousands of summer chum were documented to have died as a result of heat stress with egg skeins still intact, unlike Chinook salmon for which there were

no reports of premature deaths, just the disappearance of a large proportion of Canadian-origin fish.

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TABLES AND FIGURES

Table 1.–Recreational angler effort, number of fish harvested, and total catch by species within the YMA, 2011–2021.

Year	Angler effort (days)	Total fish	Pacific salmon						Resident Species								
			Total	Chinook	Coho	Sockeye	Pink	Chum	Total	Lake Trout	DV/ AC	Arctic Grayling	Sheefish	Northern Pike	Burbot	Whitefish	UNK[a]
Harvest																	
2011	10,291	2,368	498	102	179	0	0	217	1,870	124	11	907	118	430	168	112	0
2012	8,671	2,531	537	231	47	0	51	208	1,994	0	16	1,433	44	501	0	0	0
2013	10,332	7,719	1,697	155	127	0	0	1,415	6,022	22	319	4,062	94	1,482	36	7	0
2014	12,917	6,225	1,959	0	1,639	0	0	320	4,266	25	167	2,498	95	1,184	277	20	0
2015	8,230	3,272	804	0	413	61	136	194	2,468	149	20	1,613	19	551	13	103	0
2016	7,548	2,422	398	0	29	35	70	264	2,024	75	84	1,005	73	681	91	15	0
2017	8,592	4,742	218	0	55	0	0	163	4,524	0	172	2,639	120	983	114	486	10
2018	7,542	2,459	266	0	62	0	19	185	2,193	0	16	1,332	49	744	0	52	0
2019	7,584	1,614	55	19	0	0	0	36	1,559	0	203	511	115	553	145	32	0
2020	10,142	7,028	2,941	0	1,257	0	0	1,684	4,087	21	15	981	111	2,025	604	330	0
2021	10,060	3,574	13	0	13	0	0	0	3,561	0	0	2,260	204	965	75	57	0
Average																	
2011–20	9,185	4,038	937	51	381	10	28	469	3,101	42	102	1,698	84	913	145	116	1
2016–20	8,282	3,653	776	4	281	7	18	466	2,877		98	1,294	94	997	191	183	2
Catch																	
2011		22,924	3,530	899	558	43	92	1,938	19,394	201	272	12,842	378	5,300	245	143	13
2012		29,604	3,107	544	174	11	802	1,576	26,497	0	673	13,976	361	11,463	17	7	0
2013		47,659	13,374	927	1,597	47	78	10,725	34,285	339	1,474	21,677	247	10,450	19	7	43
2014		68,160	12,270	156	10,479	143	258	1,234	55,890	25	4,305	31,839	470	18,805	337	81	28
2015		39,331	2,253	124	1,100	89	409	531	37,078	661	760	23,567	123	11,732	13	144	78
2016		35,069	4,000	268	29	66	2,753	884	31,069	238	1,782	11,563	304	16,648	91	54	389
2017		25,411	1,225	398	223	0	0	604	24,186	0	1,287	14,583	270	7,291	139	543	73
2018		23,799	4,655	141	318	0	1,597	2,599	19,144	81	624	9,658	147	8,523	0	111	0
2019		54,547	5,012	316	0	15	3,518	1,163	49,535	0	1,608	8,734	941	38,002	179	71	0
2020		18,049	3,216	24	1,332	0	0	1,860	14,833	31	114	8,119	622	4,918	626	403	0
2021		26,812	984	218	33	24	54	655	25,828	0	391	16,775	252	7,897	100	413	0
Average																	
2011–20		36,455	5,264	380	1,581	41	951	2,311	31,191	158	1,290	15,656	386	13,313	170	156	62
2016–20		31,375	3,622	229	380	16	1,574	1,422	27,753	70	1,083	10,531	457	15,076	207	236	92

Source: Alaska Sport Fishing Survey database [Internet]. 2011–2021. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 23, 2022). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

[a] Unidentified fish species

Table 2.–Number of SWHS responses and angler effort for the YMA during 2011–2021.

	Year											Averages	
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2011–2020	2016–2020
						Downstream from Koyukuk River							
Responses	15	24	23	36	14	15	18	15	**11**	**8**	14	18	13
Angler Effort (days)	5,402	3,036	3,572	4,733	1,746	2,618	1,420	1,349	**1,943**	**688**	2,798	2,651	1,604
						Koyukuk River to Fort Yukon							
Responses	66	64	68	63	67	81	58	44	45	41	45	60	54
Angler Effort (days)	4,155	5,104	5,698	6,839	5,456	4,787	5,780	4,866	4,817	7,377	6,290	5,488	5,525
						Upstream of Fort Yukon to Canadian Border							
Responses	12	**11**	13	**8**	13	**4**	**11**	15	**11**	17	**3**	12	12
Angler Effort (days)	734	**416**	733	**1,277**	737	**121**	**1,132**	957	**471**	2,046	**821**	862	945
						Unspecified Yukon River Streams							
Responses	**0**	**4**	**3**	**2**	**3**	**1**	**5**	**4**	**6**	**1**	**1**	3	3
Angler Effort (days)	**0**	**115**	**329**	**68**	**291**	**22**	**260**	**370**	**353**	**31**	**151**	184	207
						Total Yukon Management Area							
Responses	93	103	107	109	97	101	92	78	73	67	63	92	82
Angler Effort (days)	10,291	8,671	10,332	12,917	8,230	7,548	8,592	7,542	7,584	10,142	10,060	9,185	8,282

Source: Alaska Sport Fishing Survey database [Internet]. 2011–2021. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 23, 2022). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/. Data in bold result from fewer than 12 respondents and are subject to high variance. These numbers are presented to show that sport fishing occurred in these waters with or without some level of harvest.

Table 3.–Sport harvest and catch of Chinook salmon in the YMA, 2011–2021.

	Year											Averages	
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2011–2020	2016–2020
						Downstream from Koyukuk River							
Harvest Subtotal	102	231	155	0	0	0	0	0	**19**	**0**	0	51	4
Anvik River	**102**	**231**	155	0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	49	0
Andreafsky River	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0	0
Other streams	**0**	0	**0**	0	**0**	**0**	0	**0**	**19**	**0**	**0**	2	4
Catch Subtotal	899	544	927	76	124	268	194	141	**316**	**0**	218	349	184
Anvik River	**899**	**475**	927	76	**59**	**163**	**26**	**102**	**0**	**0**	**218**	273	58
Andreafsky River	**0**	**69**	**0**	**0**	**0**	**105**	**0**	**22**	**279**	**0**	**0**	48	81
Other streams	**0**	0	**0**	0	**65**	**0**	168	**17**	**37**	**0**	**0**	29	44
						Koyukuk River to Fort Yukon							
Harvest Subtotal	0	0	0	0	0	0	0	0	0	0	0	0	0
Porcupine River	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0	0
Koyukuk River	0	0	0	0	0	0	0	0	**0**	0	0	0	0
Other streams	0	0	0	0	0	0	0	0	0	0	0	0	0
Catch Subtotal	0	0	0	80	0	0	204	0	0	24	0	31	46
Porcupine River	**0**	**0**	**0**	**0**	**0**	**0**	**204**	**0**	**0**	**0**	**0**	20	41
Koyukuk River	0	0	0	0	0	0	0	0	**0**	0	0	0	0
Other streams	0	0	0	80	0	0	0	0	0	24	0	10	5
						Upstream of Fort Yukon to Canadian Border							
Harvest	0	**0**	0	**0**	0	**0**	**0**	0	**0**	0	**0**	0	0
Catch	0	**0**	0	**0**	0	**0**	**0**	0	**0**	0	**0**	0	0
Total Harvest[a]	102	231	155	0	0	0	0	0	19	0	0	51	4
Total Catch[a]	899	544	927	156	124	268	398	141	316	24	218	380	229

Source: Alaska Sport Fishing Survey database [Internet]. 2011–2021. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 23, 2022). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/. Data in bold result from fewer than 12 respondents and are subject to high variance. These numbers are presented to show that sport fishing occurred in these waters with or without some level of harvest.

[a] Total may exceed the sum of subtotals because fishing site(s) not specified.

Table 4.–Sport harvest and catch of chum salmon in the YMA, 2011–2021.

	Harvest Year											Averages	
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2011–2020	2016–2020
						Downstream from Koyukuk River							
Harvest Subtotal	203	208	1,415	320	175	124	163	185	**36**	**0**	0	283	102
Anvik River	**203**	**116**	1,415	61	**78**	**109**	**163**	**185**	**36**	**0**	**0**	237	99
Andreafsky River	**0**	**92**	**0**	**0**	**97**	**15**	**0**	**0**	**0**	**0**	**0**	20	3
Nulato River	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0	0
Other streams	**0**	0	**0**	259	**0**	**0**	**0**	**0**	**0**	**0**	**0**	26	0
Catch Subtotal	1,924	1,525	10,696	1,184	469	700	591	2,470	**1,139**	**0**	42	2,070	980
Anvik River	**1,741**	**1,214**	10,662	713	**274**	**571**	**430**	**2,470**	**142**	**0**	**42**	1,822	723
Andreafsky River	**0**	**311**	**34**	**0**	**195**	**129**	**0**	**0**	**890**	**0**	**0**	156	204
Nulato River	**0**	**0**	**0**	**0**	**0**	**0**	**161**	**0**	**0**	**0**	**0**	16	32
Other streams	**183**	0	**0**	471	**0**	**0**	**0**	**0**	**107**	**0**	**0**	76	21
						Koyukuk River to Fort Yukon							
Harvest Subtotal	14	0	0	0	19	140	0	0	0	1,684	0	186	365
Porcupine River	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0	0
Koyukuk River	0	0	0	0	0	0	0	0	**0**	0	0	0	0
Other streams	14	0	0	0	19	140	0	0	0	1,684	0	186	365
Catch Subtotal	14	51	0	50	19	184	0	129	24	1,860	0	233	439
Porcupine River	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0	0
Koyukuk River	0	51	0	0	0	44	0	129	**0**	0	0	22	35
Other streams	14	0	0	50	19	140	0	0	24	1,860	0	211	405
						Upstream of Fort Yukon to Canadian Border							
Harvest	0	**0**	0	**0**	0	**0**	**0**	0	**0**	0	**0**	0	0
Catch	0	**0**	0	**0**	0	**0**	**0**	0	**0**	0	**0**	0	0
Total Harvest[a]	217	208	1,415	320	194	264	163	185	36	1,684	0	469	466
Total Catch[a]	1,938	1,576	10,725	1,234	531	884	604	2,599	1,163	1,860	655	2,311	1,422

Source: Alaska Sport Fishing Survey database [Internet]. 2011–2021. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 23, 2022). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/. Data in bold result from fewer than 12 respondents and are subject to high variance. These numbers are presented to show that sport fishing occurred in these waters with or without some level of harvest.

[a] Total may exceed the sum of subtotals because fishing site(s) not specified.

Table 5.–Sport harvest and catch of coho salmon in the YMA, 2011–2021.

	Catch Year											Averages	
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2011–2020	2016–2020
						Downstream from Koyukuk River							
Harvest Subtotal	167	47	127	1,639	413	11	0	62	**0**	**0**	13	247	15
Anvik River	**167**	**0**	69	1,284	**248**	**0**	**0**	**0**	**0**	**0**	**13**	177	0
Andreafsky River	**0**	**15**	**58**	**0**	**0**	**11**	**0**	**62**	**0**	**0**	**0**	15	15
Nulato River	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0	0
Other streams	**0**	32	**0**	355	**165**	**0**	**0**	**0**	**0**	**0**	**0**	55	0
Catch Subtotal	546	174	1,597	10,479	1,100	11	29	306	**0**	**0**	33	1,424	69
Anvik River	**546**	**127**	1,525	8,959	**804**	**11**	**0**	**196**	**0**	**0**	**33**	1,217	41
Andreafsky River	**0**	**15**	**72**	**0**	**0**	**0**	**29**	**62**	**0**	**0**	**0**	18	18
Nulato River	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0	0
Other streams	**0**	32	**0**	1,520	**296**	**0**	**0**	**48**	**0**	**0**	**0**	190	10
						Koyukuk River to Fort Yukon							
Harvest Subtotal	12	0	0	0	0	18	55	0	0	1,257	0	134	266
Porcupine River	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0	0
Koyukuk River	12	0	0	0	0	0	0	0	**0**	0	0	1	0
Other streams	0	0	0	0	0	18	55	0	0	1,257	0	133	266
Catch Subtotal	12	0	0	0	0	18	178	0	0	1,332	0	154	306
Porcupine River	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0	0
Koyukuk River	12	0	0	0	0	0	0	0	**0**	0	0	1	0
Other streams	0	0	0	0	0	18	178	0	0	1,332	0	153	306
						Upstream of Fort Yukon to Canadian Border							
Harvest	0	**0**	0	**0**	0	**0**	**0**	0	**0**	0	**0**	0	0
Catch	0	**0**	0	**0**	0	**0**	**0**	0	**0**	0	**0**	0	0
Total Harvest[a]	179	47	127	1,639	413	29	55	62	0	1,257	13	381	281
Total Catch[a]	558	174	1,597	10,479	1,100	29	223	318	0	1,332	33	1,581	380

Source: Alaska Sport Fishing Survey database [Internet]. 2011–2021. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 23, 2022). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/. Data in bold result from fewer than 12 respondents and are subject to high variance. These numbers are presented to show that sport fishing occurred in these waters with or without some level of harvest.

[a] Total may exceed the sum of subtotals because fishing site(s) not specified.

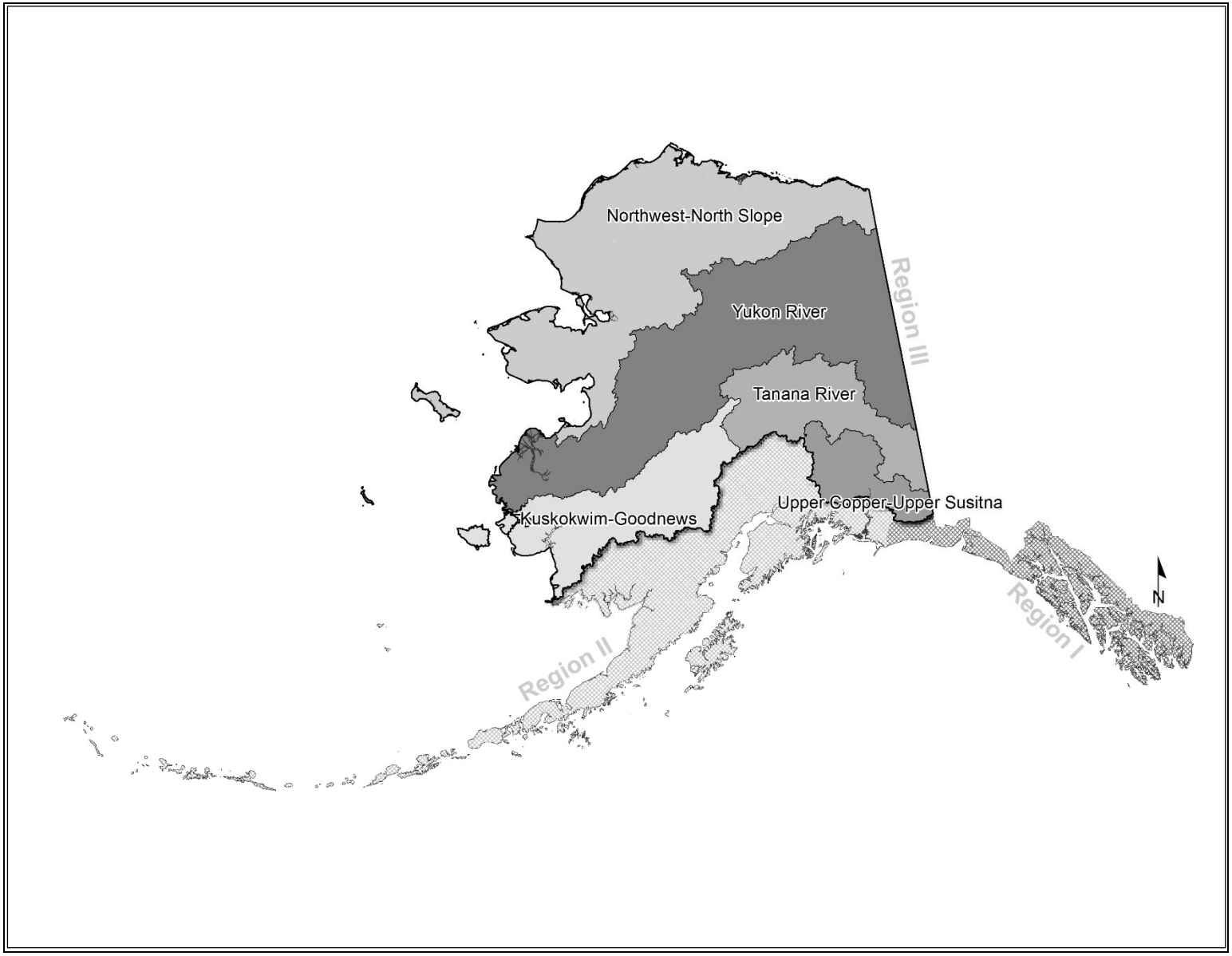

Figure 1.–Map of the sport fish regions in Alaska and the 5 management areas in Region III.

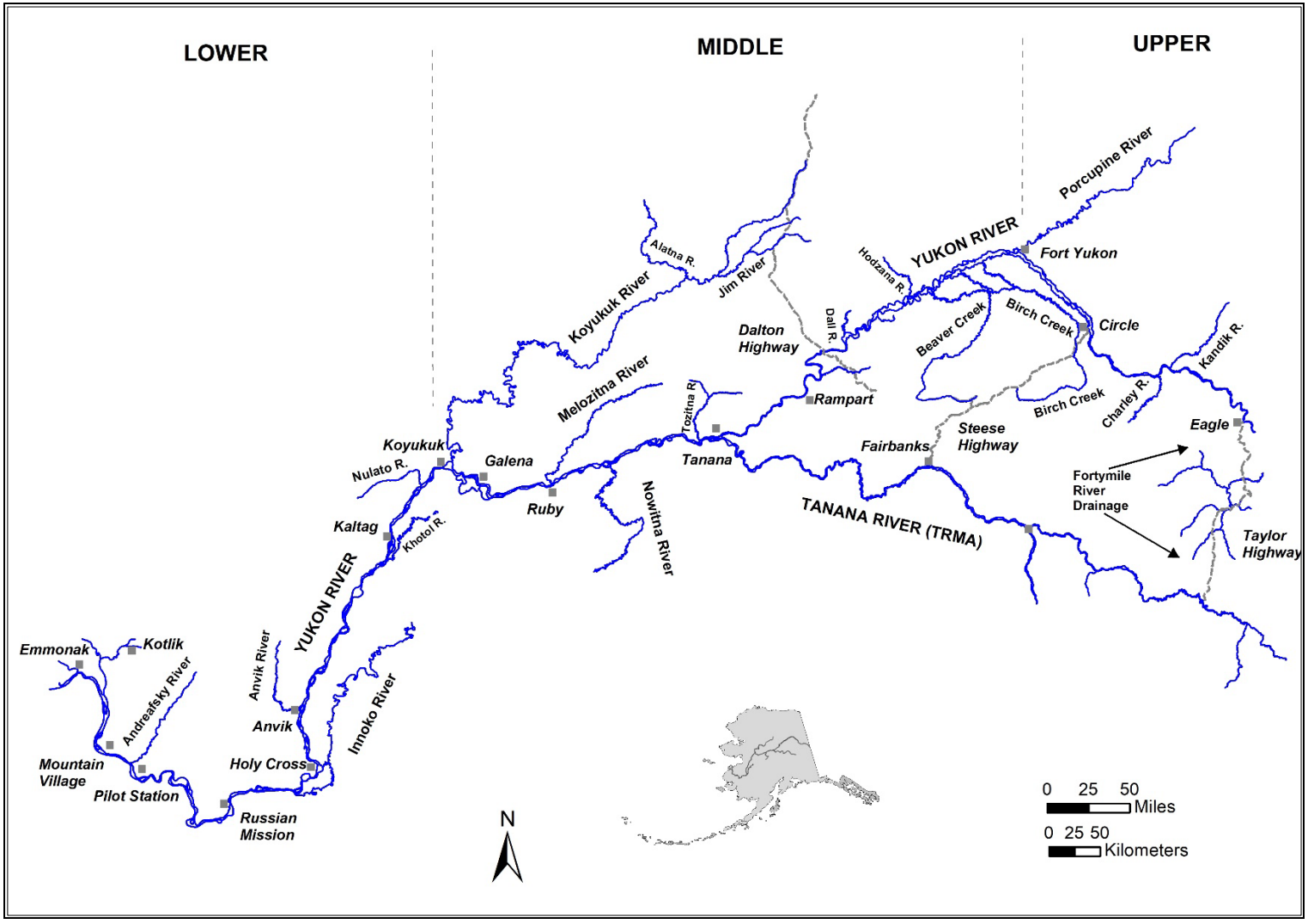

Figure 2.–Yukon River drainage delineating the Lower (Downstream from Koyukuk River), Middle (Koyukuk River to Fort Yukon), and Upper (Upstream of Fort Yukon to Canadian Border) portions of the Yukon Management Area. The Tanana River is managed separately.

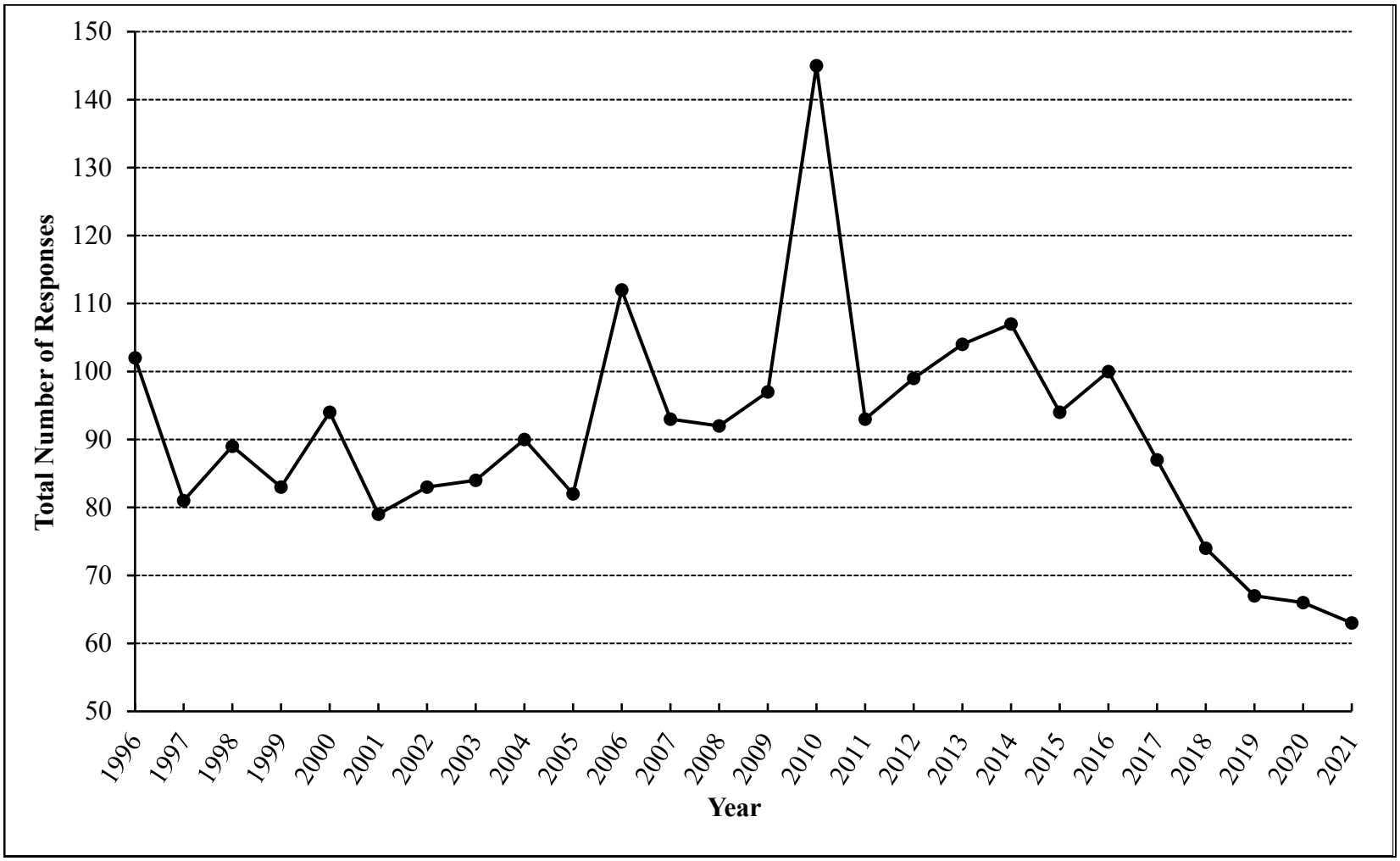

Figure 3.–Total number of SWHS responses for the YMA during 1996-2021.

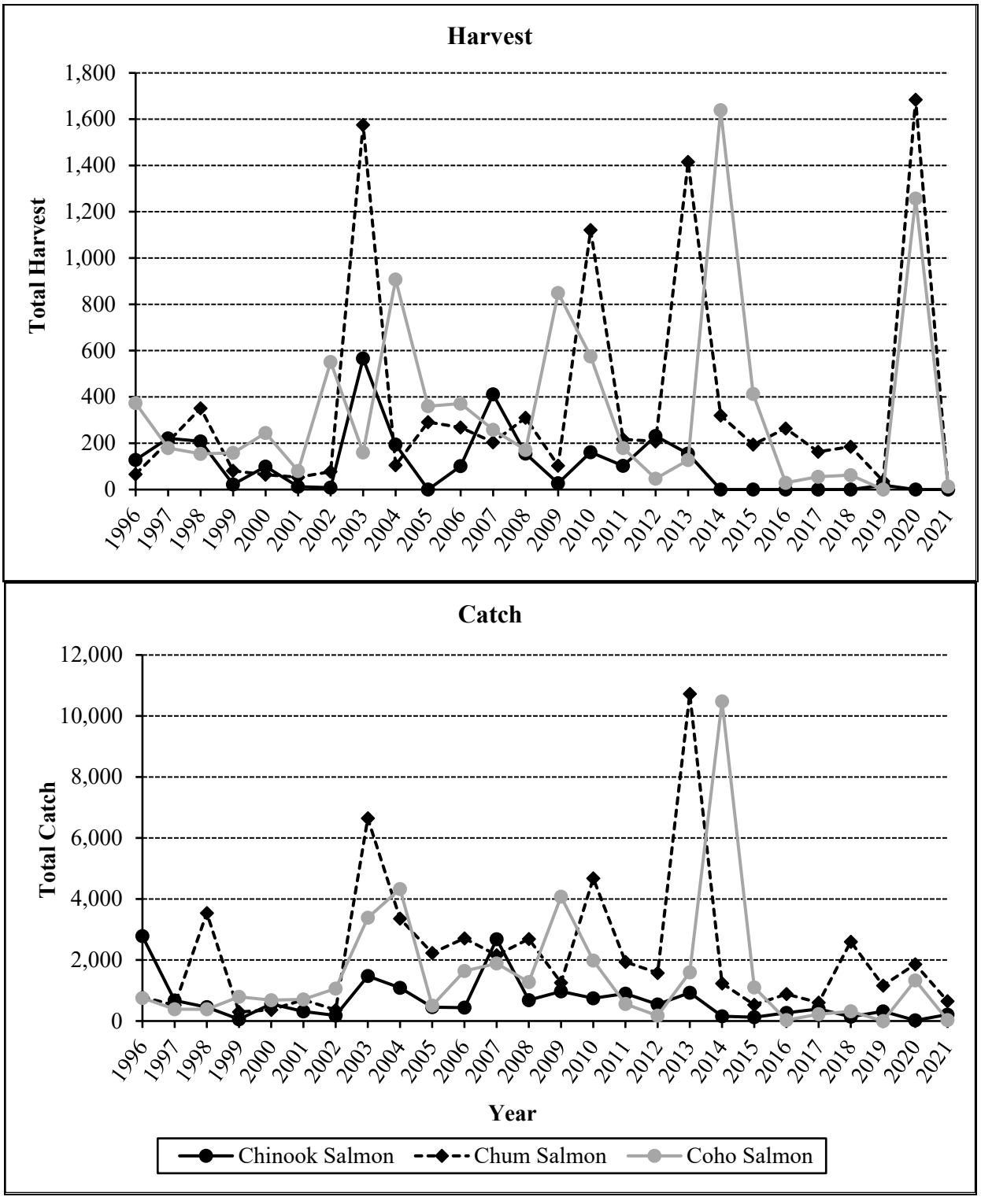

Figure 4.–Chinook, chum, and coho salmon harvest in the YMA during 1996-2021.

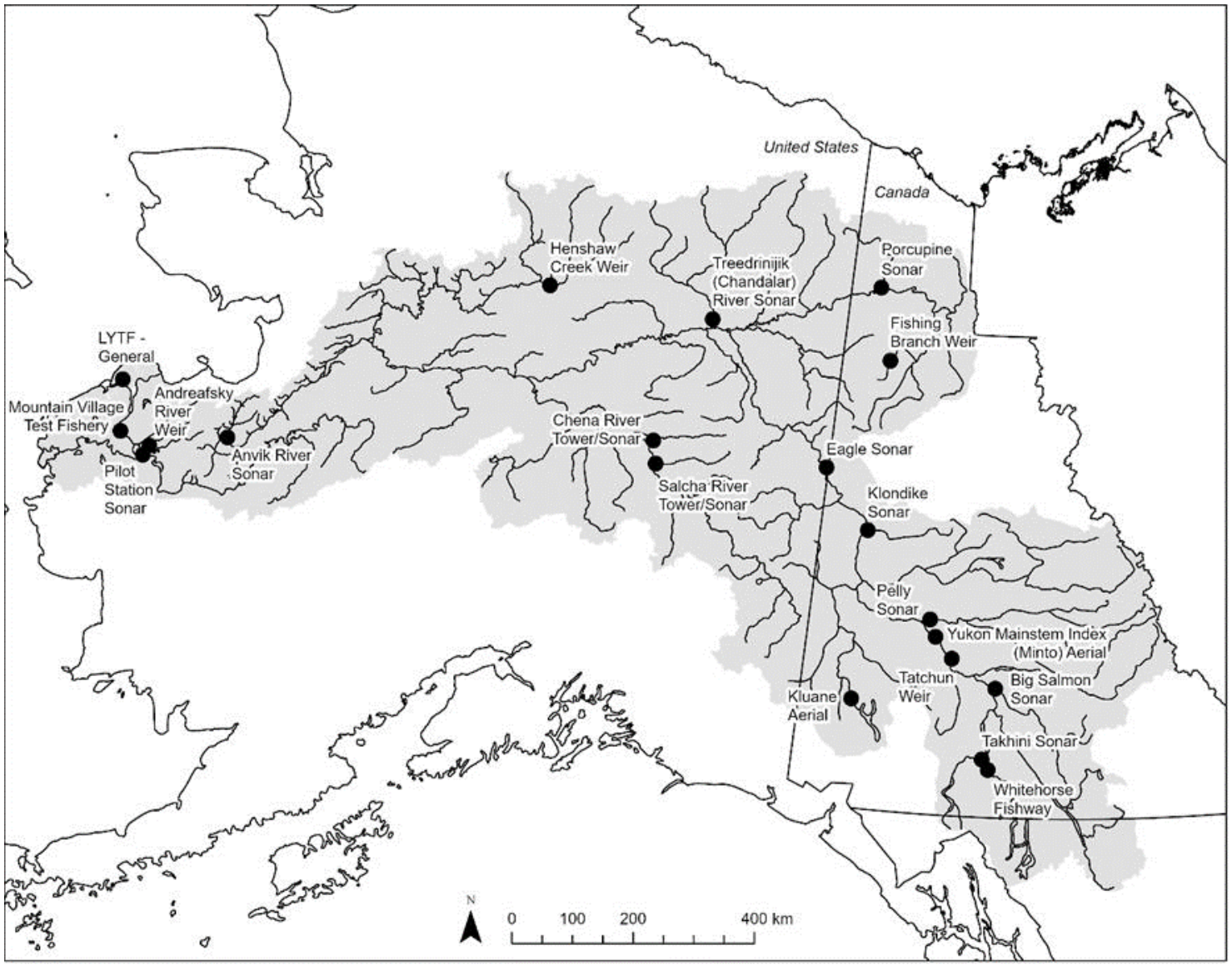

Figure 5.–Assessment projects operated in the U.S. and Canada to primarily assess Chinook and summer or fall chum salmon.

APPENDIX A:
CROSS-REFERENCING BOARD OF FISHERIES INFORMATION

Appendix A1.–References to information specific to Alaska Board of Fisheries Proposal HQ-F22-002 (Proposal 86).

Proposal subject	Tables	Figure	Appendices
Require retention of sport-caught salmon, if removed from the water, in the Yukon River Area.	1, 3, 4, 5	4	B, C1, C2, C3

APPENDIX B:
2010–2022 CHINOOK SALMON ESCAPEMENT INFORMATION AND EMERGENCY ORDERS

Appendix B.–2010–2022 Chinook salmon escapement information and yearly EO's for the YMA.

Year	Sport harvest	Sport catch	EO Number	EO Summary
2010	161	745	_	NONE
2011	102	899	3-KS-02-11	Daily bag and possession limit reduced to one Chinook salmon in all tributaries of the YMA, effective 12:01 a.m., Thursday, June 2, 2011. This EO also closed the mainstem Yukon River to sport fishing for Chinook salmon, effective 12:01 a.m., Thursday, June 2, 2011.
2012	231	544	3-KS-02-12	Daily bag and possession limit reduced to one Chinook salmon in all tributaries of the YMA, effective 12:01 a.m., Tuesday, May 15, 2012. This EO also closed the mainstem Yukon River to sport fishing for Chinook salmon, effective 12:01 a.m., Tuesday, May 15, 2012.
2013	155	927	3-KS-01-13	The mainstem Yukon River of the YMA was closed to sport fishing for Chinook salmon, effective 12:01 a.m., Wednesday, May 22, 2013. This EO also prohibited the retention of Chinook salmon in all tributaries of the Yukon River effective 12:01 a.m., Wednesday, May 22, 2013, through Sunday June 30, 2013. All tributaries were to reopen with a reduced bag limit of one Chinook salmon, effective 12:01 a.m., Monday, July 1, 2013.
2013	155	927	3-KS-09-13	All tributaries of the YMA were closed to the retention of Chinook salmon, effective 12:01 a.m., Friday, July 12, 2013. This EO prohibited the harvest of Chinook salmon and the use of bait while sport fishing in these tributaries. This EO also continued the closure of the mainstem Yukon River to sport fishing for Chinook salmon.
2013	155	927	3-KS-11-13	The prohibition of the use of bait in all tributaries of the YMA was rescinded and these tributaries were reopened to sport fishing for Chinook salmon under a reduced bag limit of one Chinook salmon effective 12:01 a.m., Wednesday, July 24, 2013. Sport fishing for Chinook salmon in the mainstem Yukon River remained closed.
2014	0	156	3-KS-02-14	The YMA was closed to sport fishing for Chinook salmon, effective 12:01 a.m., Monday, May 12, 2014.
2015	0	124	3-KS-02-15	The YMA was closed to sport fishing for Chinook salmon, effective 12:01 a.m., Monday, May 11, 2015.

-continued-

Year	Sport harvest	Sport catch	EO Number	EO Summary
2016	0	268	3-KS-03-16	The YMA was closed to sport fishing for Chinook salmon, effective 12:01 a.m. Friday, April 29, 2016.
2017	0	398	3-KS-Y-03-17	The YMA was closed to sport fishing for Chinook salmon, effective 12:01 a.m. Monday, May 1, 2017.
2017	0	398	3-KS-Y-6-17	Effective June 26, all Chinook salmon sport fisheries in the YMA reopened with a bag and possession limit of one fish and an annual limit of one Chinook salmon 20 inches or greater in length.
2018	0	141	3-KS-Y-03-18	The YMA was closed to sport fishing for Chinook salmon, effective 12:01 a.m. Friday, May 11, 2018.
2019	19	316	3-KS-Y-03-19	The YMA was closed to sport fishing for Chinook salmon, effective 12:01 a.m. Saturday, May 11, 2019.
2019	19	316	3-KS-Y-05-19	Effective July 11, 2019, the YMA Chinook salmon sport fishery reopened with a bag and possession limit of one fish 20 inches or greater in length, and an annual limit of one fish 20 inches or greater in length.
2020	0	24	3-KS-Y-2-2020	The YMA was closed to sport fishing for Chinook salmon, effective 12:01 a.m. Monday, May 11, 2020.
2021	0	209	3-KS-Y-2-2021	The YMA was closed to sport fishing for Chinook salmon, effective 12:01 a.m. Monday, May 10, 2021.
2022	–	–	3-KS-Y-4-2022	The YMA was closed to sport fishing for Chinook salmon, effective 12:01 a.m. Monday, May 1, 2022.

APPENDIX C:
COMMERCIAL, SUBSISTENCE, AND SPORT HARVEST OF CHINOOK SALMON IN THE ALASKA PORTION OF THE YUKON RIVER DRAINAGE, 2003–2022

Appendix C1.–Season totals of salmon counted at Pilot Station and Eagle sonars during 2003–2022.

	Pilot Station Sonar					Eagle Sonar	
Year	Chinook	Summer Chum	Fall Chum	Coho	Pink	Chinook	Fall Chum
2003	318,088	1,183,009	923,540	280,552	11,370	–	–
2004	200,761	1,344,213	633,368	207,844	399,339	–	–
2005	259,015	2,570,696	1,893,688	194,372	61,091	81,528	–
2006	228,763	3,780,760	964,238	163,889	183,006	73,691	245,290
2007	170,246	1,875,491	740,195	192,406	126,282	41,697	265,008
2008	175,046	1,849,553	636,525	145,378	580,127	38,097	185,409
2009	177,796	1,477,186	274,227	240,779	34,529	69,957	101,734
2010	145,088	1,415,027	458,103	177,724	917,731	35,074	132,930
2011	148,797	2,051,501	873,877	149,533	9,754	51,271	224,355
2012	127,555	2,136,476	778,158	130,734	420,344	34,747	153,248
2013	136,805	2,849,683	865,295	110,515	6,126	30,725	216,791
2014	163,895	2,020,309	706,630	283,421	679,126	63,482	172,887
2015	146,859	1,591,505	669,483	121,193	39,690	84,015	125,095
2016	176,898	1,921,748	994,760	168,297	1,364,849	72,329	161,027
2017	263,014	3,093,735	1,829,931	166,320	166,529	73,313	419,099
2018	161,831	1,612,688	928,664	136,347	689,607	57,893	168,798
2019	219,624	1,402,925	842,041	86,401	42,353	45,560	113,256
2020	162,252	692,602	262,439	107,680	207,942	33,550	23,512
2021	124,845	153,718	146,197	37,255	22,181	31,796	23,170
2022[a]	44,581	437,032	236,953	92,101	151,737	12,025	22,075

Source: JTC 2022.

[a] Numbers are preliminary.

Appendix C2.–Commercial, subsistence, and sport harvest of Chinook salmon in the Alaska portion of the Yukon River drainage, 2003–2021.

	Tanana River			Yukon River without Tanana			Total Alaska Yukon River		
Year	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport	Commercial	Subsistence	Sport
2003	1,813	2,145	2,153	39,305	54,814	566	41,118	56,959	566
2004	2,057	1,388	1,319	54,886	54,325	194	56,943	55,713	194
2005	453	1,828	483	31,886	51,581	0	32,339	53,409	0
2006	84	1,229	638	46,562	47,364	101	46,646	48,593	101
2007	281	1,717	549	34,202	53,457	411	34,483	55,174	411
2008	0	605	254	4,641	44,581	155	4,641	45,186	155
2009	0	1,285	836	316	32,520	27	316	33,805	27
2010	0	1,143	313	9,897	43,416	161	9,897	44,559	161
2011	0	1,367	372	82	39,613	102	82	40,980	102
2012	0	627	114	0	29,788	231	0	30,415	231
2013	0	367	11	0	12,166	155	0	12,533	155
2014	0	283	0	0	3,003	0	0	3,286	0
2015	0	440	13	0	7,137	0	0	7,577	0
2016	0	816	20	0	20,811	0	0	21,627	0
2017	0	778	18	168	37,258	0	168	38,036	0
2018	0	615	200	0	31,197	0	0	31,812	200
2019	0	597	19	3,110	47,782	19	3,110	48,379	38
2020	0	453	49	0	22,215	0	0	22,668	49
2021	0	7	0	0	1,995	0	0	2,002	0
Average									
2011–2020	0	634	82	336	25,097	51	336	25,731	78
2016–2020	0	652	61	656	31,853	4	656	32,504	57

Source: Commercial and subsistence harvest information is drawn from the Yukon River salmon 2021 season summary and 2022 season outlook (JTC 2022).

Source: Alaska Sport Fishing Survey database [Internet]. 2011–2021. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited September 23, 2022). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/.

Appendix C3.–Summary of 2018–2021 salmon escapement counts at various project in the YMA compared to existing goals. Figure 5 is a map of salmon project locations.

Location	Assessment method	Goal type	Goal	2018[a]	2019	2020[b]	2021
			Chinook Salmon				
E. Fork Andreafsky River	Weir	SEG	2,100-4,900	4,114	5,111	–	1,425
Pilot Station	Sonar	none	–	161,831	219,624	162,252	124,845
Gisasa River	Weir	none	–	–	1,328	–	–
Henshaw Creek	Weir	none	–	–	438	–	130
Eagle[e]	Sonar	IMEG (sonar-harvest)	42,500-55,000	57,893	45,560	33,550	31,796
			Summer Chum Salmon				
E. Fork Andreafsky River	Weir	BEG	>40,000	36,330	49,881	–	2,634
Pilot Station	Sonar	Yukon drainagewide BEG[c]	500,000-1,200,00	1,612,688	1,402,925	692,602	153,718
Anvik River	Sonar	BEG	350,000-700,000	305,098	249,014	–	18,819
Gisasa River	Weir	none	–	-	19,099	–	–
Henshaw Creek	Weir	none	–	-	34,342	–	3,729
			Fall Chum Salmon				
Pilot Station	Bayesian	Yukon drainagewide SEG[d]	300,000-600,000 (SEG)	928,664	842,041	262,439	146,197
Teedriinjik River	Sonar	BEG	74,000-152,000	170,413	116,323	–	21,162
Eagle[e]	Sonar	IMEG (sonar-harvest)	70,000-104,000	168,800	113,256	23,512	23,170

[a] Weir inoperable on Gisasa River during 2018 due to high water, and Henshaw River weir not operational.

[b] Gisasa, Teedriinjik, East Fork Andreafsky, and Anvik Rivers and Henshaw Creek salmon enumeration projects not operated in 2020 due to Covid-19 travel restrictions.

[c] Drainagewide escapement based on Pilot Station sonar and Andreafsky River weir estimates minus harvest estimates above the sonar site.

[d] Total drainagewide run size is derived by adding the estimated total harvest (U.S. and Canada) to the estimate of drainagewide escapement.

[e] Salmon passage estimates at Eagle sonar do not represent escapement estimates because some harvest may have occurred between the sonar and the Canadian border.