

Fishery Management Report No. 20-01

**Sport Fisheries of the Northern Kenai Peninsula
Management Area, 2016–2018, with Overview for
2019**

by

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January 2020

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)		General		Mathematics, statistics	
centimeter	cm	Alaska Administrative Code	AAC	<i>all standard mathematical signs, symbols and abbreviations</i>	
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	H_A
gram	g	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	e
hectare	ha	at	@	catch per unit effort	CPUE
kilogram	kg	compass directions:		coefficient of variation	CV
kilometer	km	east	E	common test statistics	(F, t, χ^2 , etc.)
liter	L	north	N	confidence interval	CI
meter	m	south	S	correlation coefficient	
milliliter	mL	west	W	(multiple)	R
millimeter	mm	copyright	©	correlation coefficient (simple)	r
		corporate suffixes:		covariance	cov
Weights and measures (English)		Company	Co.	degree (angular)	$^\circ$
cubic feet per second	ft ³ /s	Corporation	Corp.	degrees of freedom	df
foot	ft	Incorporated	Inc.	expected value	E
gallon	gal	Limited	Ltd.	greater than	>
inch	in	District of Columbia	D.C.	greater than or equal to	\geq
mile	mi	et alii (and others)	et al.	harvest per unit effort	HPUE
nautical mile	nmi	et cetera (and so forth)	etc.	less than	<
ounce	oz	exempli gratia (for example)	e.g.	less than or equal to	\leq
pound	lb	Federal Information Code	FIC	logarithm (natural)	ln
quart	qt	id est (that is)	i.e.	logarithm (base 10)	log
yard	yd	latitude or longitude	lat or long	logarithm (specify base)	log ₂ , etc.
		monetary symbols (U.S.)	\$, ¢	minute (angular)	'
Time and temperature		months (tables and figures): first three letters	Jan, ..., Dec	not significant	NS
day	d	registered trademark	®	null hypothesis	H_0
degrees Celsius	°C	trademark	™	percent	%
degrees Fahrenheit	°F	United States (adjective)	U.S.	probability	P
degrees kelvin	K	United States of America (noun)	USA	probability of a type I error (rejection of the null hypothesis when true)	α
hour	h	U.S.C.	United States Code	probability of a type II error (acceptance of the null hypothesis when false)	β
minute	min	U.S. state	use two-letter abbreviations (e.g., AK, WA)	second (angular)	"
second	s			standard deviation	SD
Physics and chemistry				standard error	SE
all atomic symbols				variance	
alternating current	AC			population sample	Var
ampere	A			sample	var
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				

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**SPORT FISHERIES OF THE NORTHERN KENAI PENINSULA
MANAGEMENT AREA, 2016–2018, WITH OVERVIEW FOR 2019**

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ABSTRACT

This report provides a detailed summary of the sport fisheries in the Northern Kenai Peninsula Management Area for 2017 and 2018, with updates for 2016 and an overview for 2019. Summary information is provided for estimates of effort, catch, and harvest through 2018. The following sport fisheries are included: Kenai River Chinook salmon (*Oncorhynchus tshawytscha*) early and late runs, Kasilof River Chinook salmon early and late runs, Russian River sockeye salmon (*O. nerka*) early and late runs, Kenai River sockeye salmon late run, areawide coho salmon (*O. kisutch*) and pink salmon (*O. gorbuscha*), and resident species including rainbow trout and steelhead (*O. mykiss*), Dolly Varden (*Salvelinus malma*), lake trout (*Salvelinus namaycush*), Arctic grayling (*Thymallus arcticus*), and illegally introduced northern pike (*Esox lucius*). The educational fisheries, guided sport fisheries, various habitat concerns, and Kenai and Kasilof rivers sockeye salmon personal use fisheries are also discussed.

Key words: Northern Kenai Peninsula Management Area, Kenai River, Kasilof River, Russian River, Chinook salmon, *Oncorhynchus tshawytscha*, sockeye salmon, *Oncorhynchus nerka*, coho salmon, *Onchoryncus kisutch*, rainbow trout, *Onchoryncus mykiss*, Dolly Varden, *Salvelinus malma*, northern pike, *Esox lucius*, personal use dip net fisheries, Alaska Board of Fisheries

INTRODUCTION

MANAGEMENT OVERVIEW

This report provides information on the following sport, and personal use fisheries of the Northern Kenai Peninsula Management Area for 2017 and 2018, with updates for 2016 and an overview 2019:

- Kenai River early-run Chinook salmon sport fishery
- Kenai River late-run Chinook salmon sport fishery
- Kasilof River early-run Chinook salmon sport fishery
- Kasilof River late-run Chinook salmon sport fishery
- Russian River early-run sockeye salmon sport fishery
- Russian River late-run sockeye salmon sport fishery
- Kenai River late-run sockeye salmon sport fishery
- Kenai River coho salmon sport fishery
- Northern Kenai Peninsula Management Area coho salmon sport fisheries
- Kenai River resident species sport fishery
- Northern Kenai Peninsula Management Area sockeye salmon personal use fisheries
- Northern Kenai Peninsula Management Area fisheries for illegally introduced northern pike

MANAGEMENT AREA DESCRIPTION

The Northern Kenai Peninsula Management Area (NKPMA) includes all Kenai Peninsula freshwater drainages from the north bank of Ingram Creek south to the south bank of the Kasilof River (Figure 1). Marine waters of NKPMA are all waters from the latitude of East Foreland south to the latitude of the Kasilof River. This area is administered from the Soldotna office of the Alaska Department of Fish and Game (ADF&G).

Larger communities located within the NKPMA include Kenai and Soldotna. Smaller communities are Cooper Landing, Hope, Moose Pass, Nikiski, and Sterling. This management area is linked to the State of Alaska highway system via the Sterling and Seward highways,

which provide sport anglers access to many of the area's major fisheries. Remote areas of the NKPMA (west side of Cook Inlet) can be accessed via boat and wheel- or float-equipped aircraft.

MANAGEMENT PLANS AFFECTING NKPMA FISHERIES

Upper Cook Inlet fisheries (commercial, sport, personal use, and subsistence) have been the focus of intensive, allocative debates for many years. These controversial issues have prompted the Alaska Board of Fisheries (BOF) to establish numerous management plans and regulatory policies that allocate the area's fisheries resources among various user groups. These plans provide for the sustained yield of fishery resources and establish management actions (in specific situations) and guidelines for ADF&G fisheries managers.

Management plans and associated Alaska Administrative Codes (AAC) germane to NKPMA fisheries are as follows:

- *Upper Cook Inlet Salmon Management Plan (5 AAC 21.363)*
- *Kenai River and Kasilof River Early-run King Salmon Management Plan (5 AAC 57.160)*
- *Kenai River Late-run King Salmon Management Plan (5 AAC 21.359)*
- *Kenai River Late-run Sockeye Salmon Management Plan (5 AAC 21.360)*
- *Russian River Sockeye Salmon Management Plan (5 AAC 57.150)*
- *Kasilof River Salmon Management Plan (5 AAC 21.365)*
- *Upper Cook Inlet Personal Use Salmon Fishery Management Plan (5 AAC 77.540)*
- *Riparian Habitat Fishery Management Plan for the Kenai Peninsula Area (5 AAC 56.180)*
- *Riparian Habitat Fishery Management Plan for the Kenai River Drainage Area (5 AAC 57.180)*
- *Kenai River Coho Salmon Management Plan (5 AAC 57.170)*

FISHERIES RESOURCES

The NKPMA offers diverse fishing opportunities for sport anglers. Anglers can target 4 species of Pacific salmon: Chinook (*Oncorhynchus tshawytscha*), sockeye (*O. nerka*), coho (*O. kisutch*), and pink (*O. gorbuscha*) salmon. Fisheries for these species occur primarily in fresh water and to a lesser degree in the salt waters of Cook Inlet. Anglers can also target salmon, rainbow trout (*O. mykiss*), Arctic char (*Salvelinus alpinus*), and Arctic grayling (*Thymallus arcticus*) stocked by the ADF&G Division of Sport Fish (SF) into various landlocked lakes. Popular fisheries for resident stocks of rainbow trout, Dolly Varden (*S. malma*), and lake trout (*S. namaycush*) also occur. Fisheries target naturalized stocks of Arctic grayling and illegally introduced stocks of northern pike (*Esox lucius*) as well. The area's anadromous stocks of Dolly Varden, steelhead (*O. mykiss*), and eulachon (*Thaleichthys pacificus*) also provide NKPMA sport fishing opportunities.

The NKPMA has limited opportunities for marine sport fisheries. Small numbers of anglers target halibut (*Hippoglossus stenolepis*), razor clams (*Siliqua patula*), and several species of hardshell clams in the waters adjacent to the mouths of the Kenai and Kasilof rivers and Cook Inlet waters within the NKPMA management area.

Two runs of wild (not enhanced with hatchery fish) Kenai River Chinook salmon combine to support the largest sport fishery for this species in Alaska. Stocked and naturally produced (a population consisting of both wild fish and naturalized hatchery fish) Chinook salmon runs to Crooked Creek support an early-run fishery in the Kasilof River. A late run composed of wild Chinook salmon also provides sport fishing opportunity at the Kasilof River. Chinook salmon have also been stocked into 1 roadside landlocked lake to provide additional fishing opportunity, primarily during winter months.

The Russian and Kenai rivers support very robust fisheries for both early and late sockeye salmon runs. These wild stocks maintain the largest sockeye salmon sport fisheries in Alaska. The NKPMA also supports personal use sockeye salmon dip net fisheries at the mouths of the Kenai and Kasilof rivers and a personal use set gillnet fishery at the mouth of the Kasilof River. The personal use fisheries on both the Kenai and Kasilof rivers are managed with established seasons and provide sockeye salmon harvest opportunities for Alaska residents.

Wild coho salmon runs to the Kenai River support the largest freshwater coho salmon sport fishery in Alaska. The Kasilof River and numerous smaller streams also support smaller coho salmon sport fisheries. Additional fishing opportunity for coho salmon is provided through a program of stocked landlocked lakes on the Kenai Peninsula.

Pink salmon return in large numbers to NKPMA drainages during even-numbered years. A significant sport fishery for this species occurs on the Kenai River. Harvests in the Kenai River have increased during even years because of liberalized bag and possession limits (6 pink salmon daily). Chum salmon (*O. keta*) runs to NKPMA streams on the east side of Cook Inlet are quite small and provide only minor sport fishing opportunity.

Wild rainbow trout populations occur in numerous lakes and streams throughout the NKPMA. Flowing waters that support major rainbow trout fisheries include the Kenai River, Russian River, and the streams and lakes of the Swanson River and Moose River drainages. The Kenai River supports the largest freshwater sport fishery for rainbow trout in Alaska. To provide alternative fishing opportunities, several landlocked lakes are also stocked with rainbow trout.

Steelhead currently provide sport fishing opportunity in the Kasilof River. Steelhead production is thought to originate from 2 primary sources: 1) a stocked return of this species developed in the 1980s using wild stocks indigenous to Crooked Creek, which was discontinued in 1996 due to excessive straying of hatchery trout into the Kenai River system; and 2) natural production of steelhead in Crooked Creek since 1995. Tributaries of Tustumena Lake (Nikolai and Shantalilik creeks) also maintain wild production and steelhead are also present in the Kenai River.

Dolly Varden are found in most freshwater drainages of the NKPMA. This species supports a major fishery in the Kenai River drainage. Numerous smaller streams and lakes also support Dolly Varden. Isolated populations of Arctic char are common in several lakes. These species provide additional sport angling opportunity at roadside as well as more remote locations.

Lake trout are found primarily in 4 lakes within the NKPMA: Hidden, Kenai, Skilak, and Tustumena lakes, supporting a modest fishery for lake trout, with Hidden Lake receiving most of the fishing effort.

Arctic grayling are present in remote areas of the Kenai River drainage. Arctic grayling were introduced during the early 1950s and now support self-sustaining populations. Estimates from

the ADF&G statewide harvest survey (SWHS¹) of sport fishing anglers indicate Crescent Lake supports modest participation and harvest. To provide additional fishing opportunity for this species, 3 roadside landlocked lakes (Arc, Scout and Tirmore lakes) were stocked with Arctic grayling beginning in 2010.

RECENT SPORT ANGLER EFFORT

Sport angler effort and harvest has been estimated annually since 1977 using the SWHS, a mail survey sent to a large sample of sport fish license holders, and these numbers are typically available in the fall of the following year. Angler effort and harvest for the sport fisheries in the NPKMA is summarized for 1998 through 2018 in Tables 1–5.

In addition to the SWHS, onsite creel surveys have been selectively implemented for fisheries that require inseason or hatchery stock composition information for management purposes. However, the following historical summaries of sport angler effort in the NPKMA are based only on estimates produced from the SWHS except for early- and late-run Chinook salmon, which incorporate inseason creel survey estimates to develop total sport inriver postseason harvest estimates.

From 2009 through 2018, the NPKMA accounted for an average of about 24% of the total statewide sport fishing effort (Table 1). Angler participation in the NPKMA since 2009 increased from a low of 437,422 angler-days in 2010 to a high of 577,890 angler-days in 2014 and has since declined to 432,231 angler-days in 2018 (Table 1, Figure 2).

The Kenai River accounts for the largest sport fishery in the NPKMA. From 2009 to 2018, angler effort varied between 324,532 angler-days in 2018 to 455,578 angler-days in 2014 and accounted for between 73% to 82% of the area's total sport angling effort (Table 1). Historically, as well as today, most of this effort occurs downstream from the Soldotna Bridge (i.e., Sterling Highway Bridge) to Cook Inlet (Table 2). Pacific salmon, rainbow trout, and Dolly Varden are the most abundant species harvested in the Kenai River (Table 3).

Other fresh waters of the Kenai Peninsula support major sport fisheries (Tables 1, 4, and 5) as well. Of these, the Russian River supports the largest fishery (Table 1), with the most participation directed towards early- and late-run sockeye salmon. The Kasilof River supports a major fishery directed at early-run Chinook salmon, as well as fisheries for late-run Chinook salmon and coho salmon. Other significant fisheries include the Swanson River sport fishery, which is primarily directed at coho salmon and rainbow trout; the Quartz Creek fishery for resident species, primarily Dolly Varden; and the NPKMA stocked lakes fishery, which supports much of the area's rainbow trout harvests (Tables 4 and 5). Total sport angling effort in sport fisheries other than the Kenai River, Kasilof River, Swanson River, Quartz Creek, and the stocked lakes has declined from the years prior to 2009 (Tables 1 and 4).

Personal use salmon fisheries at the mouths of the Kenai and Kasilof rivers continue to be popular with the public. From 1998 to 2018, fishing effort averaged 22,766 and 6,260 days fished in the Kenai and Kasilof rivers personal use dip net fisheries, respectively (Table 6). Effort in the Kasilof River personal use gillnet fishery averaged 1,489 days fished during this same time period (Table 6). The harvest of salmon in the Kenai River dip net fishery and Kasilof

¹ Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited November 2016). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.

River gillnet fisheries declined from 2017 to 2018, whereas Kasilof River dip net salmon harvest increased from 2017 to 2018. Sockeye salmon are the predominant species harvested in all NKPMA personal use fisheries (Table 6).

MAJOR RESEARCH ACTIVITIES

Several NKPMA research programs were ongoing during 2017 through 2019:

- 1) Annual stock assessment of both early- and late-run Kenai River Chinook salmon. This program has 3 study components: sonar estimates of abundance of Chinook salmon entering the lower river during both runs; age, gender, and size composition of the Chinook salmon stocks determined by sampling the early- and late-run fish entering the lower river with drift gillnets; and creel surveys to estimate the number of Chinook salmon harvested, as well as catch and fishing effort during the early- and late-run fisheries in the lower river downstream of the Soldotna Bridge. These components provide several indices of run strength that are required for inseason management of the fishery to ensure that the escapement goals, as provided by the Kenai River Chinook salmon management plans, are achieved. The data provided by this program are also used in quantitative stock assessment to construct brood tables necessary to assess spawner–recruit relationships and to evaluate escapement goals.
- 2) ARIS–DIDSON Chinook salmon abundance assessment. In 2002, the deployment and testing of dual-frequency identification sonar (DIDSON) in the Kenai River to assess Chinook salmon passage began as a research project. The findings of this research over the next several years indicated the dual-frequency identification sonar technology had several advantages over split-beam sonar. Importantly, it was used in 2010 through 2012 to estimate Chinook salmon passage. In 2013, an updated version of DIDSON (called adaptive resolution imaging sonar or ARIS) was also deployed at river mile (RM) 13.7. The RM 8.6 site (DIDSON) was the main source of information used to assess run strength through the 2014 season while research to transition upstream to RM 13.7 with ARIS was ongoing. Beginning in 2015, assessment of run strength at RM 8.6 was discontinued and sonar passage was fully transitioned to RM 13.7 with the ARIS system.
- 3) Assessment of early- and late-run Russian River sockeye salmon. A weir was used to determine the early- and late-run sockeye salmon spawning escapements. Scale samples to determine age and size composition of the sockeye salmon stocks were collected at the weir. Statewide Harvest Survey (SWHS) statistics together with weir data allow runs to be reconstructed for the development of a brood table for the early run to assess spawner–recruit relationships. The escapements obtained at the weir since 1963 provide sufficient data to estimate a biological escapement goal (BEG; a goal calculated to provide the greatest potential for maximum sustained yield) for the early-run stock and a sustainable escapement goal (SEG; a level of escapement indicated by an index or estimate) for the late-run stock. Therefore, this program remains ongoing to address inseason conservation issues for both early- and late-run Russian River sockeye salmon stocks.
- 4) Crooked Creek and Kasilof River early-run Chinook salmon enhancement project. Since the creel survey was discontinued after the 2010 season, this program now provides 2 main stock assessment elements: estimates of naturally produced and hatchery-produced Chinook salmon escapement composition as well as estimates of age, gender, and size composition from a weir located at the ADF&G Crooked Creek facility. This facility also allows ADF&G to hold naturally produced broodstock to collect Chinook salmon eggs and milt for stocking.

Smolt are stocked back into the stream of origin the following year to enhance the Kasilof early-run Chinook salmon sport fishery. The data provided by this continuing program are used to evaluate the escapement goal for early-run Crooked Creek Chinook salmon and to supply broodstock for several ADF&G Chinook salmon stocking programs around Kachemak Bay.

- 5) Invasive northern pike distribution and eradication planning. Several projects have been undertaken since 2002 to identify the distribution and reduce the abundance of northern pike and to restore lakes by eradicating northern pike in NKPMA. In addition, multi-agency planning, and public scoping efforts were initiated and completed to address large scale control and eradication of northern pike from selected NKPMA drainages. As of 2017, northern pike were considered to be eradicated from the Kenai Peninsula. Beginning in the spring of 2015, intensive planning and native fish relocation efforts were undertaken for the purpose of 1) re-establishing native fish to the treated water bodies and 2) preparing for long term monitoring of NKPMA waters for pike reintroduction. In the spring of 2019, a small population of northern pike were identified in Vogel Lake and a select few connected water bodies. Subsequent eradication planning has been initiated to be completed in the near future. These projects are an ongoing priority to minimize and eliminate the negative impact of invasive northern pike to production of native fisheries resources of the NKPMA.
- 6) Middle and Upper Kenai River Rainbow Trout Stock Assessment. Two projects were conducted on the mainstem Kenai River using mark and recapture techniques to evaluate abundance and length composition of resident rainbow trout. The first from 2017 to 2018 in the middle river, and the second in 2018 on the upper river. Rainbow trout assessment has been conducted on an irregular cycle as funding is made available in the upper river, and 2017 marked the first study in the middle river. Published results are anticipated for the fall of 2020.

RECENT ALASKA BOARD OF FISHERIES REGULATORY ACTIONS

Below is a summary of regulatory changes from the 2017 UCI BOF meeting:

All Kenai Peninsula Freshwaters

- 1) Swanson River fishing closure from May 1 through June 10.
- 2) In the Kasilof River drainage, retention of rainbow trout and steelhead is prohibited.
- 3) All tributaries of Tustumena Lake are closed to fishing for rainbow trout and steelhead from May 1 through June 10.
- 4) In the Kasilof River, a person may not fillet, mutilate, or otherwise disfigure a Chinook salmon in such a manner that prevents determining whether the fish is a wild or hatchery fish until the person has stopped fishing in the Kasilof River drainage for the day and has moved more than 100 yards away from the Kasilof River.

Kenai River Drainage

- 1) Only king² salmon less than 36 inches may be retained:
 - a) January 1 through June 30 downstream of Skilak Lake.
 - b) January 1 through July 31 downstream of Skilak Lake to the lower boundary of the Slikok Creek king salmon sanctuary.

² Note king salmon are Chinook salmon (*Oncorhynchus tshawytscha*) in the regulatory language.

- c) Bait is prohibited in these waters during the time the size limit is in effect.
- 2) From July 1 to August 15, additional Kenai River shoreline will be closed to fishing on the north bank near Honeymoon Cove at river mile (RM) 13, upstream to approximately RM 14 near Stewarts Landing.
- 3) Coho salmon season shortened upstream of Bings Landing, closing on November 1.
- 4) Gear restricted to only 1 unbaited single-hook artificial lure upstream of Bings Landing from November 1 through December 31.
- 5) Size limit of rainbow trout and Dolly Varden reduced to 1 less than 16 inches in total length in the Kenai River drainage flowing waters.
- 6) The Kenai River flowing waters closed to sport fishing from May 1 through June 10 upstream of the ADF&G markers located approximately 1 mile upstream of the Lower Killey River.
- 7) King salmon sanctuaries in effect from May 1 through July 31.
- 8) All Kenai River tributaries, except for the Russian River:
 - a) closed to fishing for salmon, only 1 unbaited, single-hook, artificial lure, with a gap between point and shank of three-eighths inch or less is allowed.
 - b) closed to all fishing from May 1 through June 10 (see regulatory summary).
- 9) All king salmon sanctuaries and fly-fishing areas (except for the Russian River fly-fishing only area) now changed to artificial fly waters, where only single-hook artificial flies may be used; for this purpose, an artificial fly means a fly that is constructed by common methods known as fly-tying, including a dry fly, wet fly, and nymph, or a bare single hook, and that is free of bait.
- 10) Hidden Lake lake trout restricted to 1 per day, less than 16 inches in total length.
- 11) Liberal pike regulations repealed in Mackey Lakes, Derks Lake, Sevena Lake, and Union Lake.
- 12) Personal use household permits allowed to harvest 1 king salmon 20 inches or greater in length, and up to 10 king salmon under 20 inches in length except in the Kasilof River dipnet fishery.
- 13) The area closed to dipnetting from shore in the Kenai River personal use fishery was increased from the mouth upstream to the Warren Ames Bridge on the north bank, and from the mouth upstream to the Kenai Landing dock on the south bank.

KENAI RIVER CHINOOK SALMON SPORT FISHERIES

2020 PROPOSALS TO THE ALASKA BOARD OF FISHERIES CONCERNING KENAI RIVER CHINOOK SALMON SPORT FISHERY ISSUES

The following proposals published in *The Alaska Board of Fisheries 2019/2020 Proposed Changes in the Subsistence, Personal Use, Sport, Guided Sport, and Commercial Fishing Regulations for Lower and Upper Cook Inlet Finfish, Kodiak Finfish, and Statewide King and Tanner Crab General Provisions*³ will probably have some impact on the sport fisheries targeting Chinook salmon in the Kenai River:

Proposal Numbers: 87, 104, 105, 106, 107, 113, 114, 115, 116, 149, 152.

³ <http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.proposalbook>.

BACKGROUND AND HISTORICAL PERSPECTIVE

Information about harvest, catch, and fishing effort is available from the SWHS and creel surveys conducted in the lower portion of Kenai River (Hammarstrom 1974–1981, 1988–1991, 1992a, 1992b, 1993, 1994; Hammarstrom and Larson 1982–1984, 1986; Hammarstrom et al. 1985; Schwager-King 1993–1995; King 1996, 1997; Marsh 1999, 2000; McKinley and Fleischman 2010; Reimer et al. 2002; Reimer 2003, 2004a, 2004b, 2007; Eskelin 2007, 2009, 2010; Perschbacher 2012a–d, 2014, 2015, *In prep*; Perschbacher and Eskelin 2016; Perschbacher and Eskelin *In prep* a–d; E. Wood, Sport Fish Biologist, ADF&G, Soldotna, personal communication). The 2019 SWHS survey results will not be available until fall of 2020. Chinook salmon catch and harvest data provided for the 2019 season contained in this document were estimated inseason and are considered *preliminary* (emphasis used throughout) until the SWHS results are available.

Chinook salmon return to Kenai River in 2 distinct runs: early and late. The early run usually has “fishable” numbers by mid-May and inriver abundance peaks in mid-June. The majority of the early-run stock has passed through the fishery by late June. Late-run fish are present in July and early August. Early-run Chinook salmon primarily spawn in tributaries to the Kenai River, and most of the spawning occurs in 2 primary tributaries: the Killey and Funny rivers. Late-run Chinook salmon primarily spawn in the mainstem Kenai River.

The sport fishery for Chinook salmon in the Kenai River is internationally recognized due to its proximity to major population centers, relative ease of access, and large Chinook salmon. Consequently, large numbers of anglers participate in this sport fishery every year. Because of the high level of participation in relation to the total number of Chinook salmon in the runs, the fishery is strictly regulated. Chinook salmon fishing is limited to a 50-mile area downstream from Skilak Lake (Figure 3) from January 1 through July 31. By regulation, the early-run Kenai River Chinook salmon fishery ends on June 30. The daily bag and possession limits are 1 Chinook salmon 20 inches or greater in length, with a protective maximum size of retention limit (no retention, must be released) for Chinook salmon greater than 36 inches. From July 1 through July 31 from the mouth of the Kenai River to a marker downstream of Slikok Creek, the bag and possession limit remains the same, but Chinook salmon of any size may be retained. The annual (January 1–December 31) limit is 2 fish. However, Chinook salmon harvested prior to July 1 that are 20 inches or more in length but less than 28 inches in length do not count toward the annual limit of 2 fish.

The majority of the harvest is taken by anglers in boats. After retaining a Chinook salmon that counts toward the annual limit, an angler is prohibited from fishing from a boat in the Kenai River downstream from Skilak Lake for the remainder of that day.

The Kenai River Chinook salmon fishery supports an industry that provides sport fishing guide services. Since 1982, guides have been required to register with the Alaska Department of Natural Resources (DNR). Guided anglers are more intensively regulated than unguided anglers. This is due, in part, to the guided angler’s greater harvest efficiency and the general concern regarding harvest parity between guided and unguided anglers.

Nearly all of the river area available to Chinook salmon fishing is managed as a state park by the DNR Division of Parks and Outdoor Recreation (DPOR). In 1986, DPOR reduced the maximum size of outboard motors that could be legally used on the river to 50 horsepower. In 1987, the maximum legal horsepower was further reduced to 35 horsepower. In 2008, a DPOR regulation

became effective that raised the maximum size of outboard motors that can be legally used on the river to 50 horsepower, provided those greater than 35 horsepower be 4-stroke or 2-stroke direct fuel injection (DFI) outboard motors. In addition, during the month of July, all outboard motors operating on the Kenai River must be 4-stroke or 2-stroke DFI. This regulation expired after the 2012 season and beginning in 2013, all outboard motors operating on the Kenai River must be 4-stroke or 2-stroke DFI year-round. There is no evidence to indicate that the change in horsepower changed angler efficiency.

Under current BOF policy, the early run is managed for the inriver sport and guided sport fishery. Although harvest is known to be relatively minor, early-run fish are intercepted in the mixed-stock Cook Inlet marine sport fishery prior to their entry into the Kenai River (Begich 2007, 2010a). In addition, there are small numbers of early-run Chinook salmon harvested in the Kenaitze Indian Tribe educational fishery (Table 7). Commercial harvests of early-run Chinook salmon are considered insignificant. By regulation, drift gillnetting in the Central District does not commence until the third Monday in June or June 19, whichever is later, and the Eastside setnet fishery does not commence until June 25 or if 50,000 sockeye have been estimated to have passed the Kasilof River sonar by June 20 in the Kasilof Section.

In 1984, ADF&G implemented an experimental sonar program to determine the number of Chinook salmon that return to Kenai River. From 1984 to 1994, the sonar counter used dual-beam transducer technology. Beginning in 1995 to 2010, the sonar program adopted split-beam technology to improve the estimation of Chinook salmon returning to the Kenai River using a target strength sonar (TS-based) estimate.

Uncertainty in sonar estimates due to problems differentiating between the various salmon species migrating together in the Kenai River has necessitated employing several different methods to better separate Chinook salmon from the more numerous sockeye salmon in the final estimates (Bosch and Burwen 2000). Since inception, the sonar program has continuously evolved. The focus of this work has been to investigate limitations of the technology to classify species detected by sonar and to address the bias in the estimates of Chinook salmon passage that are used to manage the stocks. Annual experiments to assess the utility of new sonar technology, such as dual-frequency identification sonar (DIDSON), as well as re-evaluation of split-beam technology have been undertaken. The first DIDSON trials initiated in 2002 showed promise for distinguishing between large and small fish, however the technology did not have the capability to monitor the entire distance across the Kenai River. Testing and development of DIDSON for the Kenai River Chinook salmon stock assessment program continued and resulted in the successful deployment of DIDSON operated simultaneously with split-beam sonar in 2011.

Results of these studies led to a declining confidence in TS-based estimates of run strength. Methods were developed to improve the information about the Chinook salmon passage rate into the Kenai River. During 2002, ADF&G began generating a split-beam sonar-based echo length standard deviation (ELSD) estimator of Chinook salmon passage thought to be superior at differentiating between salmon species. In addition, ADF&G standardized the Chinook salmon test-netting program conducted at the sonar station, which allowed a net-apportioned split-beam sonar estimate of the rate of daily Chinook salmon passage to be calculated. This suite of Chinook salmon sonar passage estimates, in combination with the Chinook salmon abundance indices of catch per unit effort (CPUE) in the lower river creel survey and in the test netting program, helped to evaluate the accuracy of the TS-based sonar estimates of Chinook salmon passage.

At the February 2011 Alaska Board of Fisheries (BOF) meeting, ADF&G revised the escapement goal from a biological escapement goal (BEG) to a sustainable escapement goal (SEG) because of the uncertainty in the evaluation of escapement and the lack of stock-specific information in the commercial harvest. At this same meeting, ADF&G reported that it had decided to discontinue the use of TS-based estimates of inriver run in favor of abundance indices (described below) and to continue development of a new assessment utilizing DIDSON. Because the TS-based estimates were known to overestimate abundance, and the source of the bias was identified as the imprecision in the estimates of fish length that the split-beam technology provided, use of TS-based estimates for inseason management was discontinued starting in 2011. The ELSD-based estimates, the net apportioned estimates, as well as creel and netting CPUE estimates, were used to assess inseason run strength. Following the 2011 season, it was determined the ELSD-based estimates, based on split-beam technology, also provided Chinook salmon passage estimates that were imprecise and the bias could not be corrected inseason. In 2012, the development of a new assessment utilizing DIDSON continued. The 2012 inseason run assessment utilized minimum management objectives for each index set at average values for the index when the inriver sport fishery was restricted historically to achieve adequate Chinook salmon escapements. Minimum inseason management objective values were set for DIDSON net-apportioned estimates, and creel, netting, and commercial Eastside set gillnet CPUE estimates. In addition, DIDSON estimates served as an index for comparison to the 2010 and 2011 runs when DIDSON was also operated.

During 2012, several alternative sonar sites that were above tidal influence were evaluated in the lower Kenai River. A site was selected near RM 13.7 and DIDSON was operated during the Chinook salmon runs in 2013 and 2014 as part of the sonar research program to move upstream above tidal influence to achieve a more accurate inseason assessment of both the early and late runs.

Following the 2012 season, several agenda change requests (ACR) were submitted by the public to the BOF at the October 2012 work session to address inseason Kenai River Chinook salmon management by changing the *Kenai River Late-run King Salmon Management Plan*. ADF&G also submitted an ACR to replace the late-run Chinook salmon SEG (17,800–35,700 fish) present in the management plan with a DIDSON-based escapement goal described as “transitional.” The purpose of the transitional goal was to provide the primary management objective for the fishery during the period when existing sonar, independent mark–recapture, and alternative sonar site research was ongoing. In March of 2013, the BOF replaced the SEG contained in the management plan with the transitional DIDSON-based SEG of 15,000 to 30,000 fish recommended by ADF&G (Fleischman and McKinley 2013).

Beginning in 2015, the sonar site at RM 13.7 became the primary enumeration site for Chinook salmon using the ARIS sonar to directly count large Chinook salmon defined as salmon greater than 75 cm (about 34 in) in length. This method allows ADF&G to directly estimate the number of large Chinook salmon migrating upstream without the need for an apportionment program for speciation. The large-fish-based assessment was fully adopted for the 2017 season. Estimates of Chinook salmon abundance of fish of all sizes are generated post-season to continue monitoring overall population numbers for the early and late run (Appendices B1 and B2).

Total Kenai River Chinook salmon sport fish harvest declined steadily from 1993 through 1998, then rebounded from 1999 through 2012 (Begich et al. 2017; Table 3). The most recent 5-year (2014–2018) average Kenai River Chinook salmon sport fish harvest from both runs combined

was 5,117 fish. Sport harvest and inriver abundance of Kenai River Chinook salmon have declined since 2006 (Table 3). Since 2015, there have been improvements in early and late Chinook salmon runs, although both remain well below the 20-year average (1999–2018) total runs of 7,896 and 40,064 large fish, respectively (Tables 7 and 8).

The BOF adopted several regulations affecting both the early-and late-run Kenai River Chinook salmon fisheries at the 2017 UCI BOF meeting. The early-run Chinook salmon management plan was heavily revised to be more conservative with a series of step-down management actions, adoption of an optimal escapement goal (OEG), and implementing a maximum size limit for retention of 36 inches while limiting gear to 1 unbaited, single hook or artificial lure for the duration of the early-run fishery. Additionally, the early-run fishery gear and size limit was extended to July 31 upstream of the lower Slikok Creek sanctuary marker. Both the *Kenai River and Kasilof River Early-run King Salmon Management Plan* and the *Kenai River Late-run King Salmon Management Plan* were modified by adopting escapement goals that incorporate only large Chinook salmon or fish that are 75 cm mid eye to tail fork (METF) in length or longer. This moves away from the all-sized fish goals used since sonar estimation began on the Kenai River. The new early-run SEG is 2,800 to 5,600 large fish and the BOF adopted an OEG of 3,900 to 6,600 large fish. The late-run escapement goals were modified by removing the inriver objective and implementing an SEG of 13,500 to 27,000 large fish (Fleischman and Reimer 2017).

KENAI RIVER EARLY-RUN CHINOOK SALMON

Fishery Management Objectives

In 1988, the BOF adopted the first management plan for early-run Kenai River Chinook salmon. Since 2017, this plan has mandated an optimum escapement goal (OEG) of 3,900 to 6,600 large fish and an SEG of 2,800 to 5,600 large fish. Currently, the *Kenai River and Kasilof River Early-Run King Salmon Management Plan* (Alaska Administrative Code 5 AAC 57.160) also identifies the possible management actions that can be implemented at given escapement levels. The original and current plan both enforce fishing without bait to reduce angler efficiency.

The *Kenai River and Kasilof River Early-run King Salmon Management Plan* implements restrictions to the sport fishery in a step-down fashion beginning pre-season based upon ADF&G forecast. When the forecasted inriver run is below the SEG range, the sport fishery will be closed. If the forecasted inriver run is above the lower end of the SEG and below the lower end of the OEG, the fishery may be closed or restricted to nonretention. When the forecasted inriver run is within or exceeds the OEG, the fishery may start as described in the regulation summary booklet. In-season management guidelines are also described as follows: when the in-season inriver projection is below the OEG, the fishery will close; when the in-season inriver projection is within the OEG, the fishery may proceed as described in the regulation summary booklet or be restricted to nonretention; if the in-season inriver projection exceeds the OEG, then the fishery may be liberalized from the mouth of the Kenai River to the ADF&G marker below Slikok Creek by allowing the use of bait or modifying the maximum size limit; from an ADF&G marker 300 yards downstream of Slikok Creek to the outlet of Skilak Lake, the fishery may proceed under general regulation (5 AAC 57.120).

By regulation, the fishery begins without the use of bait and is limited to the use of only 1 single hook or artificial lure. Fishing from guided vessels is not allowed on Sundays and Mondays, and fishing from motorized vessels is not allowed on Mondays, except Memorial Day.

Inseason Management Approach

The primary objective of inseason management is to achieve a spawning escapement within the OEG range of 3,900 to 6,600 large early-run Chinook salmon utilizing management steps as prescribed by the *Kenai River and Kasilof River Early-run King Salmon Management Plan* (5 AAC 57.160). Achievement of this objective requires information on the daily number of early-run Chinook salmon entering the river (inriver run), and daily sport harvest information. Spawning escapement is calculated as the inriver run minus sport harvest including release mortality. The inriver run estimate is obtained with sonar, and harvest information is obtained with ADF&G creel surveys. Management steps are instigated in conjunction with these assessments of spawning escapement to achieve the OEG.

Prior to 2015, the DIDSON Chinook salmon passage estimate at RM 8.6, supplemented with indices of abundance, was used to assess the inriver run. Beginning with the 2015 season, the assessment of inriver run was transitioned to ARIS sonar at RM 13.7. Sonar is usually operational on May 16 and the early-run Chinook salmon run is assessed daily through June 30. The early-run Kenai River Chinook salmon fishery ends by regulation on June 30. Estimates from the netting and sport harvests are available daily. The sonar estimates for large Chinook salmon (750 mm or 34 inches total length or greater) are available daily; however, total Chinook salmon passage estimates are not, due to a variety of factors affecting sonar data processing.

Harvest is estimated inseason by an onsite creel survey. This survey begins on or about mid-May, as soon as water levels rise sufficiently to permit anglers and ADF&G staff to safely use boats on the lower Kenai River downstream of the Sterling Highway Bridge. Harvest estimates are typically generated as needed by managers, but daily estimates can be calculated if required for management actions.

A preliminary estimate of spawning escapement is projected inseason using a mean run-timing model. This estimate is based on the projected inriver run minus the projected harvest (including Chinook salmon mortality associated with catch-and-release fishing).

In order to publicize fishery information, the Soldotna ADF&G office has 2 recorded message phone lines. One phone line provides a general weekly fishing forecast and the other offers a brief summary of the daily weir counts and sonar passage estimates for major Kenai Peninsula fisheries. A brief summary of the early-run fishery status is provided on the message phone as well. The message phone lines may receive several hundred calls daily during the peak of the fishery. The message phone gives the public reliable access to fishery information and increases the efficiency of the Soldotna ADF&G staff. The sonar passage estimates and status of inseason management are relayed to the public on the phone system daily. A complete run assessment summary is also posted on the sport fish “fish count” web page: <http://www.adfg.alaska.gov/sf/FishCounts/>) and can be accessed by a data query for Kenai River Chinook salmon. The summary is posted at least twice weekly throughout the season. This complete summary provides information on the status of the run including passage estimates and ADF&G’s assessment of run strength, inseason management action status, fishery update, water conditions, as well as comparative data supporting the assessment project over the most recent 10 years. The summary can also be accessed from the sport fish “Information by Area” web page for the Northern Kenai Peninsula: <http://www.adfg.alaska.gov/index.cfm?adfg=byAreaSouthcentralUpperKenai.fishingInfo#/fishcounts>. The public is also kept informed about the fishery via news releases to newspaper, radio, and TV news media. News releases and the resulting requests for interviews from print,

radio, and television broadcast media are commonly conducted because they distribute relevant information quickly regarding the status of the fishery and pending management actions.

Restrictive management actions in this fishery are socially and economically disruptive. These disruptions may be minimized by informing the public in a timely and efficient manner. Prior to any likely change in management action, continuous updates regarding the status of the fishery are provided in all available forums. Whenever possible, the staff of ADF&G strive to issue formal announcements (news releases) regarding EOs that change the management of the fishery at least 24 hours before a given action becomes effective.

2016 Fishery Performance Update

The 2016 preseason forecast of 5,206 fish of all sizes for the inriver early run of Chinook salmon was similar to the 2015 forecast and still well below average run strength and less than the OEG of 5,300 to 9,000 fish of all sizes (T. McKinley, Sport Fish Biologist, ADF&G, Anchorage, personal communication) . Consequently, the fishery began restricted, and as the run materialized stronger than forecasted, the fishery was liberalized. The estimates of all-size inriver run and escapement were 9,866 and 9,690 Chinook salmon, respectively (Appendix B1). This was an improvement from previous years that had seen extensive management restrictions and the lowest abundance estimates in the historical data set (Appendix B1).

2017 Fishery Performance

The 2017 preseason forecast for the inriver run of early-run Chinook salmon was approximately 6,500 large fish and the fishery opened under general regulations (R. Begich, Sport Fish Biologist, ADF&G, Soldotna, personal communication). An EO was issued on June 12 that increased the maximum size of less than 36 inches total length, to a maximum size of less than 46 inches total length below the ADF&G marker at Slikok Creek effective June 13 (EO 2-KS-1-14-17; Appendix A1). The fishery was further liberalized by allowing the use of bait from the Kenai River mouth to the marker downstream of Slikok Creek, effective June 21 (EO 2-KS-1-15-17; Appendix A1). The inriver run estimate for the early run was 7,341 large fish through June 30 (Table 7). Following postseason analysis of ARIS sonar data (RM 13.7) and netting data, the total run estimate was 7,410 large fish (Table 7). Based on inseason assessment information, the midpoint of the 2017 early run was June 10 and was 1 day early compared to typical run-timing through June 30. After a high from 2003 to 2007 and a low from 2012 to 2014, estimated escapement in 2017 (6,703 large fish) exceeded the escapement goal range with liberalized regulations (Table 7). The age composition information from ASL sampling inriver showed that approximately 76% of the early run was composed of ocean-age-2 and -3 Chinook salmon. Whereas ocean-age-4 fish accounted for about 24% of the early run (E. Wood, Sport Fish Biologist, ADF&G, Soldotna, personal communication).

2018 Fishery Performance

The 2018 preseason forecast of the Chinook salmon early run was approximately 5,499 large fish and the fishery opened under general regulations (R. Begich, Sport Fish Biologist, ADF&G, Soldotna, personal communication). The fishery was closed to the retention of Chinook salmon from the mouth of the Kenai River to the outlet of Skilak Lake, effective June 13 (EO 2-KS-1-13-18, Appendix A2). The fishery was closed to sport fishing for Chinook salmon from the Kenai River mouth to the marker below Slikok Creek effective June 20 through June 30 and from the marker downstream of Slikok Creek to the outlet of Skilak Lake effective June 20

through July 31 (EO 2-KS-1-20-18). The fishery remained closed in response to low abundance estimates and the need to conserve Chinook salmon to meet the escapement goal. The resulting spawning escapement estimate was 2,893 large fish through June 30 and a total run estimate of 3,063 large fish (Table 7). Based on the sonar data, the midpoint of the run at the RM 13.7 sonar site was June 10, approximately 1 day earlier than the mean midpoint of sonar data collected at RM 13.7. In combination, all data indicated the 2018 inriver run of large Chinook salmon was well below average and warranted restrictive management actions as the lower bound of the OEG was not achieved (Table 7). *Preliminary* estimates of the age composition showed a notable absence of larger older Chinook salmon during the inriver ASL sampling with ocean-age-3 and -4 fish accounting for nearly 66% of the run whereas ocean-age-2 Chinook salmon increased to 30% of the run. The remaining composition was made up of ocean-age-1 fish (E. Wood, Sport Fish Biologist, ADF&G, Soldotna, personal communication).

2019 Fishery Overview

The 2019 preseason forecast of the Chinook salmon early run was approximately 3,168 large fish, which is below the OEG (3,900–6,600 large fish) and within the SEG (2,800–5,600 large fish) (R. Begich, Sport Fish Biologist, ADF&G, Soldotna, personal communication). As directed by the management plan, the fishery opened under catch-and-release restrictions effective May 1 (EO 2-KS-1-09-19; Appendix A3). The fishery remained under this restriction until June 30 at which time the fishery transitioned to late-run Chinook salmon management. The resulting *preliminary* inriver run estimate was 4,173 large fish through June 30 (Table 7). Based on the sonar data, the midpoint of the run at the RM 13.7 sonar site was June 10, approximately 1 day earlier than the mean midpoint of sonar data collected at RM 13.7. In combination, all data indicated the 2019 inriver run of large Chinook salmon was well below average and warranted restrictive management actions because the lower bound of the OEG was narrowly achieved (Table 7). *Preliminary* estimates of the age composition showed a continued decline in the number of larger older Chinook salmon during the inriver ASL sampling, with ocean-age-3 and ocean-age-4 fish accounting for nearly 72% of the run whereas ocean-age-2 Chinook salmon increased to 13% of the run. The remaining composition was made up of ocean-age-1 and -5 fish (E. Wood, Sport Fish Biologist, ADF&G, Soldotna, personal communication).

KENAI RIVER LATE-RUN CHINOOK SALMON

Fishery Management Objectives

The Kenai River late-run Chinook salmon fishery is managed according to provisions of the *Kenai River Late-Run King Salmon Management Plan* (5 AAC 21.359). Late-run stocks of Kenai River Chinook salmon are caught by the commercial drift gillnet fishery and the commercial set gillnet fishery along the east side of Cook Inlet, both of which target sockeye salmon. Harvest also occurs in the Kenai River personal use dip net fishery, which also targets sockeye salmon. The commercial fisheries that intercept late-run Kenai River Chinook salmon are managed under provisions of the *Kenai River Late-Run Sockeye Salmon Management Plan* (5 AAC 21.360). Incidental commercial harvests of Chinook salmon stocks have been the subject of intense allocation debates among sport and commercial user groups since the early 1980s. As a result, the *Kenai River Late-run Sockeye Salmon Management Plan* contains provisions to reduce incidental harvests of Kenai River-bound Chinook salmon.

The current management objective, as outlined in the *Kenai River Late-Run King Salmon Management Plan*, is to achieve adequate escapement defined as a sustainable escapement goal from 13,500 to 27,000 large Chinook salmon (≥ 75 centimeters or 34 inches in total length).

Inseason Management Approach

Inseason management to achieve adequate escapement of late-run Chinook salmon requires a daily estimate of the number of late-run Chinook salmon entering the river, an estimate of the inseason harvest, the ability to project (predict) the total inriver run and to estimate what the total inriver harvest and the spawning escapement will be.

Late-run sonar estimates begin when the late-run fishery opens by regulation (July 1) and conclude by mid-August. The passage of late-run Chinook salmon into the river is estimated by sonar at RM 13.7. The number of Chinook salmon entering the river is estimated by ARIS and may be supplemented with 4 indices of run strength. Estimates of run strength available to management staff on a daily basis include the ARIS-based estimates of fish greater than about 34 inches in total length, estimates of CPUE from creel surveys, and test netting and eastside set gillnet CPUE. The large numbers of sockeye salmon migrating during the late run complicate estimation of Chinook salmon passage with sonar. Consequently, alternative techniques for estimating run strength are also used. Such techniques include estimates based on historical exploitation rates in the sport fishery and historical exploitation rates in the commercial set gillnet fishery. Since 2010, Chinook salmon from the Upper Cook Inlet Eastside set gillnet (ESSN) commercial fishery have been sampled for genetic tissue to determine stock of origin of these harvests. Findings by Eskelin et al. (2013b) and Eskelin and Barclay (2015, 2016) indicate the contribution of Kenai River mainstem Chinook salmon stocks to the ESSN fishery averaged across all years (2010–2015) was approximately 69% of the total ESSN harvest. Therefore, inseason estimates of run strength based on Chinook salmon harvests by the ESSN fishery have been refined by these data.

The sport fishery that occurs in about 13 miles of the lower Kenai River between RM 5 at Warren Ames Bridge upstream to Slikok Creek located at RM 18 is the predominant source of inriver sport harvest. Upstream of RM 18, regulations are restrictive and EO closures above RM 18 from 2011 to 2015 have prohibited sport fishing for Chinook salmon. The harvest in this lower river area is estimated by an onsite creel survey. Harvest above this lower river area, when Chinook salmon fishing is allowed, is estimated with the SWHS. The late-run creel survey begins July 1 and continues until the end of the fishery. The fishery is closed by regulation on July 31. However, the duration of the fishery may be adjusted by emergency order predicated on the magnitude of the inriver run. Harvest estimates are typically available at the previously mentioned informational outlets twice weekly; however, daily estimates may be calculated when needed to aid fishery managers.

The spawning escapement is projected inseason by applying sonar count data to a historical, run-timing model. Spawning escapement is the inriver run (from sonar) less the projected sport harvest (from creel survey). The projected sport harvest includes estimated mortality associated with catch-and-release fishing estimates (Bendock and Alexandersdottir 1992). For the late-run stock assessment, the escapement estimate includes an additional 4% of the cumulative sonar passage to account for spawning downstream of the sonar, which was estimated from tagging studies of late-run Chinook salmon by Reimer (2013).

Historically, when stock assessment was made using RM 8.6 run strength, a spawning escapement estimate could be projected with reasonable accuracy by approximately the third week in July. However, findings show that information for inseason management based on the RM 13.7 sonar will be delayed as fish transit the 5 additional miles upstream before abundance is estimated. This is especially true during the late run in July, when Chinook salmon exhibit less consistent upstream migration, which seems to slow or pause as Chinook salmon transit through the lower river section. Radiotelemetry results from Reimer (2013) were consistent with these findings. For managing the fishery, the main difference between using the different sonar sites is that the run-timing midpoint based on mean run timing at the RM 8.6 sonar is July 21. At the RM 13.7 site, the run-timing midpoint does not occur until July 26, and only approximately 37% of the run has passed the RM 13.7 site by July 21. Late-run management decisions cannot be delayed, so inseason projections based on RM 13.7 passage are made on a smaller fraction of the run than they were historically and are therefore more uncertain. Because management actions cannot be postponed, the error associated with inseason projections of run strength and escapement are now greater than the error associated with historical management actions. Inseason assessment was based on RM 8.6 through the year 2014; beginning in 2015 and thereafter, the assessment fully transitioned to RM 13.7.

The sport fishery for late-run Chinook salmon in the Kenai River is one of the largest in the state and is quite possibly the most controversial fishery in Alaska. The inriver sport fishery as well as Cook Inlet marine sport and commercial fisheries, educational fisheries, and personal use fisheries all harvest late-run stocks. ADF&G's interaction with the user groups affected by management decisions is critical to the successful implementation of any inseason management action.

The Soldotna SF office distributes information about the late-run Kenai River Chinook salmon fishery in a similar manner as described above for Kenai River early-run Chinook salmon.

2016 Fishery Performance Update

The 2016 late-run Chinook salmon fishery began restricted, by prohibiting the use of bait, but was quickly liberalized back to general regulation after the first week of July because inseason assessment predicted a stronger than forecasted run of 30,000 fish of all sizes, and that the run would achieve the interim SEG of 15,000–30,000 fish of all sizes. The spawning escapement estimate was 22,420 fish of all sizes (Appendix B2). The 2016 total run was above the forecast at 32,432 fish of all sizes but is still below the long-term average of 34,386 fish of all sizes (Appendix B2).

2017 Fishery Performance

During 2017, the preseason forecasted run size was approximately 33,000 large Chinook salmon (R. Begich, Sport Fish Biologist, ADF&G, Soldotna, personal communication), and as such, the fishery opened under general regulation. Inseason projections continued to indicate achievement of the escapement goal under general regulation and no further management actions were taking on the late run for the 2017 season, which closed by regulation on July 31.

After accounting for harvest (including catch-and-release mortality) above the sonar of approximately 2,452 large fish, the spawning escapement estimate was 20,501 large Chinook salmon, and a total run estimate of 30,702 large fish (Table 8). The *preliminary* sport fishing mortality (including catch-and-release mortality) was 6,670 Chinook salmon. The reported

harvest by the ESSN fishery was 2,998 large Chinook salmon and an additional 145 large Chinook salmon were harvested in the drift gillnet fishery (Table 8). *Preliminary* estimated age composition of the run was 0.4 % ocean-age-1, 5.9% ocean-age-2, 87% for ocean-age-3 and -4, and 3.1% ocean-age-5 Chinook salmon (E. Wood, Sport Fish Biologist, ADF&G, Soldotna, personal communication).

2018 Fishery Performance

The preseason forecast was for an inriver run of approximately 21,503 large late-run Kenai River Chinook salmon (R. Begich, Sport Fish Biologist, ADF&G, Soldotna, personal communication). This forecasted run strength was within the SEG (13,500–27,000) but due to the poor performance of the early run, the fishery was restricted to prohibit the use of bait from the Kenai River mouth to the marker downstream of Slikok Creek, effective July 1 (EO 2-KS-1-25-18; Appendix A2). Additionally, retention of Chinook salmon was prohibited in the personal use dip net fishery, effective July 10 (EO 2-KS-1-29-18). By July 14, the RM 13.7 passage estimate of late-run Chinook salmon was 2,770 large fish. Inseason projections indicated that continued harvest would likely result in not achieving the lower end of the escapement goal. Consequently, EOs were issued to prohibit the retention of Chinook salmon in the Kenai River sport fishery (EO 2-KS-1-41-18) effective July 18, 2018. The fishery would remain at nonretention until it closed by regulation on July 31.

The postseason estimate of the spawning escapement was 17,279 large Chinook salmon (Table 8). The estimate of inriver sport fishing mortality (including catch-and-release mortality) was 434 Chinook salmon. The reported harvest in the ESSN fishery was 555 Chinook salmon (Table 8). The sum of the sonar passage estimates and harvests below the sonar resulted in a total run estimate that was less than forecast and was approximately 17,803 late-run Chinook salmon (Table 8). The age composition estimates from inriver ASL sampling of the run indicated 64.1% of the run was composed of ocean-age-3 and -4 fish, whereas ocean-age-5 fish accounted for 1.3% of the run, and ocean-age-2 fish accounted for 31.4% of the run (E. Wood, Sport Fish Biologist, ADF&G, Soldotna, personal communication).

2019 Fishery Overview

The preseason forecast was for an inriver run of approximately 21,700 large late-run Kenai River Chinook salmon. This forecasted run strength was within the SEG (13,500–27,000) but due to the recent years of low production and an expected weak return, the fishery was restricted to prohibit the use of bait from the Kenai River mouth to the ADF&G marker located downstream of Slikok Creek, effective July 1 (EO 2-KS-1-23-19; Appendix A3). Additionally, retention of Chinook salmon was prohibited in the personal use dip net fishery, effective July 10 (EO 2-KS-1-30-19). By July 14, the RM 13.7 passage estimate of late-run Chinook salmon was 3,021 large fish. Inseason projections indicated that continued restriction would likely allow the SEG to be achieved. By July 28, the RM 13.7 passage estimate was 8,373 large fish and projections indicated the SEG would be achieved. The fishery closed by regulation on July 31. From August 1 through the second week of August, the daily passage entered a steep decline that continued through the last day of sonar operation. This prompted ADF&G, in an effort to minimize Chinook salmon mortality from incidental catch, to restrict the coho salmon fishery by prohibiting the use of bait effective August 6 (EO-KS-1-44-19; Appendix A3). The absence of the expected last portion of the Chinook salmon run occurred during a time when management

actions were very limited in their impact on achieving the SEG. The SEG was not achieved in 2019.

The *preliminary* inriver run estimate was 11,671 large Chinook salmon (Table 8). The *preliminary* reported harvest in the ESSN fishery was 613 large Chinook salmon (Table 8). The *preliminary* age composition estimates from inriver ASL sampling of the run indicated 70.3% of the run was composed of ocean-age-3 and -4 fish, whereas ocean-age-5 fish accounted for 1.1% of the run, and ocean-age-2 accounted for 22.3% of the run (E. Wood, Sport Fish Biologist, ADF&G, Soldotna, personal communication).

CURRENT ISSUES

A major issue for the management of both the early and late runs is having accurate estimates of total run and escapement, and having a harvestable surplus available to the various fisheries. Management plans for each run are essential to the biological management of the fisheries. Plans established sustainable escapement goals for each fishery and outline management strategies to achieve these goals. Recent changes to the assessment techniques such as the transition to ARIS at RM 13.7 have made these techniques seem subjective by some of the public. In addition, the decline in Chinook salmon total runs following 2007 has been exacerbated by numerous biological issues that have, to some extent, been present in the fisheries for several years. These issues include addressing adequate protections for spawning fish as well as for unique (to the Kenai River), larger-sized ocean-age-4 and -5 fish, marine harvests in the ESSN commercial fishery, habitat impacts by a robust inriver fishery, and an increase in the numbers of small younger Chinook salmon in annual runs. The social issues that have persisted throughout the development of the fisheries remain and include the allocation of the harvestable surplus between the inriver sport and commercial fisheries (primarily the ESSN fishery), competition between guided and nonguided anglers, as well as numerous and complex inriver sport fishing regulations. These social issues are magnified when inseason restrictions are implemented because restrictions are disruptive to unguided anglers, guided anglers, and businesses that derive income from these fisheries.

RECOMMENDED RESEARCH AND MANAGEMENT

ADF&G is closely monitoring biological and management performance of the large fish escapement goals since their establishment in 2017. Specifically monitoring the performance of the major changes to the early-run management scheme will require several more years of data to assess to success or short comings of the plan. The continuation of the annual assessment of Chinook salmon of all sizes remains important and will continue in order to evaluate spawner–recruit and sibling relationships between cohorts so that production can be monitored under the new management regime and variable environmental factors. Management should remain conservative as evaluation of new assessment methods and management plans continues.

KASILOF RIVER CHINOOK SALMON SPORT FISHERY

2020 PROPOSALS TO THE ALASKA BOARD OF FISHERIES CONCERNING KASILOF RIVER CHINOOK SALMON SPORT FISHERY ISSUES

The following proposals published in *The Alaska Board of Fisheries 2019/2020 Proposed Changes in the Subsistence, Personal Use, Sport, Guided Sport, and Commercial Fishing Regulations for Lower and Upper Cook Inlet Finfish, Kodiak Finfish, and Statewide King and*

*Tanner Crab General Provisions*⁴ will probably have some impact on the sport fisheries targeting Chinook salmon in the Kasilof River:

Proposal Numbers: 87, 143.

BACKGROUND AND HISTORICAL PERSPECTIVE

The hatchery stocks of early-run Chinook salmon that return to the Kasilof River were originally developed from wild fish in Crooked Creek, a tributary to the Kasilof River, approximately 6 miles upstream from Cook Inlet (Figure 4). The Kasilof River also supports a wild stock of late-run Chinook salmon. The early run usually supports the larger inriver fishery as measured by harvests (Tables 9, 10, and 11). In 1973, ADF&G constructed a hatchery to enhance fisheries on the Kenai Peninsula. The hatchery is no longer used for salmon production. Cook Inlet Aquaculture Association assumed operations at the hatchery in 1995. The facility was then returned to ADF&G in 1997 and Chinook salmon escapement monitoring began in 1999 and continues today (Table 9). From 1979 through 1999, an average of approximately 216,000 smolt was stocked annually into Crooked Creek (D. Loopstra, Sport Fish Biologist, ADF&G, Anchorage, personal communication). Because of concerns about hatchery stock introgression and straying of stocked fish, ADF&G reduced the stocking levels to a target of about 105,000 smolt in 2001. Doing so resulted in stocking between 80,000 and 109,000 smolt annually over the next 5-year period from 2000 to 2004. Since 2004, stocking has increased up to approximately 150,000 smolt in recent years (Table 12). Annual operations at the facility include monitoring natural production of Crooked Creek Chinook salmon by evaluating early-run escapement numbers and estimating naturally produced stock (a population consisting of both wild fish and naturalized hatchery fish) and hatchery stock runs to a weir at the facility in 2002. Naturally produced Chinook salmon broodstock collected at the weir support an early-run enhancement program. In addition, a creel survey was conducted from 2004 through 2010 to estimate the catch and harvest of naturally and hatchery-produced early-run Chinook salmon (Cope 2011, 2012). A research project was conducted from 2005 through 2008 to estimate abundance, spawning distribution, and run timing for late-run Kasilof River Chinook salmon (Reimer and Fleischman 2012).

The sport fishery for early-run Chinook salmon in the Kasilof River occurs from late May through June. The run-timing of the majority of the early run precedes the commercial set gillnet fishery on the eastside beaches of Cook Inlet. There is a personal use set gillnet fishery that occurs from June 15 through June 24 at the mouth of the Kasilof River. The personal use set gillnet fishery harvests primarily sockeye salmon returning to Tustumena Lake and small numbers of Chinook salmon that originate from Crooked Creek (Table 6).

The Kasilof River Chinook salmon sport fishery is limited by regulation to January 1 through July 31. During the early run (late May through June 30), the river is open in its entirety to Chinook salmon fishing. During the July late-run fishery (July 1–July 31), the area upstream from the Sterling Highway Bridge is closed to Chinook salmon fishing to protect spawning fish. Historically, the early run was harvested by relatively large numbers of shore anglers and to a lesser extent boat anglers (Nelson 1995), whereas the late run has been harvested primarily by boat anglers because discharge of the Kasilof River during July makes it difficult for anglers to effectively fish for Chinook salmon from shore. Participation and harvest during both runs are

⁴ <http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.proposalbook>.

greater for the early run, although research projects indicate the abundance is higher for the late-run stock (B. Key, Sport Fish Biologist, ADF&G, Soldotna, personal communication).

Harvest estimates for early-run and late-run Kasilof River Chinook salmon have been estimated by the SWHS since 1996. Additionally, early-run estimates of harvest for naturally and hatchery-produced stock composition were obtained through a creel survey between 2004 and 2010 (Cope 2012; Cope 2011). Between 2004 and 2018, the average annual angler harvest for early-run Kasilof River Chinook salmon was 1,748 fish (Table 9). The creel survey also estimated harvest and effort by boat and shore anglers and found that the estimated angler effort and harvest from drift boats greatly exceeded the shore-based angler effort and harvest (Table 11). From 1998 to 2018, the average annual inriver sport harvest for late-run Kasilof River Chinook salmon was 981 fish (Table 10).

Recent Alaska Board of Fisheries Actions

During the 2017 Alaska Board of Fisheries meeting, the BOF adopted the following regulation for the Kasilof River Chinook salmon fishery:

In the Kasilof River, a person may not fillet, mutilate, or otherwise disfigure a king⁵ salmon in such a manner that prevents determination whether the fish is a wild or hatchery fish until the person has stopped fishing in the Kasilof River drainage for the day and has moved more than 100 yards away from the Kasilof River.

KASILOF RIVER EARLY-RUN CHINOOK SALMON

Fishery Management Objectives

The Kasilof River early-run Chinook salmon fishery is supported primarily by stocked Chinook salmon of Crooked Creek origin and supplemented by natural production in Crooked Creek. The Kasilof River Chinook salmon early run is managed both to ensure that a sustainable escapement goal (SEG) of 650 to 1,700 naturally produced Chinook salmon ocean-age-2 or greater reach the spawning grounds above Crooked Creek weir and to harvest hatchery-produced Chinook salmon. Objectives for this fishery achieved through the enhancement program include generating a return of approximately 3,000 hatchery-produced Chinook salmon and generating approximately 17,500 angler-days of annual sport fishing opportunity directed at Chinook salmon in the Kasilof River. The broodstock goal objective has changed in recent years in an attempt to improve the fishery because of low annual runs; an egg-take goal of 150,000 eggs resulting in 105,000 released Chinook salmon smolt was increased to approximately 175,000 eggs resulting in a release of about 140,000 smolt annually into Crooked Creek.

Inseason Management Approach

Currently by regulation, the bag and possession limits are 2 fish per day, of which only 1 may a naturally produced fish. Hatchery-produced fish are allowed to be harvested 7 days each week and naturally produced fish are allowed to be harvested 3 days per week (i.e., Tuesday, Thursday, and Saturday). The *Kenai River and Kasilof River Early-run King Salmon Management Plan* directs ADF&G to achieve the SEG, to provide reasonable harvest opportunities over the entire run while ensuring adequate escapement of naturally produced Chinook salmon, and to minimize the effects of conservation actions for the Kenai River on the

⁵ King salmon refers to Chinook salmon in the regulatory language.

Kasilof River. Because Chinook salmon do not reach the weir at Crooked Creek until the later part of June and July, run strength is not evaluated inseason. Past creel survey data indicate the highest catch rates are typically observed prior to June 10. Currently, the Chinook salmon harvest is estimated postseason. Similarly, run strength estimates, harvest estimates, and data regarding the inseason performance of the fishery (catch, harvest, and effort) have not been available inseason since the creel survey was discontinued.

Since 2009, low escapements of naturally produced Chinook salmon have occurred at Crooked Creek despite restrictions to the early-run Kasilof River Chinook salmon sport fishery that prohibited retention of naturally produced fish and prohibited the use of bait. The SEG for Crooked Creek (650–1,700 naturally produced fish) was not achieved in 3 of the years from 2009 through 2018 (Table 9). In 2009 and 2012, the spawning escapement was below the SEG range and in 2016 above the SEG range. Because relatively low Chinook salmon productivity has affected several Cook Inlet stocks, including naturally produced fish of Crooked Creek origin and hatchery-produced fish stocked into Crooked Creek, ADF&G began restricting the Kasilof River inriver sport fishery prior to the season in 2010. These preseason restrictions were designed so that both escapement and broodstock goals could be achieved while still providing reasonable harvest opportunity for Chinook salmon.

2017 Fishery Performance

The 2017 Kasilof River sport fishery for Chinook salmon proceeded under standard regulation for the duration of the season. During 2017, the SEG for naturally produced Chinook salmon was achieved with an escapement of 911 naturally produced fish passing through the weir at Crooked Creek (Table 9). An additional 224 hatchery-produced fish raised the total escapement to 1,135 Chinook salmon (Table 9). The estimate of harvest from the SWHS was 2,965 Chinook salmon (Table 9). The broodstock goal was not met due to facility renovations that resulted in the weir being removed early in 2016. Subsequently, 105,396 Chinook salmon smolt were released into Crooked Creek during 2017 (Table 12).

2018 Fishery Performance

The ADF&G issued EO 2-KS-1-14-18 on June 11, 2018 to restrict the Kasilof River early-run Chinook salmon fishery to the harvest of 1 hatchery-produced Chinook salmon and prohibited retention of naturally produced fish (Appendix A2). Additionally, fishing gear was restricted to the use of single hook, artificial lures, and prohibited bait. The escapement of ocean-age-2 and older naturally produced Chinook salmon was 714 fish, which achieved the lower end of the SEG range (Table 9). An additional 473 hatchery-produced Chinook salmon were also counted in the escapement at Crooked Creek, bringing the total escapement to 1,187 Chinook salmon (Table 9). The objective for stocking approximately 140,000 Chinook salmon smolt into Crooked Creek annually was met in 2018 with approximately 149,622 smolt released (Table 12).

2019 Fishery Overview

The ADF&G issued a preseason EO 2-KS-1-10-19 on February 14, 2019 to restrict the Kasilof River early-run Chinook salmon fishery to the harvest of 1 hatchery-produced Chinook salmon and prohibited retention of naturally produced fish (Appendix A3). Additionally, fishing gear was restricted to the use of single hook, artificial lures, and prohibited bait. Restrictions remained in place throughout the early-run season. The escapement of ocean-age-2 or older naturally produced Chinook salmon was 1,444 fish, which achieved of the sustainable escapement goal

(Table 9). An additional 432 hatchery-produced Chinook salmon were also counted in the escapement at Crooked Creek (Table 9). The objective for stocking approximately 140,000 Chinook salmon smolt into Crooked Creek annually was not met in 2019 with approximately 126,600 smolt released in 2019 (Table 12).

KASILOF RIVER LATE-RUN CHINOOK SALMON

Fishery Management Objectives

The Kasilof River late-run Chinook salmon sport fishery is not specifically addressed in a BOF-adopted management plan. ADF&G objectives adopted for this fishery include providing an opportunity for angler participation at a level that can be supported by the fisheries resource and associated habitat and to ensure through appropriate management and research programs that the Chinook salmon population does not decline below the levels necessary to ensure sustained yield. Sport harvest has been monitored via the SWHS since 1996 and has averaged 981 Chinook salmon annually from 1998 to 2018 (Begich et al. 2017; Table 10). Using genetic analysis from the Eastside set net (ESSN) commercial fishery during 2010 through 2018 (except 2012) (Fleischman and McKinley 2013; Eskelin et al. 2013b; Eskelin and Barclay 2016, 2017, 2018, 2019), the 1998–2018 average ESSN harvest of late-run Kasilof River Chinook salmon has been estimated at 2,293 fish (Table 10).

Inseason Management Approach

Historically, there has been limited inseason management of this fishery. The fishery is managed through existing regulations. These regulations are conservative, permitting a harvest of late-run Kasilof River Chinook salmon downstream from the Sterling Highway Bridge only through July 31. For Chinook salmon 20 inches or more in total length, the daily bag and possession limits are 1 fish and the annual limit for Chinook salmon in Cook Inlet is 5 fish. During years of low Chinook salmon abundance, ADF&G administered inseason restrictions by EO to minimize the effects of conservation actions for the Kenai River on the Kasilof River at times when the Kenai River was restricted or closed inseason; this occurred the first time during 2012. Thereafter, ADF&G continued to use this inseason approach because low Chinook salmon production was known to be widespread throughout many Cook Inlet Chinook salmon producing locations, rather than isolated to specific rivers (R. Begich, Sport Fish Biologist, ADF&G, Soldotna, personal communication).

Beginning in 2018, ADF&G began operating an ARIS sonar just upstream of the Sterling Highway Bridge to monitor sockeye and large Chinook salmon (≥ 75 cm in total length). The large Chinook salmon portion of the project is currently in the feasibility phase. In theory, this project will give ADF&G a relative estimate of Kasilof River late-run Chinook salmon that spawn predominantly in the upper portions of the mainstem Kasilof River. Several more years of data will be necessary to make the project applicable for inseason management actions and escapement goal development.

There have been no inseason data collected for the management of the Kasilof River Chinook salmon late run. During 2005–2008, ADF&G research projects collected information on run timing, spawning distribution, and inriver abundance of late-run Kasilof River Chinook salmon postseason (Reimer and Fleischman 2012). Catches of Chinook salmon for the research program were relatively stable from 2005 to 2008. Information on run strength or sport fishery performance is collected via angler reports during the season as well as from the guide logbook

reports and SWHS. Results indicate that sport harvests are relatively stable. Similar to Chinook salmon runs elsewhere in Cook Inlet, Kasilof River stocks also experienced lower runs over recent years, including low production of hatchery-stocked early-run Chinook salmon used to supplement the Kasilof River early-run fishery.

2016 Fishery update and 2017 Fishery Performance

In 2016 and 2017, Chinook salmon returns to the Kenai River were stronger than anticipated and so no restrictions were enacted on the Kenai River Chinook salmon fishery, thus the Kasilof late-run Chinook salmon fishery also proceeded under general regulation for the duration of the seasons. The estimated inriver sport harvest was 1,249 Chinook salmon in 2016 and 1,323 Chinook salmon in 2017 (Table 10)

2018 Fishery Performance

In 2018, the Kasilof River late-run Chinook salmon fishery proceeded under general regulation until July 18, when EO 2-KS-1-41-18 was issued prohibiting retention of Chinook salmon and restricting sport fishing gear to 1 unbaited, single-hook, artificial lure downstream of the Sterling Highway Bridge (Appendix A2). This same restriction was enacted on the Kenai River Chinook salmon fishery. These restrictions remained in place until the fishery closed on July 31. The estimated inriver sport harvest was 787 Chinook salmon (Table 10).

2019 Fishery Overview

In 2019, the Kasilof River late-run Chinook salmon fishery began restricted July 1, when EO 2-KS-1-22-19 was issued, restricting sport fishing gear to 1 unbaited, single-hook, artificial lure downstream of the Sterling Highway Bridge (Appendix A3). This same restriction was enacted on the Kenai River Chinook salmon fishery. These restrictions remained in place until the fishery closed on July 31. Harvests during 2019 are anticipated to be smaller, due largely in part to reduced abundance of Chinook salmon in Cook Inlet and because the sport fishery was restricted by inseason management actions that were paired to restrictions taken in the Kenai River late-run Chinook salmon fishery (Appendix A3).

There have been changes in the commercial fisheries targeting sockeye salmon bound for the Kasilof River in the past decade due to large numbers of sockeye salmon passing the ADF&G Kasilof River sonar station in excess of escapement needs. These commercial fishery changes included the implementation of terminal commercial fishing periods at the mouth of the Kasilof River over several years. These terminal commercial fishing periods were designed to reduce the numbers of sockeye salmon entering the Kasilof River when it is determined the sockeye salmon escapement will be exceeded; however, Chinook salmon are also harvested. All of the commercially harvested Chinook salmon bound for the Kasilof River during these terminal fishery periods were presumed to be of Kasilof River origin. Recent genetic sampling results by Eskelin et al. (2013b) and Eskelin and Barclay (2015, 2016) show harvests in the terminal harvest area are not exclusively Kasilof River origin Chinook salmon (Table 13).

CURRENT ISSUES

Low abundance of early-run naturally produced Kasilof River Chinook salmon was persistent from 2009, 2011, 2012 and 2018 (Table 9). At these lower levels of abundance, the SEG for naturally produced Chinook salmon and the broodstock objectives are not likely to be achieved under existing regulations so restrictions may be necessary to meet these objectives. Balancing

the need to provide opportunity to harvest hatchery-produced fish during periods of low natural Chinook salmon production has been achieved by inseason management actions to restrict harvest of naturally produced fish while maintaining harvest levels of hatchery-produced fish. Future management strategies should be considered that may increase exploitation of hatchery fish. Because we do not have the ability to foresee or predict inordinately high numbers of smaller, younger hatchery-produced Chinook salmon in annual runs, consideration should be given to regulations or inseason actions that maximize exploitation of hatchery-produced fish.

The social issues related to limited access and angler congestion have persisted for decades. Historically, there was a lack of good road and foot access for the public to the fishing areas and shoreline area of the Lower Kasilof River. Consequently, angling from boats was the most popular and effective way to sport fish in the lower river Chinook salmon fishery. Growth in the Chinook salmon stocking program created demand for improved access to the river. This issue was partly addressed by the Department of Natural Resources, Division of Parks and Outdoor Recreation (DNR, DPOR) when lands were acquired and developed for shore-based angling at the Crooked Creek State Recreation Site at the Crooked Creek–Kasilof River confluence. In 2004 DNR, DPOR also constructed a new boat launch at RM 8 adjacent to the Sterling Highway Bridge crossing of the Kasilof River where anglers access the fishery by drift boat. Although these positive changes provided access, issues remain related to parking and amenities (bathrooms, picnic areas) for anglers fishing from shore and those anglers fishing from drift boats. Specifically, there is no public boat landing facility in the lower river. Rather, access for drift boat retrieval is accomplished at a privately owned launch in the lower river downstream of the point where nearly all Chinook salmon fishing occurs. Historically, 3 privately owned landings to retrieve drift boats were available for public use in the lower river. Due to the landing locations relative to the layout of the fishery and established fishing patterns, 1 landing received primary use while the other 2 received only infrequent use by drift boat anglers. Currently, one of the infrequently used landings is no longer available for public use and the property where the primary drift boat retrieval landing is located has been purchased by the State of Alaska (SOA) DNR but is not operational because of liability issues and a lack of financial resources for construction improvements. Hence, just 1 landing is available for drift boat retrieval. Because of this situation and the popularity of the drift boat fishery, construction of a publicly owned, agency-managed, boat landing with sufficient infrastructure is desired by the public to maintain access.

During 2007, ADF&G conducted a *Lower Kasilof River Boat Launch Study, Acquisition and Development* project. The project provided a site investigation report for 2 locations in the lower river for the construction of boat landings to support powerboat use. The evaluations were rejected by the public due to concern that construction of a powerboat landing would increase use and congestion on the lower Kasilof River.

Hydraulic analysis for fish passage flows at the Sterling Highway road crossing culvert at Crooked Creek indicates that the culvert is substandard for both adult and juvenile salmonids during some months of the year. Crooked Creek is approximately 50 miles long, and the culvert is located 47 miles downstream of its source or approximately 3 miles upstream of the Crooked Creek–Kasilof River confluence. The culvert was replaced in July 2019. It is not understood how the culvert barrier has impacted Chinook salmon production in the 52.6 square mile Crooked Creek watershed.

Reduced ADF&G stocking level objectives for several years (2000–2013) in combination with lower production of naturally produced Chinook salmon have increased public awareness of the enhancement program. The sport fishing guide industry desires that the stocking levels be increased by over 100% or restored to those levels prior to 2000. Because stocking is dependent upon high abundance of naturally produced fish and the SEG is a higher priority objective than stocking, the numbers of naturally produced fish available for annual artificial spawning (collection of eggs and milt) for future smolt release varies from year to year and cannot be guaranteed. Stocking levels will not be increased to over 200,000 smolt per year until these issues are addressed: 1) boat landing infrastructure, and 2) the introgression of naturally and hatchery-produced Chinook salmon. Although significant steps have been taken to remedy these issues, all the work has not been completed. Meanwhile, ADF&G has increased stocking objectives by nearly 50% (from 105,000 to 140,000 smolt).

Like the early run, issues related to limited access are present with the late run as well. Angling from a drift boat is the most effective way to sport fish in the lower Kasilof River in July. Consequently, there is a large demand for improved access to launch and retrieve drift boats. Harvest of Chinook salmon in the commercial fisheries, particularly in the Kasilof River Special Harvest Area (KRSHA) at the mouth of the Kasilof River by both set and drift gillnet operators during July, is a contentious social and allocative issue. This fishery was opened frequently under certain circumstances to reduce the escapement of sockeye salmon to the Kasilof River; however, Chinook salmon harvest also occurs. The KRSHA was not opened during the 2017 and 2019 commercial fishing season and was opened during the 2018 commercial fishing seasons.

RECOMMENDED RESEARCH AND MANAGEMENT

Future research will focus on the long-term quantitative stock assessment of naturally produced Crooked Creek Chinook salmon, including estimating the numbers of fish in the annual runs by utilizing harvest estimates from the sport fishery and monitoring escapements at the weir. This information is necessary to estimate returns by age from the escapements to refine the existing escapement goal of naturally produced fish. Beginning in 2000, the number of Chinook salmon smolt stocked into Crooked Creek was reduced to 105,000 from a long-term average of approximately 210,000. Since 2000, stocking levels have remained relatively stable until they were increased to approximately 140,000 in the 2014 (Table 12). It appears that the natural production of Chinook salmon in Crooked Creek has been too low to compensate for the reduction in stocking levels to support historical angler effort and harvest levels (Begich et al. 2017; Table 9). In 2008–2012, total runs of naturally produced Chinook salmon were lower than in previous years 2004–2007 (Table 9). The number of naturally produced fish to the weir during 2016, 2017, and 2019 indicated the total runs of both naturally and hatchery-produced Chinook salmon improved. In 2018, the run was again low, and restrictions were necessary. Returns from higher levels of spawning escapement will continue to be assessed by reconstructing the annual runs of early-run Chinook salmon. In order to provide guidance to future management and stocking levels to support this fishery, another facet of research we recommend is to evaluate the hatchery-integrated Chinook salmon enhancement program for Crooked Creek.

Management efforts are focused on ensuring the established escapement goal for Crooked Creek is achieved and to minimize the contribution of hatchery-stocked fish into the escapement through existing as well as inseason emergency order regulations. Other management efforts are focused on restoration and infrastructure improvements to the Crooked Creek facility where

1) escapements are monitored, 2) adults are collected and held for broodstock egg takes to continue the stocking program, and 3) smolt are held for imprinting prior to release during spring. Other efforts have been made to restore and maintain the connectivity of Crooked Creek as important waterway for the spawning and rearing of anadromous fish through streambank restoration and replacement of the Sterling Highway culvert.

We recommend a review of the available harvest data and total returns from recent years prior to the start of each season to determine if a preseason restriction is necessary to achieve fishery management and stocking objectives.

At present, efforts are focused on annual assessment of large Kasilof River late-run Chinook salmon through the ARIS sonar located at the Sterling Highway Bridge. Collecting more years of abundance data will likely lead to development of an escapement goal and inseason management based upon the sonar estimates. Recent inriver abundance estimates indicate there are no immediate fishery conservation concerns for this stock because, under existing regulations and emergency order authority, the potential for the inriver fishery to overharvest this stock is low. Long-term research and management goals include estimating total run abundance. Estimating this abundance would require an estimate of the inriver run as well as harvests from the various marine fisheries harvesting this stock so that annual runs to the Kasilof River can be reconstructed. Through 2018, information to manage this fishery by existing regulations is provided by the guide logbook program and the SWHS. Due to the discontinuation of the guide logbook program in the spring of 2019, fishery participation and harvest information will be derived from the SWHS only until an escapement goal is developed from sonar estimates.

RUSSIAN RIVER SOCKEYE SALMON SPORT FISHERIES

2020 PROPOSALS TO THE ALASKA BOARD OF FISHERIES CONCERNING RUSSIAN RIVER SOCKEYE SALMON SPORT FISHERY ISSUES

The following proposals published in “*The Alaska Board of Fisheries 2019/2020 Proposed Changes in the Subsistence, Personal Use, Sport, Guided Sport, and Commercial Fishing Regulations for Lower and Upper Cook Inlet Finfish, Kodiak Finfish, and Statewide King and Tanner Crab General Provisions*”⁶ will probably have some impact on the sport fisheries targeting sockeye salmon in the Russian River:

Proposal Numbers: 86, 87, 147, 152.

BACKGROUND AND HISTORICAL PERSPECTIVE

The Russian River is a clearwater tributary to the Kenai River located near the community of Cooper Landing approximately 100 miles south of Anchorage (Figure 5). Lands bordering this river are federally managed. The public can access the Russian River via the Kenai–Russian River ferry operated by a private concessionaire. The ferry is located at the Kenai National Wildlife Refuge parking area on the north shore of the Kenai River just downstream from the confluence with the Russian River. Additional access is provided at the Chugach National Forest campground on the Russian River (Figure 6).

⁶ <http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.proposalbook>.

The drainage supports one of the largest runs of sockeye salmon to upper Cook Inlet (UCI) and provides one of the largest freshwater sport fisheries for sockeye salmon in Alaska. In addition, Chinook, coho, and pink salmon also spawn in the Russian River drainage as well as resident populations of rainbow trout and Dolly Varden. The drainage is closed to fishing for Chinook salmon but supports sport fisheries for the other species.

Sockeye salmon return to the Russian River during 2 distinct time periods. An early run arrives at the confluence of the Kenai and Russian rivers in early June. Because of this early run-timing, these fish are not harvested in the (UCI) commercial salmon fisheries. The primary harvest of these fish occurs in the inriver sport fishery at the Russian River. Early-run fish typically congregate at the confluence of the Russian and Kenai rivers for several days prior to moving into the clear waters of Russian River. A late run, part of the larger late run of UCI sockeye salmon, arrives at the confluence in mid-July and typically migrates directly into the Russian River. This run has 2 discrete components: one that spawns in the upper reaches of the drainage (upstream of the falls and the weir) and one that spawns in the lower river reaches (downstream of the falls). The population component that spawns in the lower river reaches is more closely related (genetically) to the mainstem Kenai River sockeye salmon stocks than to the population component spawning upstream of the weir (Seeb et al. 1996). Typically, the spawning escapement of the late run exceeds that of the early run. For the most part, spawning locations used by the late run are distinct from locations used by the early run. Because of their run timing, late-run sockeye salmon are harvested by a combination of commercial, sport, and personal use user groups. In addition, a Federal Subsistence Fishery has been prosecuted at the Russian River since 2007 for qualifying rural residents from the communities of Cooper Landing, Ninilchik, and Hope.

The sport fishery for both early- and late-run sockeye salmon occurs primarily in the lower 3 miles of Russian River and in a 1-mile stretch of the Kenai River below its confluence with Russian River. Both runs support popular fisheries. The most recent 10-year (2009–2018) average harvest of early and late-run sockeye salmon is approximately 28,066 and 16,199 fish, respectively (Table 14). The Federal Subsistence Fishery prosecuted on both runs supports a total annual harvest of approximately 1,450 fish, with the majority of this harvest taken from the early run (Table 14).

Angler effort estimates from the SWHS over the most recent 10-year period (2009–2018) have averaged 50,205 angler-days per year (Table 14). Although these estimates include effort directed toward other species, including resident species as well as coho salmon, it is believed the majority of sport fishing effort occurs during the sockeye salmon season (June 11–August 20). Overall, annual effort expended since 2011 has remained relatively stable. Because this area is popular for various forms of outdoor recreation, the 2 public campgrounds and day use parking areas managed by federal agencies are routinely filled to capacity. Consequently, during the peak times of the sockeye salmon fisheries, public demand for access to the fishery exceeds capacity and waiting periods of several hours may be required for parking; reservations made months in advance may be necessary for camping areas.

In 1993, ADF&G Division of Sport Fish (SF) purchased property that adjoins U.S. Fish and Wildlife Service (USFWS) lands along the north shore of the Kenai River directly across from the confluence of the Kenai and Russian rivers. The 4.4-acre property was formerly the site of the privately-owned Sportsman's Lodge. This purchase was made using primarily Federal Aid in Wildlife and Sport Fish Restoration funds (Dingell–Johnson, or D–J Amendment) to provide a

launch and take-out area for boat anglers fishing the Kenai River and to provide an additional 50 to 75 parking places for anglers. Purchase of this property and improvements since 2000 have partially alleviated parking issues in this area during peak days of the fishery.

Historically, as angler effort has increased in this fishery, the regulations governing the sport fishery have become more restrictive. In 1964, the use of treble hooks was prohibited in an effort to reduce snagging. This was followed by adoption of a flies-only regulation in 1965 for the 1966 season. Under this regulation, terminal gear was limited to flies and a fly-fishing-only area was designated. The BOF required that only fish hooked in the head, mouth, or gills could be retained and in 1969, this regulation was amended to include all fresh waters of the Kenai Peninsula. In 1973, the regulation was further amended to require that fish hooked elsewhere than in the mouth must be released immediately.

Currently, the sport fishery is restricted to terminal tackle consisting of a single-hook, unweighted fly, with a maximum hook gap of three-eighths inch or less. This measure was implemented to reduce angler efficiency and lessen the angler's ability to snag fish illegally. This affords an increased measure of protection to fish as they near their spawning destinations. In order to protect "schooled" fish that hold in the confluence area of the Kenai and Russian rivers (termed the "sanctuary"), the sanctuary is closed to sport fishing until the lower end of the early-run escapement range is projected to be met inseason. Only the lower 3 miles of the Russian River drainage, from 100 yards upstream of its mouth to an ADF&G marker 600 yards downstream of the falls, are open to salmon fishing. The upstream portion of the Russian River (i.e., above the ADF&G marker below the falls) is closed to all salmon fishing to allow fish to migrate and spawn in the remainder of the drainage.

Recent Alaska Board of Fisheries Actions

No regulation changes were made to the Russian River sockeye salmon sport fisheries during the 2017 meeting.

RUSSIAN RIVER SOCKEYE SALMON MANAGEMENT OBJECTIVES

Management of this fishery is governed by the *Russian River Sockeye Salmon Management Plan* (5 AAC 57.150). The primary management objective, as directed in the plan, is to achieve a biological escapement goal (BEG) of 22,000 to 42,000 early-run sockeye salmon and a sustainable escapement goal (SEG) of 30,000 to 110,000 late-run sockeye salmon in the Russian River system. The escapement goals have changed over time for both runs and have been achieved or exceeded in all years since 1977, based upon the management plan in effect at that time.

The *Russian River Sockeye Salmon Management Plan* recognizes that commercial users as well as mainstem Kenai and Russian River sport anglers harvest late-run sockeye salmon stocks bound for the Russian River drainage. It stipulates how the burden of conservation shall be distributed between commercial and sport users. In the event that conservation measures are required to achieve the minimum escapement goal, ADF&G may restrict Kenai River drainage sport fisheries downstream to and including Skilak Lake. Restrictions to the commercial fishery shall be limited to meeting the inriver escapement goal for Kenai River late-run sockeye salmon as outlined in the *Kenai River Late-Run Sockeye Salmon Management Plan* (5 AAC 21.360).

The goal ranges for both runs are based on data collected at the weir. Precise biological data collected annually at the weir is enough to develop a BEG for the early-run stock only. The

late-run stock SEG is based on weir counts that have sustained the fishery. In the case of the early run, ADF&G recommended a new BEG in 2011 (Fair et al. 2010). Since the Russian River late run is a component of the larger late run returning to the Kenai River drainage, the total returns for late run Russian River sockeye salmon are not known. However, although they have similar run timing, there is a significant genetic difference between late-run Russian River sockeye salmon and late-run Kenai river sockeye salmon. Genetic stock identification (GSI) was undertaken to identify the degree to which late-run Russian River sockeye salmon are harvested by the various mixed-stock marine commercial, personal use, and sport fisheries in order to reconstruct the total return of late-run Russian River sockeye from 2006 to 2008 (Eskelin et al. 2013a). In the future, this type of analysis might enable ADF&G to better assess late-run sockeye salmon production in the Russian River drainage.

INSEASON MANAGEMENT APPROACH

The early- and late-run fisheries are managed based on escapements counted at a weir at the outlet of Lower Russian Lake. In years of low abundance, the escapement is achieved through inseason restrictions to the sport fishery. In years of high abundance, the fisheries are liberalized to provide additional harvest opportunity. The weir is installed during early June each year and is removed from the river during early September in most years. Early-run sockeye salmon are classified as those that pass through the weir from the weir installation date through July 14, whereas fish passing through the weir from July 15 until the weir is removed are classified as late-run sockeye salmon.

Sockeye salmon run strength is determined by examining 3 indicators: weir counts, instream fish abundance estimates, and observed fishery performance. Weir counts are the primary indicator of run strength. Historical weir counts provide the mean migratory run timing statistics to project inseason abundance and escapement. An estimation of run strength can generally be made several days prior to the historical midpoint of the run (June 28 for the early run, and August 7 for the late run). In some years, fish have been late or have “held” in the Kenai River. Weir counts are supplemented by onsite foot surveys of the fish present downstream from the weir, including the area between the weir and the falls, the falls area, lower Russian River, and the sanctuary area (Figure 6). Fish may “hold” for long periods of time in the falls area during periods of extreme high water or low water. In the case of high water, ADF&G staff observe fish behavior in the falls and monitor water levels at the weir site with a staff gauge. In extreme cases when the staff gauge readings exceed approximately 19 inches and flow input of Rendezvous Creek (located downstream of the weir but above the falls) may prevent fish from migrating upstream through the falls, a fish passage around the falls is opened. No methods are employed to facilitate fish passage to spawning areas during low water conditions. Historically, the fish pass is used infrequently for early-run sockeye salmon during high water caused by the combination of spring snow-melt runoff and rain in early June. It has not been used during the late-run period that begins July 15. The fish pass was last used during high water events in June 2012, 2013, and 2018. Utilization of the fish pass has no direct effect on sport fishing opportunities because the upstream boundary of the fishing area is approximately 550 meters (one-third of a mile) downstream of the falls; however, it does facilitate the sockeye salmon passage rate into the escapement, which is of primary importance to determine run strength so that appropriate inseason management actions can be taken to achieve escapement goals. In addition, observed fishery performance in the Kenai River downstream from the sanctuary area for the early run and throughout the entire fishery downstream to Skilak Lake in the late run are

used as indicators of run strength. If inseason restrictions become necessary in order to achieve the escapement goal, the *Russian River Sockeye Salmon Management Plan* specifies several options to ensure adequate escapement, including bag limit reductions and closures by area and time in the Russian River as well as the mainstem Kenai River downstream to and including Skilak Lake. When inseason restrictions are implemented, they remain in place until the lower end of the escapement range is projected to be met.

The sockeye salmon sport fishery opens June 11 and closes August 20 by regulation. Sockeye salmon run strength at the Russian River improved during the recent 2009–2019 period, with the highest early-run escapement (125,942) in the historical data occurring in 2019 (Table 14). As a result, the early-run sport fishery was liberalized in 2017, 2018, and 2019. The late-run escapements improved from 37,837 fish in 2016 to well above the 10-year average of 49,935 fish in 2018 and 2019 (Table 14). The liberalization of the early-run fishery is generally implemented by opening the 700-yard sanctuary area at the confluence of the Kenai and Russian rivers to fishing. The sanctuary area opens by regulation after the early-run period on July 15. However, it may be opened by EO earlier if information indicates sockeye salmon abundance is high and the lower end of the early-run BEG (22,000-42,000) will be achieved. Experience has proven that a daytime opening facilitates an orderly expansion of fishing opportunity in the fishery. Late evening and midnight openings are avoided. If weir counts, instream fish estimates, and observed performance of the fishery remain high, and the projected escapement is greater than the upper bound of the BEG, the bag limit is increased to contain the escapement into Lower Russian Lake within the BEG. Typically, the bag limit increase is applied in all waters of the Kenai and Russian rivers fly-fishing-only waters, which include the Russian River, the Russian River sanctuary, and that portion of the Kenai River from ADF&G regulatory marker located below the Ferry Crossing on the Kenai River downstream to the powerline crossing. Since 2009, the bag limit increase was applied downstream to Jim’s Landing to increase exploitation on a large run (Begich and Pawluk 2010). Historically, the bag limits have been increased from 3 fish to 4 or 6 fish. Over more recent years, the fishery has been liberalized from the Russian River downstream to the markers located at the outlet of Skilak Lake and the bag limit liberalization has been standardized to increase from 3 fish to 6 fish, while the commensurate increase in the possession limit is from 6 fish to 12 fish when the bag limit is increased.

2016 EARLY-RUN FISHERY PERFORMANCE UPDATE

The 2016 early run was below average abundance and no management actions were taken. The BEG (22,000–42,000) was achieved and the final escapement count at the weir was 38,739 sockeye salmon through July 14. The estimated harvest was 13,086 fish, which is well below the 2009–2018 average of 28,066. The estimated total run was 52,915 fish, which is also well below the 2009–2018 average of 67,423 (Table 14).

2017 EARLY-RUN FISHERY PERFORMANCE

Following installation of the weir, initial stream surveys of the Russian River and sanctuary area at the start of the sport fishery indicated low sockeye salmon abundance. The abundance of fish increased later in the month than usual; however, weir passage by the third week of June indicated abundance was large enough to increase harvest opportunity. Consequently, ADF&G issued 2 EOs (2-RS-1-19-17; 2-RS-1-20-17) effective June 24, 2017 to open the sanctuary area and to increase the bag and possession limits from 3 and 6 to 6 and 12 in the Russian River and Kenai River from the Russian–Kenai rivers confluence downstream to Skilak Lake

(Appendix A1). The escapement (ending July 14) of early-run sockeye salmon was 37,123 fish and met the BEG (22,000–42,000) (Tables 14 and 15). Fishing success was good, and the estimated harvest was 27,109 and the estimated total run was 65,829 fish (Table 14).

2018 EARLY-RUN FISHERY PERFORMANCE

The weir was installed on June 4 at Lower Russian Lake. Fish passage was relatively low until the third week of June. Sockeye salmon were not observed to accumulate in the sanctuary area nor within the Russian River. These observations combined with relatively mediocre fishery performance delayed liberalization of the fishery until June 19th when the sanctuary area was opened by EO 2-RS-1-21-18 (Appendix A2). The fishery was further liberalized on July 3 by increasing the bag and possession limits from 3 and 6 to 6 and 12 in the Russian River and Kenai River from the Russian–Kenai rivers confluence downstream to Skilak Lake (Appendix A2). The escapement (ending July 14) of early-run sockeye salmon was 44,110 fish and was above the BEG (22,000–42,000) (Tables 14 and 15). The estimated sport fishery harvest was 26,999 fish, which was below the recent 10-year average of 28,066 fish, and the estimated total run was 72,800 fish (Table 14).

2019 EARLY-RUN FISHERY OVERVIEW

The weir was installed on June 4 at Lower Russian Lake. Fish passage was strong and well above average through the end of the early-run counts on July 14. Sockeye salmon were observed to be abundant prior to the season opening on June 11. These observations combined with indications from the Kenai River Chinook salmon sonar resulted in liberalization of the fishery early in the season when the sanctuary area was opened June 12 by EO 2-RS-1-18-19 (Appendix A3). The fishery was further liberalized on June 14 under EO-2-RS-1-19-19 by increasing the bag and possession limits from 3 and 6 to 6 and 12 in the Russian River and Kenai River from the Russian–Kenai rivers confluence downstream to Skilak Lake. The fishery was liberalized again on June 19 under EO 2-RS-1-21-19, which increased the bag and possession limits to 9 and 18 in the Russian River and Kenai River from the Russian–Kenai river confluence downstream to Skilak Lake (Appendix A3). The escapement (ending July 14) of early-run sockeye salmon was 125,942 fish and was well above the BEG (22,000–42,000) (Tables 14 and 15). The 2019 return was the largest escapement of early-run sockeye observed since ADF&G began estimating the annual returns. The estimated harvest will not be available until the fall of 2020; however, an above-average harvest is expected for 2019 based on fishery performance, sockeye salmon abundance, and liberalized regulations.

2016 LATE-RUN FISHERY PERFORMANCE UPDATE

The 2016 escapement of 37,837 fish through the weir met the SEG (30,000–110,000) and was below average. Fishery observations indicated that both catch rates and passage rates at the weir were low for the duration of the sockeye salmon fishery when it closed under existing regulations on August 20. No management actions were taken for the 2016 late-run Russian River sockeye salmon sport fishery. The estimated harvest was 11,543 fish, which was below average but corresponded to inseason angler reports. The estimated total run was 49,966 fish, which is also below average for the late run (Table 14).

2017 LATE-RUN FISHERY PERFORMANCE

During the 2017 season, the late-run Russian River Area sockeye salmon sport fishery catches were below average. No inseason management actions were taken for the sport fishery. The lower bound of the SEG (30,000–110,000) was reached on August 15, 2017 (Table 16) and the final escapement through the weir was 45,012 fish. The estimated late-run sockeye salmon harvest was 10,592 fish and was the 2nd lowest harvest in the past decade (Table 14). By summing sockeye salmon harvest and escapement through the weir, the total run estimate for late-run Russian River sockeye was approximately 55,840 fish (Table 14).

2018 LATE-RUN FISHERY PERFORMANCE

No management actions were taken for the 2018 late-run Russian River sockeye salmon sport fishery. Sockeye salmon were enumerated at the Russian River weir from July 15 through September 6. The 2018 late-run sockeye salmon escapement through the Russian River weir was 71,052 fish and achieved the SEG range of 30,000 to 110,000 fish (Table 14). This was above the recent 10-year (2009–2018) average escapement of 49,935 fish. The lower bound of the SEG was reached on August 8, 2018 (Table 16). Passage rates of sockeye salmon at the weir were consistent, with days of relatively moderate passage (1,000 fish) building to passage rates of approximately 2,000 fish during the peak days (Table 16). Many sockeye salmon arrived at the Russian River area in an advanced state of maturity in mid-to-late August near the standard regulatory closure of the fishery on August 20. The estimated sport fishery harvest was 15,344 fish, which was below the recent 10-year average of 16,199 fish, and the estimated total run was 86,759 fish (Table 14)

2019 LATE-RUN FISHERY OVERVIEW

No management actions were taken for the 2019 late-run Russian River sockeye salmon sport fishery. Sockeye salmon were enumerated at the Russian River weir from July 15 through August 18. Due to the rapid expansion of the Swan Lake wildfire and concerns for ADF&G staff safety, the weir was opened to unobstructed passage and the camp evacuated on August 18. The 2019 escapement estimate is a partial count and the number of days missed were too numerous to offer valid estimations of missed passage. The 2019 late-run sockeye salmon escapement observed through the Russian River weir was 64,585 fish and was within the SEG range of 30,000 to 110,000 fish (Table 14); it is unknown if the range was exceeded after August 18. This number was above the previous 10-year (2009–2018) average escapement of 49,935 fish. The lower bound of the SEG was reached on August 3 (Table 16). Daily passage rates of sockeye salmon at the weir were consistent, with days of above average passage (2,000 fish) building to passage rates of approximately 3,000 fish during the peak days (Table 16). Passage was approximately 2,500 fish per day for the week prior to the weir being evacuated. Many sockeye salmon arrived at the Russian River area in an advanced state of maturity in mid-to-late August near the standard regulatory closure of the fishery on August 20. The estimated harvest will not be available until the fall of 2020; however, below average harvest is expected for 2019 based on highly restricted public access to the fishery in response to the Swan Lake wildfire's proximity to the major access points. (Table 14).

CURRENT ISSUES

Presently, there are no biological issues associated with this fishery. Social issues focus on angler congestion during peak fishing periods. There is no evidence indicating angler-caused habitat impacts or that infrastructure (trails, boardwalks, stairways) added to support anglers have affected the productivity of the Russian–Kenai river fisheries. The early-run Russian River sockeye salmon are at high levels of abundance. Spawning escapement goals have been consistently achieved or exceeded. Angler opportunity and harvest have been maximized to the extent practicable.

For the late-run stock, delayed arrival of fish to the upper Kenai River area as well as relatively low harvests and escapement counts were observed from 2010 through 2017; however, escapements were larger in 2018 and 2019. In the Russian River downstream of the weir, consistently high counts of spawning sockeye salmon have been observed during foot-survey counts conducted during late August. The late timing is a new issue and it is a concern for anglers because the majority of sockeye salmon have been reaching the area in August, just days before the normal regulatory closure of the Russian River to sockeye salmon sport fishing on August 20. These fish are in an advanced state of maturity and therefore considered to be of low food quality. Consequently, fishing effort directed at sockeye salmon during August at the Russian River has declined. There is no information to determine what factors may be contributing to delayed run timing of late-run Russian River sockeye salmon.

RECOMMENDED RESEARCH AND MANAGEMENT

No change in management strategy is recommended at this time. Spawning escapement goals have been consistently achieved for both runs. For the early-run, data collected at the RM 14 sonar during May and June as well as information from 2017 radiotelemetry studies and continuing genetic work on early-run sockeye salmon, are leading to an understanding of run strength prior to the arrival of the run to the Russian River and the start of the fishing season. This information will help with preemptive management to achieve the escapement goal for early-run Russian River sockeye salmon.

ADF&G has recommended the late-run sustainable escapement goal (SEG) change from 30,000 to 110,000 to an SEG of 44,000 to 85,000 sockeye salmon. ADF&G also recommends biological data, specifically escapement counts and age, sex, and length data, continue to be collected from the escapement to enable continued analysis and refinement of escapement goals (Appendices C1–C6). Upper Russian River late-run sockeye salmon total run reconstructions by Eskelin et al. (2013a) estimated in a 3-year study (2006–2008) total runs averaged about 178,743 fish and escapements averaged 62,955 fish. The 2010 through 2017 late-run escapements counted through the weir were less than this prior average (2006–2008; Table 14). Over this same time period (2010–2017), sport harvests of late-run sockeye salmon at Russian River showed a similar drop from the 2006–2008 average (Table 14). It is not known if changes in fishing patterns by down-river sport, personal use, and marine commercial fisheries contributed to this period of lower escapements and lower sport harvests at Russian River or was a result of a decline in production of late-run Russian River sockeye. Eskelin et al. (2013a) estimated the harvest rate of Upper Russian River late-run sockeye salmon by all fisheries was 43% in 2006, 74% in 2007, and 73% in 2008. During the study, on average, the drainage-wide sport fishery accounted for 48% of the harvest of Upper Russian River late-run sockeye salmon, the Upper Cook Inlet commercial fishery accounted for 41% of the harvest, and the Kenai River

personal use fishery accounted for the remaining 11% of the harvest (Eskelin et al. 2013a). In order to determine if exploitation on the stock is increasing or a result of low production, mark-recapture methods using genetic stock identification (GSI) methods to reconstruct the annual runs of Upper Russian River late-run sockeye salmon, such as those used by Eskelin et al. (2013a), should be used in the future.

KENAI RIVER LATE-RUN SOCKEYE SALMON SPORT FISHERIES

2020 PROPOSALS TO THE ALASKA BOARD OF FISHERIES CONCERNING SOCKEYE SALMON SPORT FISHERY ISSUES

The following proposals published in “*The Alaska Board of Fisheries 2019/2020 Proposed Changes in the Subsistence, Personal Use, Sport, Guided Sport, and Commercial Fishing Regulations for Lower and Upper Cook Inlet Finfish, Kodiak Finfish, and Statewide King and Tanner Crab General Provisions*”⁷ will probably have some impact on the sport fisheries targeting sockeye salmon in the Kenai River:

Proposal Numbers: 86, 87, 96, 97, 98, 99, 145, 146, 147, 150, 151, 152.

BACKGROUND AND HISTORICAL PERSPECTIVE

The Kenai River originates at Kenai Lake near the community of Cooper Landing and terminates in Cook Inlet adjacent to the city of Kenai. The river is glacial and approximately 82 miles in length. It is paralleled for much of its length by the highway road system, making it the most accessible of Alaska's major salmon-producing rivers (Figure 7).

Historically, snagging was the traditional harvest method for taking sockeye salmon in the Kenai River. It was generally believed that this species would not strike a lure or accept bait and that conventional (nonsnagging) techniques could not be used to harvest these fish. When the number of sport anglers was relatively small, snagging posed neither a biological nor a social problem. However, as the population of Southcentral Alaska expanded and the Kenai River sport fishery increased in popularity, anglers began to oppose the practice as an unethical harvest method. Anti-snagging measures, first adopted at the Russian River, culminated in 1975 with the BOF promulgating a regulation that prohibited snagging in all freshwaters of the state. In 1979, snagging was prohibited in salt water within a 1-mile radius of the Kenai River mouth and in 1984, all snagging in salt waters north of Anchor Point was similarly prohibited.

Because snagging was no longer a legal harvest method in either fresh or salt water, anglers began to experiment with alternative terminal tackle in an attempt to legally harvest sockeye salmon in the Kenai River. Initial efforts were moderately successful with annual harvests averaging 23,778 sockeye salmon from 1977 through 1981 (Begich et al. 2017).

Between 1981 and 1989, the average harvest increased. This dramatic increase (277,906 sockeye salmon were harvested in 1989; Begich et al. 2017) is attributed to the use of coho flies as terminal gear. The coho flies are drifted along the bank like the technique used for a number of years at the Russian River. The belief that sockeye salmon could not be harvested with conventional tackle was gradually dispelled and this innovative technique prompted additional

⁷ <http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.proposalbook>.

anglers to seek these fish. The change in fishing technique, coupled with relatively clear water in 1982 and 1983, played a large role in the increased harvests. The larger harvests were further influenced by the magnitude of the inriver runs, which exceeded 1,300,000 sockeye salmon from 1987 to 1989 (Begich et al. 2017). Kenai River late run sockeye salmon sport fish harvests from 1998 to 2018 have ranged from 164,536 to 455,454 and averaged 285,072 fish, whereas the estimated sockeye salmon runs to the sonar have exceeded a million fish on many occasions (Tables 17 and 18).

The sport fishery for sockeye salmon in the Kenai River is characterized as follows:

- 1) Large numbers of sockeye salmon must be present to provide acceptable harvest rates.
- 2) The fishery is short in duration, usually within July 14 to August 5 depending on run timing, and is approximately 15–20 days.
- 3) The fishery is affected by water conditions; i.e., high water levels with high discharge inundate shore fishing locations with turbid water and generally decrease angler efficiency whereas average discharge increases catch rates.
- 4) Only a percentage of the total angler effort on the Kenai River is directed toward sockeye salmon, irrespective of run strength or fishing conditions. This is a result of the Kenai River being a multispecies fishery in July and August when the late-run sockeye salmon sport fishery occurs. ADF&G expects angler effort to increase as the population of Alaska increases. Angler participation in the Chinook salmon sport fishery, coho salmon sport fishery, and during even years, the sport fishery for pink salmon, as well as fishing effort for resident rainbow trout and Dolly Varden, account for the remainder of total angler participation.

Recent Alaska Board of Fisheries Actions

During the 2017 Alaska Board of Fisheries meeting, the *Kenai River Late-Run Sockeye Salmon Management Plan* (5 AAC 21.360) was modified by repealing the OEG of 700,000 to 1,400,000 sockeye salmon and adopted an SEG of 700,000 to 1,200,000 sockeye salmon. Additionally, inriver tiers were modified by establishing a middle-tier inriver goal range of 1,000,000 to 1,300,000 fish, which provides for a spawning escapement of 1,100,000 fish (maximum sustainable yield [MSY] point estimate), a lower-tier inriver goal range of 900,000 fish to 1,100,000 fish and an upper-tier inriver range of 1,300,000 to 1,500,000 fish. The intent of this option is to increase the probability of achieving a spawning escapement that is near the MSY point estimate (1,100,000 fish).

KENAI RIVER SOCKEYE SALMON LATE-RUN MANAGEMENT OBJECTIVES

Kenai River late-run sockeye salmon are managed under provisions of the *Kenai River Late-Run Sockeye Salmon Management Plan* (5 AAC 21.360). SF manages the inriver sport fishery. Late-run Kenai River sockeye salmon are a component of the harvest of the Upper Cook Inlet commercial fishery managed by the Division of Commercial Fisheries (CF). Since 2017, the Kenai River has been managed to achieve an SEG of 700,000 to 1,200,000 sockeye salmon.

The plan directs ADF&G to do 3 things:

- 1) Meet the sustainable escapement goal.
- 2) Achieve inriver goals as established by the BOF and measured at the Kenai River sonar counter located at RM 19.

- 3) Distribute the escapement of sockeye salmon evenly within the SEG range, in proportion to the size of the run.

Inriver goals set in the plan are ranges of sockeye salmon passing the sonar at RM 19 (Figure 7) of the Kenai River, and are derived from 3 levels of projected run strength. Ranges of projected run strength and corresponding inriver (sonar) goals are outlined in the plan as follows:

- 1) If the projected run strength is less than 2.3 million fish, the inriver (sonar) goal is 900,000–1,100,000 sockeye salmon.
- 2) If the projected run strength is 2.3–4.6 million fish, the inriver goal is 1,000,000–1,300,000 sockeye salmon.
- 3) If the projected run strength is greater than 4.6 million fish, the inriver goal is 1,100,000–1,500,000 sockeye salmon.

ADF&G CF operates the RM 19 sonar and is responsible for managing UCI commercial fisheries to achieve the inriver (sonar) goals. It is the responsibility of ADF&G SF to assess inriver harvests and to take steps to ensure that the SEG range is achieved by issuing EOs to restrict or liberalize the sport harvest, if necessary.

INSEASON MANAGEMENT APPROACH

Historically, management of this fishery has changed in concert with changes in the *Kenai River Late-Run Sockeye Salmon Management Plan*. Prior to the late 1980s, management of the sockeye salmon sport fishery was accomplished through changes to bag and possession limits. Sport harvests were not large enough to significantly impact spawning escapements. Growth in this fishery during the late 1980s and early 1990s witnessed significantly greater inriver harvests.

In 1996, the BOF amended the management plan to incrementally increase the inriver escapement goals for late-run Kenai River sockeye salmon. The inriver goal during the 1996 season was established at 550,000 to 800,000 fish. The inriver goal was subsequently increased to 550,000 to 825,000 fish in 1997 and 550,000 to 850,000 fish in 1998. The inriver goal changed under the tiered management system adopted by the BOF in 1999 and was managed for an OEG of 500,000 to 1,000,000 fish. In 2011, the BOF amended the management plan after ADF&G completed the transition from Bendix sonar technology to dual-frequency identification sonar (DIDSON) technology as the method to assess late-run Kenai River sockeye salmon. The goals adopted by the BOF (described above) reflected the adjustment in the estimated number of sockeye salmon passing the RM 19 sonar station as estimated by DIDSON technology that were historically provided by Bendix sonar technology.

Changes to the goals within the management plan did not alter the process for inseason management of the inriver sport fishery because management of this fishery relies on sonar estimates of inriver run strength, escapement, and postseason assessment of the sport harvest from the SWHS. There is no need to assess the sport harvest of sockeye salmon inseason, provided the inriver goal can be met. The current management plan provides a buffer or “escapement gap” between the inriver goal and the lower limit of the SEG range. This gap between the lower limit of the SEG and the inriver goal estimated at the sonar is intended to provide for inriver sport harvests. If the inriver goal (sonar estimate) is achieved, the sport fishery can be prosecuted without restriction. This management strategy for the Kenai River sockeye salmon sport fishery depends heavily upon the successful management of the

commercial salmon fishery in UCI to meet the inriver goal. Achieving the inriver goal provides sockeye salmon for inriver harvests and achieves the SEG.

2016 FISHERY PERFORMANCE UPDATE

The 2016 preseason forecast for Kenai River late-run sockeye salmon was for a run of approximately 4.7 million fish, which was about 1 million fish greater than the 20-year average. The sport fishery was liberalized by increasing the bag and possession limits on July 22. The final estimate of harvest above the sonar was 262,981, which when subtracted from the sonar count of 1,383,692 fish, gave an estimated escapement of 1,120,711, fish which was within the OEG range (700,000–1,400,000). The estimated total run of Kenai River late-run sockeye salmon was approximately 3.5 million fish, which was less than the preseason forecasted run strength.

2017 FISHERY PERFORMANCE

The 2017 preseason forecast for Kenai River late-run sockeye salmon was for a run of approximately 2.2 million fish (Shields and Frothingham 2018). This forecasted run size was less than the long-term average run size of just over 3.6 million sockeye salmon. The final estimated total run (escapement and all harvests) was approximately 2.9 million Kenai River sockeye salmon (Shields and Frothingham 2018). The estimated number of sockeye salmon to pass the sonar counter was 1,308,498 fish (Table 18). When sport harvest estimates above the sonar were subtracted from the sonar estimate, the estimated escapement of late-run Kenai River sockeye salmon was 1,073,290 fish and achieved the SEG (700,000–1,200,000 fish; Table 18).

2018 FISHERY PERFORMANCE

The 2018 preseason forecast for Kenai River late-run sockeye salmon was for a run of approximately 2.5 million fish, which was about 1 million fish less than the 20-year average of 3.6 million sockeye salmon (Marston and Frothingham 2019). ADF&G used inseason assessment data to project that the 2018 Kenai River sockeye salmon run was returning weak and may not achieve the SEG. Based on this projection, ADF&G issued EO 2-RS-1-46-18 and EO 2-RS-45-18 to decrease the sockeye salmon bag and possession limits to 1 per day and 2 in possession, and close the personal use dipnet fishery at the mouth, effective July 30 downstream of Skilak Lake (Appendix A2). At the time the EO was issued, approximately 367,895 sockeye salmon had passed the sonar. Further action was taken on August 4, 2018 with EO 2-RS-1-49-18, which closed the sockeye salmon sport fishery from the mouth of the Kenai River upstream to the outlet of Skilak Lake. At the time the EO was issued 434,560 has passed the RM 19 sonar and by the close of the RM 19 sockeye salmon sonar on August 19, the cumulative passage estimate was 1,035,761 sockeye salmon (Table 18). The fishery was reopened on August 23 by EO 2-RS-1-58-18. When sport harvest estimates above the sonar were subtracted from the sonar estimate, the estimated escapement of late-run Kenai River sockeye salmon was 888,268 fish and achieved the SEG (700,000-1,200,000 fish, Table 18).

2019 FISHERY OVERVIEW

The 2019 preseason forecast for Kenai River late-run sockeye salmon was for a run of approximately 3.8 million fish, which was slightly above the 20-year average of 3.6 million sockeye salmon (B. Marston, Commercial Fish Biologist, Soldotna, personal communication). ADF&G used inseason assessment data to project that the 2019 Kenai River sockeye salmon run

was returning as forecasted and would achieve the SEG. Based on this projection, ADF&G issued EO 2-RS-1-42-19 and EO 2-RS-1-41-19 to increase the sockeye salmon bag and possession limits to 6 per day and 12 in possession, and open the personal use dipnet fishery at the mouth 24 hours per a day, effective July 24 downstream of Skilak Lake (Appendix A3). At the time the EO was issued, 616,246 sockeye salmon had passed the sonar. The *preliminary* cumulative passage estimate was 1,849,054 sockeye salmon through August 19 (Table 18). The final estimates of harvest above the sonar will be available in 2020; however, the final estimated escapement will probably be within the SEG range (700,000–1,200,000). The *preliminary* estimated total run of Kenai River late-run sockeye salmon was approximately 3.6 million fish, which was less than the preseason forecasted run strength.

CURRENT ISSUES

Allocation of the harvestable surplus of sockeye salmon remains a divisive issue between commercial, personal use, and inriver sport users. Success rates in the sport fishery can decline during or after commercial fishing periods. Consecutive fishing periods may mean consecutive days of low success rates in the sport fishery. Greater harvest in the personal use fishery decreases the numbers of sockeye salmon that may reach upriver sport fishing areas. Therefore, low success rates in the sport fishery are an issue in the management of the fishery.

Provisions within the *Kenai River Late-run Sockeye Management Plan* that require ADF&G to make an inseason projection of the total run of late-run sockeye salmon to the Kenai River cause issues with the public. The responsibility of developing the inseason projection falls upon CF staff. Inherent limitations of the assessment techniques used to make the inseason projections and associated levels of accuracy and precision they afford creates confusion among the public during the implementation of the management plan. The purposes of the ranges of projected run strength, the corresponding inriver (sonar) run goals, and the SEG are often misunderstood by the public.

Large numbers of anglers concentrated in confined shoreline fishing areas during this brief but intense sport fishery is an issue. Damage to riparian habitat is an issue of biological concern that has been addressed where possible through regulations adopted by the BOF. Maintaining and providing sport fishing access and infrastructure is an ongoing effort on public lands not closed to fishing. This effort involves several agencies who manage lands in the Kenai River corridor, municipalities, borough, as well as the public.

RECOMMENDED RESEARCH AND MANAGEMENT

We recommend continuing the evaluation of the sockeye salmon sustainable escapement goal as well as research to improve the assessment techniques used to make the inseason projections of sockeye salmon run strength.

The *Kenai River Late-Run Sockeye Salmon Management Plan* states in part⁸:

...the sonar count levels established in this section may be lowered by the board if noncommercial fishing, after consideration of mitigation efforts, results in a net loss of riparian habitat on the Kenai River. The department will, to the extent practicable, conduct habitat assessments on a schedule that conforms to the Board of Fisheries triennial meeting cycle. If the assessments demonstrate a net loss of riparian habitat caused by noncommercial fishermen, the department is requested to report those findings to the board and submit proposals to the board for appropriate modification of the Kenai River late-run sockeye salmon inriver goal.

Language in this plan has created confusion with the public as to whether or not ADF&G can regulate use on public, private, municipal, and borough lands in the Kenai River corridor. We recommend that it is not practicable to measure habitat loss that is directly attributable to the fishery on lands for which ADF&G holds a management right because these lands are protected from development in perpetuity and are contained in 5 AAC 57.180: *Riparian Habitat Fishery Management Plan for the Kenai River Drainage*. We recommend that ADF&G remain active in securing management rights to additional land parcels within the Kenai River corridor for riparian habitat conservation.

NORTHERN KENAI PENINSULA AREA COHO SALMON SPORT FISHERIES

2020 PROPOSALS TO THE ALASKA BOARD OF FISHERIES CONCERNING NKPMA COHO SALMON SPORT FISHERY ISSUES

The following proposals published in “*The Alaska Board of Fisheries 2019/2020 Proposed Changes in the Subsistence, Personal Use, Sport, Guided Sport, and Commercial Fishing Regulations for Lower and Upper Cook Inlet Finfish, Kodiak Finfish, and Statewide King and Tanner Crab General Provisions*”⁹ will probably have some impact on the sport fisheries targeting coho salmon in the Kenai River and Northern Kenai Peninsula Management Area:

Proposal Numbers: 87, 145, 147, 152, 153, 154.

BACKGROUND AND HISTORICAL PERSPECTIVE

Run timing of coho salmon bound for the Kenai River and other Kenai Peninsula systems is slightly later than many Northern District systems. Anecdotal evidence suggests that 2 runs of coho salmon migrate into the Kenai River. However, creel surveys conducted from 1991 to 1993 and in 1998 indicate that 2 distinct runs are not readily discernable from harvest rate data(Clark et al. *Unpublished*).¹⁰ Furthermore, recoveries of coho salmon marked as smolt and returning to the Kenai River as adults indicate that time of entry and time of spawning are independent of date of marking as smolt (Clark et al. *Unpublished*).⁵ As a result, coho salmon in the Kenai River are managed as a single stock based on harvest information and smolt abundance.

⁸ In regulatory language, “board” refers to the Alaska Board of Fisheries and “department” means Alaska Department of Fish and Game.

⁹ <http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.proposalbook>.

¹⁰ Clark, B., R. Lafferty, G. Sandone, J. Fox, P. Cyr, J. Carlon, and J. Hasbrouck. *Unpublished*. Stock status of coho salmon in Upper Cook Inlet: A report to the Alaska Board of Fisheries, February 2000, Anchorage.

Coho salmon typically begin entering the Kenai River in late July, continue through mid- September, and continue at much reduced levels into late November. Elsewhere in the NKPMA, the Kasilof and Swanson rivers support major coho salmon fisheries with smaller fisheries also occurring at Crooked, Resurrection, and Sixmile creeks. Unlike the Chinook salmon fisheries, area coho salmon fisheries are generally more accommodating to angler participation; i.e., easy to access by shore or boat fishing with a wide variety of terminal tackle and less specialized equipment. Beginning in the year 2000, bag and possession limits were reduced to 2 fish. All NKPMA coho salmon stocks are assumed to be subject to an unknown degree of commercial exploitation in Upper Cook Inlet (UCI).

It is assumed that the Kenai River has the only significant late-season coho salmon run in Cook Inlet. Sport effort shifts to coho salmon almost immediately after the termination of the Chinook salmon season at the end of July or during the first week in August. The inriver sport fishery occurs downstream from Kenai Lake to the river's terminus at Cook Inlet (Figure 8). Like the highly mobile Chinook salmon fishery, the coho salmon fishery is conducted from boats; however, unlike the fishery for Chinook salmon, fishing from anchored boats as well as from shore is very common. Beginning in the year 2000, bag and possession limits were reduced to 2 fish. Additionally, a 3-day closure was adopted to provide a temporal break between the intensely targeted Chinook salmon fishery at the end of July and the traditional start of coho salmon fishing during the first week in August. In 2002, the BOF adopted the closure as an allocative means to reduce overall harvest of coho salmon by sport anglers as part of the *Kenai River Coho Salmon Conservation Management Plan* (5AAC 57.170). The plan established a coho salmon fishing season end date of September 30 and also included various restrictions on the use of bait, as well as restrictions to guided anglers. Coho salmon fishing regulations were liberalized for the Kenai River by the BOF in 2005. Changes resulted in a net gain in fishing time and area, and also incorporated less restrictive fishing methods. Several liberalizations implemented for the Kenai River coho salmon sport fishery included the following:

- 1) The end date of the season was extended for coho salmon fishing within the Kenai River drainage from September 30 to October 31.
- 2) Bait was allowed throughout the entire season downstream of the upper Killey River.
- 3) The August 1–3 coho salmon fishing closure downstream of Skilak Lake was repealed, allowing a continuous season from July 1 through October 31.
- 4) The regulation prohibiting fishing after a person takes a bag limit of 2 coho salmon below the upper Killey River was reduced to below the Soldotna Bridge, allowing a person to continue to fish upstream of the Soldotna Bridge.
- 5) Fishing from a guided vessel was allowed on Monday for species other than coho salmon upstream of the confluence of the Moose and Kenai rivers.

Coho salmon fishing regulations were also liberalized for the Kenai River by the BOF in 2008. Changes resulted in an increase in the bag and possession limits as well as a net gain in fishing time. The most recent liberalizations implemented for the Kenai River coho salmon sport fishery included the following:

- 1) A bag and possession limit increase from 2 coho salmon to 3 coho salmon within the Kenai River beginning September 1, except within the Russian River and the Kenai–Russian Rivers fly-fishing only waters.
- 2) A 30-day season extension for coho salmon fishing within the Kenai River drainage downstream of Skilak Lake from October 31 to November 30.

In 2011 coho salmon fishing regulations for the Kenai River were reviewed by the BOF. The regulatory changes related to the Kenai River were as follows:

- 1) A coho salmon 16 inches or greater that is removed from fresh water must be retained and becomes part of the bag limit of the person who originally hooked the fish.
- 2) A person may not remove a coho salmon 16 inches or greater from the water before releasing it.
- 3) The bag limit in the Kenai–Russian Rivers confluence area downstream of the ferry crossing to the powerline was reduced from 2 coho salmon per day and in possession to 1 per day and in possession.

Kenai River coho salmon stocks are subject to commercial exploitation in Upper Cook Inlet (UCI). Data from a comprehensive coded-wire-tagging (CWT) program (Carlson and Hasbrouck 1996–1998; Massengill and Carlson 2004a, 2004b, 2007a, 2007b; Massengill 2007a, 2007b, 2008, 2013; Massengill and Evans 2007; Begich and Pawluk 2010; R. Massengill, Sport Fish Biologist, ADF&G, Soldotna, personal communication) indicated that Kenai River coho salmon stocks in UCI commercial salmon fisheries were principally harvested in the Central District Eastside setnet (ESSN) fishery along the entire coastline of the Kenai Peninsula. Most of this harvest was taken from the setnet fisheries on Coho and Ninilchik beaches (south of the Kasilof River). The majority of the total harvest of Kenai River stocks occurs in the sport fisheries of the Kenai River (i.e., those in Table 19).

Kenai River coho salmon are also harvested in personal use and subsistence fisheries. In 1981 and 1983–1993, there was a fall personal use and subsistence set gillnet fishery for coho salmon on the eastside beaches open to commercial setnetting. This fishery was open in September and therefore harvested late-running coho salmon. In 1985 and 1991–1994, there was also a subsistence set gillnet fishery on Central and Northern District beaches that were open to commercial setnetting. This fishery was generally open on scheduled days from May through September, with open periods concentrated in July (Brannian and Fox 1996).

Kenai River coho salmon are also harvested in the Kenai inriver personal use dip net fishery (Table 6). This fishery has existed in various forms in most years since 1981 and targets Kenai River sockeye salmon in late July and early August. It is described in more detail in the *Kenai River Sockeye Salmon Dip Net Fishery* section of this report. In March 1997, the Alaska BOF changed the closing date of this fishery from August 5 to July 31 to reduce the harvest of coho salmon. The personal use fishery was extended by EO from August 3 through 10 during 2006 due to a late return of sockeye salmon to Kenai River.

Despite relatively stable harvests in the sport fishery through the early 1990s, fisheries managers became increasingly concerned that the current harvest levels could not be sustained.

SF began a stock assessment program in 1992 that focused on the estimation of annual smolt production as an indicator of future abundance (Carlson 2000, 2003; Carlson and Hasbrouck 1997; Carlson and Hasbrouck 1998). Data from this program indicated a decline in smolt abundance from approximately 1,000,000 from 1992 to 1993 to less than 500,000 in 1995. Because this decline in smolt abundance was likely to result in reduced adult returns to the Kenai River, the BOF addressed this fishery in March 1997.

In 1998, SF began an adult coho salmon tagging program to estimate the number of adult coho salmon returning to the Kenai River. This program provided data to estimate the number of adult

coho salmon returning to the Sterling Highway Bridge at RM 20 in Soldotna, with acceptable levels of accuracy and precision from 1999 to 2004. In addition, this inriver estimate in combination with the sport harvest data from the SWHS enabled ADF&G to estimate total runs, spawning escapement, and exploitation of Kenai River coho salmon. These estimates, combined with the smolt abundance estimates, also provided estimates of smolt to adult survival.

From 1999 through 2004, the coho salmon runs averaged about 140,000 fish with harvests averaging just over 62,000 fish. From 2000 to 2004, exploitation rates ranged from about 35% to 47%. Smolt abundance ranged from nearly 580,000 to 1,200,000 with marine survival ranging from 6% to 32% (Carlson and Evans 2007; Massengill and Evans 2007).

From 2005 through 2007, the focus of the coho salmon stock assessment program was to estimate smolt abundance through a mark–recapture project. In this project, smolt were tagged in the spring and early summer at Moose River. Fish wheels, operated upstream of the Soldotna Bridge at RM 28, captured returning adults in order to estimate the number of smolt leaving the system the prior year. Smolt tagging was discontinued in 2007 and returning adults were sampled for tags during 2008 (R. Massengill, Sport Fish Biologist, ADF&G, Soldotna, personal communication).

Annual Kenai River coho salmon sport harvests increased from a low of 9,537 fish in 1977 to a record high 86,711 fish in 1994 (Begich et al. 2017). Sport harvests then decreased from 1994 to 1999. Kenai River coho salmon sport harvests averaged 40,776 fish during 1977–1999, prior to the 2-fish per day bag limit that started in 2000, and have averaged 49,325 fish between 2000 and 2018 (Begich et al. 2017; Table 19).

Like the Kenai River stock, other NKPMA coho salmon stocks are assumed to be subject to some unknown degree of commercial exploitation in Upper Cook Inlet (UCI). Kasilof River coho salmon are also harvested in a personal use fishery (Table 6). The Kasilof River personal use fishery is open through August 7.

Sport harvests of coho salmon in the Kasilof and Swanson River drainages as well as in Resurrection Creek have remained fairly stable, with some variation (Table 20). In 2018, Sixmile Creek reported the highest harvest since 2002. Harvests for the most recent 10-year average (2009–2018) are slightly greater in Kenai River tributaries, the Kasilof River drainage, and other drainages (excluding Swanson River drainage) than harvests prior to the bag limit reduction in 2000 (Tables 19 and 20).

Recent Alaska Board of Fisheries Actions

During the 2017 BOF meeting, 2 regulations were adopted affecting coho salmon sport fisheries in the NKPMA. The first shortened the fishing season for coho salmon to close on November 1 from Bings Landing upstream to the outlet of Skilak Lake. The second restricted legal gear to 1 unbaited, single-hook, artificial lure from November 1 through December 31 in the same area described above.

COHO SALMON MANAGEMENT OBJECTIVES

In March 1997, the BOF adopted the *Kenai River Coho Salmon Management Plan* (5 AAC 21.357). This plan contained regulations that reduced the total (combined sport and commercial) harvest by approximately 20%. In the spring of 2000, the BOF amended this plan again and adopted it as the *Kenai River Coho Salmon Conservation Management Plan*

(5AAC 57.170). It contains management directives and outlines the burden of conservation between various user groups in the NKPMA. It directs ADF&G to minimize the incidental take of Kenai River coho salmon stocks in the commercial fishery. It also directs ADF&G to manage Kenai River coho salmon stocks primarily for sport and guided sport uses in order to provide fishermen with reasonable opportunity to harvest these stocks over the entire run, as measured by the frequency of restrictions.

During the February–March meeting of the BOF in 1999, early-run Kenai River coho salmon were addressed in the *Upper Cook Inlet Salmon Management Plan* (5 AAC 21.363). This BOF-adopted management plan directed ADF&G to minimize the harvest of this species in the Cook Inlet commercial salmon fishery. In 1999, the BOF amended this plan.

In 2005, the *Kenai River Coho Salmon Conservation Management Plan* was repealed. The resulting plan, *Kenai River Coho Salmon Management Plan* (5AAC 57.170), provides the current regulatory framework and guidelines for management to ensure an adequate escapement of coho salmon into Kenai River.

In addition to objectives and guidelines given in the *Kenai River Coho Salmon Management Plan*, ADF&G management objectives for NKPMA coho salmon are as follows:

- 1) Provide opportunity for angler participation at a level that can be supported by the fisheries resource and associated habitat.
- 2) Ensure, through appropriate management and research programs, that the spawning escapement does not decline below levels necessary to ensure sustained yield.

INSEASON MANAGEMENT APPROACH

Currently, there are no active research programs associated with NKPMA coho salmon fisheries. For the Kenai River stock, there are no quantitative data to assess coho salmon stock status, and an escapement goal has not been established. With the exception of 1997, when use of bait was prohibited and the coho salmon bag and possession limits were reduced to 1 fish, there has been no inseason management of NKPMA coho salmon stocks except in the Kenai River during 2004 when the coho salmon season was extended 31 days from September 30 to October 31. Rather, all the NKPMA coho salmon sport fisheries are presently managed inseason by regulation.

Inseason fishery performance in the Kenai River from 1999 through 2007 was gauged by fish wheel catches from the coho salmon stock assessment program, through direct observation by research and management staff, and by information provided by anglers. Escapement was not estimated from ADF&G fish wheels inseason. However, fishwheel capture rates can indicate an index of low, medium, or high magnitudes for the Kenai River coho salmon run size. Currently, inseason fishery performance is assessed through information provided by anglers and through guided angler success determined from the guided logbook program data received at the Soldotna office during August through September.

The SWHS is currently used to assess coho salmon fishery performance postseason (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/>). Results from this survey are typically available during the year following the season. A comprehensive CWT project in Cook Inlet has estimated the annual smolt outmigration from the Moose River drainage. These estimates were previously thought to be a useful management tool under the assumption that there is a correlation between the magnitude of smolt outmigration and the magnitude of total return.

However, research results indicate that the correlation is weak due to variation in smolt to adult survival (R. Massengill, Sport Fish Biologist, ADF&G, Soldotna, personal communication).

2016–2018 FISHERY PERFORMANCE AND 2019 FISHERY OVERVIEW

Inseason run strength and fishing success were gauged by reports volunteered by guides and individual anglers. Final harvest estimates are provided by the SWHS as well as the guide logbook program.

Areawide reports from anglers as well as harvest estimates indicated the 2017 and 2018 coho salmon fisheries were average to above average, whereas the 2016 and 2019 fisheries were below average. The long-term (1998–2018) average harvest is 47,418 coho salmon and the most recent 10-year (2009–2018) average harvest is 48,893 fish (Table 19). The estimated harvest in the Kenai River declined each year from 52,912 in 2010 to 36,407 in 2012, but increased to above the 2009–2018 average in 2014 and 2015 (Table 19). Harvest declined to below average with 39,931 fish in 2016; however, harvests rebounded to near average levels with 48,427 fish in 2017 and 50,575 in 2018 (Table 19). Recent harvests in the Swanson River drainage have been lower than harvests in the past. The 2016 harvest (1,158 fish) was below the long-term (1998–2018) average, the 2017 harvest (1,688 fish) was near average, and the 2018 estimated harvest of 1,203 coho salmon was lower than average (Table 20). Coho salmon harvest estimates in other NKPMA drainages were higher than the long-term average harvests estimated for those systems. Based on angler reports, staff observations, and information throughout Cook Inlet, it appeared that the 2018 and 2019 coho salmon run timing was later than typically observed. For instance, reports from many streams throughout the Cook Inlet area indicated high fishing success during late August and early September at locations where fishing success typically peaks during August. Reports from anglers during the coho salmon fishery indicated the fishery declined after 2017, with many fisheries reporting very low success rates during the traditional peak coho salmon fishing in August and September. ADF&G expects that the 2019 harvests of coho salmon from these fisheries will be less than the recent 10-year average for each system.

The *Kenai River Coho Salmon Management Plan* was established to prevent the over exploitation of the stock in times of weak or very low runs. Although no estimate for the total number of coho salmon in the run to Kenai River is available, estimates of harvest from the SWHS for the 2016 and 2017 seasons indicated a small increase in harvest in 2017. The harvest continued to increase to slightly above the recent 10-year average in 2018 (Table 19). For both 2017 and 2018, run abundances were probably average.

Reports from anglers during the 2019 Kenai River coho salmon sport fishery indicated the fishery started out very slow and did not improve to good fishing success. Poor to fair coho salmon catches were reported throughout the season from early August through October. Reports indicated that good fishing was sporadic and did not improve later in the run and these reports indicated run strength was probably well below average. The below-average run strength was reflected in ADF&G catches of coho salmon in the lower Kenai River Chinook salmon netting program, which detected few coho salmon passing into the Kenai River during mid-August. Therefore, below-average harvest estimates are anticipated for the Kenai River in 2019.

CURRENT ISSUES

Since 1977, fishery performance, measured by catch and harvest, was thought to be proportional to abundance and therefore the fishery was managed under a 3-fish bag limit. The fishery is

presently managed under a 2-fish bag limit, except for the Kenai River where the bag limit increases to 3 fish beginning September 1. Recent catch and harvest estimates are similar to or larger than those estimated historically. Without an inseason assessment program or biological information upon which to manage each of the numerous coho salmon stocks that compose this fishery, the fishery is managed with a 2-fish bag limit to avoid decreasing coho salmon production during years of low abundance. The lack of information to estimate total runs, escapements, and a harvestable surplus is a concern for the public that desires a 3-fish bag limit.

RECOMMENDED RESEARCH AND MANAGEMENT

We do not recommend a change in the management of NKPMA coho salmon until a stock assessment program can be initiated and developed to estimate total runs, spawning escapement, and harvestable surplus available to the various fisheries.

NORTHERN KENAI PENINSULA MANAGEMENT AREA PINK SALMON SPORT FISHERIES

2020 PROPOSALS TO THE ALASKA BOARD OF FISHERIES CONCERNING PINK SALMON SPORT FISHERY ISSUES

The following proposals published in “*The Alaska Board of Fisheries 2019/2020 Proposed Changes in the Subsistence, Personal Use, Sport, Guided Sport, and Commercial Fishing Regulations for Lower and Upper Cook Inlet Finfish, Kodiak Finfish, and Statewide King and Tanner Crab General Provisions*”¹¹ will probably have some impact on the sport fisheries targeting pink salmon in the Kenai River:

Proposal Numbers: No proposals affecting the pink salmon for the 2020 Alaska Board of Fisheries meeting.

BACKGROUND AND HISTORICAL PERSPECTIVE

Runs of pink salmon occur each year; however, in the NKPMA, this species is more abundant during even-numbered years. Although small numbers of pink salmon return to several NKPMA streams, the Kenai and Kasilof rivers and Resurrection Creek near Hope support the largest runs. The majority of the pink salmon harvest occurs in the Kenai River (Table 21).

Pink salmon are readily caught with a variety of artificial lures, flies, and with bait. Because this species tends to limit its inriver distribution to near tide water in the lower sections of rivers while maturing, massive aggregations of fish are present in some years, making them popular with juvenile anglers and tourists. In 1989, the bag and possession limits in the Kenai River were increased to 6 fish in the Kenai River; in other NKPMA drainages, it remains an aggregate bag limit of 3 sockeye, pink, and coho salmon 16 inches or greater in length of which no more than 2 can be coho salmon.

Recent Alaska Board of Fisheries Actions

There have been no recent regulatory changes in this fishery.

¹¹ <http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.proposalbook>.

PINK SALMON MANAGEMENT OBJECTIVES

This fishery is not specifically addressed in a sport fishery management plan adopted by the BOF. ADF&G objectives for this fishery are as follows:

- 1) Provide opportunity for angler participation at a level that can be supported by the fisheries resource and associated habitat.
- 2) Ensure, through appropriate management and research programs, that the spawning escapement does not decline below levels necessary to ensure a sustained yield.

INSEASON MANAGEMENT APPROACH

Inseason management has not been required in this fishery. Management is achieved through existing regulations. The SWHS is currently used to assess pink salmon fishery performance postseason (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/>). Results from this survey are typically available during the year following the season.

2016–2018 FISHERY PERFORMANCE AND 2019 FISHERY OVERVIEW

Inseason run strength was gauged by reports from ADF&G staff, and information volunteered by guides and by individual anglers. Final harvest estimates provided by the SWHS indicate the Kenai River even-year catch and harvest estimates from 2016 and 2018 were below average when compared to historical even-year catch and harvest levels from 2000 to 2018 of 155,146 and 18,989 fish, respectively (Table 21). However, according to staff observations and angler reports, the run strength of pink salmon to NKPMA rivers was unusually strong with noticeably large fish. This was most obvious in the Kenai River sockeye salmon sport fishery where catch rates of pink salmon overwhelmed catch rates of target species (sockeye salmon) beginning the last week of July through the remainder of the season. In addition, large aggregations of pink salmon were observed by staff and the public in several areas of the Kenai River downstream of Skilak Lake with the most noteworthy numbers being distributed in the lower section of river from Soldotna downstream to tidewater.

The 2017 and 2019 abundances of pink salmon were greater relative to historical odd-year run strengths as reported from ADF&G staff, guides, and individual anglers. Odd-year pink salmon catch and harvest have been increasing steadily over time as reported in the SWHS. The most recent odd-year average (1999–2017) catch and harvest is 13,041 and 3,680 fish, respectively. Although the even-year indicators show a stable fishery, the odd-year fishery has been increasing steadily since 1999, with the 2017 catch (20,374 fish) and harvest (5,899 fish) being the largest in the historical dataset for an odd-year run (Table 21).

CURRENT ISSUES

There are currently no biological concerns regarding Northern Kenai Peninsula pink salmon.

RECOMMENDED RESEARCH AND MANAGEMENT

No research or management activities specific to this fishery are recommended.

NORTHERN KENAI PENINSULA MANAGEMENT AREA RESIDENT SPECIES SPORT FISHERIES

KENAI RIVER RAINBOW TROUT SPORT FISHERY

2020 Proposals to the Alaska Board of Fisheries Concerning Kenai River Rainbow Trout Sport Fishery Issues

The following proposals published in “*The Alaska Board of Fisheries 2019/2020 Proposed Changes in the Subsistence, Personal Use, Sport, Guided Sport, and Commercial Fishing Regulations for Lower and Upper Cook Inlet Finfish, Kodiak Finfish, and Statewide King and Tanner Crab General Provisions*”¹² will probably have some impact on the sport fisheries targeting rainbow trout in the Kenai River:

Proposal Numbers: 147, 148, 152.

Background and Historical Perspective

The Kenai River is the most heavily utilized river for freshwater sport fishing in Alaska and one of the largest rainbow trout fisheries in the United States. Although many of the anglers fishing the Kenai River participate in the river's salmon fisheries, the Kenai River drainage also supports a major rainbow trout fishery with annual catches that have trended upwards for 2 to 3 decades. Catches have ranged from 8,720 to 241,651 fish since 1984 and have been more stable in recent years (Table 22, Figure 9), although the 2015 reported catch exhibits a dramatic increase over prior and subsequent years, possibly a reflection of limited Chinook salmon opportunity due to early-run closure. The sharp decline in the 2018 reported catch may reflect the decrease in effort, which is mostly attributable to sockeye salmon (Table 1). Anglers that fish for Kenai River sockeye salmon also fish for resident species. These anglers who would normally travel to the Kenai Peninsula to fish for sockeye salmon may not have made trips based on the poor sockeye salmon return, thus limiting the amount of effort and catch of other species.

Increasing public concern for the rainbow trout resource and a scarcity of biological and fishery data from the early years of the fishery prompted the BOF to adopt increasingly restrictive regulations between 1959 and 2008 (Appendix D1).

In 1986, ADF&G began to compile population and fishery databases for use in formulation of a drainagewide management strategy for Kenai River rainbow trout. During 1986, a mark-recapture program was designed to estimate the rainbow trout population in section 004 from Jim's Landing upstream to the power line near the Russian River (Lafferty 1989; Figure 10). The rainbow trout population estimates for section 004 for fish over 200 mm were 3,640 fish in 1986 and 4,950 fish in 1987 (Lafferty 1989).

In 1987, the study was expanded to include 2 sections (002 and 003) of the river below Skilak Lake in the middle river (Lafferty 1989; Figure 10). Lafferty (1989) concluded that the best estimates of rainbow trout abundance, 200 mm or greater in length, for section 003 of the middle river was 1,750 fish (Table 23). This study also concluded that these estimates were probably negatively biased.

¹² <http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.proposalbook>.

In 1995, the population estimate was repeated in section 004 (Hayes and Hasbrouck 1996). Data analysis in 1995 included a reevaluation of the 1986 and 1987 data to provide comparable estimates. Estimates of abundance of rainbow trout, 300 mm (12 inches) or greater in length, in section 004 in 1986, 1987, and 1995 were 2,520, 3,472, and 5,598 fish, respectively (Table 23). This study concluded that the rainbow trout population in the upper Kenai River had increased and that there was an increased number of rainbow trout in each 50 mm (2 inch) size class of the population from 300–550 mm (12–22 inches) in length. It was further concluded that the upper Kenai River rainbow trout population numbers had been maintained at a high level and that section 004 could serve as an index of abundance of the upper Kenai River rainbow trout population.

In 1998, additional research was instituted to reassess the population of rainbow trout in the Kenai River drainage. This study was a multi-year study that addressed multiple sections of the river. Primary aspects of this work were to repeat the mark–recapture programs in the area below Skilak Lake and in the upper river section to compare population estimates among years (Larson and Hansen 2000; King and Breakfield 2007).

The middle river estimate of abundance in 1999 was 7,883 fish, compared to 1,750 fish during 1987 (Larson and Hansen 2000). The estimated number of rainbow trout had increased by 400% in the 12 years between studies. Final conclusions were that the population was increasing and the numbers of fish in each size class were increasing, with the exception of large fish (those over 24 inches in length). Over this same period, rainbow trout catches in the middle river (Moose River to Skilak Outlet) increased from 6,430 fish in 1987 to 32,050 fish in 1999 (Begich et al. 2017; Table 22). Harvest remained relatively stable and averaged about 802 fish from 1987 to 1999 (Begich et al. 2017; Table 22).

In 2001, the fourth rainbow trout population estimate in 16 years was derived for the upper river index area (King and Breakfield 2007). The estimated number of rainbow trout, 300 mm (12 inches) or more in length, increased from 5,598 fish in 1995 to 6,365 fish in 2001 and was nearly 300% higher than the population size estimated in the mid-1980s (King and Breakfield 2007; Table 23). The reported catch of rainbow trout in the upper river (Skilak Inlet to Kenai Lake) from 1986 to 1987 averaged 2,945 fish and the catch increased to 33,475 fish in 1995 and was 78,836 fish in 2000 (Begich et al. 2017; Table 22).

During 2009, abundance of rainbow trout in the upper river was indexed for the fifth time (Eskelin and Evans 2013). The estimated number of rainbow trout 300 mm (12 inches) or more in length, was 5,106 fish in 2009 (Table 23). The 2001 data were reevaluated in 2009 using different assumptions resulting in an estimated population size of 6,365 fish (Table 23). The 2009 estimate is lower than the 2001 estimate but within the range of abundance estimates from this area since 1995. The decline was attributed to a slight reduction in the estimated numbers of smaller rainbow trout. The numbers of large rainbow trout increased slightly over abundance estimates conducted previously.

Based on these positive findings about the status of the upper and middle Kenai River rainbow trout stocks, ADF&G did not have a concern for the health of the stocks.

In 2010, a rainbow trout radiotelemetry project was initiated to define the seasonal movements and spring spawning distribution of rainbow trout in the middle and lower sections of the Kenai River. Findings from this project showed that rainbow trout summering in the area of the river between Moose River at RM 36 and Slikok Creek at RM 18 undertake seasonal migrations

amongst overwintering, spawning, and oversummering areas that are relatively well defined. Specifically, radiotagged rainbow trout present in the middle Kenai River downstream of Moose River (RM 36) in summer generally overwinter upstream of RM 42 to Skilak Lake (Figure 10). In addition, a majority of tagged fish that were successfully tracked over 1 year spawn mostly from Skilak Lake outlet downstream to RM 44, an area downstream of the upper Killey–Kenai rivers confluence (Figure 10; A. Eskelin, Sport Fish Biologist, ADF&G, Soldotna, personal communication).

In 2017–2018, a rainbow trout length composition and abundance assessment study was conducted on the Middle Kenai River. Preliminary findings from this project showed that the rainbow trout population numbers are healthy and robust. Results from the length composition estimates point towards a decline in abundance of the larger, trophy sized fish and the majority of fish sampled displayed some form of hooking injury. The same study design was also undertaken in 2018 on the upper Kenai River. Preliminary results mirror trends observed in the Middle Kenai River study. Both studies took place in the spring while sport fishing is closed in the study areas and in locations where fish congregate for spawning. Results of these studies are expected to be published in the fall of 2020 (A. Eskelin, Sport Fish Biologist, ADF&G, Soldotna, personal communication).

Recent Alaska Board of Fisheries Actions

During the 2017 Alaska Board of Fisheries meeting, regulations were adopted aligning spring rainbow trout spawning closure dates for the Kenai River drainage and Swanson River drainage. Sport fishing is closed in the mainstem and tributaries from May 1 through June 10 upstream of the lower Killey River mouth excluding Skilak and Kenai lakes. Additionally, the size limit of rainbow trout was also reduced to 1 less than 16 inches in total length in the Lower Kenai River drainage. See Southcentral Sport Fishing Regulation Summary for details.

Kenai River Rainbow Trout Management Objectives

Management objectives for this fishery were first developed from and were contained in the *Cook Inlet and Copper River Basin Rainbow/Steelhead Trout Management Policy* (CIRTMP; ADF&G 1987). This policy was adopted by the BOF in 1986 for Cook Inlet waters and was amended in 1988 to include the Copper River Basin. This plan was replaced in 1998 by the *Criteria for Establishing Management Areas for Trout* (5 AAC 75.013), which was replaced by the *Special Management Areas and Liberal Harvest Opportunities for Trout* (5 AAC 75.210) in 2003. This most recent version of the plan establishes the criteria for considering proposed regulatory changes for bodies of water that would diversify sport fishing opportunity through the liberalization of harvest opportunities for rainbow trout.

As specified in the plan, the Kenai River rainbow trout fishery is managed for sustained yield. The fishery provides a diversity of sport fishing opportunities for wild rainbow trout through establishment of special management areas by regulation. These management areas provide for diverse fishing practices as well as modest harvest opportunity.

Fishery objectives for the Kenai River rainbow trout fishery are as follows:

- 1) Provide the opportunity for angler participation at a level that can be supported by the fisheries resource and associated habitat.
- 2) Ensure, through appropriate management and research programs, that the trout population does not decline below levels necessary to ensure sustained yield.

Inseason Management Approach

The Kenai River rainbow trout fishery is highly restricted and inseason management is directed by regulation. The adoption of the rainbow trout spring spawning season fishing closure in 2005 resulted in a net gain in fishing time and fishing area for rainbow trout anglers in the Kenai River drainage. Currently, the rainbow trout population numbers in the Kenai River watershed are considered relatively robust. Information from the SWHS indicates sport fishing for rainbow trout in the Kenai River remains very popular. ADF&G staff have observed the presence of both guided and unguided anglers fishing for rainbow trout throughout several months of the year. Fishing in winter months, provided sections of the river remain free of ice, is popular near Cooper Landing and downstream of Skilak Lake. Reports from the general public and staff observations indicate rainbow trout fishing during the fall, winter, and early spring prior to the spawning closure on May 2 is still gaining popularity.

2016–2018 Fishery Performance and 2019 Fishery Overview

Sport harvest and catch for the Kenai River rainbow trout fishery is determined by the SWHS (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/>). Total catches of Kenai River rainbow trout increased steadily since the mid-1980s and remain high with some variation (Figure 9, Table 22). The most recent 10-year (2009-2018) average catch and harvest, as determined from the SWHS, is 175,888 and 2,197 fish respectively (Table 22). The most recent 10-year (2009–2018) average percent of rainbow trout retained of fish caught in the flowing waters of the Kenai River is less than 2% (Table 22). ADF&G estimates that the 2019 total catch will be less than the most recent average due to the Swan Lake Fire. Due to public safety concerns and firefighting efforts, the Department of Natural Resources implemented complete or partial closures of the upper Kenai River and both Skilak Lake boat launches from August 18 through September 21.

Retention of rainbow trout by anglers has not changed much since the mid to late 1990s (Begich et al. 2017; Table 22). Retention of fish in the former catch-and-release fishery between Kenai and Skilak lakes has been allowed since the 2005 season for trout that are 16 inches or less. Retention in this fishery increased sharply from an estimated harvest of 267 fish in 2005 to about 941 in 2008 (Table 22). Since 2009, the estimated harvests have averaged less than 400 fish. During 2017, the estimated harvest of rainbow trout in this section between the lakes was 830 fish, making it the second highest recorded catch on record for this section during this time (Table 22). For the entire river, the overall percentage of retention has declined due to greater catches (especially after 2003), probably precipitated by more anglers participating in the fishery. The percentage of the total number of rainbow trout caught (101,424 fish) in the Kenai River in 2018 that were retained (1,152 fish) was about 1.1% (Table 22). This is similar to the recent percentages estimated for fish retention. In 2019, ADF&G anticipates reduced catch and harvest overall due to the Swan Lake Fire river closures. The SWHS information shows that the Kenai River rainbow trout fishery is a popular catch-and-release sport fishery. Information about the rainbow trout stock in combination with catch and harvest information indicates the stock remains robust and stable.

Reports from anglers participating in the 2019 fishery and ADF&G staff observations suggest that the rainbow trout and Dolly Varden fishing was considered average in the middle section of the Kenai River. No unusually high-water events occurred during late August through September to reduce angler participation; however, the Swan Lake Fire may have shifted effort from the upper Kenai River to this section. The complete or partial closures of the upper Kenai River will

likely cause an increase in catch rates of rainbow trout and Dolly Varden. ADF&G did not receive reports from anglers during the season that indicated that the rainbow trout stocks in the Kenai River were declining, failing, weak, or that fish size had changed appreciably. Several reports of large trophy rainbow trout were relayed to area staff in the Soldotna office.

Current Issues

Kenai River rainbow trout are conservatively managed under restrictive bag limits and fishing is not permitted during the spawning period upstream of approximately RM 44.0. Fishing during the spawning period in the lower Kenai River is allowed under existing regulation; however, only limited spawning activity takes place in this area.

Recommended Research and Management

Interest and participation in the Kenai River rainbow trout fishery as measured by annual catch remains high and the population appears to be robust. We recommend continued projects conducted periodically to determine the abundance and ASL composition of rainbow trout in select sections of the Kenai River.

KENAI RIVER DOLLY VARDEN SPORT FISHERY

2020 Proposals to the Alaska Board of Fisheries Concerning Kenai River Dolly Varden Sport Fishery Issues

The following proposals published in “*The Alaska Board of Fisheries 2019/2020 Proposed Changes in the Subsistence, Personal Use, Sport, Guided Sport, and Commercial Fishing Regulations for Lower and Upper Cook Inlet Finfish, Kodiak Finfish, and Statewide King and Tanner Crab General Provisions*”¹³ will probably have some impact on the sport fisheries targeting Dolly Varden in the Kenai River:

Proposal Numbers: 147, 148, 152.

Background and Historical Perspective

Dolly Varden are harvested in all areas of the Kenai River. Harvest and catch of this species is determined by the SWHS (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/>). The open season for Dolly Varden fishing is January 1 through December 31, except in those areas of the river upstream of a marker approximately 1 mile upstream from the mouth of the Lower Killey River and upstream of Skilak Lake, where more restrictive seasons apply. Prior to 1984, the bag and possession limits were 10 Dolly Varden of any size. Beginning in 1984, these limits were reduced to 5 Dolly Varden of any size. In 1990, the BOF chose a more conservative management approach and reduced the daily bag and possession limit for the upper Kenai River to 2 fish, only 1 of which could be 24 inches or larger. The bag and possession limits for the remainder of the drainage were unchanged until 1992, when the BOF reduced the limit from 5 to 2 fish of any size. In 1996, the limit for all Kenai Peninsula flowing waters was reduced to 2 fish, including a protected slot limit prohibiting retention of fish between 12 and 24 inches, and an open season from June 15 through April 14 was also established. In 1998, spawning season closures were established in 3 upper Kenai River tributaries that were identified as important for Dolly Varden production. Fishing was

¹³ <http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.proposalbook>.

prohibited from September 15 through October 31 in Cooper Creek, Quartz Creek, and Snow River.

The Kenai River is assumed to support both resident and anadromous Dolly Varden populations. Only limited biological information is available regarding both populations. Resident fish are believed to inhabit the entire river, including both Skilak and Kenai lakes. Seasonal movements of these resident fish are not known, but it is assumed that a percentage of the stream-residing fish overwinter in Skilak and Kenai lakes. The anadromous population is believed to enter Kenai River in July and it is assumed that some of these fish also overwinter in Skilak Lake and probably Kenai Lake. Dolly Varden emigrate from both of these lakes in April and May. Harvest estimates presented in Table 24 do not differentiate between resident and anadromous populations.

A study of Kenai River Dolly Varden was initiated in 1996. The primary objective of this study was to locate major staging areas of Dolly Varden within the Kenai River watershed upstream of Skilak Lake (Palmer and King 2005). Future Dolly Varden studies will investigate the age, maturity, and availability of Dolly Varden in these locations.

A number of staging areas where Dolly Varden congregate have been located by deploying various trapping devices and conducting visual observations. The U.S. Fish and Wildlife Service (USFWS) conducted a Dolly Varden radiotelemetry study during 1998 and 1999 when radio transmitters were placed in Dolly Varden in the Kenai River, selected tributaries, and Skilak and Kenai lakes. The radiotelemetry study provided information on major staging areas, seasonal fish movements, and overwintering areas (Palmer and King 2005).

Research findings indicate Dolly Varden occupy most tributary streams to Kenai Lake and the Kenai River. Staging areas containing spawning fish were identified in Quartz, Summit, and Cooper creeks and the Snow River; Quartz Creek and its associated tributaries were also suspected of supporting one of the major spawning populations upstream of Skilak Lake. To date, no major Dolly Varden staging areas have been located within Kenai Lake during summer or fall. Radiotelemetry data indicate Dolly Varden prefer traveling throughout the pelagic zone of Kenai Lake during the summer and fall rather than along the shoreline. During winter, fish may frequent the area around Porcupine Island. Porcupine Island is one of the few areas within Kenai Lake having a shallow gravel bottom, which may be preferred overwintering habitat for Dolly Varden.

During the 2002 BOF meeting, changes were made pertaining to size retention and bag and possession limits of Dolly Varden. In the Kenai River drainage upstream of the upper Killey River, the protected slot limit was removed and the bag limits were changed to 1 per day and 1 in possession less than 18 inches in length. In 2005, the BOF aligned the Dolly Varden regulations in the Kenai River to be the same or similar to those for rainbow trout. The bag and possession limits remained at 1 fish; however, the maximum retention length of a Dolly Varden was restricted to less than 16 inches in waters above Skilak Lake with a season of June 11 through May 1. In the Kenai River below Skilak Lake, the bag and possession limits were reduced to 1 fish less than 18 inches and the season was open the entire year. During the 2014 Alaska Board of Fisheries meeting, no regulations were adopted affecting the Kenai River Dolly Varden sport fisheries.

Recent Alaska Board of Fisheries Actions

During the 2017 Alaska Board of Fisheries meeting, regulations were adopted reducing the size of Dolly Varden to 1 less than 16 inches in total length in the Lower Kenai River.

Kenai River Dolly Varden Management Objectives

This Dolly Varden fishery is not directly addressed in a management plan adopted by the BOF. ADF&G objectives for this fishery are as follows:

- 1) Provide the opportunity for angler participation at a level that can be supported by the fisheries resource and associated habitat.
- 2) Ensure, through appropriate management and research programs that the Kenai River Dolly Varden population does not decline below the level necessary to ensure sustained yield.

Inseason Management Approach

Inseason management has not been required in this fishery. The fishery is managed by existing regulations. Populations of Dolly Varden currently appear to be robust.

2016–2018 Fisheries Performance and 2019 Fishery Overview

There is no creel survey or monitoring program to assess this population inseason. Harvest estimates are derived postseason from the SWHS and catch for this species was first estimated by the SWHS in 1990 (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/>). Harvest estimates reflect a fishery with a peak harvest in 1984 of 31,407 (Figure 11; Begich et al. 2017). The significant decline for 1986 and 1987 harvests is attributed to more restrictive bag limits (from 5 fish per day to 2 fish per day in 1993; from 2 fish per day to 1 fish per day in 2005), and the adoption of a voluntary catch-and-release philosophy. The Dolly Varden catch is thought to be greatest when increasing angler effort is directed toward rainbow trout beginning in August. Because the regulatory structure is similar to that for rainbow trout, this fishery is not harvest oriented and nearly all fish caught are released. Dolly Varden undertake seasonal migrations in the fall when anglers welcome the additional fishing opportunity they provide.

The most recent 10-year average (2009–2018) Dolly Varden harvest from the Kenai River was 2,760 fish (Table 24). The 2018 SWHS estimate of total catch of Dolly Varden in the Kenai River was 67,452 fish and is the lowest catch since 1998 (Figure 11, Table 24). The percentage of Dolly Varden retained in 2018 (3.1%) was larger than the most recent 10-year average (2009–2018) of 2.3% (Table 24). Anglers are expected to continue to retain low percentages of Dolly Varden caught in the Kenai River sport fisheries. ADF&G projects that the 2019 season's sport fishing catch and harvest should be less than the 2018 season due to Department of Natural Resources closures in the upper Kenai River as a result of the Swan Lake Fire.

Current Issues

There are currently no major issues associated with the Kenai River Dolly Varden fishery.

Recommended Research and Management

As interest and participation in the Kenai River fisheries for rainbow trout has increased so has interest in Dolly Varden. Over recent years, total participation in the Kenai River fisheries has stabilized; however, fisheries for resident species have continued to grow as measured by catch.

The conservative management of Dolly Varden has stabilized annual catches and reduced harvest. We do not recommend any specific research or management for this fishery.

OTHER NORTHERN KENAI PENINSULA MANAGEMENT AREA RESIDENT SPECIES SPORT FISHERIES

2020 Proposals to the Alaska Board of Fisheries Concerning Other NKPMA Resident Species Sport Fishery Issues

The following proposals published in “*The Alaska Board of Fisheries 2019/2020 Proposed Changes in the Subsistence, Personal Use, Sport, Guided Sport, and Commercial Fishing Regulations for Lower and Upper Cook Inlet Finfish, Kodiak Finfish, and Statewide King and Tanner Crab General Provisions*”¹⁴ will probably have some impact on the sport fisheries targeting resident species in the NKPMA:

Proposal Numbers: 144.

Background and Historical Perspective

Lake survey data collected by ADF&G from 362 lakes within the NKPMA document that 212 lakes support natural populations of game fish, and an additional 25 lakes are stocked by ADF&G. Game fish present in area lakes include rainbow trout, Dolly Varden, Arctic char, Arctic grayling, lake trout, landlocked salmon, and burbot (*Lota lota*). Numerous flowing waters also support fisheries for rainbow trout as well as Dolly Varden. Steelhead (*O. mykiss*) occur in both the Kasilof and Kenai rivers.

With the exception of a few studies, investigations by ADF&G for these fisheries is limited to research on stocked lakes, summarized by Pawluk and Berkahn (2012), and on unstocked lakes by Tobin III and Palmer (1997). Overall, research information on area lakes is confined to basic lake survey information conducted by ADF&G during the 1960s and 1970s. These resident species fisheries are not monitored inseason. The statewide harvest survey has been used to determine the catch, harvest, and participation from lakes, provided the number of respondents is sufficient to estimate these sport fishing parameters. Similarly, statewide harvest survey estimates are available for numerous flowing waters that support popular fisheries for resident species.

Tributaries within the Kenai River drainage, including the Russian River, Quartz, and Ptarmigan creeks, support popular fisheries for both rainbow trout and Dolly Varden (Tables 25–28). Estimates of participation and catch of both species at these locations increased through the early 1990s with some variation (Begich et al. 2017). Although in 2011 and 2012 there was a marked decline in effort and catch (excluding the Russian River), the estimated total fishing effort and catch for rainbow trout and Dolly Varden have increased since then.

Steelhead occur naturally in the Kasilof River. In the early 1980s, steelhead spawning in Crooked Creek, a tributary to the Kasilof River, were used to enhance the stock for sport fishing. According to the SWHS, enhancement generated relatively large catches exceeding 6,000 fish and harvest in excess of 2,000 fish during 1993 (Begich et al. 2017). This program was terminated in 1996. In the Kasilof River drainage from 2004 to 2009, steelhead were assessed using weirs at Crooked and Nikolai creeks; Nikolai Creek is a tributary of Tustumena Lake. In

¹⁴ <http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.proposalbook>.

combination, counts averaged over 1,000 steelhead. During this same time period, the USFWS conducted a steelhead telemetry study at the Kasilof River and documented seasonal distributions and run-timing patterns of Kasilof River steelhead (Gates and Palmer 2008; Gates 2009; Gates et al. 2010). This documented fish from Nikolai Creek, as well as a Kasilof River mainstem spawning component previously not known to be present. These findings are significant because it was originally thought that all Kasilof River steelhead originated from Crooked Creek.

The Kasilof River supports a minor steelhead fishery with sporadic harvests. Presently, catch and harvest supported by natural production are small in comparison to what occurred when the enhancement program was ongoing. Steelhead have also been documented in the Kenai River drainage. The main source for this information is from the adult coho salmon assessment projects conducted from 1998 to 2007 (R. Massengill, Sport Fish Biologist, ADF&G, Soldotna, personal communication). During these years, fish wheels were operated at approximately RM 28 and inriver netting was conducted as part of a capture–recapture experiment upstream of RM 28 to approximately RM 36 in the middle river during October; these wheels and nets occasionally captured steelhead. Since that time, anglers fishing during late fall and winter report catches of large rainbow trout with physical characteristics commonly observed in the anadromous form. Steelhead and rainbow trout present in the Kenai River are not separated for management purposes. In addition, the SWHS information is not categorized between the life history forms of rainbow trout. The anadromous form is larger in size (greater than 20 inches in total length) at first maturity when they are recruited into the sport fishery. In the Kenai River, steelhead are conservatively managed because harvest of rainbow trout 16 inches or greater in total length is prohibited year-round where they have been observed downstream of Skilak Lake.

In addition to the Kenai River drainage, the Swanson River and Swanson River drainage canoe route lakes provide rainbow trout and Dolly Varden sport fishing opportunities in 40 lakes that are linked to the 46-mile long Swanson River that flows into Cook Inlet. The river and canoe route lakes are accessible by the road system. Historically, this fishery gained popularity during the 1980s, displaying moderate annual increases in participation and catch until the mid-1990s (Begich et al. 2017). The fishery remained relatively stable until about 2001. Over the past decade, the estimated effort has declined as has catch, but this catch is similar to other years of low effort (Tables 25–28).

Natural populations of rainbow trout are not supplemented with hatchery rainbow trout in open water systems of the NKPMA. The first lake stocking in the NKPMA took place in 1952 when Longmere Lake was stocked with rainbow trout. Since that time, the stocking of barren lakes that did not support game fish and that were on the road system has been expanded to present-day stocking levels that include 25 lakes in the NKPMA. Select lakes are also stocked with Arctic grayling, Arctic char, as well as landlocked coho and Chinook salmon. The objective of the NKPMA lakes stocking program is to provide sport fishing diversity through annual or alternate year stocking of these species in area lakes. The lake-stocking program on the Northern Kenai Peninsula is designed to provide additional public fishing as well as harvest opportunities that cannot be supported by natural populations of resident fish. Since 1999, the numbers of all species stocked has averaged 272,158 fish (Table 29). Catches and harvests have trended upwards since 2009, though they dropped in 2018 (Table 29).

Lake trout are indigenous to several NKPMA lakes and have been introduced to 1 lake. Lake trout occur in glacial Tustumena, Skilak, Kenai, and the Trail lakes. Clearwater lakes that

naturally support lake trout include Hidden, Juneau, Swan, and Trout lakes. The lake trout present in Upper Summit Lake were transplanted from Skilak Lake during 1970. ADF&G's basic lake survey data, as well as angler reports of lake trout catch, documents a successful transplant. Recent SWHS information, observations by ADF&G staff, as well as reports from anglers, indicate that relatively little fishing effort is directed toward lake trout in the glacial lakes (Begich et al. 2017; Table 30). Lake trout are caught in the Kenai, Kasilof, and Trail rivers near river inlets and outlets incidental to fisheries directed at other resident species (rainbow trout, Dolly Varden) and are often reported by the SWHS as harvest from these rivers (Begich et al. 2017; Table 30).

Hidden Lake supports the primary lake trout fishery in the NKPMA. Staff observations and angler reports indicate the fishery is popular near the time of ice-out in spring and through the winter months. Lake trout harvest at Hidden Lake is estimated by the SWHS. Harvest in this fishery has been variable but has declined over the past decade (Table 30). Historically, lake trout harvest regulations were liberal. The bag limit was 10 between 1948 and 1968. In 1969, the bag limit remained at 10 of which only 2 were allowed to be over 20 inches. In 1983, the fishery was liberalized to allow a bag limit of 12 lake trout: 2 over 20 inches and 10 under 20 inches. The fishery was prosecuted under these regulations through 1996. In 1997, the regulations changed to a bag and possession limit of 2 fish regardless of size. Concurrent to the 1997 bag limit reduction from 12 fish to 2 fish was the closure of Hidden Lake to burbot fishing. The closure reduced the number of lines that could be used by anglers fishing through the ice from 15 lines to just 2 lines. These changes greatly reduced the catch and harvest of lake trout estimated by the SWHS (Begich et al. 2017; Table 30). Over the next 10 years, the popularity of the fishery during winter remained relatively stable. Public concern regarding lake trout abundance and angler reports about small fish led ADF&G to investigate the sustained yield for lake trout at Hidden Lake.

Because of public concerns and the high lake trout harvests estimated historically from Hidden Lake, information from a lake-area model was used to ascertain a yield potential in numbers of lake trout for Hidden Lake (R. Begich, Sport Fish Biologist, ADF&G, Soldotna, unpublished data). The estimated yield potential for Hidden Lake ranged from 316 to 612 lake trout. In comparison to yields estimated by the SWHS, the estimated yield potential in numbers of fish for Hidden Lake was exceeded in each year for the 20-year period between 1977 and 1996. Consequently in 2008, the BOF adopted an ADF&G proposal to reduce the bag and possession limits to 1 fish, regardless of size in order to prevent annual harvests from increasing to those that were estimated prior to 1996 (greater than 600 fish) (Begich et al. 2017; Table 30). In 2017, BOF adopted size restrictions limiting the harvest of lake trout to less than 16 inches in length. In 2011, the USFWS did a study of lake trout to determine seasonal distribution and size structure of lake trout in Hidden Lake (Gates 2012). Overall, total catch of lake trout in the NKPMA has remained fairly stable since 2013, except in 2016 when 0 fish were reported caught by the SWHS (Table 30).

Prior to statehood in 1952, Arctic grayling were introduced into Crescent Lake by the USFWS. Arctic grayling were also stocked by ADF&G during the 1960s. The introductions resulted in self-sustaining populations of Arctic grayling in Crescent, Upper Paradise, Lower Paradise, Lower Fuller, Grayling, Twin, and Bench lakes. Arctic grayling are the only game fish species present in these remote lakes that are accessible by road system trails or by float plane. Crescent Lake is an alpine lake located within the Chugach National Forest and supports the largest

fishery for this species in the NKPMA (Table 31). Primary access is via 2 hiking trails—the 6.4-mile Crescent Creek trail and the 3.3-mile Carter Lake trail—or access may be gained via float plane. During 2009–2010, a radiotelemetry study documented seasonal distributions and time of spawning (A. Reimer, Biometrician, ADF&G, Soldotna, unpublished data). In addition, basic life history information (size, age, maturity compositions) was collected during the telemetry project. Foot surveys were continued by ADF&G after the telemetry project during 2011–2013 to document time of spawning (A. Reimer, Biometrician, ADF&G, Soldotna, unpublished data). Preliminary results indicate the following: 1) spawning areas were more widely dispersed than previously known; 2) time of spawning was more variable than documented historically; 3) fish displayed distinct seasonal spring spawning movements, and summer and overwintering distributions; and 4) no relevant comparisons could be made between historical and recent basic life history information due limited historical data. Catch and harvest of Arctic grayling in other lakes is small. Historical size composition information from Bench Lake indicates the presence of Arctic grayling that are larger in size than those at Crescent Lake. In 2011–2012, efforts by ADF&G to collect size composition information about Bench Lake Arctic grayling were not successful.

Recent Alaska Board of Fisheries Actions

During the 2017 BOF meeting Hidden Lake trout harvest was restricted to 1 per day, less than 16 inches in total length.

Resident Species Management Objectives

These fisheries are not directly addressed in a management plan adopted by the BOF. ADF&G objectives for these fisheries are as follows:

- 1) Provide the opportunity for angler participation at a level that can be supported by the fisheries resource and associated habitat.
- 2) Ensure, through appropriate management and research programs that the resident species populations do not decline below the level necessary to ensure sustained yield.

Inseason Management Approach

Inseason management has not been required in these fisheries. The fisheries are managed by existing regulations.

2016–2018 Fishery Performance and 2019 Fishery Overview

Harvest estimates derived from the SWHS (<http://www.adfg.alaska.gov/sf/sportfishingsurvey/>) indicate that from 2016 to 2018, populations of resident species appear to be stable (Tables 25–31). Based on staff observations and reports from anglers, 2019 fishery performance will be similar to that of the most recent 3 years.

Current Issues

There are currently no major issues associated with “other” NKPMA resident species fisheries. For the most part, SWHS information indicates that the catch and harvest in area lake fisheries will wax and wane as angler participation increases or decreases. Participation in stocked lake fishing has remained relatively constant, whereas fishing effort in several area unstocked lakes has declined. To attract anglers to area lake fisheries, stocked lakes are located in close proximity to communities, rural subdivisions, or popular recreation areas. Most lakes can be reached by

highway vehicle, although a few are remote and accessible by short hiking trails. Stocked lakes provide opportunity for both open water and winter ice fishing. A total of 28 lakes were stocked through 2012. Beginning in 2013, 24 lakes were stocked and will continue to be stocked. Stocking was discontinued in Aurora, Cecille, and Quintin lakes due to very low or nonexistent levels of participation reported by the SWHS. Stocking was also discontinued in 2012 for Jerome Lake due to an ailing gabion barrier; however, participation in this fishery was also very low or nonexistent. Beginning in 2018, stocking was reinstated at Aurora Lake, bringing the area total to 25 lakes. Fish from all lakes that are no longer stocked are being distributed to the more popular remaining stocked lakes to provide additional opportunity. In addition to provide sport fishing diversity, Arctic grayling were stocked into area lakes in 2009 (Arc Lake), 2010 (Scout Lake), and 2012 (Tirmore Lake), and Arctic char were stocked in 2016 (Elephant Lake). This species has generated high interest from the public. The SWHS will be used to assess if stocking this species has resulted in additional participation in fishing these lakes.

Recommended Research and Management

We do not recommend any research project or revision to management activities to “other” resident species fisheries at this time. Resident species are conservatively managed in all waters where they occur naturally. Management will continue to engage in public informational and educational activities to apprise the public of the fisheries status and to promote lawful and ethical fishing practices. ADF&G management is active in the dissemination of lake fishing information to the public. Recently, a statewide stocked lake database was created for the ADF&G web page that now includes NKPMA lakes; some unstocked lakes have been added to the database and others are planned to be added. Stocked lakes access evaluation and improvement should remain an ongoing activity for area management and access staff. The stocked lakes will continue to be monitored by the SWHS so that stocking practices can be evaluated and, if necessary, adjusted to benefit public use of stocked fish.

NORTHERN KENAI PENINSULA MANAGMENT AREA NORTHERN PIKE SPORT FISHERY

2020 PROPOSALS TO THE ALASKA BOARD OF FISHERIES CONCERNING NORTHERN PIKE IN THE NORTHERN KENAI PENINSULA MANAGEMENT AREA SPORT FISHERY ISSUES

The following proposals published in “*The Alaska Board of Fisheries 2019/2020 Proposed Changes in the Subsistence, Personal Use, Sport, Guided Sport, and Commercial Fishing Regulations for Lower and Upper Cook Inlet Finfish, Kodiak Finfish, and Statewide King and Tanner Crab General Provisions*”¹⁵ will probably have some impact on the sport fisheries targeting northern pike in the NKPMA:

Proposal Numbers: No proposals affecting the northern pike for the 2020 Board of Fish meeting.

BACKGROUND AND HISTORICAL PERSPECTIVE

Northern pike (*Esox lucius*) are not indigenous to the Kenai Peninsula or elsewhere in Southcentral Alaska. It is believed this species was first illegally introduced to the Kenai

¹⁵ <http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.proposalbook>.

Peninsula at Derks Lake, a tributary of Soldotna Creek within the Kenai River Drainage, during the early 1970s. From this initial introduction, they spread rapidly to other lakes in the drainage. Additional illegal introductions and natural dispersal over the next 4 decades resulted in northern pike occurring in at least 25 NKPMA waterbodies. These waterbodies included Soldotna Creek and 7 tributary lakes, Stormy Lake in the Swanson River drainage, a group of 7 lakes in the Tote Road area near Soldotna, 6 unassociated lakes between Sterling and Kaslihof, and most recently, Vogel Lake and North Vogel Lake within the Miller Creek drainage located in the Kenai National Wildlife Refuge. An attribute of nearly all these northern pike waters is they are accessible by highway vehicle except for Vogel Lake and North Vogel Lake, which are only accessible by plane or snowmachine. In 2017, an illegally introduced muskellunge (*Esox masquinongy*) population (the largest member of the Pike Family) was detected in an unnamed 20-acre lake just north of the Tote Road northern pike lakes in 2017. Genetic analysis revealed these muskellunge originated in Wisconsin.

Northern pike are an apex aquatic predator and can cause dramatic impacts to other fish populations when introduced, particularly in systems where northern pike habitat (shallow weedy areas) is plentiful. Historical data from the ADF&G Statewide Harvest Survey, ADF&G lake netting data, and anecdotal angler reports confirm that as invasive northern pike populations increase, the presence of native fish species typically decreases and sometimes are completely eliminated. For example, some lakes in the Soldotna Creek drainage supported productive rainbow trout fisheries, rearing coho salmon, and threespine stickleback (*Gasterosteus aculeatus*) prior to the introduction of northern pike; however, after the introduction of northern pike, these species were essentially eliminated. Likewise, the discovery of northern pike at Stormy Lake was followed by the collapse of its popular native rainbow trout and Arctic char fisheries. Looking beyond the Kenai Peninsula in Southcentral Alaska, invasive northern pike are associated with the collapse of important salmon fisheries in the Susitna River drainage such as the Chinook salmon fishery in Alexander Creek, and the sockeye salmon fishery in Shell Lake. Invasive northern pike in Alaska are expanding their range by traveling through the salt waters of Cook Inlet and invading drainages on the West Side of Cook Inlet such as the Threemile Creek drainage.

On the Kenai Peninsula, there is concern that invasive northern pike could establish new populations in vulnerable habitat, most notably in the Moose River in the Kenai River drainage and in the Swanson River drainage, ultimately causing losses to important native salmon and trout fisheries. Although small numbers of northern pike have reportedly been caught in the Kenai River mainstem since the 1990s (Table 32), there is no evidence that a self-sustaining northern pike population has become established anywhere in the Kenai River drainage beyond the Soldotna Creek drainage. Similarly, northern pike have not been detected anywhere in the Swanson River drainage outside of Stormy Lake.

Northern pike have used Soldotna Creek and the Kenai River as a travel corridor. A video weir operated by USFWS at Soldotna Creek near its confluence with the Kenai River documented the passage of northern pike from the creek to the Kenai River during 2009 and 2010. In spring 1986, USFWS established a weir on the Moose River in conjunction with a rainbow trout study and 1 northern pike was observed near the weir site but never captured. Subsequent springtime ADF&G weir operation in the Moose River from 1992 to 2007 failed to detect any northern pike. Information from the SWHS indicates that anglers have reported harvesting small numbers of northern pike in some lakes in the East Fork of the Moose River (i.e., Afonasi, Imeri, Watson,

Egumen, Peterson, Kelly, and Hikers lakes). These harvests are too small to be estimated for specific lakes (Table 32). Fish surveys conducted in the Moose River drainage by the USFWS and ADF&G since the 1990s have failed to collect a single northern pike.

Of the lakes where northern pike have occurred on the Kenai Peninsula, several have been ADF&G stocked lakes (Arc Lake, Scout Lake, and Loon Lake). Generally, fish stocking is discontinued when invasive northern pike are discovered and does not resume until they are eradicated.

Although there is some local interest in northern pike fishing, this species supports a minor, if not insignificant, sport fishery. Annual total northern pike harvest on the Kenai Peninsula has historically averaged about 142 fish and none were reported harvested in the 2018 SWHS (Table 32).

Significant progress has been made to remove northern pike from the entire Kenai Peninsula and restore lost or depressed native fish populations affected by their predation. To date, all known northern pike populations on the Kenai Peninsula have been successfully removed except for the newly discovered population in the Miller Creek drainage at Vogel Lake and North Vogel Lake. The primary method for removal has been to chemically treat the waterbody with rotenone, a common fish pesticide. At treatment concentrations, rotenone primarily affects gilled organisms, does not enter groundwater or bioaccumulate, and degrades quickly with warm temperatures and sunlight.

Intensive under-ice gillnetting has been used successfully to eradicate northern pike on the Kenai Peninsula from 3 lakes: Tiny Lake (2011), Hall Lake (2011), and Warfle Lake (2017). Although netting is often deemed impractical as an eradication tool, these successful net removal efforts shared these traits in common: 1) relatively small waterbodies (<40 surface acres), 2) small northern pike populations ($N < 30$ individuals), 3) the lakes were closed systems, and 4) reproduction was poor as evidenced by the lack of juvenile northern pike observed. At 2 lakes (Denise and Tree lakes), northern pike unexpectedly disappeared by unknown reasons although winterkill (mortality from low dissolved oxygen during winter) is the suspected cause at Tree Lake.

As the primary northern pike removal tool, rotenone was first used for that purpose on the Kenai Peninsula at Arc Lake during 2008. In 2009, northern pike were removed from Scout Lake using rotenone, and in 2012, northern pike were removed using rotenone from Stormy Lake, which was ADF&G's first treatment of an anadromous open system. During the period of 2014–2017, northern pike were removed from the entire Soldotna Creek drainage using successive rotenone treatments. Lentic waters treated in that drainage included Union Lake, West Mackey Lake, East Mackey Lake, Derks Lake, Derks Pond, Sevena Lake, and Loon Lake.

In 2018, 7 northern pike lakes in the Tote Road area were treated with rotenone: Leisure Lake, Leisure Pond, CC Lake, Hope Lake, Ranchero Lake, Crystal Lake, and Fred's Lake (some lake names are unofficial). A nearby lake (G Lake) with invasive muskellunge was also treated with rotenone.

Stocking of hatchery-reared fish at Arc, Scout, and Loon lakes resumed the year following their respective rotenone treatments. ADF&G test netting, angler reports, and the SWHS have demonstrated all these lakes are now supporting catchable populations of Arctic grayling (Arc Lake and Scout Lake), coho salmon (Arc Lake), and rainbow trout (Scout Lake and Loon Lake).

In 2013, staff from ADF&G released about 7,000 native Arctic char into Stormy Lake after rotenone treatment. The stocked Arctic char originated from Stormy Lake and Dolly Varden Lake broodstock and were reared at William Jack Hernandez Sport Fish Hatchery specifically for release into Stormy Lake. Prior to and during the Stormy Lake treatment, a native fish collection effort was initiated to capture and hold fish (rainbow trout, juvenile coho salmon, Arctic char, threespine stickleback, and longnose sucker (*Catostomus catostomus*) over the treatment period and after until the rotenone fully degraded and was no longer toxic to fish. Fish were held in net pens in a nearby lake. During 2013, all surviving native fish collected prior to or during the rotenone treatment were stocked back to Stormy Lake. ADF&G has since issued various emergency orders (Appendices A1–A3) each year prohibiting retention of fish from Stormy Lake. Currently, the retention of fish is allowed, except for Arctic char, in order to protect them until they are capable of self-propagation.

Nonlethal netting of Stormy Lake has been ongoing since 2013 to assess the status of native fish populations, and the fish assemblage has changed dramatically. Rainbow trout, juvenile coho salmon, and Arctic char are the primary species caught during netting surveys as opposed to pretreatment primary catches of northern pike and long-nose suckers. Posttreatment catches of threespine stickleback and juvenile longnose suckers indicate these species are present and reproducing.

Between 2015 and 2018, over 95,000 wild fish were relocated from the mainstem of Soldotna Creek and released into the Mackey Lake chain (Union, West Mackey, East Mackey, and Derks lakes) to aid in restoration of their native fish assemblage after northern pike removal. The released fish include 4,595 rainbow trout, 4,837 Dolly Varden, 49,368 juvenile coho salmon, 32,850 threespine stickleback, and 3,708 slimy sculpin (*Cottus cognatus*).

Eight former northern pike and muskellunge lakes in the Tote Road area were restocked with native threespine stickleback in the summer of 2018 by a collaborative effort involving multiple universities interested stickleback research. Additionally, rainbow trout and juvenile coho salmon were stocked in each lake. Although still ongoing, the annual salmonid stocking goal over the next 5 years (2018–2022) will be about 100 salmonids per acre. This should provide a fishery for the public that replaces the former northern pike fishery.

NORTH KENAI PENINSULA MANAGEMENT AREA NORTHERN PIKE FISHERY OBJECTIVES

This fishery is not specifically addressed in any management plan adopted by the BOF. The ADF&G objective for this fishery is to eradicate northern pike from the Kenai Peninsula to protect and restore native fish populations.

INSEASON MANAGEMENT APPROACH

There has been no inseason management in the history of this fishery. The fishery is managed through existing regulations. Regulations are liberal because northern pike were illegally introduced into Kenai Peninsula waters and because they prey on resident trout and salmon species. Currently, there is no bag limit or closed season for northern pike in the NKPMA.

Beginning in 2002 through the present, ADF&G has been assessing the distribution of invasive northern pike on the Kenai Peninsula and implementing research and control measures (McKinley 2013; Begich and McKinley 2005; Begich 2010b; Massengill 2010, 2011, 2014).

Since 2008, ADF&G has been systematically eradicating invasive northern pike populations in the NKPMA.

In 2013, ADF&G conducted a study to evaluate the use of environmental DNA (eDNA) as a tool to assess the success of invasive northern pike eradication efforts. Results indicate that eDNA sampling of waterbodies can be a highly sensitive tool for detecting the presence of northern pike, and when combined with traditional sampling methods, provides the best information on northern pike presence (Massengill and Dunker 2013).

Public scoping meetings are typically held to address removal of invasive northern pike for projects involving rotenone and environmental assessments are also produced for these projects. Educational messages about invasive northern pike through the ADF&G Web site, kiosks, and angler outreach program are ongoing and remain a high priority component of ADF&G information and education programs.

2016–2018 FISHERY PERFORMANCE AND 2019 FISHERY OVERVIEW

The recent SWHS and guide logbook report results detected the harvest of northern pike in the Kenai River during 2017 (Table 32). Over the last 10 years, northern pike harvest has decreased, which is probably due to increased eradication efforts of northern pike in area lakes, particularly as a result of the rotenone treatments that have successfully eradicated known populations until the spring 2019 discovery in Vogel Lake. According to the SWHS, when northern pike harvests were larger, such as in 2008 and 2009, most of the northern pike harvested were from Stormy Lake and the Tote Road Lakes (Table 32). Due to the successful eradication of northern pike and the restoration of native fish and fisheries, especially at Stormy Lake and the Mackey Lakes chain, catches and harvests of northern pike in the NKPMA are likely to remain at very low levels; in 2018, zero northern pike were reported caught in NKPMA.

CURRENT ISSUES

The negative impact of invasive northern pike on the production of native species will remain a fishery conservation issue until northern pike are no longer present in waters of the NKPMA. Recently discovered illegal introductions of northern pike, muskellunge, and fathead minnows (*Pimephales promelas*) to NKPMA waters underscores that illegal introductions continue, and public education and outreach is critical in reducing these occurrences.

RECOMMENDED RESEARCH AND MANAGEMENT

The removal of the last known population of northern pike on the Kenai Peninsula (Miller Creek drainage) will be addressed by planning and executing a northern pike removal project in the drainage no later than 2021. Because this northern pike population is located within a Wilderness Area of the Kenai National Wildlife Refuge, this effort will require a cooperative joint agency response between the USFWS and ADF&G. In addition, an existing long-term plan to monitor for invasive fish and support the restoration of native fish populations will continue. This monitoring and restoration plan ensures ADF&G can reasonably detect and respond to new invasive fish introductions and continue aiding and monitoring restored native fish populations previously impacted by invasive fish.

NORTHERN KENAI PENINSULA MANAGEMENT AREA EDUCATIONAL FISHERIES

2020 PROPOSALS TO THE ALASKA BOARD OF FISHERIES CONCERNING EDUCATIONAL FISHERIES IN THE NORTHERN KENAI PENINSULA MANAGEMENT AREA

The following proposals published in “*The Alaska Board of Fisheries 2019/2020 Proposed Changes in the Subsistence, Personal Use, Sport, Guided Sport, and Commercial Fishing Regulations for Lower and Upper Cook Inlet Finfish, Kodiak Finfish, and Statewide King and Tanner Crab General Provisions*”¹⁶ will probably have some impact on the education fisheries in the NKPMA:

Proposal Numbers: No proposals affecting the educational fisheries for the 2020 Alaska Board of Fisheries meeting.

EDUCATIONAL FISHERIES OBJECTIVE

The educational fisheries that occur in the NKPMA are Federal Court–ordered fisheries for which regulations were developed by consent preliminary injunction. Terms of the injunction were incorporated into the educational permit. The objective of each fishery is to implement the provisions of the permit. Standards, general conditions, and requirements of an educational fishery program are outlined in 5 AAC 93.200–235.

Objectives for the educational fisheries include teaching and preserving the cultural and traditional subsistence ways of life as well as providing salmon for others in need.

HISTORICAL PERSPECTIVE

The first Kenaitze Indian Tribe fishery (1989) originated as a Federal Court-ordered subsistence fishery resulting from extensive legislation and litigation related to both state and federal interpretation of subsistence. Prior the 1993 season, the Alaska Superior Court, in negotiations with ADF&G and the Kenaitze Indian Tribe, ordered ADF&G to issue educational fishing permits as an interim measure during ongoing litigation. A chronology of events leading to the present day fishery is available in Nelson et al. (1999) and Gamblin et al. (2004).

Including the Kenaitze Indian Tribe Fishery, a total of 3 educational fisheries are permitted within the NKPMA. The Alaska Territorial Lodge educational fishery was first permitted in 2007 and the Kasilof Regional Historical Association has been permitted since 2008 (Tables 33–35). Each permit contains stipulations that are specific to gear, periods, seasons, location, quotas, and harvest reporting. The Kenaitze Indian Tribe is permitted to fish at the Kenai, Kasilof, and Swanson rivers. The Kasilof Regional Historical Association is permitted to fish in marine waters near the Kasilof River mouth while the Alaska Territorial Lodge fishes near Moose Point on the east coast of Cook Inlet several miles north of the Kenai River.

¹⁶ <http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.proposalbook>.

INSEASON MANAGEMENT APPROACH

Inseason management of the fisheries follows terms of each of the educational permits issued each year. Authorized representatives for each issued permit report harvests inseason on a schedule established by both ADF&G staff and the permit holder. The Kenaitze Indian Tribe follows a weekly reporting format, whereas the Alaska Territorial Lodge and Kasilof Regional Historical Association report harvests as they occur. ADF&G maintains the flexibility to modify stipulations of each permit based on annual review of the fisheries as well as inseason through emergency order authority to restrict or to close educational fishing in accordance with applicable fisheries management plans adopted by the BOF.

2017–2019 FISHERY PERFORMANCE

The Kenaitze Indian Tribe educational fishery supports the largest educational fishery salmon harvest in the NKPMA, and sockeye salmon are the primary species harvested (Table 33). Total salmon harvests averaged 8,628 fish from 2017 to 2019 (Table 33). During 2017–2019, the Kenaitze Indian Tribe educational fishery at the Kenai River was restricted on a schedule corresponding to the emergency order actions taken in the inriver sport fishery to conserve Chinook salmon. From 2017 to 2019, the annual harvest of early-run Chinook salmon averaged 5 fish and the annual harvest of late-run Chinook salmon averaged 4 fish. Total harvests in both the Alaska Territorial Lodge and Kasilof Regional Historical Association educational fisheries are relatively minor (Tables 34 and 35). Fishing occurs sporadically during the season, and sockeye and coho salmon are the primary species harvested (Tables 34 and 35). No harvest quotas were exceeded in the NKPMA by these other two educational fisheries during 2017–2019.

CURRENT ISSUES

Total harvest of salmon from the educational fisheries has remained relatively constant. Presently, effort in this fishery is directed at achieving a harvest commensurate with educational needs. Therefore, harvest during subsequent years will likely remain similar unless these needs change and are subsequently approved in permit form.

The Kenaitze Indian Tribe educational fishery harvests mainly salmon of Kenai River origin. The harvest of Chinook salmon is minor and probably has an insignificant effect on the performance of the inriver sport fishery during years when inriver fisheries are not restricted. Recent low runs of Chinook salmon to the Kenai River have resulted in restrictions to all fisheries harvesting these stocks, including the Kenaitze Indian Tribe educational fishery. Public dissatisfaction with this fishery is visible because there was some negative public reaction to this fishery when other fisheries have been restricted and the Kenaitze Indian Tribe has continued to fish (C. Lipka, Sport Fish Biologist, ADF&G, Soldotna, personal communication).

RECOMMENDED RESEARCH AND MANAGEMENT

No research or management activity specific to this fishery is recommended.

NORTHERN KENAI PENINSULA MANAGEMENT AREA GUIDED SPORT FISHERY

2020 PROPOSALS TO THE ALASKA BOARD OF FISHERIES CONCERNING GUIDED SPORT FISHING ISSUES IN THE NKPMA

The following proposals published in “*The Alaska Board of Fisheries 2019/2020 Proposed Changes in the Subsistence, Personal Use, Sport, Guided Sport, and Commercial Fishing Regulations for Lower and Upper Cook Inlet Finfish, Kodiak Finfish, and Statewide King and Tanner Crab General Provisions*”¹⁷ will probably have some impact on the sport fisheries for guided anglers in the NKPMA:

Proposal Numbers: 155, 156, 157, 158, 159, 160, 161, 162, 163.

BACKGROUND AND HISTORICAL PERSPECTIVE

The guided sport fishery, particularly on the Kenai River, has generally been recognized as an important component of the local recreational economy for several decades. Growth in guided sport fishing effort and harvests on both the Kenai and Kasilof rivers began mostly in the 1980s and continued over the next 2 decades. Significant growth in the number of guides who offer sport fishing services on the Kenai River is well documented (Begich et al. 2017; Table 36). Increased participation in guided sport fishing prompted the BOF to adopt fishing regulations to provide opportunity for private (unguided) anglers when no guided anglers are present; these are as follows: 1) restrictions in area for guided sport fishing, 2) limited hours when guided sport fishing can occur, and 3) prohibited days of the week when anglers may fish from a registered guide vessel. Information from ADF&G Chinook salmon creel surveys conducted on both the Kenai and Kasilof rivers indicate that catch and harvest rates are greater for guided than for unguided anglers. At specific areas, times of the day, or days of the week, the numbers of guided anglers may also exceed the number of unguided anglers. Effects of these BOF regulations include changes to total fishing effort by angler type as well as changes to catch and harvest rates.

In 1998, the BOF adopted *Sport Fishing Services and Sport Fishing Guide Services; License Requirement; Regulations of Activities* (5 AAC 75.075). No licensing program, fees, or daily fishing activity reporting were required from guides until 2 years after the Alaska State Legislature established licensing requirements for sport fishing guide business owners and sport fishing guides in 2004. By 2006, guide logbooks required reporting of guided anglers’ license numbers as well as harvest and release of the number of fish by species, and date and location(s) fished. Further regulations implemented for the logbook program include an approximate 14-day reporting requirement of daily fishing activity on a schedule determined by ADF&G each year. Results of the logbook program have been published annually by ADF&G (Sigurdsson and Powers 2009–2014, 2016).

In addition to the ADF&G requirements, relatively extensive administrative permitting and registrations are required to operate as a fishing guide on the Kenai River because of State of Alaska and Federal land ownership. All fishing guides are required to register and be permitted by the Department of Natural Resources, Division of Parks and Outdoor Recreation

¹⁷ <http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.proposalbook>.

(DNR-DPOR) to operate within the Kenai River Special Management Area State Park (KRSMA). A requirement established in 2006 for all guides operating in the KRSMA includes the successful completion of the Kenai River Guide Academy (KRGa). The KRGa is a week-long course that satisfies DNR-DPOR KRSMA regulation that has been in place since 2006 and is required to obtain a commercial use permit to operate as a fishing guide in the KRSMA. In addition, permits are also required for guides to operate in specific areas of the KRSMA from the United States Forest Service (USFS) on waters within the Chugach National Forest and from the United States Fish and Wildlife Service (USFWS) on waters within the Kenai National Wildlife Refuge (KNWR). In waters bounded by the KNWR from the Russian–Kenai rivers confluence near Sportsman’s Landing downstream to the waters of Skilak Lake, the number of guide operators is managed under a USFWS limited vendor program. This program has been in place since 1987 and limits the number of commercial businesses that may offer fishing guide services on a daily basis to approximately 18 businesses per year, of which each business may have 2 starts per day or 10 starts per week. Although the number of guides that may operate on a daily basis through the year is controlled by the limited vendor program, management of fishing guides in this area provides for additional guided fishing opportunity by allowing all other Kenai River fishing guides registered through DNR–DPOR 3 starts per year to guide fishing trips on this section of the Kenai River. Both the USFS and USFWS require operators to complete annual reports of commercial use activities on Kenai River waters bounded by federal lands.

Numerous proposals to change guided sport fishing regulations are submitted during each regularly scheduled Upper Cook Inlet Finfish BOF meeting. Proposed regulatory changes seek to both expand and to relax restrictions to guided sport fishing. All proposed changes are allocative because guided anglers are generally more successful than unguided anglers.

Recent Alaska Board of Fisheries Actions

No actions were taken during the 2017 Alaska Board of Fisheries meeting.

NORTHERN KENAI PENINSULA MANAGEMENT AREA GUIDED SPORT FISHERY OBJECTIVES

This fishery is not specifically addressed in any management plan adopted by the BOF. The fishery objective is to implement the provisions of the BOF-adopted management plans and sport fishing regulations for the NKPMA as well as guide licensing provisions contained in 5 AAC 75.075.

INSEASON MANAGEMENT APPROACH

There has been no inseason management in the history of this fishery. The fishery is managed through existing regulations.

RECENT FISHERY PERFORMANCE

According to SWHS and guide logbook data, guided angler participation is most prevalent on the Kenai and Kasilof rivers and occurs to a significantly lesser extent in all other NKPMA waters (Tables 1, 37, and 38). The total number of fishing guides operating on the Kenai River has declined from 396 in 2006 and 2007 to 258 in 2015 (Table 36). The number of fishing guides on the Kenai River in 2019 was 288, a small decrease from 2018 (Table 36).

Logbook information for the Kenai River indicates that annual changes in guided fishing activity are evident by month. Generally, as the open water fishing season progresses (May through September), guided fishing effort increases then decreases (Tables 37 and 38). Changes in guided fishing effort are also evident among years. For example, from 2006 to 2016, total guided effort each year has declined significantly in May, June, and July and increased slightly during August, whereas guided fishing effort in September and October has remained stable (Tables 37 and 38). Decreases in June and July (Table 37) are probably the result of low Chinook salmon abundance over recent years from 2009 through 2016.

Annual changes in logbook catch and harvest of salmon by species are probably indicative of run strength. For instance, logbook data show that guided anglers harvested 8,757 Chinook salmon from the Kenai River during 2006, when the estimated total run of large (≥ 75 cm) Chinook salmon was 10,605, whereas logbook data from 2014 indicates a harvest of 299 Chinook salmon by guided anglers when the estimated total run of large Chinook salmon was 2,690 (Tables 7 and 39). Annual trends in participation are most evident in July and August, when the majority of guided sport fishing effort occurs (Tables 37 and 38). Proportions of resident and nonresident guided anglers have remained relatively stable since 2006. Nonresident guided anglers compose most of the guided anglers fishing the Kenai River each year (Tables 37 and 38). Similar trends in effort, fishing patterns, and guided angler demographics are anticipated for the 2017 through 2019 seasons.

CURRENT ISSUES

A decline in Chinook salmon total runs in recent years has resulted in the implementation of inseason restrictions that are disruptive to guided anglers and businesses that derive income from these fisheries. The number of registered sport fishing guides operating on the Kenai River has been in decline. Issues that are social and allocative in nature will continue to be addressed through the BOF process and include competition between guided and unguided anglers, restrictive guide regulations, as well as numerous and complex sport fishing regulations.

In 2019, the freshwater guide logbook program was discontinued due to lack of state funding.

RECOMMENDED RESEARCH AND MANAGEMENT

Guided fishing effort and catch and harvest by species will continue to be monitored through the SWHS. This information will allow ADF&G to discern changes in fishing patterns and to aid in providing information to address social and allocative issues related to the NKPMA guided sport fishery.

NORTHERN KENAI PENINSULA MANAGEMENT AREA HABITAT

2020 PROPOSALS TO THE ALASKA BOARD OF FISHERIES CONCERNING HABITAT ISSUES

The following proposals published in *“The Alaska Board of Fisheries 2019/2020 Proposed Changes in the Subsistence, Personal Use, Sport, Guided Sport, and Commercial Fishing Regulations for Lower and Upper Cook Inlet Finfish, Kodiak Finfish, and Statewide King and*

*Tanner Crab General Provisions*¹⁸ will probably have some impact on sport fishery habitat in the NKPMA:

Proposal Numbers: No proposals affecting sport fishery habitat for the 2020 Alaska Board of Fisheries meeting.

BACKGROUND AND HISTORICAL PERSPECTIVE

Maintaining healthy riparian and aquatic habitat in the NKPMA is important for area fisheries resources. Various habitat types occur along the Kenai River's 67-mile length. Including islands, the river provides approximately 166 miles of waterfront shoreline (134 miles river upland shoreline and 32 miles of island shoreline; Liepitz 1994). Twenty-seven species of fish have been documented to occur from the Kenai River Delta at the river's mouth upstream to Kenai Lake (Bendock and Bingham 1988a, 1988b). The diversity of fish species decreases with distance inland because the highest diversity occurs in the lower river delta area.

Land ownership along the Kenai River comprises several entities. Landowners along the interlake section of approximately 15 miles (30 miles total riverfront shoreline) between Skilak Lake and Kenai Lake include the USFS, USFWS, Kenai Peninsula Borough (KPB), as well as the State of Alaska, and private individuals. Less than about 3 miles of total riverfront shoreline of the interlake section is in private ownership. In 1986, land ownership status of the 50-mile river corridor (100 miles shoreline) below Skilak Lake was as follows: 66% of the river shoreline was private, 15% State of Alaska, 15% municipal (owned by the Cities of Soldotna, Kenai, and the Kenai Peninsula Borough), and 4% was in federal ownership¹⁹. Since that time, ownership status may have changed. Some privately held parcels have been added into the KRSMA and some lands have been conveyed to various municipalities, the Kenai Peninsula Borough, and the State of Alaska. Presently, the approximate land ownership status of the lower river 50-mile corridor or 100 miles of shoreline downstream of Skilak Lake is as follows: 40% private, 24% State of Alaska, 14% Federal, and about 22% other, which includes the cities of Soldotna, Kenai, a Native corporation, and the Kenai Peninsula Borough (Table 40).

ADF&G is the manager of Kenai River fish stocks and does not manage lands along the Kenai River corridor that are within the Kenai River Special Management Area (KRSMA). Under Alaska Statute AS.16.05.871, *Protection of Fish and Game*, ADF&G authority extends from the riverbed to mean ordinary high water, giving the ADF&G permit jurisdiction over activities affecting anadromous streams and activities in streams frequented by fish. The DNR–DPOR manages State of Alaska-owned KRSMA shorelands above mean ordinary high water of which several parcels are subject to a conservation easement to protect them from development in perpetuity. ADF&G was also given a management right to support the protections for these DNR lands important to fish resources. Consequently, the BOF has adopted the *Riparian Habitat Fishery Management Plan for the Kenai River Drainage* (5 AAC 57.180) to complement land protection efforts where it is legal to do so on public lands. Under this plan, the number of State of Alaska-owned parcels that are closed to fishing within 10 feet of the shoreline from July 1 through August 15 has been increasing over the past 2 decades, with the most recent acquisition

¹⁸ <http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.proposalbook>.

¹⁹ ADNR (Alaska Department of Natural Resources). 1998. Kenai River Comprehensive Management Plan, adopted December 1997. Alaska Department of Natural Resources, Division of Land, Division of Parks & Outdoor Recreation in conjunction with Alaska Department of Fish and Game, Habitat and Restoration Division; Kenai Peninsula Borough.

and subsequent BOF action occurring in 2017. Presently, 25 parcels representing approximately 13.83 miles of State of Alaska owned riverfront shoreline are closed to all fishing within 10 feet of the shoreline from July 1 through August 15. Therefore, about 43% of the approximately 31.5 shoreline miles owned by the State of Alaska downstream of Skilak Lake is managed by restricting sport fishing access (Table 40). Riparian habitat on these lands that is beneficial to fisheries resources remains intact and has not been lost. Additional riverbank closures may be proposed by ADF&G and more may occur as parcels are acquired as conservation easements into the KRSMA for which the ADF&G holds a management jurisdiction. Jurisdiction over land-use activities on all other public and private lands above mean ordinary high water within the KRSMA resides with the DNR, KPB, Department of Environmental Conservation (DEC), and United States Army Corps of Engineers (ACE). In addition to BOF-adopted fishing regulations to protect lands, other agencies have jurisdiction to restrict or to close activities on riverfront shoreline uplands. For example, DNR–DPOR has several internal administrative orders in place prohibiting all public use of several shoreline areas along the Kenai River.

Kenai River habitat research was first conducted by the ADF&G Habitat Division in 1993 (Liepitz 1994). Further projects conducted by the Division of Sport Fish from 1996 through 2001 included angler distribution surveys, assessment of bank position change, assessment of vegetation changes, and a pilot study using aerial photogrammetry techniques (Larson and McCracken 1998; King and Clark *Unpublished*²⁰; King 2007; King and Hansen 1999, 2001, 2002, 2015a, 2015b). Findings from these projects identified sensitive riverfront uplands on conservation easement lands as well as other lands that could be damaged but not lost by public use. This information was used to close areas to sport fishing under the previously mentioned BOF-adopted plan.

MANAGEMENT APPROACH AND RECENT ACTIVITIES

Habitat management is accomplished by several governmental as well as nongovernmental agencies, including ADF&G, that are involved in maintaining and increasing the suitability of Kenai River habitat for fisheries resources. Habitat maintenance occurs through several methods: 1) protective habitat regulations pursuant to the multiagency permitting process that reviews instream and riverfront upland projects; 2) BOF-adopted habitat closures, clean outboard motor regulations, and passenger limits to reduce boat wakes; and 3) land-use restrictions or closures by land managing agencies. Recent habitat projects within the Kenai River drainage are mainly multiagency habitat restoration and improvement projects.

From the mid-1990s through 2009, a total of 385 Kenai River cost-share habitat projects beneficial to fisheries resources were completed (Johnston and Pyper 2010). These projects focused on restoration and protection of shoreline habitats as well as recovering damaged fish habitat. Completion of this work resulted in the improvement, through restoration, of about 9 miles of Kenai River shoreline habitat or 9% of the 100 miles of riverfront shoreline downstream of Skilak Lake. Projects have continued from 2010 through 2019, including projects identified by Johnston and Pyper (2010), and over 570 projects have been completed on the Kenai River (J. Johnson, Habitat Biologist, ADF&G, Anchorage, personal communication).

²⁰ King, M. A., and R. Clark. *Unpublished*. 2004 Kenai River Riparian Assessment. Alaska Department of Fish and Game, Report to the Alaska Board of Fisheries, 2005, Anchorage.

CURRENT ISSUES

The *Kenai River Late-Run Sockeye Salmon Management Plan* in part states:

...the sonar count levels established in this section may be lowered by the board if noncommercial fishing, after consideration of mitigation efforts, results in a net loss of riparian habitat on the Kenai River. The department will, to the extent practicable, conduct habitat assessments on a schedule that conforms to the Board of Fisheries (board) triennial meeting cycle. If the assessments demonstrate a net loss of riparian habitat caused by noncommercial fishermen, the department is requested to report those findings to the board and submit proposals to the board for appropriate modification of the Kenai River late-run sockeye salmon inriver goal.

Language in this plan has created confusion with the public as to whether ADF&G is following the management plan and if they can regulate land-use practices on public, private, municipal, and borough lands in the Kenai River corridor. Conversely, less shoreline is available to the public for sport fishing than was available in the past decade due to management regulations. Because less area is available, angler densities in the remaining areas may increase to undesirable levels.

RECOMMENDED RESEARCH AND MANAGEMENT

Since 1986, land status ownership of the lower Kenai River corridor has changed substantially with an approximate 26% reduction in private land ownership and a significant increase in State of Alaska ownership. This is mainly due to land acquisitions by the State of Alaska through the Exxon Valdez Trustee Council. We recommend that ADF&G remain active in securing management rights to additional land parcels within the Kenai River corridor for ownership by the State of Alaska. However, future management considerations should include strategies that prevent the loss of shoreline areas to sport fishing by closure of newly acquired lands.

NORTHERN KENAI PENINSULA MANAGEMENT PERSONAL USE FISHERIES

2020 PROPOSALS TO THE ALASKA BOARD OF FISHERIES CONCERNING NORTHERN KENAI PENINSULA PERSONAL USE DIP NET FISHERIES ISSUES

The following proposals published in “*The Alaska Board of Fisheries 2019/2020 Proposed Changes in the Subsistence, Personal Use, Sport, Guided Sport, and Commercial Fishing Regulations for Lower and Upper Cook Inlet Finfish, Kodiak Finfish, and Statewide King and Tanner Crab General Provisions*”²¹ will probably have some impact on the personal use dip net fisheries targeting sockeye salmon in the Kenai and Kasilof rivers:

Proposal Numbers: 86, 87, 93, 97, 113, 145, 171, 172, 173.

BACKGROUND AND HISTORICAL PERSPECTIVE

The *Cook Inlet Personal Use Salmon Dip Net Fishery Management Plan* was adopted at the 1981 BOF meeting. This plan provided for personal use dip net fisheries in the Kenai and

²¹ <http://www.adfg.alaska.gov/index.cfm?adfg=fisheriesboard.proposalbook>.

Kasilof Rivers that targeted sockeye salmon and a personal use gillnet fishery in the marine waters at the mouth of Kasilof River. The fisheries are open only to Alaska residents. The BOF's intent was to provide for salmon dip net fisheries in Cook Inlet by allowing Alaska residents an opportunity to harvest sockeye salmon for their personal consumptive needs without disrupting existing fisheries. Personal use dip net fisheries did not initially open until ADF&G determined that specific escapement goals were met and subsistence, commercial, and other sport users have had, or will have, reasonable opportunity to harvest fish in excess of spawning requirements. Participants in these fisheries include mainly local and regional residents from Southcentral Alaska as well as minor numbers of participants from other areas of the state. Sockeye salmon are the primary species harvested in each fishery; however, coho, pink, and Chinook salmon are also caught and retained.

Prior to adoption of the *Upper Cook Inlet Personal Use Salmon Fishery Management Plan* (5 AAC 77.540) in 1996, several changes to the management of personal use fisheries occurred. During the late 1980s through 1995, legal, legislative, and BOF actions affected the implementation of the personal use fisheries in the NKPM. Management changes specific to the Kenai River or Kasilof River were dependent upon abundance of returning salmon and were tied into fisheries management plans for other user groups.

In 1989, an Alaska Supreme Court's decision had the effect of making all Alaska residents subsistence users. In December 1990, the BOF adopted the *Upper Cook Inlet Subsistence Salmon Management Plan*. Under this plan, subsistence fishing was allowed in most marine waters of Upper Cook Inlet (UCI) normally open to commercial gillnet fishing. Set gillnet fishing was also allowed in Knik Arm, as well as dip net fishing in the mouths of the Kenai and Kasilof rivers. Permits were required to participate in these subsistence fisheries and a valid Alaska resident sport fishing license was not required. The annual bag and possession limits were 25 salmon per head of household of which no more than 5 could be Chinook salmon. In addition, a household was allowed another 10 salmon for each household member, of which no more than 1 could be a Chinook salmon.

After the 1989 Alaska Supreme Court decision, the *Cook Inlet Personal Use Dip Net Fishery Management Plan* was still in place; however, this management plan specified that personal use fisheries in the Kasilof and Kenai rivers could not occur on the same day as the subsistence dip net fishery.

During the 1992 session, the Alaska State Legislature passed legislation that required the Alaska Boards of Fisheries and Game (Joint Boards) to identify nonsubsistence areas where dependence on subsistence was not a principle characteristic of the economy, culture, and way of life. During their November 1992 meeting, the Joint Boards established the Anchorage–Matanuska–Susitna–Kenai nonsubsistence area. The BOF also rescinded the *Upper Cook Inlet Subsistence Salmon Management Plan*. This ended all subsistence fisheries in UCI except the Tyonek subsistence fishery. The personal use dip net fishery remained in place. The escapement trigger for opening the personal use dip net fishery on the Kenai River was now 400,000 sockeye salmon, and once the fishery opened, fishing could be continuous.

In October 1993, Superior Court Judge Dana Fabe (in *Kenaitze v. Alaska*) found unconstitutional the provision in the 1992 state subsistence law that directed the Joint Boards to designate nonsubsistence areas. This ruling was appealed by the State of Alaska to the Alaska Supreme Court where a stay was granted on March 10, 1994. The full court vacated this stay on

April 11, 1994. A special meeting of the Joint Boards was convened on April 28, 1994 by teleconference. As a result of these meetings, the *Upper Cook Inlet Subsistence Salmon Management Plan* was readopted on April 28, 1994.

Because there was not enough time for a formal board meeting prior to the 1994 season, the BOF directed that the Commissioner of ADF&G should exercise his emergency regulatory authority to adopt subsistence fishing regulations for the 1994 fishery. The BOF directed that this fishery should mirror the 1992 subsistence fishery. Subsistence fishing periods were again on select Wednesdays and Saturdays from late May to the end of September. The annual bag and possession limits were again 25 salmon per head of household of which no more than 5 could be Chinook salmon. In addition, a household was allowed another 10 salmon for each household member, of which no more than 1 could be a Chinook salmon. A permit was required to participate, but not a sport fishing license.

In 1995, subsistence fisheries were scheduled to begin on May 20; however, in early May, the Alaska Supreme Court overturned the October 1993 Superior Court decision. This ruling reestablished the Anchorage–Matanuska–Susitna–Kenai nonsubsistence area. The BOF convened an emergency meeting by teleconference on May 24, 1995 to close subsistence fisheries in the now nonsubsistence area. The BOF delegated authority to the ADF&G Commissioner to readopt the *Upper Cook Inlet Subsistence Salmon Management Plan* as a personal use fishery. The 1995 dip net fishery was therefore prosecuted as a personal use fishery, having the same regulations as the 1994 subsistence fishery, and still requiring a permit. This permitted fishery was open on select Wednesdays and Saturdays from late May to the end of September. To further complicate the situation, the old personal use fishery, allowed under the *Cook Inlet Personal Use Salmon Dip Net Management Plan*, was still in place.

The management issues created by the legal challenges summarized above resulted in the *Upper Cook Inlet Personal Use Salmon Fishery Management Plan* adopted by the BOF in 1996. The plan contained personal use fishing regulations that were not tied to the fisheries management plans for other user groups and were independent of the abundance of returning salmon. This plan established a July 10–August 5 season that allowed fishing 24 hours per day. The permitting system for the personal use dip net fisheries was developed and initiated in 1996. Since then, 1 permit is issued for all 4 (UCI) personal use salmon fisheries (Kenai River dip net, Kasilof River dip net, Kasilof River gillnet, and Fish Creek dip net), and a sport fishing license is required along with the permit.

Several regulations have changed since 1996. In the Kenai River, the area open to those dipnetting from a boat was restricted to that area from a marker immediately upstream from the Kenai City dock to the downstream edge of the Warren Ames Bridge (Figure 12). In 1997, the season ending date was amended to July 31 due to expected low abundance of Kenai River coho salmon stocks, and daily hours were reduced to 17 hours daily (6:00 AM to 11:00 PM).

The Kenai River fishery was modified again in 1999 by closure of a section of the lower Kenai River to dipnetting from shore along the bluff on the north side of the river in response to increased erosion of lands owned by the City of Kenai (Figure 13). In addition, harvested salmon from the personal use fishery must be recorded “immediately” (defined as “before concealing the salmon from plain view or transporting it from the fishing site”).

During 2008, the BOF adopted an outboard motor regulation for the Kenai River personal use fishery. The current regulation, which was also effective for the 2008 season, is that fish may not

be taken from a boat powered by a 2-stroke motor, other than direct fuel injection (DFI). This regulation was adopted in response to high hydrocarbon levels in the lower Kenai River during peak-use days in late July. Detailed season dates, effort, and harvest of sockeye salmon are available in Table 41.

Regulations governing the Kasilof River personal use dip net fishery from 1996 to 2001 remained the same (Figure 14). New regulations were adopted by the BOF for the 2002 Kasilof River personal use dip net fishery that extended the fishing season up to 44 days per year. Beginning in 2002, the new season dates for this fishery were from June 25 through August 7. The 2002 salmon harvest for the Kasilof River personal use dip net fishery was 46,769 sockeye, 106 Chinook, 1,197 coho, 1,862 pink, and 139 chum salmon (Table 6). This includes a known harvest from 14,284 returned permits and an estimate of the harvest from those who had permits but did not return them (see Brannian and Fox 1996). During 2002, participation in the dip net fishery was 4,020 household-days fished (Tables 6 and 42).

A personal use gillnet fishery also occurs in June at the mouth of Kasilof River that targets sockeye salmon (Figure 15). This fishery began in 1982. The personal use gillnet harvest of salmon in Cook Inlet was prohibited except at the mouth of the Kasilof River. From 1996 through 2001, it opened on June 16 and closed by emergency order issued by CF when approximately 10,000–20,000 fish had been taken. The fishery typically lasted for about 9 days. The gillnet fishery is included in the *Upper Cook Inlet personal use fishery management plan*. Harvest in the gillnet fishery counts toward the permit holder's total allowable harvest in all 4 Upper Cook Inlet personal use fisheries (Kenai dip net, Kasilof dip net, Fish Creek dip net, and Kasilof gillnet). In the gillnet fishery, participants are allowed to keep all the Chinook salmon that they catch. From 1996 through 2001, the Kasilof River personal use gillnet fishery was monitored inseason by CF and is discussed in an annual management report (Fox and Shields 2001). During 2002, the BOF adopted regulations for the Kasilof River personal use gillnet fishery, establishing a June 15 through June 24 season. Although the personal use permit system is administered by SF, inseason management authority of the gillnet fishery is the responsibility of CF. The basic regulations governing the Kasilof River personal use gillnet and dip net fisheries remained unchanged from 2002 to 2010. During the 2011 BOF meeting, the definition of personal use salmon in regulation was aligned with the definition in Alaska Statute.

Recent Alaska Board of Fisheries Actions

In 2017, the area allowed to dipnetting from shore in the Kenai River dipnet fishery was reduced, closing the north bank from the Warren Ames bridge downstream to the channel marker at the mouth and the south bank from the Kenai Landing dock downstream to a marker at the mouth. Additionally, the bag and possession limit for Chinook salmon was defined as 1 Chinook salmon greater than 20 inches in length and 10 Chinook salmon less than 20 inches in length per household permit.

KENAI RIVER PERSONAL USE DIP NET FISHERY MANAGEMENT OBJECTIVES

This fishery is managed under provisions of the *Kenai River Late-Run Sockeye Salmon Management Plan* (5 AAC 21.360) and the *Upper Cook Inlet Personal Use Salmon Fishery Management Plan* (5 AAC 77.540). The fishery objective is to implement provisions contained in the respective management plans. The fishery primarily targets sockeye salmon.

Inseason Management Approach

Management of this fishery is the joint responsibility of CF and SF. CF is responsible for operation of the Kenai River sonar counter that estimates sockeye salmon entering the river. The personal use dip net fishery opens and closes by regulation. Inseason management by SF would be required only in the event the minimum inriver escapement goal for sockeye salmon could not be projected and achievement of that goal required restrictions to the dip net fishery; if the projected run strength is greater than 2.3 million sockeye salmon and the SEG is projected to be met, additional time is allowed by EO.

All participants in this personal use fishery are required to be Alaska residents with a valid Alaska sport fishing license to get a free permit or be a member of a household with a permit and be named on that permit. Permits are household permits that allow all members of the household to fish under the same permit. Completed permits must be returned to ADF&G following the fishing season. Persons who do not comply with the reporting requirement are sent reminder letters to prompt their response. Since 1996, harvest and effort in the Kenai River personal use dip net fishery has been estimated from reported harvest on returned permits. All permit holders who returned their permits before the second reminder letter was mailed are considered compliant households. Information obtained by permit holders who returned their permits after the second reminder letter was mailed is considered to be from noncompliant households. Participation and harvest by noncompliant households was estimated by calculating the mean participation (household-days fished) and harvest by species for noncompliant permits that were returned. These were then expanded to include all nonrespondents. Total estimates of participation and harvest by species for the fishery were obtained by summing the estimates for the noncompliant households with the information obtained from compliant households.

The Kenai River personal use fishery opens by regulation on July 10 for the daily hours of 6:00 AM through 11:00 PM and closes at 11:00 PM on July 31. Given sufficient run strength of greater than 2.3 million Kenai River late-run sockeye salmon, the personal use fishery may be liberalized to a 24-hour per day fishery. If the fishery is liberalized, it is typically done during the last week in July.

2016 Fishery Performance Update

In the 2016 Kenai river dip net fishery, the total harvest of sockeye salmon was below the long-term average and was approximately 259,057 fish (Tables 6 and 41). A total of 3,277 coho, 7,834 pink, and 717 chum salmon were also harvested in the Kenai River personal use dip net fishery during 2016 (Table 6). The fishery was open for 22 consecutive days without disruption. The final Kenai River sockeye salmon run size of 3.5 million fish was less than the forecasted run of 4.7 million fish (Shields and Frothingham 2018).

2017 Fishery Performance

In the 2017 Kenai river dip net fishery, the total harvest of sockeye salmon was above the long-term average and was approximately 297,049 fish (Tables 6 and 41). A total of 732 coho, 7,962 pink, and 886 chum salmon were also harvested in the Kenai River personal use dip net fishery during 2017 (Table 6). The fishery was open for 22 consecutive days without disruption. The final Kenai River sockeye salmon run size of 4.6 million fish was greater than the forecasted run of 4.0 million fish (Shields and Frothingham 2018).

2018 Fishery Performance

The 2018 estimated harvest of sockeye salmon from the Kenai River personal use dip net fishery was 169,553 fish (Tables 6 and 41). This is below the 1998–2018 average of 273,422 sockeye salmon and was the lowest harvest since 2006 (Tables 6 and 41). Due to the anticipated low abundance of Chinook salmon, a preseason EO (2-KS-1-29-18) was issued that prohibited retention of Chinook salmon in the personal use dip net fishery for the season (Appendix A2). The fishery was open for the harvest of other salmon for the reduced 20-day season. The fishery was closed by EO (2-RS-1-45-18) on July 30 in response to low abundance of sockeye salmon (Appendix A2). The 2018 inseason projections indicated a poor return that may not achieve the SEG leading into the last week of July. Postseason analysis indicated the run exhibited late run-timing and the SEG was achieved. Analysis indicated a total Kenai River sockeye salmon run of approximately 1.6 million fish, which is less than the forecasted run of 2.5 million fish (Marston and Frothingham 2019).

2019 Fishery Overview

The 2019 dip net fishery significantly improved over the 2018 season relative to the influx of sockeye salmon in the lower Kenai River. Consequently, catch rates were high because of high numbers of sockeye salmon immigrating into the river each day. Due to low numbers of Chinook salmon, the fishery was prohibited from retaining Chinook salmon of any size by EO (2-KS-1-30-19; Appendix A3). One liberalizing management action was taken for the 2019 Kenai River personal use dip net fishery; EO 2-RS-1-41-19 opened the fishery for 24 hours per day effective July 27 (Appendix A3). The *preliminary* inseason estimated total abundance of late-run Kenai River sockeye salmon was 3.5 million fish, which is slightly less than the forecasted run of 3.8 million fish (B. Marston, Commercial Fish Biologist, ADF&G, Soldotna, personal communication).

Current Issues

From 2016 to 2019, late-run Kenai River sockeye salmon have achieved the SEG; however, there are several issues associated with the Kenai River personal use dip net fishery. Allocation of the harvestable surplus of sockeye salmon remains an allocative issue between commercial, personal use, and inriver sport users. Success rates in the personal use fishery can decline during or after commercial fishing periods. Consecutive fishing periods may mean consecutive days of low success rates in the dip net fishery. Greater harvest in the personal use fishery decreases the numbers of sockeye salmon that may reach upriver sport fishing areas. Therefore, low success rates in the personal use and inriver sport fishery are an issue in the management of the fishery.

Participation in the fishery was previously thought to be capacity limited by the amount of land area available for public parking at access points to the fishery. This does not appear to be the case because over the past decade, the fishery has experienced incremental growth in participation. Parking to access the fishery occurs from various Kenai City lands, residential streets, local businesses, nearby campgrounds, and from upriver boat launches. Most shore-based participants fish on the north and south shores at the river's mouth. A growing number of participants park wherever space is available to access the river area open to dip net fishing. The City of Kenai owns the areas on the north and south banks at the river mouth, and shore-based dip netting, accessed from near the Warren Ames Bridge, occurs on KRSMA lands managed by DPOR. Parking, congestion, high traffic volume, litter, safety, trespass, and public nuisance have continued to be issues of concern in all areas that support shore-based dipnetting. A new access

road to the south beach personal use fishing area was constructed and was open for public use during the 2016 season. The participation in boat-based dipnetting has also greatly increased to the extent that waiting lines routinely form at the Kenai City dock near the mouth of the river (sometimes backing up traffic out onto Bridge Access Road) as well as at upriver boat launches such as Eagle Rock and Pillars boat launches, historically used for sport fishing access to the river. Boating safety and congestion of river areas previously used by sport anglers are issues present throughout the lower river corridor during the dip net fishery.

Numerous proposals to change personal use fishing regulations are submitted during each regularly scheduled Upper Cook Inlet Finfish BOF meeting to address the concerns about the growth of the fishery. However, regulations have remained relatively unchanged for several years. The only changes that have occurred are related to supporting growth of the fishery because local city and borough governments are active in planning to control congestion through the development of infrastructure (parking, rest rooms, traffic management, new road access), increasing law enforcement, and establishing local ordinances to help manage growth in the numbers of people visiting the area during July to participate in the fishery.

Recommended Research and Management

No research or revised management strategies are recommended.

KASILOF RIVER PERSONAL USE DIP NET AND GILLNET FISHERIES

Management Objectives

Regulation and management of this fishery are governed by the *Upper Cook Inlet Personal Use Salmon Fishery Management Plan* (5 AAC 77.540). The fishery objective is to implement the provisions of the BOF-adopted management plan.

Inseason Management Approach

Management of this fishery is the joint responsibility of CF and SF. CF is responsible for operation of the Kasilof River sonar counter that enumerates sockeye salmon entering the river. The personal use gillnet and dip net fisheries open and close by regulation. Inseason management by SF would be required only in the unlikely event the minimum sonar count and biological escapement goal could not be projected and achievement of these goals required restrictions to the dip net fishery or if the projected run strength exceeded the upper goal range. Prior to 2011, in the event that the upper bound of the BEG range of 150,000-250,000 sockeye salmon was projected to be exceeded, ADF&G staff had the tools to liberalize the personal use fishery. In this event, the Kasilof River personal use dip net fishery area could be expanded for shoreline and boat-based dipnetting. The shoreline-based dipnetting area could be expanded to the Sterling Highway Bridge and the area opened to dipnetting from boats could also be expanded upriver to river mile 3 below Trujillo's Landing. Both liberalizations were enacted concurrently when sockeye salmon escapement was proceeding at a rate greater than that needed to ensure the BEG was met. In 2011, the BOF amended the *Kasilof River Salmon Management Plan* after ADF&G completed the transition from Bendix sonar technology to DIDSON technology as the method to assess the Kasilof River sockeye salmon run. The BEG of 150,000–250,000 was replaced with a BEG of 160,000–390,000 sockeye salmon. The new goal reflected the adjustment in the estimated number of sockeye salmon passing the Kasilof River sonar station in terms of the DIDSON technology that replaced the Bendix sonar technology.

Change to the new goal within the management plan did not alter the process for inseason management of the personal use fishery, just the trigger points of when to restrict and when to liberalize. Like the years prior to 2011, inseason management relies on estimates of inriver sonar counts and estimated escapement.

Participants in this personal use fishery are required to obtain a permit and are required to return the permit to ADF&G, regardless of whether or not they fished. Persons who do not comply with the reporting requirement are sent reminder letters to prompt their response. Since 1996, harvest and effort in the Kasilof River personal use dip net and gillnet fishery have been estimated from reported harvest on returned permits. All responses prior to the second reminder letter are treated as a census of “compliant” permits. Responses from the second (and up to fourth in some years) reminder letters are considered to be a sample of the “noncompliant” permits. Estimates of mean harvest and effort from the noncompliant permits are expanded by the known total number of noncompliant permits and used to generate the total estimate of “noncompliant” harvest and effort. This estimate is then added to the sum of the harvest and effort from the compliant permits to generate the estimate of total harvest for the fishery.

2016 Fishery Performance Update

The estimated harvest of sockeye salmon in the 2016 personal use gillnet fishery was 26,539 fish, which was greater than the 1998–2018 average of 20,579 fish (Table 6). The dip net harvest was 58,273 sockeye salmon, and 1,255 coho salmon. The sockeye salmon harvest was consistent with the 1998–2018 average of approximately 58,953 sockeye salmon (Tables 6 and 42).

2017 Fishery Performance

The 2017 Kasilof River personal use fisheries produced good opportunities to harvest sockeye salmon periodically throughout the season depending upon daily passage rates of sockeye salmon into the river. During commercial fishery closures, personal use dip net harvests may significantly increase, and the inverse may also be experienced during commercial fishery openings. The estimated harvest of sockeye salmon in the 2017 personal use gillnet fishery was 21,927 fish, and the dip net harvest was 78,260 fish (Tables 6 and 42). The dip net harvest was larger than the 1998–2018 average of approximately 58,953 sockeye salmon (Tables 6 and 42).

No management actions were taken in the 2017 Kasilof River personal use fisheries. The final estimated escapement was 358,724 sockeye salmon past ADF&G’s sonar station (Table 42).

2018 Fishery Performance

The 2018 sockeye salmon run to the Kasilof River resulted in an estimated escapement of 394,309 sockeye salmon (Table 42). Similar to 2017, no management actions were taken in the dipnet fishery. The gillnet fishery was restricted by EO 2-S-02-18 by limiting fishing time to 11:00 AM to 11:00 PM in an effort to reduce harvest of Chinook salmon (Appendix A2). The personal use harvest of sockeye salmon was 14,390 fish in the gillnet fishery and 92,034 fish in the dip net fishery (Table 6). The dip net harvest estimate was the highest ever recorded for the fishery.

2019 Fishery Overview

The 2019 *preliminary* inseason sockeye salmon passage estimate was 378,416 fish (Table 42). This passage was slightly above average and provided personal use gillnetting and dipnetting

opportunity for participants. It is anticipated that the 2019 Kasilof River personal use estimates of sockeye salmon harvest will be similar to the historical average harvest based on the level of participation observed during the fisheries. Similar to 2018, the personal use gillnet fishery was restricted by EO 2-S-03-19 by limiting fishing time to 11:00 AM to 11:00 PM in an effort to reduce harvest of Chinook salmon. The personal use dipnet fishery was liberalized on July 24 by EO (2-RS-1-36-19) which expanded the area open to dipnetting from shore upstream to the Sterling Highway bridge and from a boat to 3 miles upstream of the mouth (Appendix A3).

Current Issues

From 2016 to 2019, Kasilof River sockeye salmon escapement has met or exceeded the OEG. Historically, land use and lack of infrastructure to support increases in participation are issues associated with the Kasilof River personal use fisheries. Parking, congestion, litter, safety, trespass, public nuisance, and camping have continued to be issues of concern in these fisheries. State lands where these fisheries occur are open to generally allowed public use. The Kasilof River Special Use Area was established through DNR, Division of Lands Mining and Water. This designation will aid in developing regulations to control land use that will address land use and infrastructure issues during the summer months when the Kasilof River personal use fisheries occur.

Recommended Research and Management

No research or revised management strategies are recommended at this time.

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TABLES

Table 1.—Angler-days of effort expended by sport anglers fishing Northern Kenai Peninsula Management Area waters, 1998–2018.

Year	Kenai River ^a		Russian River ^b		Kasilof River ^c		Other NKPMA		NKPMA total	Percent of state	Alaska total
	Effort	% NKPMA	Effort ^c	% NKPMA	Effort	% NKPMA	Effort	% NKPMA			
1998	216,650	66	47,942	15	26,487	8	36,561	11	327,640	18	1,856,976
1999	307,446	68	64,536	14	40,263	9	38,471	9	450,716	18	2,499,152
2000	358,569	69	69,864	13	46,654	9	44,472	9	519,559	20	2,627,805
2001	298,817	70	55,972	13	39,034	9	35,770	8	429,593	19	2,261,941
2002	312,815	68	68,263	15	35,198	8	41,003	9	457,279	20	2,259,091
2003	321,044	74	50,448	12	30,840	7	33,564	8	435,896	20	2,219,398
2004	376,313	75	60,784	12	29,889	6	33,749	7	500,735	20	2,473,961
2005	389,379	76	55,801	11	30,436	6	33,386	7	509,002	21	2,463,929
2006	330,085	72	70,804	15	26,323	6	33,254	7	460,466	20	2,297,961
2007	410,381	77	57,755	11	28,246	5	38,554	7	534,936	21	2,543,674
2008	360,344	75	55,444	12	29,939	6	35,630	7	481,357	21	2,315,601
2009	337,217	73	64,518	14	24,545	5	34,949	8	461,229	21	2,216,445
2010	347,938	80	39,873	9	19,481	4	30,130	7	437,422	22	2,000,167
2011	365,863	79	47,264	10	23,422	5	24,516	5	461,065	24	1,919,313
2012	374,732	82	41,152	9	22,099	5	19,873	4	457,856	24	1,885,768
2013	411,592	78	59,682	11	27,430	5	31,942	6	530,646	24	2,202,957
2014	455,578	79	57,544	10	30,369	5	34,399	6	577,890	25	2,309,853
2015	422,792	78	55,420	10	29,766	6	31,502	6	539,480	24	2,212,331
2016	380,638	80	39,957	8	22,111	5	32,896	7	475,602	24	1,982,300
2017	376,612	78	49,455	10	24,733	5	31,007	6	481,807	24	2,006,244
2018	324,532	75	47,186	11	32,729	8	27,784	6	432,231	23	1,878,008
Average											
1998–2018	356,159	75	55,222	12	29,524	6	33,496	7	474,400	22	2,211,089
2009–2018	379,749	78	50,205	10	25,669	5	29,900	6	485,523	24	2,061,339

Source: Statewide Harvest Survey (SWHS) estimates from the Alaska Sport Fishing Survey database [Intranet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2019). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.

^a Does not include Skilak and Kenai lakes; mainstem only.

^b Does not include Lower and Upper Russian lakes; all data are from SWHS.

^c Does not include Tustumena Lake.

Table 2.—Angler-days of sport fishing effort for the Kenai River by section, 1998–2018.

Year	Cook Inlet to Soldotna Bridge	Soldotna Bridge to Moose River	Moose River to Skilak Outlet	Skilak Inlet to Kenai Lake	Kenai River not specified ^a	Kenai River total
1998	95,378	56,342	36,218	28,712	ND	216,650
1999	157,493	69,331	41,573	39,049	ND	307,446
2000	178,460	92,056	41,911	46,142	ND	358,569
2001	153,356	75,249	34,918	35,294	ND	298,817
2002	142,492	78,165	33,228	52,937	5,993	312,815
2003	143,144	90,072	35,804	40,815	11,209	321,044
2004	166,202	100,180	51,188	49,814	8,929	376,313
2005	168,570	111,806	40,903	51,892	15,506	388,677
2006	151,623	91,912	35,667	40,624	9,296	329,122
2007	164,411	110,099	60,820	67,164	7,887	410,381
2008	161,607	90,811	47,204	50,655	10,067	360,344
2009	132,059	87,360	48,661	60,319	8,818	337,217
2010	133,856	105,095	53,375	43,344	12,268	347,938
2011	159,254	107,121	53,315	43,750	2,423	365,863
2012	147,721	127,598	54,024	43,222	2,167	374,732
2013	137,963	144,901	63,948	62,213	2,567	411,592
2014	175,187	157,066	70,741	49,038	3,546	455,578
2015	168,628	135,996	65,826	50,607	1,735	422,792
2016	163,873	124,314	49,368	41,627	1,456	380,638
2017	157,514	125,162	45,653	47,182	1,101	376,612
2018	137,332	100,513	46,920	38,840	927	324,532
Average 1998–2018	152,196	103,864	48,155	46,821	6,229	356,080

Source: Statewide Harvest Survey (SWHS) estimates from the Alaska Sport Fishing Survey database [Intranet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2019). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.

Note: ND means no data collected.

^a Prior to 2002, these data were listed under the “Other Streams” category.

Table 3.—Kenai River sport fish harvest by species, 1998–2018.

Year	Chinook salmon	Sockeye salmon	Coho salmon	Pink salmon	Chum salmon	Rainbow trout	Dolly Varden	Lake trout	Arctic grayling	Northern pike	Other ^a	Total
1998	8,685	164,536	26,967	8,926	79	2,015	6,079	117	25	0	610	218,039
1999	21,724	200,574	31,637	1,895	333	3,784	7,568	293	64	0	64	267,936
2000	17,040	230,983	48,519	19,081	350	3,459	7,427	115	93	6	751	327,824
2001	18,879	200,762	49,782	2,069	498	2,422	6,528	156	76	0	1,141	282,313
2002	13,506	225,917	59,650	22,995	959	6,019	5,781	173	146	12	806	335,964
2003	19,782	286,089	46,657	2,847	94	2,278	6,113	243	42	58	274	364,477
2004	20,757	294,793	65,952	20,638	123	3,311	5,845	80	277	58	136	411,970
2005	22,024	294,287	50,411	5,112	52	2,517	4,316	0	62	12	759	379,552
2006	20,504	173,425	37,639	12,448	52	2,499	3,218	41	10	0	158	249,994
2007	14,934	308,850	38,017	3,308	30	2,666	3,276	0	12	10	144	371,247
2008	14,638	230,030	51,624	15,108	227	3,214	3,766	153	31	25	359	319,175
2009	11,968	252,319	49,960	4,038	89	2,454	2,718	22	13	0	149	323,730
2010	8,538	304,635	52,912	12,959	71	2,403	2,996	129	87	0	246	384,976
2011	8,689	395,840	44,132	3,586	77	1,727	1,789	0	0	0	355	456,195
2012	794	455,454	36,407	17,637	357	2,540	2,144	7	0	11	1,695	517,046
2013	1,405	436,988	48,954	3,130	149	1,771	3,609	0	0	23	495	496,524
2014	1,301	360,831	60,566	24,919	31	1,619	3,927	62	0	29	352	453,637
2015	4,009	376,422	57,067	4,914	190	2,265	3,834	0	0	0	1,196	449,897
2016	8,524	329,702	39,931	23,679	579	2,462	2,327	439	16	0	514	408,173
2017	9,802	291,405	48,427	5,899	12	3,577	2,149	20	198	0	2,055	363,544
2018	1,951	172,672	50,575	20,427	0	1,152	2,109	0	0	0	1,035	249,921
Average 1998–2018	11,879	285,072	47,418	11,220	207	2,674	4,168	98	55	12	633	363,435

Source: Statewide Harvest Survey (SWHS) estimates from the Alaska Sport Fishing Survey database [Intranet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2019). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.

^a Includes whitefish (*Coregonus clupeaformis*), steelhead, burbot (*Lota lota*), and those listed under “Other Fish” in the SWHS.

Table 4.—Angler-days of sport fishing effort for other Northern Kenai Peninsula Management Area streams and drainages by fishery, 1998–2018.

Year	Stocked lakes ^a	Quartz Creek	Swanson River	Hidden Lake	Resurrection Creek	Swanson R Canoe Route	Swan Lakes Canoe Route	Skilak Lake	Kenai Lake	Sixmile Creek	Crescent Lake	Tustumena Lake	Other NKPMA fisheries	Total
1998	6,588	3,166	3,422	1,576	6,101	1,671	1,515	1,645	520	1,370	1,145	985	6,857	36,561
1999	5,151	4,708	3,606	2,017	2,167	3,279	2,022	1,182	1,462	445	1,266	599	10,567	38,471
2000	7,880	2,423	5,839	1,804	5,751	2,929	1,742	2,072	1,033	1,207	1,504	1,368	8,920	44,472
2001	6,543	3,105	4,060	1,604	2,377	3,345	816	1,701	2,509	1,024	1,099	731	6,856	35,770
2002	7,641	4,245	4,249	1,412	3,456	1,396	2,296	1,668	2,502	2,001	1,457	871	7,809	41,003
2003	4,802	4,357	3,807	1,761	2,534	1,150	1,148	2,068	1,097	1,089	1,412	802	7,537	33,564
2004	4,978	6,589	2,878	1,902	3,116	762	580	2,460	497	1,297	1,104	972	6,614	33,749
2005	8,205	6,106	3,552	1,548	1,708	1,334	932	594	2,072	511	1,028	684	5,112	33,386
2006	6,488	5,582	3,533	1,975	4,550	1,136	794	1,152	619	1,127	790	455	5,053	33,254
2007	3,079	8,694	4,481	2,449	5,030	2,231	2,097	1,462	648	988	1,389	525	5,481	38,554
2008	2,802	7,105	5,006	1,543	5,584	2,221	1,341	1,692	728	641	959	750	5,258	35,630
2009	3,707	6,217	2,698	3,559	6,805	1,923	400	1,126	687	1,535	1,609	764	3,919	34,949
2010	5,510	4,859	2,303	2,393	3,287	900	1,385	1,085	955	1,361	758	348	4,986	30,130
2011	7,192	2,184	3,922	1,314	1,801	247	505	918	869	348	996	134	4,086	24,516
2012	5,867	1,238	700	835	2,511	397	930	538	1,179	655	896	ND	4,127	19,873
2013	10,161	3,262	1,916	1,745	2,157	660	1,041	2,060	2,964	742	1,213	539	3,482	31,942
2014	8,485	3,507	2,022	743	5,262	875	660	1,616	3,030	1,108	1,186	ND	5,905	34,399
2015	10,362	3,137	1,470	645	2,844	731	771	1,188	2,048	1,940	1,041	858	4,467	31,502
2016	11,557	2,989	1,778	302	3,865	217	536	503	1,247	1,020	1,499	141	7,332	32,986
2017	12,548	1,669	2,411	672	4,011	335	250	713	2,134	671	999	294	4,300	31,007
2018	6,616	2,459	2,021	565	6,196	1,442	685	488	674	1,485	899	100	4,154	27,784
Average														
1998–2018	6,960	4,171	3,127	1,541	3,863	1,390	1,069	1,330	1,404	1,075	1,155	596	5,849	33,500
2009–2018	8,201	3,152	2,124	1,277	3,874	773	716	1,024	1,579	1,087	1,110	353	4,676	29,909

Source: Statewide Harvest Survey (SWHS) estimates from the Alaska Sport Fishing Survey database [Intranet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2019). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.

^a From 1998 to 2004, a yearly combined total of 2 Rainbow Lakes (one stocked, one not) are included because there was no breakdown available.

Table 5.—Sport fish harvest by species for systems other than the Kenai River mainstem in the Northern Kenai Peninsula Management Area, 1998–2018.

Year	Chinook salmon	Sockeye salmon ^a	Coho salmon ^b	Pink salmon	Chum salmon	Rainbow trout	Dolly Varden	Lake trout	Arctic grayling	Northern pike	Other	Total
1998	4,845	72,572	14,600	7,842	313	10,081	3,196	1,890	872	0	164	116,375
1999	8,255	72,722	10,281	1,022	230	9,763	3,233	2,353	984	47	44	108,934
2000	9,912	79,370	13,043	3,380	0	13,784	4,289	1,559	1,111	48	250	126,746
2001	8,866	60,630	15,377	2,036	116	7,646	2,334	1,577	888	522	647	100,639
2002	5,261	91,209	21,447	4,183	140	13,070	2,915	1,628	982	356	202	141,393
2003	4,234	58,496	14,420	2,459	145	7,674	2,553	624	1,139	459	185	92,388
2004	4,346	64,076	16,279	3,624	125	5,245	3,842	1,703	647	256	102	100,245
2005	4,566	61,778	12,008	1,190	108	4,868	1,690	1,229	739	212	230	88,618
2006	3,304	89,238	13,502	5,110	388	4,597	1,263	821	387	55	87	118,752
2007	3,731	58,169	8,791	3,485	61	6,373	2,197	669	523	548	37	84,584
2008	3,789	74,264	12,292	6,254	52	4,677	1,815	429	635	229	0	104,436
2009	3,801	100,938	11,239	5,926	184	3,648	1,293	893	883	0	152	128,957
2010	3,549	39,550	8,076	2,256	77	5,145	1,195	609	285	59	269	61,070
2011	3,714	45,625	8,726	1,766	34	5,527	1,138	404	732	0	228	67,894
2012	927	37,118	10,067	2,501	18	4,439	631	359	635	0	267	56,962
2013	1,835	60,721	10,748	1,175	234	6,377	1,266	1,415	1,177	428	282	85,658
2014	637	74,653	9,219	4,026	20	5,560	1,531	613	597	0	142	96,998
2015	1,379	60,757	10,825	3,602	332	6,485	809	655	603	0	55	85,502
2016	3,059	33,651	6,969	4,253	143	10,482	1,126	640	547	0	422	61,292
2017	4,288	46,550	9,184	4,424	116	6,309	858	659	173	8	215	72,784
2018	2,264	59,126	12,108	5,609	286	2,814	738	55	181	0	864	84,045
Average												
1998–2018	4,122	63,867	11,867	3,625	149	6,884	1,901	990	701	154	231	94,489

Source: Statewide Harvest Survey (SWHS) estimates from the Alaska Sport Fishing Survey database [Intranet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2019). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.

^a Includes kokanee (landlocked *O. nerka*) as reported in the SWHS.

^b Includes natural and stocked landlocked coho salmon as reported in the SWHS.

Table 6.—Household-days of effort (days fished) and harvest for Kenai River and Kasilof River personal use fisheries, 1998–2018.

Fishery	Year	Days open	Days fished	Sockeye salmon	Chinook salmon	Coho salmon	Pink salmon	Chum salmon	Total
Kasilof River gillnet									
	1998	5	1,075	15,975	126	0	15	12	16,128
	1999	10	1,287	12,832	442	25	10	10	13,319
	2000	13	1,252	14,774	514	9	17	10	15,324
	2001	8	1,001	17,201	174	6	11	7	17,399
	2002	10	1,025	17,980	192	12	30	13	18,227
	2003	10	1,206	15,706	400	107	9	4	16,226
	2004	10	1,272	25,417	163	58	6	0	25,644
	2005	11	1,506	26,609	87	326	16	1	27,039
	2006	10	1,724	28,867	287	420	11	6	29,591
	2007	10	1,570	14,943	343	68	2	0	15,356
	2008	10	1,534	23,432	151	65	35	23	23,706
	2009	10	1,761	26,646	127	165	14	11	26,963
	2010	10	1,855	21,924	136	23	23	1	22,107
	2011	10	1,846	26,780	167	47	23	3	27,020
	2012	10	1,696	15,638	103	161	53	15	15,970
	2013	5	1,082	14,439	46	129	3	5	14,622
	2014	10	1,389	22,567	50	30	105	18	22,770
	2015	10	1,741	27,567	61	191	20	2	27,841
	2016	10	1,962	26,539	141	23	5	23	26,731
	2017	10	1,874	21,927	118	5	48	43	22,141
	2018	10	1,616	14,390	120	2	22	5	14,539
	Average	10	1,489	20,579	188	89	23	10	20,889
Kasilof River dip net									
	1998	27	3,421	45,161	134	731	610	74	46,710
	1999	27	3,611	37,176	127	286	264	52	37,905
	2000	27	2,622	23,877	134	1,004	841	34	25,890
	2001	27	3,382	37,612	138	766	307	23	38,846
	2002	44	4,020	46,769	106	1,197	1,862	139	50,073
	2003	44	3,874	43,870	57	592	286	30	44,835
	2004	44	4,432	48,315	44	668	396	90	49,513
	2005	44	4,500	43,151	16	538	658	102	44,465
	2006	44	5,763	56,144	55	1,057	992	105	58,353
	2007	44	4,627	43,293	35	487	383	136	44,334
	2008	44	5,552	54,051	46	509	787	143	55,536
	2009	44	7,650	73,035	34	1,441	1,274	173	75,957
	2010	44	7,588	70,774	31	1,768	974	279	73,826
	2011	44	6,571	49,766	24	977	652	144	51,562
	2012	44	6,536	73,419	16	1,170	896	147	75,649
	2013	44	8,556	85,528	18	1,666	683	339	88,233
	2014	44	10,236	88,513	0	2,606	2,769	342	94,230
	2015	44	10,346	89,000	0	2,723	1,607	597	93,927

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Table 6.–Page 2 of 2.

Fishery	Year	Days open	Days fished	Sockeye salmon	Chinook salmon	Coho salmon	Pink salmon	Chum salmon	Total
Kasilof River dip net									
(continued)	2016	44	9,334	58,273	26	1,255	1,733	329	61,616
	2017	44	9,458	78,260	14	605	2,850	969	82,698
	2018	44	9,377	92,034	6	326	3,272	326	96,311
	Average	41	6,260	58,953	51	1,065	1,147	218	61,451
Kenai River dip net									
	1998	18	10,802	103,847	254	1,011	1,032	85	106,229
	1999	22	13,738	149,504	488	1,009	1,666	102	152,769
	2000	22	12,354	98,262	410	1,449	1,457	193	101,771
	2001	22	14,772	150,766	638	1,555	1,326	155	154,440
	2002	22	14,840	180,028	606	1,721	5,662	551	188,568
	2003	22	15,263	223,580	1,016	1,332	1,647	249	227,824
	2004	22	18,513	262,831	792	2,661	2,103	387	268,774
	2005	22	20,977	295,496	997	2,512	1,806	321	301,132
	2006	20	12,685	127,630	1,034	2,235	11,127	551	142,577
	2007	22	21,908	291,270	1,509	2,111	1,939	472	297,301
	2008	22	20,772	234,109	1,362	2,609	10,631	504	249,215
	2009	22	26,171	339,993	1,189	2,401	5,482	285	349,350
	2010	22	28,342	389,552	865	2,870	3,655	508	397,450
	2011	22	32,818	537,765	1,243	4,745	3,914	915	548,583
	2012	22	34,374	526,992	40	4,008	3,770	425	535,236
	2013	22	33,193	347,222	11	3,169	3,625	701	354,727
	2014	22	36,380	379,823	0	4,710	19,140	1,194	404,866
	2015	22	31,487	377,532	66	4,150	4,147	957	386,853
	2016	22	30,745	259,057	638	3,277	7,834	717	271,524
	2017	22	27,775	297,049	1,194	732	7,962	886	307,824
	2018	20	20,170	165,028	7	529	10,435	441	176,439
	Average	22	22,766	273,206	684	2,419	5,255	505	282,069

Source: Reimer and Sigurdsson (2004); Dunker and Lafferty (2007); Dunker (2010, 2013, 2018); A. St. Saviour, Sport Fish Biologist, ADF&G, Palmer, personal communication.

Note: Summaries of returned permits are expanded to include harvest of permits not returned.

Table 7.—Kenai River early-run large (≥ 75 cm) Chinook salmon population data, 1986–2019.

Year	Cook Inlet marine harvest ^a	Misc. marine ^b	Kenaitze educational harvest ^c	Inriver run ^d	Sport harvest above sonar ^e	Catch-and- release mortality above sonar	Spawning escapement	Total run	Harvest rate
1986	128	0	0				6,562	14,143	0.54
1987	175	0	0				4,660	18,348	0.75
1988	201	0	0				2,668	17,537	0.85
1989	169	0	64				2,663	10,359	0.74
1990	218	0	37				5,523	7,825	0.29
1991	238	0	2				6,830	9,124	0.25
1992	275	0	67				7,902	10,514	0.25
1993	377	0	109				3,108	12,568	0.75
1994	320	0	52				3,448	11,777	0.71
1995	408	0	37				1,692	12,447	0.86
1996	206	0	91				1,940	8,485	0.77
1997	296	0	116				2,898	9,716	0.70
1998	278	0	126				5,918	7,719	0.23
1999	216	0	100				2,808	10,471	0.73
2000	229	0	119				6,580	8,812	0.25
2001	154	0	166				6,455	8,937	0.28
2002	139	0	40				8,489	9,442	0.10
2003	151	0	94				11,735	14,481	0.19
2004	152	0	56				15,319	18,335	0.16
2005	156	194	63				11,529	15,414	0.25
2006	218	0	56				6,072	10,605	0.43
2007	167	23	13				5,151	8,485	0.39
2008	97	63	36				4,138	7,604	0.46
2009	59	9	41				4,034	5,435	0.26
2010	70	26	26				3,012	4,255	0.29
2011	93	0	35				5,196	6,543	0.21
2012	47	0	19				2,977	3,376	0.12
2013	86	0	9				1,601	1,688	0.05
2014	65	10	1				2,621	2,690	0.03
2015	66	41	8				4,198	4,303	0.02
2016 ^f	23	14	2	6,528	5	42	6,478	6,567	0.01
2017 ^f	40	19	10	7,341	462	72	6,703	7,410	0.10
2018 ^f	15	16	1	3,031	79	28	2,893	3,063	0.06
2019 ^f	NA	NA	0	4,173	NA	NA	NA	NA	NA
Average									
1986–2013	190	11	56				5,390	10,159	0.28
2014–2018	42	20	4	5,633	182	47	4,579	4,807	0.04

Source: Statewide Harvest Surveys from Mills (1987–1994), Howe et al. (1995, 1996), and Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>. Other data sources are Alexandersdottir and Marsh (1990); Nelson et al. (1999); Hammarstrom and Timmons (2001a); Reimer et al. (2002); Reimer (2003, 2004a–b, 2007); Eskelin (2007, 2009, 2010); Perschbacher (2012a–d, 2014, 2015); McKinley and Fleischman (2013); Perschbacher and Eskelin (2016); and A. Eskelin, Sport Fish Biologist, ADF&G Soldotna, personal communication; 1994–2018 Educational data Kenaitze Indian Tribe.

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Note: NA means data not available.

- ^a Cook Inlet marine sport harvest; calculated as 5% of total Cook Inlet marine sport harvest.
- ^b 60% of commercial cost-recovery harvest and eastside setnet harvest before 25 June.
- ^c Prior to 1994, there was no educational fishery; this was considered a subsistence fishery.
- ^d Estimates for 2016–2019 are unpublished preliminary estimates.
- ^e Includes creel survey estimates for the area from Cook Inlet to the Soldotna Bridge and estimates from the SWHS from the Soldotna Bridge to the outlet of Kenai Lake.
- ^f These estimates are preliminary until biometrically reviewed and published.

Table 8.–Kenai River late-run large (≥ 75 cm) Chinook salmon population data, 1986–2019.

Year	Cook Inlet marine harvest ^a	Eastside setnet harvest ^b	Drift gillnet harvest ^c	Kenaitze educational	Subsistence	Personal use dipnet ^d	Sport harvest below sonar ^e	Inriver run	Sport harvest above sonar ^f	Release mortality above sonar	Spawning escapement ^g	Total run	Harvest rate
1986	332	9,541	763	0	ND	0					42,101	60,367	0.30
1987	711	11,638	2,163	0	ND	186					48,393	74,737	0.35
1988	878	7,424	1,116	0	ND	0					42,815	70,391	0.39
1989	795	6,005	0	17	ND	0					26,253	41,615	0.37
1990	793	1,705	221	8	ND	0					25,139	32,979	0.24
1991	967	2,380	103	202	ND	0					27,133	37,645	0.28
1992	1,205	5,539	275	299	ND	0					37,469	51,116	0.27
1993	1,629	7,775	365	21	ND	0					33,432	59,520	0.44
1994	1,089	8,734	225	317	ND	0					26,145	53,161	0.51
1995	1,102	5,945	253	2	ND	505					24,874	43,497	0.43
1996	1,113	6,033	175	1	ND	222					29,056	43,953	0.34
1997	1,613	5,868	281	15	ND	272					25,221	45,345	0.44
1998	917	2,165	123	1	ND	156					33,385	43,130	0.23
1999	502	4,402	231	3	ND	327					29,100	45,657	0.36
2000	568	1,795	114	4	ND	288					25,502	41,719	0.39
2001	465	1,905	170	4	ND	291					29,531	45,754	0.35
2002	226	3,483	132	3	ND	321					40,514	55,910	0.28
2003	95	4,375	317	5	ND	432					48,461	67,984	0.29
2004	832	9,990	439	7	ND	525					65,112	91,312	0.29
2005	583	9,501 ^h	744	7	ND	632					55,688	84,189	0.34
2006	477	3,074 ^h	742	5	ND	460					39,305	57,122	0.31
2007	387	4,055 ^h	260	3	ND	717					29,664	44,421	0.33
2008	287	3,425 ^h	255	10	ND	887					28,094	42,680	0.34
2009	128	1,410	187	1	ND	432					18,251	28,044	0.35
2010	262	2,384	170	11	ND	456					13,037	22,180	0.41
2011	425	2,499	208	3	ND	726					15,731	26,381	0.40
2012	211	333	89	0	ND	27					22,453	23,206	0.03
2013	229	679	89	2	ND	3					12,305	14,382	0.14
2014	322	706	93	0	ND	0					11,980	13,403	0.11

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Year	Cook Inlet marine harvest ^a	Eastside setnet harvest ^b	Drift gillnet harvest ^c	Kenaitze educational	Subsistence	Personal use dip net ^d	Sport harvest below sonar ^e	Inriver run	Sport harvest above sonar ^f	Release mortality above sonar	Spawning escapement ^g	Total run	Harvest rate
2015	354	2,808	143	4	ND	28					16,825	22,796	0.26
2016 ⁱ	16	3,993	268	4	0	470	3,296	21,348	3,167	148	14,676	25,629	0.43
2017 ⁱ	102	2,998	145	8	0	1,096	4,218	27,448	2,299	153	20,501	30,702	0.33
2018 ⁱ	19	555	199	1	0	5	64	17,029	108	262	17,279	17,803	0.03
2019 ⁱ	NA	613	NA	1	NA	NA	NA	11,671	NA	NA	NA	NA	NA
Average													
1986–2013	672	4,788	365	34	NA	281					31,934	48,157	0.30
2014–2018	163	2,212	170	3	0	320	2,526	21,942	1,858	188	16,252	22,067	0.23

Source: Statewide Harvest Surveys from Mills (1987–1994), Howe et al. (1995, 1996), and Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>. Other data sources are Hammarstrom and Timmons (2001b); Reimer and Sigurdsson (2004); Dunker and Lafferty (2007); Dunker (2010, 2013, 2018); Fleischman and McKinley (2013); Shields and Frothingham (2018); and A. St. Saviour, Sport Fish Biologist, ADF&G Palmer, personal communication; R. Begich, Sport Fish Biologist, ADF&G, Soldotna, personal communication.

Note: NA means data not available.

^a 60% of SWHS estimates of Cook Inlet marine sport harvest after 24 June.

^b Estimates for 1986–2009 are Fleischman and McKinley (2013). Estimates for 2010–2015 from Eskelin et al. (2013b), and Eskelin and Barclay (2015, 2016).

^c Estimates for 1986–2009 are from Fleischman and McKinley (2013). Estimates for 2010–2015 are from ESSN GSI allocation.

^d Estimates for 1986–1994 from SWHS. Estimates for 1995 are from Ruesch and Fox (1996). Estimates for 1996–2018 are from returned permits.

^e Creel survey estimates are from below RM 8.6 prior to 2013 and below RM 13.7 since 2013.

^f Creel survey and SWHS estimates are from above RM 8.6 sonar prior to 2013 and above RM 13.7 sonar since 2013.

^g Some catch-and-release mortality (usually less than 100 fish) occurs below the sonar and is not counted towards escapement.

^h Harvest estimate does not include Kasilof River terminal fishery which occurred 2005–2008.

ⁱ These estimates are preliminary until biometrically reviewed and published.

Table 9.—Historical summary of early-run Kasilof River–Crooked Creek Chinook salmon stocks, 2004–2019.

Year	Harvest ^a			Run to weir ^b			Total run ^b			Spawning escapement ^b		
	Total	Naturally produced	Hatchery-produced	Total	Naturally produced	Hatchery-produced	Total	Naturally produced	Hatchery-produced	Total	Naturally produced	Hatchery-produced
2004	2,407	0	2,407	4,873	2,641	2,232	7,280	2,641	4,639	4,356	2,196	2,160
2005	2,665	572	2,093	3,168	2,108	1,060	5,833	2,680	3,153	2,936	1,909	1,027
2006	2,489	1,057	1,432	2,646	1,589	1,057	5,135	2,646	2,489	2,569	1,516	1,053
2007	2,654	1,107	1,547	1,527	1,038	489	4,181	2,145	2,036	1,452	965	487
2008 ^c	1,984	832	1,129	1,414	1,018	396	3,398	1,850	1,525	1,181	879	302
2009 ^c	1,532	576	956	929	674	255	2,461	1,250	1,211	734	617	117
2010 ^{c,d}	1,333	273	1,060	1,352	1,090	262	2,685	1,363	1,322	1,348	1,088	260
2011 ^{c,e}	2,054	ND	ND	933	677	256	2,987	ND	ND	782	654	128
2012 ^d	872	ND	ND	796	633	163	1,668	ND	ND	731	631	100
2013 ^d	1,073	ND	ND	1,409	1,211	198	2,482	ND	ND	1,213	1,102	111
2014 ^d	323	ND	ND	2,433	1,522	911	2,756	ND	ND	2,148	1,411	737
2015 ^d	589	ND	ND	2,240	1,639	601	2,829	ND	ND	1,903	1,456	447
2016 ^{d,f}	1,810	ND	ND	4,017	1,833	2,184	5,827	ND	ND	3,847	1,747	2,100
2017	2,965	ND	ND	1,676	994	682	4,641	ND	ND	1,135	911	224
2018 ^d	1,468	ND	ND	1,741	777	964	3,209	ND	ND	1,187	714	473
2019 ^d	NA	ND	ND	3,636	1,641	1,995	NA	ND	ND	1,876	1,444	432
Average												
2004–2018	1,748	294	708	2,077	1,296	781	3,825	972	1,092	1,835	1,186	648

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>. Other data sources are Cope (2012); Begich et al. (2017); A. Waldo and J. Gates, Sport Fish Biologists, ADF&G, Soldotna, personal communication.

Note: ND means no data collected.

- ^a Excludes ocean-age-1 fish for 2004–2010. Data for 2004–2010 are from inseason creel surveys. Data for 2011–present are from SWHS. These data do not include harvest from the Kasilof River personal use fishery.
- ^b Excludes ocean-age-1 fish. Beginning in 2017, hatchery-produced fish were opportunistically culled.
- ^c In 2008, regulations were changed to allow retention of naturally produced Chinook salmon on Tuesdays, Thursdays, and Saturdays only, with a limit of 2 Chinook salmon per day of which only 1 may be naturally produced; annual limits applied.
- ^d Restrictions were placed on harvest of Chinook salmon during these years. See Appendices for more details.
- ^e The Kasilof River early-run Chinook salmon creel survey was discontinued in 2011.
- ^f Incomplete weir count; weir pulled July 25.

Table 10.—Late-run Kasilof River Chinook salmon harvest and abundance, 1998–2018.

Year	ESSN harvest ^a	Inriver sport harvest	Inriver abundance ^b
1998	1,480	637	ND
1999	2,754	658	ND
2000	1,072	1,086	ND
2001	1,749	1,378	ND
2002	2,758	451	ND
2003	4,310	1,144	ND
2004	6,310	1,038	ND
2005	6,285	1,052	12,097
2006	2,897	883	8,611
2007	3,577	1,062	8,522
2008	2,204	793	8,276
2009	1,626	2,164	ND
2010	2,305	1,310	ND
2011	2,538	1,660	ND
2012	205	55	ND
2013	637	762	ND
2014	891	314	ND
2015	1,564	790	ND
2016	1,667	1,249	ND
2017	905	1,323	ND
2018	428	787	ND
<hr/>			
1998–2018			
Min	205	55	8,276
Average	2,293	981	9,377
Max	6,310	2,164	12,097

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>. Other data sources are Fleischman and McKinley (2013); Eskelin et al. (2013); Eskelin and Barclay (2016, 2017, 2018, 2019); Shields and Frothingham (2018); R. Begich, Sport Fish Biologist, ADF&G, Soldotna, personal communication.

Note: ND means no data collected.

^a Uses 2010, 2011 and 2013–2015 Eastside setnet genetic stock allocation estimates to calculate Kasilof River Chinook salmon harvest component.

^b Mark–recapture tagging abundance estimates from Reimer and Fleischman (2012).

Table 11.—Fishing effort, catch, and harvest of early-run Chinook salmon by angler type from the Kasilof River creel survey, 16 May–30 June, 2004–2010.

Angler type	Year	2004	2005	2006	2007	2008	2009	2010	Average	Percent of grand total average
Shore										
Guided										
	Anglers	0	0	0	0	57	50	4		
	Angler-hours	0	0	0	0	248	204	10		
	Catch	0	0	0	0	14	0	0		
	Harvest	0	0	0	0	14	0	0		
Unguided										
	Anglers	5,138	5,142	7,910	6,181	6,511	6,242	4,743		
	Angler-hours	15,096	16,452	23,199	17,953	19,712	17,091	14,371		
	Catch	1,643	1,366	887	747	564	354	660		
	Harvest	503	497	296	329	274	169	170		
Total										
	Anglers	5,138	5,142	7,910	6,181	6,568	6,292	4,747		
	Angler-hours	15,096	16,452	23,199	17,953	19,960	17,295	14,381		
	Catch	1,643	1,366	887	747	578	354	660		
	Harvest	503	497	296	329	288	169	170		
Boat										
Guided										
	Year	2,004	2,005	2,006	2,007	2,008	2,009	2,010		
	Anglers	4,328	4,615	5,410	4,625	4,420	3,526	4,790		
	Angler-hours	24,670	32,840	38,065	32,363	31,113	24,255	33,792		
	Catch	3,463	3,446	3,330	3,162	2,303	1,711	2,334		
	Harvest	1,479	1,768	1,818	1,940	1,490	1,196	1,089		
Unguided										
	Anglers	2,550	2,297	2,928	2,109	2,325	1,575	963		
	Angler-hours	12,089	11,300	13,994	10,926	10,740	7,361	4,800		
	Catch	983	743	553	516	304	211	135		
	Harvest	426	401	375	384	207	166	74		

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Angler type	Year	2004	2005	2006	2007	2008	2009	2010	Average	Percent of grand total average
Boat										
	Total									
	Anglers	6,878	6,911	8,338	6,734	6,744	5,101	5,753		
	Angler-hours	36,759	44,140	52,059	43,290	41,853	31,616	38,592		
	Catch	4,446	4,189	3,884	3,678	2,607	1,922	2,468		
	Harvest	1,904	2,169	2,193	2,325	1,697	1,362	1,163		
	Guided total									
	Anglers	4,328	4,615	5,410	4,625	4,477	3,576	4,794	4,546	36
	Angler-hours	24,670	32,840	38,065	32,363	31,361	24,459	33,802	31,080	53
	Catch	3,463	3,446	3,330	3,162	2,316	1,711	2,334	2,823	67
	Harvest	1,479	1,768	1,818	1,940	1,503	1,196	1,089	1,542	72
	Unguided total									
	Anglers	7,688	7,438	10,838	8,290	8,836	7,817	5,706	8,088	64
	Angler-hours	27,185	27,752	37,193	28,879	30,452	24,452	19,172	27,869	47
	Catch	2,626	2,109	1,440	1,263	868	565	795	1,381	33
	Harvest	929	898	672	713	481	336	244	610	28
	Grand total									
	Anglers	12,015	12,053	16,248	12,915	13,313	11,393	10,500	12,634	
	Angler-hours	51,854	60,592	75,258	61,243	61,813	48,911	52,974	58,949	
	Catch	6,089	5,555	4,771	4,426	3,184	2,276	3,128	4,204	
	Harvest	2,407	2,665	2,490	2,654	1,984	1,532	1,333	2,152	

Source: Cope (2011, 2012)

Note: Some totals may vary slightly from calculated totals due to rounding differences. The creel survey was discontinued in 2011.

Table 12.—Historical releases of adipose finclipped Crooked Creek Chinook salmon, 1998–2019.

Release year	Broodstock origin	Hatchery	Number of smolt released	Number of AFC smolt released	% AFC
1998	Homer (Crooked Creek) ^a	Elmendorf	137,338	42,874	31.2
1999	Homer (Crooked Creek) ^a	Elmendorf	192,304	43,431	22.6
2000	Crooked Creek	Elmendorf	108,507	108,507	100.0
2001	Crooked Creek	Elmendorf	109,201	109,201	100.0
2002	Crooked Creek	Elmendorf	99,547	99,547	100.0
2003	Crooked Creek	Ft. Richardson	98,800	98,800	100.0
2004	Crooked Creek	Ft. Richardson	80,601	80,601	100.0
2005	Crooked Creek	Ft. Richardson	113,613	113,071	99.5
2006	Crooked Creek	Ft. Richardson	111,705	111,705	100.0
2007	Crooked Creek	Ft. Richardson	111,382	111,271	99.9
2008	Crooked Creek	Ft. Richardson	114,588	114,588	100.0
2009	Crooked Creek	Ft. Richardson	115,035	114,734	99.7
2010	Crooked Creek	Ft. Richardson	106,145	106,145	100.0
2011	Crooked Creek	Ft. Richardson	64,578	64,578	100.0
2012	Crooked Creek	Jack Hernandez	52,759	52,759	100.0
2013	Crooked Creek	Jack Hernandez	0	0	ND
2014	Crooked Creek	Jack Hernandez	143,751	143,191	99.6
2015	Crooked Creek	Jack Hernandez	145,855	141,334	96.9
2016	Crooked Creek	Jack Hernandez	143,280	139,054	97.1
2017	Crooked Creek	Jack Hernandez	105,396	104,342	99.0
2018	Crooked Creek	Jack Hernandez	149,622	142,897	95.5
2019	Crooked Creek	Jack Hernandez	126,600	125,587	99.2
Average 1998–2019			110,482		

Source: D. Loopstra, Sport Fish Biologist, ADF&G, Anchorage, personal communication.

Note: ND means no data collected. AFC means adipose finclipped.

^a Broodstock collection occurred at the Nick Dudiak Fishing Lagoon. Broodstock at this collection site were Crooked Creek progeny.

Table 13.—Proportions of ESSN Chinook salmon harvested by reporting group, 2010–2015.

Year	Kenai River		Kasilof River	Cook Inlet
	Mainstem	Tributaries	Mainstem	Other
2010	0.643	0.011	0.326	0.020
2011	0.667	0.001	0.330	0.002
2013	0.766	0.001	0.213	0.019
2014	0.609	0.002	0.387	0.002
2015	0.770	0.002	0.201	0.027
Average	0.691	0.003	0.291	0.014

Source: Eskelin et al. (2013b); Eskelin and Barclay (2015, 2016).

Table 14.—Angler effort, harvest, and escapement, Russian River early-run (ER) and late-run (LR) sockeye salmon, 1998–2019.

Year	Effort ^a	Sport harvest ^b		Subsistence harvest ^c		Spawning escapement ^d		Total run ^e	
		ER	LR	ER	LR	ER	LR	ER	LR
1998	47,942	42,711	25,110	ND	ND	34,143	113,480	76,854	138,590
1999	64,536	34,283	32,335	ND	ND	36,607	139,863	70,890	172,198
2000	69,864	40,732	30,229	ND	ND	32,736	56,580	73,468	86,809
2001	55,972	35,400	18,550	ND	ND	78,255	74,964	113,655	93,514
2002	68,263	52,139	31,999	ND	ND	85,943	62,115	138,082	94,114
2003	50,448	22,986	28,085	ND	ND	23,650	157,469	46,636	185,554
2004	60,784	32,727	22,417	ND	ND	56,582	110,244	89,309	132,661
2005	55,801	37,139	18,503	ND	ND	52,903	59,473	90,042	77,976
2006	70,804	51,167	29,694	ND	ND	80,524	89,160	131,691	118,854
2007	57,755	36,805	16,863	380	316	27,298	53,068	64,483	70,247
2008	55,444	42,492	23,680	928	478	30,989	46,638	74,409	70,796
2009	64,518	59,097	33,935	605	369	52,178	80,088	111,880	114,392
2010	39,873	23,412	9,333	615	246	27,074	38,848	51,101	48,427
2011	47,264	22,697	14,412	684	315	29,129	41,529	52,510	56,256
2012	41,152	15,231	15,074	867	461	24,115	54,911	40,213	70,446
2013	59,682	27,162	20,146	768	567	35,776	31,573	63,706	52,286
2014	57,544	35,870	17,864	1,276	496	44,920	52,277	82,066	70,637
2015	55,420	29,997	13,744	989	704	50,226	46,223	81,212	60,671
2016	39,957	13,086	11,543	1,090	586	38,739	37,837	52,915	49,966
2017	49,455	27,109	10,592	1,597	236	37,123	45,012	65,829	55,840
2018	47,186	26,999	15,344	1,691	363	44,110	71,052	72,800	86,759
2019	NA	NA	NA	NA	NA	125,942	64,585 ^f	NA	NA
Average									
1998–2018	55,222	33,773	20,926			43,953	69,638	78,274	90,809
2009–2018	50,205	28,066	16,199	1,018	434	38,339	49,935	67,423	66,568

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>. Subsistence data from USFWS.

Note: ND means no data collected. NA means data not available.

^a Estimates for 1998–2018 are from the SWHS and include effort for the whole year and for other species.

^b Harvest from 1998–present was estimated from the annual SWHS.

^c The subsistence fishery started in 2007 and includes Russian River Falls and Upper Kenai River dipnet and rod-and-reel; it does not include Moose Range Meadows data.

^d Escapements for the early run are the number of fish past the weir from its installation in June through July 14.

^e Total run is determined from escapement above the weir plus harvest.

^f Incomplete count, weir evacuated August 18, 2019 due to nearby wildfire danger.

Table 15.—Daily escapement of early-run sockeye salmon at the Russian River weir, 2017–2019.

Date	2017			2018			2019		
	Daily count	Total count	Cumulative proportion by day	Daily count	Total count	Cumulative proportion by day	Daily count	Total count	Cumulative proportion by day
5 Jun	0	0	0.000	0	0	0.000	0	0	0.000
6 Jun	0	0	0.001	0	0	0.001	0	0	0.001
7 Jun	14	14	0.001	0	0	0.001	624	624	0.001
8 Jun	53	67	0.003	0	0	0.003	2,104	2,728	0.003
9 Jun	212	279	0.006	0	0	0.006	2,016	4,744	0.006
10 Jun	748	1,027	0.014	27	27	0.014	3,727	8,471	0.014
11 Jun	895	1,922	0.023	151	178	0.025	5,294	13,765	0.024
12 Jun	1,196	3,118	0.037	579	757	0.038	8,209	21,974	0.038
13 Jun	1,299	4,417	0.050	877	1,634	0.052	5,262	27,236	0.052
14 Jun	1,453	5,870	0.073	916	2,550	0.076	7,345	34,581	0.075
15 Jun	1,146	7,016	0.094	1,876	4,426	0.097	5,859	40,440	0.097
16 Jun	1,196	8,212	0.118	1,786	6,212	0.121	5,338	45,778	0.121
17 Jun	1,242	9,454	0.143	1,547	7,759	0.146	4,863	50,641	0.147
18 Jun	1,037	10,491	0.170	691	8,450	0.173	4,733	55,374	0.173
19 Jun	1,253	11,744	0.196	32	8,482	0.199	4,025	59,399	0.199
20 Jun	989	12,733	0.232	862	9,344	0.235	4,968	64,367	0.234
21 Jun	1,004	13,737	0.265	680	10,024	0.268	4,898	69,265	0.267
22 Jun	1,174	14,911	0.301	505	10,529	0.304	4,218	73,483	0.302
23 Jun	1,513	16,424	0.340	2,417	12,946	0.342	3,555	77,038	0.341
24 Jun	1,565	17,989	0.388	1,940	14,886	0.390	2,566	79,604	0.389
25 Jun	1,974	19,963	0.433	1,541	16,427	0.435	2,433	82,037	0.434
26 Jun	1,167	21,130	0.477	2,069	18,496	0.480	2,943	84,980	0.478
27 Jun	949	22,079	0.519	2,511	21,007	0.521 ^a	2,893	87,873	0.519 ^a
28 Jun	1,098	23,177	0.556 ^a	2,805	23,812	0.558	2,625	90,498	0.557
29 Jun	996	24,173	0.595	3,080	26,892	0.596	1,568	92,066	0.597
30 Jun	953	25,126	0.633	3,385	30,277	0.634	1,775	93,841	0.635
1 Jul	1,094	26,220	0.672	2,516	32,793	0.673	3,038	96,879	0.675
2 Jul	1,374	27,594	0.718	1,598	34,391	0.719	3,763	100,642	0.720
3 Jul	1,116	28,710	0.757	1,824	36,215	0.758	3,415	104,057	0.759
4 Jul	918	29,628	0.789	1,844	38,059	0.790	1,445	105,502	0.792
5 Jul	959	30,587	0.820	1,435	39,494	0.820	1,221	106,723	0.822
6 Jul	1,771	32,358	0.853	1,591	41,085	0.853	1,280	108,003	0.855
7 Jul	1,506	33,864	0.882	918	42,003	0.883	3,663	111,666	0.885
8 Jul	511	34,375	0.908	351	42,354	0.909	3,094	114,760	0.910
9 Jul	318	34,693	0.931	291	42,645	0.931	2,442	117,202	0.932
10 Jul	370	35,063	0.948	286	42,931	0.948	2,946	120,148	0.948
11 Jul	466	35,529	0.965	309	43,240	0.965	2,022	122,170	0.965
12 Jul	629	36,158	0.979	194	43,434	0.979	1,987	124,157	0.979
13 Jul	549	36,707	0.991	207	43,641	0.991	1,012	125,169	0.991
14 Jul	416	37,123	1.000	469	44,110	1.000	773	125,942	1.000

Source: S. Simons, Fish and Wildlife Technician III, ADF&G, Soldotna, unpublished data, 2017–2019.

^a Midpoint of run.

Table 16.– Daily escapement of late-run sockeye salmon at the Russian River weir, 2017–2019.

Date	2017			2018			2019		
	Daily count	Total count	Cumulative proportion by day	Daily count	Total count	Cumulative proportion by day	Daily count	Total count	Cumulative proportion by day
15 Jul	338	338	0.008	204	204	0.003	819	819	0.010
16 Jul	633	971	0.022	221	425	0.006	639	1,458	0.019
17 Jul	784	1,755	0.039	515	940	0.013	1,727	3,185	0.041
18 Jul	679	2,434	0.054	787	1,727	0.024	1,587	4,772	0.061
19 Jul	960	3,394	0.075	505	2,232	0.031	1,886	6,658	0.085
20 Jul	344	3,738	0.083	1,852	4,084	0.057	744	7,402	0.094
21 Jul	795	4,533	0.101	2,010	6,094	0.086	816	8,218	0.105
22 Jul	500	5,033	0.112	1,202	7,296	0.103	1,211	9,429	0.120
23 Jul	446	5,479	0.122	829	8,125	0.114	1,363	10,792	0.138
24 Jul	293	5,772	0.128	437	8,562	0.121	2,016	12,808	0.163
25 Jul	200	5,972	0.133	596	9,158	0.129	1,181	13,989	0.178
26 Jul	275	6,247	0.139	1,244	10,402	0.146	999	14,988	0.191
27 Jul	413	6,660	0.148	1,419	11,821	0.166	1,334	16,322	0.208
28 Jul	527	7,187	0.160	1,736	13,557	0.191	1,128	17,450	0.222
29 Jul	609	7,796	0.173	2,067	15,624	0.220	1,562	19,012	0.242
30 Jul	491	8,287	0.184	2,188	17,812	0.251	1,919	20,931	0.267
31 Jul	684	8,971	0.199	1,420	19,232	0.271	1,906	22,837	0.291
1 Aug	1,107	10,078	0.224	2,960	22,192	0.312	1,700	24,537	0.313
2 Aug	1,005	11,083	0.246	662	22,854	0.322	4,301	28,838	0.368
3 Aug	1,904	12,987	0.289	910	23,764	0.334	2,448	31,286	0.399
4 Aug	1,623	14,610	0.325	961	24,725	0.348	2,554	33,840	0.431
5 Aug	1,736	16,346	0.363	1,963	26,688	0.376	2,051	35,891	0.457
6 Aug	1,842	18,188	0.404	1,175	27,863	0.392	2,116	38,007	0.484
7 Aug	1,252	19,440	0.432	1,341	29,204	0.411	2,016	40,023	0.510 ^{a,b}
8 Aug	1,123	20,563	0.457	2,184	31,388	0.442	1,264	41,287	0.526
9 Aug	1,028	21,591	0.480	1,660	33,048	0.465	1,313	42,600	0.543
10 Aug	1,189	22,780	0.506 ^a	1,747	34,795	0.490	2,453	45,053	0.574
11 Aug	1,281	24,061	0.535	1,815	36,610	0.515 ^a	2,515	47,568	0.606
12 Aug	1,456	25,517	0.567	1,561	38,171	0.537	3,742	51,310	0.654
13 Aug	1,418	26,935	0.598	1,968	40,139	0.565	3,733	55,043	0.701
14 Aug	1,738	28,673	0.637	1,821	41,960	0.591	2,791	57,834	0.737
15 Aug	1,429	30,102	0.669	1,397	43,357	0.610	2,249	60,083	0.766
16 Aug	1,172	31,274	0.695	1,817	45,174	0.636	2,052	62,135	0.792
17 Aug	744	32,018	0.711	2,312	47,486	0.668	2,142	64,277	0.819
18 Aug	906	32,924	0.731	2,385	49,871	0.702	308	64,585	0.823
19 Aug	696	33,620	0.747	1,528	51,399	0.723			
20 Aug	924	34,544	0.767	1,213	52,612	0.740			
21 Aug	751	35,295	0.784	1,398	54,010	0.760			
22 Aug	1,058	36,353	0.808	1,534	55,544	0.782			
23 Aug	1,463	37,816	0.840	1,476	57,020	0.803			
24 Aug	752	38,568	0.857	1,465	58,485	0.823			
25 Aug	638	39,206	0.871	1,303	59,788	0.841			
26 Aug	741	39,947	0.887	1,512	61,300	0.863			

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Date	2017			2018			2019		
	Daily count	Total count	Cumulative proportion by day	Daily count	Total count	Cumulative proportion by day	Daily count	Total count	Cumulative proportion by day
27 Aug	727	40,674	0.904	1,377	62,677	0.882			
28 Aug	625	41,299	0.918	1,206	63,883	0.899			
29 Aug	591	41,890	0.931	1,120	65,003	0.915			
30 Aug	880	42,770	0.950	1,279	66,282	0.933			
31 Aug	757	43,527	0.967	1,169	67,451	0.949			
1 Sep	600	44,127	0.980	789	68,240	0.960			
2 Sep	397	44,524	0.989	716	68,956	0.971			
3 Sep	218	44,742	0.994	698	69,654	0.980			
4 Sep	179	44,921	0.998	734	70,388	0.991			
5 Sep	91	45,012	1.000	424	70,812	0.997			
6 Sep				240	71,052	1.000			

Source: S. Simons, Fish and Wildlife Technician III, ADF&G, Soldotna, unpublished data, 2017–2019.

^a Midpoint of run.

^b Incomplete counts; evacuation August 18, 2019 due to nearby wildfire danger. Midpoint of the run estimated using historical mean run-timing projection estimate at time of weir removal.

Table 17.—Kenai River sport harvest of sockeye salmon by river section as determined by the Statewide Harvest Survey, 1998–2018.

Year	Cook Inlet to Soldotna Bridge		Soldotna Bridge to Moose River		Moose River to Skilak Lake		Skilak Lake to Kenai Lake		Kenai River not specified ^a		Total harvest	Total effort for all species (angler-days)
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent		
1998	57,464	34.9	61,763	37.5	24,315	14.8	20,994	12.8	ND	ND	164,536	216,650
1999	77,865	38.8	61,344	30.6	27,569	13.7	33,796	16.8	ND	ND	200,574	307,446
2000	98,048	42.4	74,132	32.1	30,825	13.3	27,978	12.1	ND	ND	230,983	358,569
2001	86,880	43.3	73,841	36.8	19,616	9.8	20,425	10.2	ND	ND	200,762	298,817
2002	78,964	35.0	79,608	35.2	23,488	10.4	40,115	17.8	3,742	1.7	225,917	312,815
2003	102,689	35.9	116,383	40.7	30,914	10.8	25,771	9.0	10,332	3.6	286,089	321,044
2004	105,521	35.8	111,048	37.7	42,489	14.4	29,185	9.9	6,550	2.2	294,793	376,313
2005	98,114	33.3	115,270	39.2	32,655	11.1	34,779	11.8	13,469	4.6	294,287	389,379
2006	52,364	30.2	71,854	41.4	22,177	12.8	19,941	11.5	7,089	4.1	173,425	330,085
2007	102,521	33.2	116,719	37.8	47,448	15.4	35,248	11.4	6,914	2.2	308,850	410,381
2008	77,882	33.9	82,061	35.7	33,461	14.5	28,803	12.5	7,823	3.4	230,030	360,344
2009	77,568	30.7	88,668	35.1	36,831	14.6	42,247	16.7	7,005	2.8	252,319	337,217
2010	100,878	33.1	125,606	41.2	45,969	15.1	23,359	7.7	8,823	2.9	304,635	347,938
2011	155,964	39.4	158,797	40.1	52,040	13.1	23,322	5.9	5,717	1.4	395,840	365,863
2012	173,143	38.0	202,429	44.4	55,414	12.2	20,856	4.6	3,612	0.8	455,454	374,732
2013	133,323	30.5	199,849	45.7	63,212	14.5	36,065	8.3	4,539	1.0	436,988	411,592
2014	132,004	36.6	154,057	42.7	45,861	12.7	27,082	7.5	1,827	0.5	360,831	455,578
2015	140,554	37.3	157,267	41.8	53,438	14.2	24,205	6.4	958	0.3	376,422	422,792
2016	134,385	40.8	135,689	41.2	39,810	12.1	17,256	5.2	2,562	0.8	329,702	380,638
2017	113,700	39.0	123,184	42.3	30,820	10.6	23,684	8.1	17	0.0	291,405	376,612
2018	69,542	40.3	61,809	35.8	21,062	12.2	20,060	11.6	199	0.1	172,672	324,532
1998–2018												
Min	52,364	30.2	61,344	30.6	19,616	9.8	17,256	4.6	17	0.0	164,536	216,650
Average	103,303	36.3	112,923	38.8	37,115	13.0	27,389	10.4	5,363	1.9	285,072	356,159
Max	173,143	43.3	202,429	45.7	63,212	15.4	42,247	17.8	13,469	4.6	455,454	455,578

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018).

Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.

Note: ND means no data collected. NA means data not available.

^a SWHS began consistently reporting in 2002.

Table 18.—Kenai River drainage sockeye salmon escapement and inriver harvest, 1998–2019.

Year	PU dip net and edu. harvest	Sport harvest below sonar ^a	Kenai River sonar count ^b	Total inriver run	Kenai R. below Soldotna bridge	Kenai R. sonar to Soldotna bridge	Harvest above sonar						Total harvest above sonar	Spawning escap.
							Kenai R. above Soldotna bridge	Kenai River not specified ^c	Skilak Lake / Kenai River tribs ^d	Russian River late run	Hidden Lake Cr PU and sport	Inriver Fed. subst ^e		
1998	105,497	33,980	1,084,993	1,224,470	57,464	23,484	107,072	ND	158	25,110	81	ND	155,905	929,088
1999	150,993	46,043	1,137,003	1,334,039	77,865	31,822	122,709	ND	0	32,335	859	ND	187,725	949,278
2000	99,571	57,978	900,695	1,058,244	98,048	40,070	132,935	ND	377	30,229	190	ND	203,801	696,894
2001	152,580	51,374	906,333	1,110,287	86,880	35,506	113,882	ND	24	18,550	142	ND	168,104	738,229
2002	182,229	46,693	1,339,681	1,568,603	78,964	32,271	143,211	3,742	1,535	31,999	308	ND	213,066	1,126,615
2003	227,207	60,722	1,656,026	1,943,955	102,689	41,967	173,068	10,168	144	28,085	302	ND	253,734	1,402,292
2004	266,937	62,397	1,945,383	2,274,717	105,521	43,124	182,722	5,795	276	22,417	502	ND	254,836	1,690,547
2005	300,105	58,017	1,908,823	2,266,945	98,114	40,097	182,704	13,469	45	18,503	0	ND	254,818	1,654,005
2006	130,486	30,964	2,064,726	2,226,176	52,364	21,400	113,972	7,089	98	29,694	385	ND	172,638	1,892,088
2007	293,941	60,623	1,229,944	1,584,508	102,521	41,898	199,415	6,876	94	16,863	240	316	265,702	964,242
2008	236,355	46,053	917,138	1,199,546	77,882	31,829	144,325	7,823	199	23,680	0	478	208,334	708,804
2009	343,302	45,868	1,090,057	1,479,227	77,568	31,700	167,746	7,005	102	33,935	1,019	431	241,938	848,119
2010	393,317	59,651	1,294,884	1,747,852	100,878	41,227	194,934	8,823	275	9,333	1,744	246	256,582	1,038,302
2011	543,043	92,225	1,599,217	2,234,485	155,964	63,739	234,159	5,717	13	14,412	97	347	318,484	1,280,733
2012	530,128	102,376	1,581,555	2,214,059	173,132	70,756	278,675	3,611	20	15,074	37	547	368,720	1,212,835
2013	350,302	78,837	1,359,893	1,789,032	133,323	54,486	299,126	4,539	735	20,146	86	567	379,685	980,208
2014	384,018	78,057	1,520,340	1,982,415	132,004	53,947	227,000	1,827	740	17,864	0	620	301,998	1,218,342
2015	384,095	83,112	1,709,051	2,176,258	140,554	57,442	234,910	958	1,171	13,744	0	779	309,004	1,400,047
2016	264,900	79,465	1,383,692	1,728,057	134,385	54,920	192,755	2,562	609	11,543	0	592	262,981	1,120,711
2017	304,632	67,233	1,308,498	1,680,363	113,700	46,467	177,688	17	129	10,592	79	236	235,208	1,073,290
2018	169,553	41,122	1,035,761	1,246,436	69,542	28,420	102,931	199	222	15,344	0	377	147,493	888,268
2019	NA	NA	1,849,054	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Average														
1998–2018	276,820	61,090	1,379,700	1,717,600	103,300	42,220	177,430	5,310	330	20,930	290	460	245,750	1,133,950
2009–2018	366,730	72,790	1,388,290	1,827,820	123,110	50,310	210,990	3,530	400	16,200	310	470	282,210	1,106,090

-continued-

Table 18.–Page 2 of 2.

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>. Other data sources are Reimer and Sigurdsson (2004), Dunker and Lafferty (2007), and Dunker (2010, 2013, 2018); A. St. Saviour, Sport Fish biologist, ADF&G, Palmer, personal communication; Pappas and Marsh (2004); Shields and Dupuis (2015, 2016, 2017); Shields and Frothingham (2018), A. Frothingham, Commercial Fish Biologist, ADF&G, Soldotna, personal communication; educational harvest data from Kenaitze Indian Tribe; 2007–2018 subsistence data from USFWS.

Note: PU means personal use. ND means no data collected. NA means data not available.

- ^a In 1994 and 1995, a creel survey was conducted to estimate harvest below the sonar. In 1994, 49.7% of the below Soldotna Bridge harvest was taken below the sonar. In 1995, 68.6% was taken below the sonar. The average of these 2 percentages is applied to all other year's below-bridge harvest to estimate the harvest below the sonar.
- ^b Bendix sonar counts were converted to DIDSON estimates (equivalents) for 1998–2010. Estimates after these dates are actual DIDSON generated estimates.
- ^c SWHS began reporting this data consistently in 2002.
- ^d Tributaries include Cooper Creek, Funny River, Kelly Lake, Moose River, Ptarmigan Creek, Quartz Creek, Soldotna Creek, Swan Lake (Kenai River), Swan Canoe Route lakes.
- ^e Federal subsistence started in 2007 and occurs in the Russian River, the Upper Kenai River, and the Lower Kenai River with both dip nets and rod-and-reel. This includes harvest from late-run sockeye salmon only.

Table 19.—Estimated sport harvest of Kenai River coho salmon by river section, 1998–2018.

Year	Cook Inlet to Soldotna Bridge			Soldotna Bridge to Moose River			Moose River to Skilak Lake			Skilak Lake to Kenai Lake			Kenai River not specified ^a			All sections		
	Prior to 1 Sep	After 1 Sep	Total	Prior to 1 Sep	After 1 Sep	Total	Prior to 1 Sep	After 1 Sep	Total	Prior to 1 Sep	After 1 Sep	Total	Prior to 1 Sep	After 1 Sep	Total	Prior to 1 Sep	After 1 Sep	Total
1998	9,955	5,506	15,461	3,667	1,430	5,097	2,373	1,833	4,206	1,764	439	2,203	ND	ND	ND	17,759	9,208	26,967
1999	14,413	6,029	20,442	4,732	654	5,386	1,268	1,812	3,080	1,951	778	2,729	ND	ND	ND	22,364	9,273	31,637
2000	22,392	8,444	30,836	8,185	1,880	10,065	3,894	1,159	5,053	1,652	913	2,565	ND	ND	ND	36,123	12,396	48,519
2001	23,501	8,977	32,478	7,381	1,947	9,328	3,565	1,986	5,551	1,672	753	2,425	ND	ND	ND	36,119	13,663	49,782
2002	27,062	9,641	36,703	8,220	2,630	10,850	2,663	2,406	5,069	3,965	886	4,851	1,552	625	2,177	43,462	16,188	59,650
2003	20,093	5,963	26,056	8,961	2,029	10,990	3,160	1,517	4,677	2,690	490	3,180	1,367	352	1,754	36,271	10,351	46,657
2004	29,606	12,010	41,616	9,145	4,055	13,200	3,492	2,234	5,726	2,733	868	3,601	1,135	637	1,809	46,111	19,804	65,952
2005	17,331	7,810	25,141	10,793	3,563	14,356	1,697	2,739	4,436	2,310	2,103	4,413	1,671	339	2,065	33,802	16,554	50,411
2006	13,817	7,132	20,949	4,800	2,331	7,131	1,890	2,939	4,829	2,638	890	3,528	797	405	1,202	23,942	13,697	37,639
2007	12,891	7,443	20,334	6,322	1,133	7,455	3,230	2,361	5,591	2,390	1,400	3,790	621	226	847	25,454	12,563	38,017
2008	20,602	10,562	31,164	6,122	3,161	9,283	2,262	3,012	5,274	3,110	1,426	4,536	796	571	1,367	32,892	18,732	51,624
2009	19,022	9,044	28,066	5,509	2,907	8,416	4,016	3,879	7,895	2,391	1,966	4,357	1,146	80	1,226	32,084	17,876	49,960
2010	20,001	8,134	28,135	7,140	3,889	11,029	5,671	3,213	8,884	2,115	618	2,733	2,005	126	2,131	36,932	15,980	52,912
2011	16,784	10,562	27,346	6,509	2,430	8,939	2,185	3,346	5,531	1,038	1,175	2,213	61	42	103	26,577	17,555	44,132
2012	14,842	8,123	22,965	4,819	2,668	7,487	2,202	1,862	4,064	768	494	1,262	375	254	629	23,006	13,401	36,407
2013	17,414	6,417	23,831	12,090	2,860	14,950	3,669	3,232	6,901	1,649	1,329	2,978	212	82	294	35,034	13,920	48,954
2014	18,930	11,829	30,759	9,224	3,654	12,878	3,940	5,644	9,584	4,928	2,288	7,216	89	40	129	37,111	23,455	60,566
2015	20,317	13,685	34,002	7,673	4,467	12,140	2,881	5,210	8,091	2,356	404	2,760	45	29	74	33,272	23,795	57,067
2016	15,759	9,019	24,778	6,593	2,867	9,460	2,597	1,275	3,872	883	730	1,613	131	77	208	25,963	13,968	39,931
2017	17,810	11,815	29,625	6,859	3,662	10,521	2,926	3,225	6,151	826	1,159	1,985	83	62	145	28,504	19,923	48,427
2018	20,168	9,531	29,699	7,735	3,297	11,032	3,585	3,540	7,125	1,499	1,108	2,607	29	17	112	33,016	17,493	50,575
Average																		
1998–2018	18,700	8,937	27,637	7,261	2,739	10,000	3,008	2,782	5,790	2,158	1,058	3,216	713	233	957	31,705	15,705	47,418
2009–2018	18,105	9,816	27,921	7,415	3,270	10,685	3,367	3,443	6,810	1,845	1,127	2,972	418	81	505	31,150	17,737	48,893

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018).

Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.

Note: ND means no data collected.

^a SWHS began reporting consistently in 2002.

Table 20.—Northern Kenai Peninsula Management Area (except Kenai River drainage) coho salmon sport harvest, 1998–2018.

Year	Kasilof River drainage				Swanson River drainage			Other NKPMA drainages				
	Tustumena Lake ^a	Kasilof River	Crooked Creek	Total	Swanson River	Swanson Canoe Route Lakes	Total	Sixmile Creek	Resurrection Creek	Chickaloon River	Other ^b	Total
1998	119	2,107	0	2,226	2,371	123	2,494	470	274	115	0	859
1999	48	3,269	0	3,317	2,054	0	2,054	92	233	0	0	325
2000	229	2,965	0	3,194	2,506	0	2,506	429	52	136	0	617
2001	90	3,173	110	3,373	1,959	117	2,076	459	125	19	86	689
2002	93	6,046	35	6,174	2,467	0	2,467	1,025	114	22	163	1,324
2003	46	4,082	0	4,128	3,087	80	3,167	262	125	23	0	410
2004	338	4,217	270	4,825	1,466	45	1,511	582	138	0	0	720
2005	117	3,124	117	3,358	2,367	0	2,367	146	39	120	72	377
2006	85	3,782	54	3,921	2,028	32	2,060	545	121	0	0	666
2007	15	1,740	0	1,755	1,660	10	1,670	252	289	0	0	541
2008	252	3,613	0	3,865	2,814	0	2,814	354	195	0	0	549
2009	61	2,725	63	2,849	1,790	0	1,790	664	103	0	0	767
2010	45	2,327	0	2,372	1,074	19	1,093	691	422	60	0	1,173
2011	0	2,359	0	2,359	1,348	0	1,348	150	0	0	0	150
2012	0	3,610	0	3,610	264	19	283	294	36	0	0	330
2013	77	4,037	32	4,146	815	0	815	547	63	0	0	610
2014	0	3,693	0	3,693	702	80	782	50	233	0	0	283
2015	229	3,735	0	3,964	766	203	969	789	200	499	0	1,488
2016	0	1,907	0	1,907	1,158	0	1,158	66	237	43	0	346
2017	53	2,975	29	3,057	1,688	0	1,688	148	161	0	0	309
2018	118	5,330	0	5,448	1,203	0	1,203	920	208	0	0	1,128
Average												
1998–2018	96	3,372	34	3,502	1,695	35	1,729	425	160	49	15	651
2009–2018	58	3,270	12	3,341	1,081	32	1,113	432	166	60	0	658

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.

^a Tustumena Lake data includes harvests from creeks draining into Tustumena Lake (Nikolai Creek: 1998, 2000; Glacier Creek 2004).

^b Harvest data from Ingram Creek (2001, 2002), Sunrise Creek (2005).

Table 21.—Sport catch and harvest of pink salmon in the northern Kenai Peninsula management area, 1998–2018.

Year	Kenai River		Resurrection Creek		Russian River		Kasilof River		Sixmile Creek		Other ^a	
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest
1998	81,776	8,926	31,739	7,418	790	244	1,038	105	1,233	75	229	0
1999	6,806	1,895	4,947	691	758	246	100	47	348	0	144	38
2000	185,915	19,081	31,030	2,661	3,467	357	2,582	137	1,466	184	950	41
2001	8,774	2,069	11,584	1,586	2,140	272	198	91	1,112	87	281	0
2002	186,967	22,995	12,010	2,362	3,933	933	3,607	618	792	48	2,954	222
2003	9,319	2,847	7,046	1,750	3,291	431	551	116	1,181	94	173	39
2004	155,910	20,638	9,212	2,087	4,163	1,222	1,929	187	231	15	464	113
2005	17,277	5,112	6,602	836	788	123	432	179	140	21	149	31
2006	154,671	12,448	22,645	4,122	4,737	539	1,517	291	879	158	134	0
2007	15,118	3,308	26,482	2,876	1,352	312	337	103	1,129	91	409	103
2008	186,789	15,108	25,524	5,500	2,853	244	4,612	424	810	66	2,047	146
2009	14,099	4,038	31,700	4,801	1,604	582	675	343	3,270	200	456	0
2010	104,698	12,959	9,557	1,499	1,230	51	2,533	553	1,350	29	779	124
2011	10,058	3,586	6,044	1,310	1,077	227	267	152	89	0	767	77
2012	135,114	17,637	6,357	917	9,353	688	4,972	896	898	0	240	0
2013	10,565	3,130	8,494	972	1,728	48	114	83	946	30	407	42
2014	174,252	24,919	13,982	2,795	3,346	375	4,415	841	436	15	506	0
2015	18,018	4,914	6,600	2,133	766	411	1,550	757	1,298	281	121	20
2016	133,245	23,679	11,778	2,620	4,717	219	2,265	1,228	599	153	100	33
2017	20,374	5,899	16,974	3,329	1,969	584	559	345	1,093	24	337	142
2018	133,903	20,427	23,708	3,869	2,185	111	6,909	1,596	996	33	548	0
Average												
1999–2018												
Odd-year	13,041	3,680	12,647	2,028	1,547	324	478	222	1,061	83	324	49
Even-year	155,146	18,989	16,580	2,843	3,998	474	3,534	677	846	70	872	68

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.

^a Includes all other NKPMA area catch and harvest not already listed on this table; does not include the SWHS categories "Other Streams" or "Other Lakes," which may contain some non-NKPMA data.

Table 22.—Estimated Kenai River rainbow trout catch (C), harvest (H), and retention rate (%R) by river section, 1998–2018.

Year	Cook Inlet to Soldotna Bridge			Soldotna Bridge to Moose River			Moose River to Skilak Outlet			Skilak Inlet to Kenai Lake			Kenai River not specified ^a			Kenai River total		
	C	H	%R	C	H	%R	C	H	%R	C	H	%R	C	H	%R	C	H	%R
1998	5,502	608	11.1	5,380	670	12.5	12,158	737	6.1	42,224	0	0.0	ND	ND	ND	65,264	2,015	3.1
1999	11,415	1,516	13.3	8,325	695	8.3	32,050	1,573	4.9	50,189	0	0.0	ND	ND	ND	101,979	3,784	3.7
2000	16,477	1,292	7.8	9,428	1,083	11.5	18,990	1,084	5.7	78,836	0	0.0	ND	ND	ND	123,731	3,459	2.8
2001	11,216	987	8.8	7,473	868	11.6	22,392	567	2.5	51,130	0	0.0	ND	ND	ND	92,211	2,422	2.6
2002	12,641	995	7.9	8,157	944	11.6	19,355	864	4.5	71,753	0	0.0	2,269	216	9.5	114,175	3,019	2.6
2003	12,844	1,026	8.0	10,913	700	6.4	41,204	372	0.9	54,552	0	0.0	3,536	180	5.1	123,049	2,278	1.9
2004	15,080	1,452	9.6	13,310	978	7.3	34,026	831	2.4	91,443	0	0.0	5,651	50	0.9	159,510	3,311	2.1
2005	14,119	953	6.7	11,585	647	5.6	34,675	607	1.8	57,936	267	0.5	7,949	43	0.5	126,264	2,517	2.0
2006	13,168	588	4.5	13,683	1,109	8.1	33,222	472	1.4	67,741	289	0.4	4,005	41	1.0	131,819	2,499	1.9
2007	11,829	542	4.6	18,832	769	4.1	52,701	684	1.3	90,757	661	0.7	4,851	10	0.2	178,970	2,666	1.5
2008	26,385	696	2.6	20,943	794	3.8	47,956	772	1.6	103,095	941	0.9	4,496	11	0.2	202,875	3,214	1.6
2009	11,502	625	5.4	16,165	543	3.4	67,940	828	1.2	102,745	399	0.4	3,280	59	1.8	201,632	2,454	1.2
2010	9,397	553	5.9	16,944	786	4.6	63,655	696	1.1	79,663	237	0.3	3,642	131	3.6	173,301	2,403	1.4
2011	19,849	571	2.9	27,305	464	1.7	80,908	318	0.4	71,088	374	0.5	615	0	0.0	199,765	1,727	0.9
2012	16,119	843	5.2	23,866	878	3.7	47,253	396	0.8	81,349	386	0.5	856	37	4.3	169,443	2,540	1.5
2013	11,140	464	4.2	13,174	461	3.5	52,992	400	0.8	90,301	446	0.5	435	0	0.0	168,042	1,771	1.1
2014	12,123	616	5.1	14,216	502	3.5	43,059	273	0.6	69,629	135	0.2	166	93	56.0	139,193	1,619	1.2
2015	29,097	797	2.7	22,093	534	2.4	67,020	648	1.0	123,441	286	0.2	0	0	0.0	241,651	2,265	0.9
2016	23,241	834	3.6	25,492	860	3.4	43,042	599	1.4	78,149	169	0.2	1,011	0	0.0	170,935	2,462	1.4
2017	18,206	1,526	8.4	17,967	918	5.1	53,884	303	0.6	103,437	830	0.8	0	0	0.0	193,494	3,577	1.8
2018	10,132	323	3.2	15,302	259	1.7	27,538	219	0.8	48,373	351	0.7	79	0	0.0	101,424	1,152	1.1
Average																		
2009–2018	16,081	715	4.7	19,252	621	3.3	54,729	468	0.9	84,818	361	0.4	1,008	32	6.6	175,888	2,197	1.3
2014–2018	18,560	819	4.6	19,014	615	3.2	46,909	408	0.9	84,606	354	0.4	251	19	11.2	169,339	2,215	1.3

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018).

Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.

Note: ND means no data collected.

^a SWHS began consistently reporting in 2002.

Table 23.–Historical abundance estimates of rainbow trout in the upper Kenai River index area, 1986–2009.

Year ^a	Number of rainbow trout in the upper Kenai River index area				Number of rainbow trout in the middle Kenai River index area	
	≥200 mm	SE	≥300 mm	SE	≥200 mm	SE
1986	3,640	456	2,520	363	ND	ND
1987	4,950	376	3,472	482	1,750	453
1995	ND	ND	5,598	735	ND	ND
1999	ND	ND	ND	ND	7,883	1,276
2001	8,553	806	6,365	625	ND	ND
2009	5,916	481	5,106	431	ND	ND

Source: Lafferty (1989); Larson and Hansen (2000); Hayes and Hasbrouck (1996); King and Breakfield (2007); Eskelin and Evans (2013); A. Eskelin, Sport Fish Biologist, ADF&G, Soldotna, personal communication.

^a Abundance estimates for 2001 were reevaluated using techniques implemented in 2009.

Table 24.—Estimated Kenai River Dolly Varden, catch (C), harvest (H), and retention rate (%R) by river section, 1998–2018.

Year	Cook Inlet to Soldotna Bridge			Soldotna Bridge to Moose River			Moose River to Skilak Outlet			Skilak Inlet to Kenai Lake			Kenai River not specified ^a			Kenai River total			
	C	H	%R	C	H	%R	C	H	%R	C	H	%R	C	H	%R	C	H	%R	
1998	7,560	1,977	26.2	5,961	1,787	30.0	11,732	1,847	15.7	35,659	468	1.3	ND	ND	ND	60,912	6,079	10.0	
1999	14,752	3,867	26.2	6,316	1,086	17.2	20,053	1,932	9.6	31,826	683	2.1	ND	ND	ND	72,947	7,568	10.4	
2000	18,261	3,916	21.4	9,122	1,759	19.3	21,291	1,403	6.6	56,375	349	0.6	ND	ND	ND	105,049	7,427	7.1	
2001	16,304	3,763	23.1	8,367	1,613	19.3	28,312	789	2.8	54,802	363	0.7	ND	ND	ND	107,785	6,528	6.1	
2002	16,414	2,191	13.3	7,751	1,431	18.5	13,384	1,105	8.3	38,481	766	2.0	1,324	288	21.8	77,354	5,781	7.5	
2003	15,520	2,996	19.3	9,765	1,318	13.5	25,972	1,066	4.1	50,969	487	1.0	1,459	246	16.9	103,685	6,113	5.9	
2004	14,386	1,759	12.2	13,591	2,129	15.7	23,833	1,220	5.1	89,318	452	0.5	5,072	285	5.6	146,200	5,845	4.0	
2005	13,501	1,548	11.5	9,629	934	9.7	27,398	1,243	4.5	62,798	565	0.9	5,615	26	0.5	118,941	4,316	3.6	
2006	11,405	971	8.5	8,135	1,061	13.0	24,499	515	2.1	52,048	414	0.8	2,211	257	11.6	98,298	3,218	3.3	
2007	8,048	1,201	14.9	10,261	764	7.4	52,701	687	1.3	90,757	584	0.6	4,851	40	0.8	166,618	3,276	2.0	
2008	19,177	1,154	6.0	17,063	961	5.6	30,579	604	2.0	78,489	1,003	1.3	2,293	44	1.9	147,601	3,766	2.6	
2009	8,278	1,003	12.1	7,825	842	10.8	34,973	384	1.1	91,815	412	0.4	1,053	77	7.3	143,944	2,718	1.9	
2010	7,732	956	12.4	9,298	825	8.9	30,930	777	2.5	63,254	402	0.6	851	36	4.2	112,065	2,996	2.7	
2011	11,377	928	8.2	13,356	539	4.0	34,250	172	0.5	50,768	150	0.3	507	0	0.0	110,258	1,789	1.6	
2012	11,398	843	7.4	15,330	614	4.0	28,715	372	1.3	66,323	304	0.5	748	11	1.5	122,514	2,144	1.8	
2013	11,229	1,134	10.1	12,687	1,557	12.3	33,199	413	1.2	70,350	492	0.7	228	13	5.7	127,693	3,609	2.8	
2014	15,689	1,902	12.1	17,101	1,161	6.8	32,974	488	1.5	66,551	287	0.4	103	89	86.4	132,418	3,927	3.0	
2015	22,163	1,530	6.9	12,681	1,247	9.8	30,375	422	1.4	86,330	621	0.7	14	14	100.0	151,563	3,834	2.5	
2016	22,088	797	3.6	13,418	767	5.7	33,998	342	1.0	69,309	398	0.6	187	23	12.3	139,000	2,327	1.7	
2017	9,727	904	9.3	10,633	790	7.4	24,433	319	1.3	60,211	136	0.2	29	0	0.0	105,033	2,149	2.0	
2018	9,218	918	10.0	7,521	588	7.8	17,288	229	1.3	33,281	374	1.1	144	0	0.0	67,452	2,109	3.1	
Average																			
2009–2018	12,890	1,092	9.2	11,985	893	7.8	30,114	392	1.3	65,819	358	0.6	386	26	21.7	121,194	2,760	2.3	
2014–2018	15,777	1,210	8.4	12,271	911	7.5	27,814	360	1.3	63,136	363	0.6	95	25	39.7	119,093	2,869	2.5	

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018).

Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.

Note: ND means no data collected.

^a SWHS began consistently reporting in 2002.

Table 25.—Rainbow trout catch, harvest, and effort for all species for the Russian River, Swanson River drainage, and Quartz Creek, 1998–2018.

Year	Swanson River drainage										
	Russian River			Swanson River drainage						Quartz Creek	
	Effort ^a	Catch	Harvest	Effort ^{a,b}	Canoe route		Swanson River		Effort ^a	Catch	Harvest
1998	47,942	20,088	351	5,093	3,985	1,248	3,235	535	3,166	2,252	0
1999	64,536	37,764	83	6,885	6,853	1,759	1,840	267	4,708	2,132	0
2000	69,864	34,948	44	5,250	7,952	1,701	4,630	1,142	2,423	1,212	0
2001	55,972	16,007	215	4,161	5,299	2,262	2,899	528	3,105	1,814	0
2002	68,263	29,484	16	3,692	2,714	992	4,347	679	4,245	2,617	0
2003	50,448	21,204	182	2,298	1,691	476	5,146	362	4,357	3,359	0
2004	60,784	42,875	49	3,640	1,523	482	1,504	373	6,589	7,939	0
2005	55,801	20,026	232	4,886	1,695	609	1,674	144	6,106	2,897	0
2006	70,804	28,059	256	4,669	2,610	348	1,435	425	5,582	5,698	0
2007	57,755	25,718	261	6,712	7,195	1,559	2,753	904	8,694	6,193	0
2008	55,444	20,333	219	7,227	4,918	691	2,540	360	7,105	5,900	0
2009	64,518	21,047	214	4,621	4,942	1,005	1,635	167	6,217	8,770	0
2010	39,873	14,710	97	3,203	2,165	477	972	189	4,859	2,859	0
2011	47,264	17,817	108	4,296	158	283	1,684	650	2,184	1,457	0
2012	41,152	21,275	216	1,097	439	0	528	168	1,238	644	0
2013	59,682	27,869	275	2,576	485	41	592	116	3,262	1,540	31
2014	57,544	32,711	514	2,897	675	277	437	84	3,507	2,605	46
2015	55,420	31,208	277	2,201	1,054	255	702	102	3,137	8,431	41
2016	39,957	24,258	101	1,995	437	156	868	43	2,989	4,243	12
2017	49,455	24,675	516	2,746	256	41	326	0	1,669	1,322	20
2018	47,186	13,015	161	3,463	1,468	464	2,515	28	2,459	1,205	0
Average											
2009–2018	50,205	22,859	248	2,910	1,208	300	1,026	155	3,152	3,308	15
2014–2018	49,912	25,173	314	2,660	778	239	970	51	2,752	3,561	24

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.

^a Effort (angler-days) directed toward all species.

^b Total effort for both Swanson River and Swanson River Canoe Route (and Canoe Route lakes).

Table 26.—Rainbow trout catch, harvest, and effort for all species for Ptarmigan Creek, Skilak Lake, and Kenai Lake, 1998–2018.

Year	Ptarmigan Creek			Skilak Lake			Kenai Lake		
	Effort ^a	Catch	Harvest	Effort ^a	Catch	Harvest	Effort ^a	Catch	Harvest
1998	701	2,053	0	1,645	625	209	520	183	43
1999	883	3,382	0	1,182	1,904	119	1,462	1,753	93
2000	732	1,026	0	2,072	2,578	181	1,033	327	117
2001	430	625	0	1,701	568	65	2,509	762	153
2002	888	3,268	0	1,668	939	63	2,502	1,312	58
2003	899	424	0	2,068	1,009	0	1,097	386	0
2004	687	3,027	0	2,460	911	436	497	140	93
2005	599	1,253	0	594	851	32	2,072	252	55
2006	1,061	3,612	0	1,152	1,045	0	619	52	52
2007	896	1,291	0	1,462	484	0	648	494	49
2008	389	1,087	0	1,692	962	18	728	313	88
2009	441	1,750	0	1,126	998	0	687	28	18
2010	317	1,366	0	1,085	372	15	955	263	63
2011	389	744	0	918	345	0	869	116	0
2012	227	518	11	538	11	0	1,179	147	0
2013	263	1,485	0	2,060	1,500	345	2,964	761	231
2014	756	1,805	0	1,616	524	36	3,030	1,002	86
2015	1,150	4,385	0	1,188	464	87	2,048	1,313	89
2016	445	806	0	503	36	0	1,247	665	37
2017	387	724	0	713	1,025	18	2,134	340	143
2018	563	392	0	488	366	28	674	80	24
Average									
2009–2018	494	1,398	1	1,024	564	53	1,579	472	69
2014–2018	660	1,622	0	902	483	34	1,827	680	76

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.

^a Effort (angler-days) directed toward all species.

Table 27.—Dolly Varden catch and harvest, and effort for all species for Quartz Creek, Russian River, Ptarmigan Creek, and Skilak Lake, 1998–2018.

Year	Quartz Creek			Russian River			Ptarmigan Creek			Skilak Lake		
	Effort ^a	Catch	Harvest	Effort ^a	Catch	Harvest	Effort ^a	Catch	Harvest	Effort ^a	Catch	Harvest
1998	3,166	16,990	396	47,942	5,957	73	701	4,195	185	1,645	214	17
1999	4,708	8,051	223	64,536	11,791	196	883	3,191	77	1,182	782	110
2000	2,423	6,318	80	69,864	11,596	168	732	821	44	2,072	1,487	175
2001	3,105	10,280	65	55,972	11,087	253	430	3,096	11	1,701	243	48
2002	4,245	11,510	114	68,263	8,566	175	888	1,242	0	1,668	1,414	134
2003	4,357	19,627	123	50,448	10,504	263	899	1,028	50	2,068	825	64
2004	6,589	31,267	342	60,784	25,713	324	687	3,609	68	2,460	653	152
2005	6,106	23,953	216	55,801	9,218	232	599	3,018	0	594	464	0
2006	5,582	31,731	219	70,804	11,390	261	1,061	4,291	0	1,152	321	39
2007	8,694	44,588	442	57,755	7,857	196	896	2,126	143	1,462	607	22
2008	7,105	34,401	152	55,444	9,481	354	389	954	29	1,692	405	0
2009	6,217	40,456	135	64,518	10,741	146	441	1,185	0	1,126	754	0
2010	4,859	14,416	182	39,873	7,645	45	317	2,058	0	1,085	552	0
2011	2,184	5,399	345	47,264	7,375	165	389	704	21	918	26	16
2012	1,238	6,157	37	41,152	7,659	47	227	1,106	10	538	10	10
2013	3,262	5,977	177	59,682	14,505	198	263	1,302	17	2,060	751	35
2014	3,507	18,540	90	57,544	13,647	332	756	4,970	0	1,616	40	0
2015	3,137	21,539	143	55,420	11,897	189	1,150	4,083	0	1,188	216	20
2016	2,989	18,816	114	39,957	12,259	281	445	100	0	503	92	0
2017	1,669	5,574	15	49,455	12,306	213	387	379	0	713	1,885	27
2018	2,459	7,030	166	47,186	8,264	147	563	732	0	488	212	0
Average												
2009–2018	3,152	14,390	140	50,205	10,630	176	494	1,662	5	1,024	454	11
2014–2018	2,752	14,300	106	49,912	11,675	232	660	2,053	0	902	489	9

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.

^a Effort (angler-days) directed toward all species.

^b Total effort for both Swanson River and Swanson River Canoe Route (and Canoe Route lakes).

Table 28.—Dolly Varden catch and harvest, and effort for all species for Swanson River drainage and Kenai Lake, 1998–2018.

Year	Swanson River drainage						Kenai Lake		
	Effort ^{a,b}	Swanson canoe route		Swanson River		Effort ^a	Catch	Harvest	
		Catch	Harvest	Catch ^c	Harvest				
1998	5,093	899	248	244	40	520	67	25	
1999	6,885	1,534	348	23	0	1,462	611	88	
2000	5,250	2,275	963	334	59	1,033	333	95	
2001	4,161	1,313	457	613	145	2,509	456	176	
2002	3,692	643	221	313	79	2,502	935	309	
2003	2,298	221	37	0	0	1,097	107	54	
2004	3,640	25	13	388	99	497	40	13	
2005	4,886	125	99	134	38	2,072	262	165	
2006	4,669	245	99	51	13	619	143	24	
2007	6,712	208	89	1,868	317	648	376	77	
2008	7,227	250	98	167	70	728	0	0	
2009	4,621	447	252	0	0	687	11	11	
2010	3,203	747	48	56	12	955	161	29	
2011	4,296	52	64	20	10	869	145	25	
2012	1,097	269	10	0	0	1,179	108	0	
2013	2,576	515	0	35	0	2,964	63	16	
2014	2,897	101	20	0	0	3,030	446	106	
2015	2,201	35	16	39	0	2,048	312	0	
2016	1,995	33	33	0	0	1,247	541	69	
2017	2,746	54	0	0	0	2,134	206	92	
2018	3,463	149	11	0	0	674	93	40	
Average									
2009–2018	2,910	240	45	15	2	1,579	209	39	
2014–2018	2,660	74	16	8	0	1,827	320	61	

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.

^a Effort (angler-days) directed toward all species.

^b Total effort for both Swanson River and Swanson River Canoe Route (and Canoe Route lakes).

Table 29.—Kenai Peninsula stocked lakes total effort, catch, catch per unit effort (CPUE), harvest, and harvest per unit effort (HPUE) of stocked species 1998–2018.

Year	Number of fish stocked	Effort ^a	Catch	CPUE	Harvest	HPUE
1998	ND	6,588	20,652	3.13	8,898	1.35
1999	409,500	5,151	11,076	2.15	4,723	0.92
2000	255,373	7,880	28,050	3.56	7,851	1.00
2001	311,220	6,543	16,423	2.51	4,985	0.76
2002	210,420	7,641	19,809	2.59	10,977	1.44
2003	236,893	4,802	10,578	2.20	3,927	0.82
2004	266,668	4,978	16,375	3.29	4,612	0.93
2005	202,077	8,205	10,276	1.25	4,850	0.59
2006	187,388	6,488	12,571	1.94	3,440	0.53
2007	296,816	3,079	5,687	1.85	3,158	1.03
2008	277,219	2,802	6,137	2.19	2,135	0.76
2009	378,652	3,707	8,030	2.17	1,564	0.42
2010	300,399	5,510	8,072	1.46	3,135	0.57
2011	251,151	7,192	9,113	1.27	3,627	0.50
2012	295,738	5,867	16,029	2.73	4,099	0.70
2013	279,279	10,161	9,857	0.97	4,479	0.44
2014	279,321	8,485	11,960	1.41	5,439	0.64
2015	274,034	10,362	18,003	1.74	5,105	0.49
2016	232,173	11,557	23,902	2.07	9,141	0.79
2017	245,668	12,548	15,542	1.24	6,030	0.48
2018	253,169	6,616	9,833	1.49	1,681	0.25
Average						
2009–2018	278,958	8,201	13,034	1.65	4,430	0.53
2014–2018	256,873	9,914	15,848	1.59	5,479	0.53

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018).

Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>. Other data source D. Loopstra, Sport Fish Biologist, ADF&G, Anchorage, personal communication.

Note: ND means no data collected.

^a Effort in angler-days fished.

Table 30.— Kenai Peninsula lake trout catch (C) and harvest (H) as determined by Statewide Harvest Survey, 1998–2018.

Year	Hidden Lake		Kenai Lake		Kenai River		Skilak Lake		Tustumena Lake		Kasilof River		Other lakes ^a		Other rivers ^a		Total	
	C	H	C	H	C	H	C	H	C	H	C	H	C	H	C	H	C	H
1998	1,012	550	374	181	539	117	553	355	334	239	66	66	838	546	434	361	4,150	2,415
1999	1,452	545	1,950	623	2,155	293	1,408	621	89	81	690	284	473	446	36	27	8,253	2,920
2000	437	318	221	202	988	115	1,561	543	184	175	182	155	631	350	27	0	4,231	1,858
2001	734	160	1,490	980	658	156	249	72	118	44	332	81	384	270	0	0	3,965	1,763
2002	653	200	3,220	886	1,228	173	824	147	248	20	466	293	424	180	0	0	7,063	1,899
2003	443	285	405	226	1,423	243	713	230	87	45	15	0	90	68	224	0	3,400	1,097
2004	1,188	482	199	199	400	80	696	529	287	151	275	211	130	115	16	32	3,191	1,799
2005	728	216	890	631	0	0	145	54	468	130	160	128	156	70	0	0	2,547	1,229
2006	580	386	306	190	224	41	94	23	110	10	239	161	42	20	31	31	1,626	862
2007	1,084	420	540	226	352	0	42	14	230	9	0	0	35	0	0	0	2,283	669
2008	891	210	0	0	392	153	153	122	36	21	8	0	75	61	23	23	1,578	590
2009	2,351	616	1,011	185	541	22	47	0	129	58	11	0	78	34	0	0	4,168	915
2010	1,396	235	1,099	117	447	129	51	51	274	206	0	0	41	0	0	0	3,308	738
2011	1,124	61	12	12	17	0	33	16	320	104	0	0	348	211	0	0	1,854	404
2012	369	123	171	114	15	7	27	27	0	0	95	79	64	16	0	0	741	366
2013	612	197	820	639	43	0	856	343	172	172	0	0	0	0	85	64	2,588	1,415
2014	330	61	1,458	466	203	62	160	37	0	0	0	0	283	49	0	0	2,434	675
2015	741	82	1,304	375	218	0	59	20	0	0	40	0	178	178	0	0	2,540	655
2016	0	0	531	231	457	439	0	0	172	172	0	0	310	237	0	0	1,470	1,079
2017	293	52	721	594	102	20	0	0	0	0	0	0	343	13	0	0	1,459	679
2018	74	19	95	0	8	0	57	19	0	0	0	0	76	0	17	17	327	55
Average																		
2009–2018	729	145	722	273	205	68	129	51	107	71	15	8	172	74	10	8	2,089	698
2014–2018	288	43	822	333	198	104	55	15	34	34	8	0	238	95	3	3	1,646	629

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018).

Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>. Other data source D. Loopstra, Sport Fish Biologist ADF&G, Anchorage, personal communication.

^a Includes other NKPMAs not listed here individually; does not include "Unspecified" category in the SWHS.

Table 31.—Arctic Grayling catch (C), harvest (H), and effort (E) for all species for Crescent Lake, Paradise Lakes, Fuller Lakes, Grayling Lake, Twin Lakes and Bench Lake, 1998–2018.

Year	Crescent Lake			Paradise Lakes ^b			Fuller Lakes ^b			Grayling Lake			Twin Lakes			Bench Lake		
	E ^a	C	H	E ^a	C	H	E ^a	C	H	E ^a	C	H	E ^a	C	H	E ^a	C	H
1998	1,145	6,784	536	207	2,652	181	210	896	208	282	276	34	24	50	50	13	307	0
1999	1,266	3,187	550	1,006	6,944	322	104	338	22	68	135	0	91	339	90	15	11	0
2000	1,504	6,782	462	493	5,793	660	336	1,174	200	91	188	38	27	100	0	0	0	0
2001	1,099	6,493	245	528	1,863	261	197	730	223	90	184	126	0	0	0	44	16	7
2002	1,457	6,656	427	808	2,993	636	242	1,324	0	28	120	0	0	0	0	91	977	15
2003	1,412	6,785	1,008	134	1,126	14	208	1,437	47	80	117	12	50	140	0	0	0	0
2004	1,104	5,510	101	218	2,260	488	182	1,029	32	33	79	0	0	0	0	33	57	57
2005	1,028	5,231	438	404	2,893	236	289	1,091	64	37	0	0	35	321	0	0	0	0
2006	790	3,161	166	104	3,421	0	296	329	0	52	386	55	49	207	0	0	0	0
2007	1,389	6,202	365	124	303	70	74	234	46	37	117	35	0	0	0	0	0	0
2008	959	2,542	306	163	234	101	294	5,348	0	197	1,979	228	0	0	0	35	0	0
2009	1,609	7,456	814	0	0	0	261	1,550	54	14	50	0	21	67	33	0	0	0
2010	758	1,916	170	17	1,114	0	334	741	60	17	35	0	84	683	55	34	92	23
2011	996	3,150	606	133	347	13	234	697	99	30	53	0	0	0	0	36	196	0
2012	896	2,857	446	143	1,292	189	71	112	0	69	50	0	0	0	0	0	0	0
2013	1,213	6,786	653	105	265	43	165	571	0	261	374	231	0	0	0	114	1,079	34
2014	1,186	2,554	263	133	1,248	101	38	206	0	33	33	0	0	0	0	57	186	0
2015	1,041	2,196	251	0	0	0	166	196	196	43	283	0	0	0	0	44	808	0
2016	1,499	3,437	476	0	0	0	22	0	0	84	0	0	0	0	0	65	184	0
2017	999	2,178	68	294	2,811	41	0	0	0	0	0	0	0	0	0	0	0	0
2018	899	448	181	27	98	0	0	0	0	0	0	0	0	0	0	27	30	0
Average																		
2009–2018	1,110	3,298	393	85	718	39	129	407	41	55	88	23	11	75	9	38	258	6
2014–2018	1,125	2,163	248	91	831	28	45	80	39	32	63	0	0	0	0	39	242	0

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018).

Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.

^a Effort (angler-days) directed toward all species.

^b Includes data for Upper, Lower, and “Unspecified”.

Table 32.—Northern Kenai Peninsula Management Area catch and harvest of northern pike, 1998–2018.

Year	Kenai River		Mackey Lakes		Sevena Lake		Stormy Lake		Tote Road lakes		Other lakes or streams ^a		Total NKPMA		
	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	Catch	Harvest	
1998	7	0	0	0	0	0	0	0	0	0	0	0	0	7	0
1999	0	0	0	0	47	47	0	0	0	0	0	0	0	47	47
2000	6	6	76	38	0	0	0	0	0	0	10	10	92	54	
2001	0	0	13	13	155	155	103	103	0	0	601	251	872	522	
2002	94	12	0	0	322	322	34	34	0	0	0	0	450	368	
2003	58	58	0	0	218	218	241	241	0	0	24	0	541	517	
2004	553	58	241	241	0	0	45	15	0	0	0	0	839	314	
2005	12	12	47	47	0	0	165	165	0	0	0	0	224	224	
2006	0	0	0	0	0	0	55	55	0	0	0	0	55	55	
2007	41	10	0	0	0	0	150	135	413	413	0	0	604	558	
2008	33	25	0	0	0	0	12	12	349	204	13	13	407	254	
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	59	59	59	59	
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	11	11	0	0	0	0	10	0	0	0	0	0	21	11	
2013	108	23	428	428	0	0	0	0	0	0	0	0	536	451	
2014	65	29	0	0	0	0	0	0	0	0	0	0	65	29	
2015	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2017	8	0	0	0	0	0	0	0	8	8	0	0	16	8	
2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Average															
2009–2018	19	6	43	43	0	0	1	0	1	1	6	6	70	56	
2014–2018	15	6	0	0	0	0	0	0	2	2	0	0	16	7	

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.

^a Includes data from Arc Lake, Derks Lake, Island Lake, Seven Lake, Sixmile Creek, Swanson River, and Union Lake. Does not include data from “Other Lakes” or “Other Streams” categories in the SWHS.

Table 33.—Kenai River salmon harvest in the Kenaitze Indian Tribe educational fishery, 1998–2019.

Year	Chinook salmon				Sockeye salmon				Coho salmon				Pink Salmon		Total salmon harvest
	Early-run ^a	%	Late-run ^b	%	Early-run ^a	%	Late-run ^b	%	Early-run ^c	%	Late-run ^d	%	Harvest	%	
1998 ^e	131	3.8	2	0.1	971	28.1	1,650	47.8	252	7.3	386	11.2	58	1.7	3,450
1999 ^e	114	4.4	4	0.2	455	17.5	1,489	57.3	258	9.9	272	10.5	5	0.2	2,597
2000 ^e	124	3.6	6	0.2	779	22.3	1,309	37.5	319	9.1	337	9.7	617	17.7	3,491
2001 ^e	198	4.6	8	0.2	1,627	37.6	1,814	41.9	310	7.2	262	6.1	107	2.5	4,326
2002	48	1.1	6	0.1	650	15.1	2,201	51.1	489	11.4	432	10.0	482	11.2	4,308
2003	126	2.4	11	0.2	1,038	19.5	3,627	68.1	192	3.6	272	5.1	63	1.2	5,329
2004	72	1.1	10	0.2	1,201	18.3	4,106	62.5	366	5.6	399	6.1	417	6.3	6,571
2005	76	1.1	11	0.2	1,696	24.6	4,609	66.9	47	0.7	442	6.4	12	0.2	6,893
2006	65	1.2	11	0.2	1,456	27.5	2,856	53.9	201	3.8	488	9.2	223	4.2	5,300
2007	16	0.4	6	0.1	1,213	26.6	2,671	58.5	220	4.8	323	7.1	119	2.6	4,568
2008	40	0.9	15	0.3	1,112	25.2	2,246	50.9	346	7.8	176	4.0	481	10.9	4,416
2009	49	0.7	4	0.1	2,374	33.7	3,309	46.9	485	6.9	769	10.9	63	0.9	7,053
2010	32	0.5	21	0.3	1,366	20.8	3,765	57.3	419	6.4	794	12.1	170	2.6	6,567
2011	42	0.6	5	0.1	1,595	21.7	5,278	71.7	217	2.9	222	3.0	5	0.1	7,363
2012	19	0.5	0	0.0	275	6.7	3,136	76.1	100	2.4	40	1.0	553	13.4	4,123
2013	11	0.2	8	0.2	1,458	28.3	3,080	59.8	383	7.4	183	3.6	24	0.5	5,147
2014	1	0.0	1	0.0	1,920	28.0	4,195	61.1	261	3.8	138	2.0	352	5.1	6,868
2015	10	0.1	10	0.1	1,546	18.9	6,563	80.1	63	0.8	0	0.0	4	0.0	8,196
2016 ^f	4	0.1	6	0.1	864	11.7	5,843	78.8	220	3.0	273	3.7	203	2.7	7,413
2017	13	0.1	9	0.1	1,701	17.5	7,583	78.0	121	1.2	211	2.2	90	0.9	9,728
2018	2	0.0	1	0.0	1,630	22.1	4,525	61.5	496	6.7	449	6.1	259	3.5	7,362
2019	0	0.0	1	0.0	1,028	11.7	7,544	85.8	58	0.7	139	1.6	24	0.3	8,794
Average															
2010–2019	13	0	6	0	1,338	19	5,151	71	234	4	245	4	168	3	7,156
2015–2018	6	0	5	0	1,354	16	6,412	77	192	2	214	3	116	2	8,299

Source: Harvest data, Kenaitze Indian Tribe.

^a Defined as fish caught from 1 May through 30 June.

^b Defined as fish caught from 1 July through 30 September.

^c Defined as coho caught from 1 June through 31 August.

^d Defined as coho caught from 1 September through 30 November.

^e Prior to 2002, reported harvest included Kenai, Kasilof, and Swanson rivers.

^f Kenaitze Indian Tribe also reported harvest on 17 September 2016 of 9 coho and 1 sockeye salmon in the Swanson River.

Table 34.—Kasilof River salmon harvest in Kasilof Regional Historical Association and Kenaitze Indian Tribe educational fisheries, 2002–2019.

Year	Chinook salmon				Sockeye salmon				Coho salmon				Pink salmon		Total salmon harvest
	Early-run ^a	%	Late-run ^b	%	Early-run ^a	%	Late-run ^b	%	Early-run ^c	%	Late-run ^d	%	Harvest	%	
2002	16	29.6	0	0.0	38	70.4	0	0.0	0	0.0	0	0.0	0	0.0	54
2003	6	25.0	0	0.0	18	75.0	0	0.0	0	0.0	0	0.0	0	0.0	24
2004	3	10.0	0	0.0	20	66.7	7	23.3	0	0.0	0	0.0	0	0.0	30
2005	13	50.0	0	0.0	12	46.2	0	0.0	0	0.0	1	3.8	0	0.0	26
2006	10	16.7	0	0.0	38	63.3	0	0.0	0	0.0	12	20.0	0	0.0	60
2007 ^e	3	5.0	0	0.0	57	95.0	0	0.0	0	0.0	0	0.0	0	0.0	60
2008	6	5.0	0	0.0	23	19.0	13	10.7	0	0.0	45	37.2	34	28.1	121
2009	4	4.1	0	0.0	60	61.9	1	1.0	18	18.6	14	14.4	0	0.0	97
2010	8	2.6	0	0.0	260	85.2	0	0.0	2	0.7	35	11.5	0	0.0	305
2011 ^f	3	4.5	0	0.0	25	37.3	0	0.0	15	22.4	24	35.8	0	0.0	67
2012	2	1.4	0	0.0	116	78.9	0	0.0	0	0.0	27	18.4	2	1.4	147
2013	3	0.9	0	0.0	299	86.2	1	0.3	28	8.1	16	4.6	0	0.0	347
2014 ^f	0	0.0	0	0.0	18	39.1	0	0.0	0	0.0	28	60.9	0	0.0	46
2015 ^f	1	1.3	0	0.0	31	40.8	1	1.3	7	9.2	36	47.4	0	0.0	76
2016	2	2.6	0	0.0	45	59.2	2	2.6	9	11.8	18	23.7	0	0.0	76
2017 ^f	0	0.0	0	0.0	27	39.1	0	0.0	42	60.9	0	0.0	0	0.0	69
2018 ^f	0	0.0	0	0.0	0	0.0	10	21.3	26	55.3	11	23.4	0	0.0	47
2019 ^f	0	0.0	0	0.0	0	0.0	0	0.0	4	12.9	27	87.1	0	0.0	31
Average															
2010–2019	2	1	0	0	82	47	1	3	13	18	22	31	0	0	121
2015–2019	1	1	0	0	21	28	3	5	18	30	18	36	0	0	60

Source: Harvest data, Kenaitze Indian Tribe and Kasilof Regional Historical Association.

^a Defined as fish caught from 1 May through 30 June.

^b Defined as fish caught from 1 July through 30 September.

^c Defined as coho caught from 1 June through 31 August.

^d Defined as coho caught from 1 September through 30 November.

^e Prior to 2007, all data are from Kenaitze Indian Tribe educational fishery; 2007–present includes data from Kasilof Regional Historical Fishery.

^f Kenaitze Indian Tribe did not fish this area during these years.

Table 35.—Alaska Territorial Lodge educational fishery salmon harvest in Northern Cook Inlet (Moose Point), 2007–2019.

Year	Chinook salmon				Sockeye salmon				Coho salmon				Pink salmon		Chum salmon		Total salmon harvest
	Early-run ^a	%	Late-run ^b	%	Early-run ^a	%	Late-run ^b	%	Early-run ^c	%	Late-run ^d	%	Harvest	%	Harvest	%	
2007	49	16.8	0	0.0	9	3.1	95	32.6	121	41.6	5	1.7	8	2.7	4	1.4	291
2008	6	3.3	0	0.0	35	19.4	29	16.1	103	57.2	0	0.0	7	3.9	0	0.0	180
2009	9	9.1	1	1.0	10	10.1	33	33.3	30	30.3	0	0.0	12	12.1	4	4.0	99
2010	14	13.0	0	0.0	36	33.3	9	8.3	27	25.0	3	2.8	19	17.6	0	0.0	108
2011	6	8.7	0	0.0	16	23.2	11	15.9	32	46.4	0	0.0	4	5.8	0	0.0	69
2012	4	4.0	0	0.0	70	70.7	0	0.0	14	14.1	0	0.0	1	1.0	10	10.1	99
2013	7	3.8	0	0.0	31	17.0	69	37.9	27	14.8	4	2.2	33	18.1	11	6.0	182
2014	8	4.0	0	0.0	67	33.2	51	25.2	25	12.4	0	0.0	51	25.2	0	0.0	202
2015	2	0.8	0	0.0	50	21.1	102	43.0	29	12.2	0	0.0	53	22.4	1	0.4	237
2016	3	2.0	0	0.0	28	18.8	57	38.3	17	11.4	12	8.1	20	13.4	12	8.1	149
2017	3	1.9	0	0.0	63	39.6	43	27.0	23	14.5	0	0.0	21	13.2	6	3.8	159
2018	14	10.0	0	0.0	60	42.9	22	15.7	29	20.7	2	1.4	7	5.0	6	4.3	140
2019	0	0.0	0	0.0	47	20.5	98	42.8	31	13.5	7	3.1	39	17.0	7	3.1	229
Average																	
2010–2019	6	5	0	0	47	32	46	25	25	19	3	2	25	14	5	4	157
2015–2019	4	3	0	0	50	29	64	33	26	14	4	3	28	14	6	4	183

Source: Harvest data, Alaska Territorial Lodge.

^a Defined as fish caught from 1 May through 30 June.

^b Defined as fish caught from 1 July through 30 September.

^c Defined as coho caught from 1 June through 31 August.

^d Defined as coho caught from 1 September through 30 November.

Table 36.—Number of Kenai River fishing guides and vessels registered with Alaska State Parks, 1998–2019.

Year	Guide business type		Vessels registered		
	Fishing	Nonfishing	Motorized	Drift	Total ^a
1998	325	35	278	82	360
1999	329	39	288	80	368
2000	341	39	300	80	380
2001	335	39	296	78	374
2002	348	35	304	79	383
2003	339	36	301	74	375
2004	352	32	303	81	384
2005	365	42	324	83	407
2006	396	41	369	68	437
2007	396	29	372	53	425
2008	380	32	361	51	412
2009	338	46	322	62	384
2010	316	46	300	62	362
2011	319	60	297	82	379
2012	301	52	279	74	353
2013	284	66	259	91	350
2014	267	69	239	97	336
2015	258	74	226	106	332
2016	267	73	241	99	340
2017	296	51	252	95	347
2018	296	40	254	42	296
2019	288	49	246	42	288
Average 1998–2019	324	47	291	76	367

Source: Guide and vessel data, Alaska DNR.

^a This column includes nonfishing guide business vessels.

Table 37.—Guided freshwater logbook data of fishing effort from 2006–2016 for the Kenai River from May to July.

Year	May				June				July			
	Number of trips	Number of anglers			Number of trips	Number of anglers			Number of trips	Number of anglers		
		Resident	Nonresident	Total		Resident	Nonresident	Total		Resident	Nonresident	Total
2006	165	132	419	551	2,777	1,337	8,090	9,427	6,415	2,624	21,045	23,669
2007	192	123	435	558	2,719	1,220	7,643	8,863	6,361	2,914	19,769	22,683
2008	160	70	382	452	2,526	1,256	7,010	8,266	6,088	2,725	18,613	21,338
2009	149	154	264	418	1,892	1,172	4,784	5,956	4,736	2,570	13,591	16,161
2010	129	125	278	403	1,510	675	4,114	4,789	4,560	2,388	13,205	15,593
2011	130	94	271	365	1,664	843	4,443	5,286	4,415	1,984	13,261	15,245
2012	128	84	299	383	1,238	576	3,250	3,826	3,414	1,030	10,216	11,246
2013	21	11	48	59	939	370	2,389	2,759	3,625	1,039	11,063	12,102
2014	14	2	32	34	813	332	2,145	2,477	3,591	951	11,036	11,987
2015	3	4	4	8	895	234	2,429	2,663	3,615	1,040	11,024	12,064
2016	24	19	43	62	1,046	303	2,851	3,154	4,116	1,247	12,718	13,965
Average	101	74	225	299	1,638	756	4,468	5,224	4,631	1,865	14,140	16,005

Source: Freshwater Logbook Program from Sigurdsson and Powers (2009–2014) and Powers and Sigurdsson (2016); R. Powers, Program Coordinator, ADF&G, Anchorage, personal communication.

Note: 2017 and 2018 data not available at time of publication.

Table 38.—Guided freshwater logbook data of fishing effort from 2006–2016 for the Kenai River from August to October.

Year	August			September			October					
	Number of trips	Number of anglers		Number of trips	Number of anglers		Number of trips	Number of anglers				
		Resident	Nonresident		Total	Resident		Nonresident	Total	Resident	Nonresident	Total
2006	2,549	589	7,872	8,461	1,031	462	2,598	3,060	64	96	70	166
2007	2,752	968	7,920	8,888	1,009	544	2,532	3,076	92	114	149	263
2008	3,042	1,026	8,975	10,001	1,125	654	2,801	3,455	83	130	115	245
2009	2,354	973	6,367	7,340	1,179	900	2,576	3,476	64	102	66	168
2010	2,916	1,118	8,458	9,576	1,146	883	2,434	3,317	94	114	142	256
2011	3,046	1,277	8,741	10,018	1,238	929	2,822	3,751	82	110	122	232
2012	3,124	1,105	9,032	10,137	1,094	671	2,520	3,191	92	139	132	271
2013	3,243	1,327	9,437	10,764	1,261	910	2,897	3,807	38	42	58	100
2014	3,319	1,282	9,658	10,940	1,201	872	2,714	3,586	77	144	90	234
2015	3,400	1,421	9,942	11,363	1,237	801	2,908	3,709	84	145	106	251
2016	3,393	1,258	9,696	10,954	1,186	758	2,706	3,464	128	202	172	374
Average	3,013	1,122	8,736	9,858	1,155	762	2,683	3,445	82	122	111	233

Source: Freshwater Logbook Program from Sigurdsson and Powers (2009–2014) and Powers and Sigurdsson (2016); R. Powers, Program Coordinator, ADF&G, Anchorage, personal communication.

Note: 2017 and 2018 data not available at time of publication.

Table 39.—Guided freshwater logbook catch (C) and harvest (H) data for the Northern Kenai Peninsula Management Area from 2006–2016.

River	Year	Chinook salmon		Sockeye salmon		Coho salmon		Rainbow trout		Dolly Varden		Arctic grayling		Lake trout		Other ^a	
		C	H	C	H	C	H	C	H	C	H	C	H	C	H	C	H
Kenai																	
	2006	15,117	8,757	12,884	6,719	9,122	7,839	46,610	622	34,031	356	1,140	18	0	0	16,548	2,687
	2007	12,634	7,410	11,818	7,442	9,545	8,573	60,774	643	44,346	293	52	5	35	2	65	11
	2008	9,770	7,183	8,620	5,372	12,069	11,249	50,799	238	42,303	178	39	0	51	6	8,474	1,577
	2009	6,451	4,039	11,722	8,001	10,722	9,878	47,533	165	44,291	149	72	0	0	0	149	13
	2010	4,951	3,557	11,886	7,921	10,620	9,839	46,541	136	36,234	187	41	0	59	1	5,042	1,021
	2011	5,567	3,642	18,021	12,331	11,342	10,777	48,004	144	38,325	215	88	0	22	1	152	0
	2012	1,242	309	37,884	28,976	7,696	7,312	42,596	139	35,882	131	25	3	73	0	13,033	1,664
	2013	1,408	766	19,867	15,498	13,874	13,153	42,716	198	34,966	200	154	0	12	0	145	17
	2014	765	299	25,606	21,524	11,865	11,041	40,172	123	36,951	239	176	1	21	0	15,881	3,563
	2015	2,401	1,760	32,140	26,777	13,216	12,570	48,859	418	39,231	394	76	0	57	5	146	22
	2016	4,604	3,153	20,079	16,845	8,306	7,918	49,532	146	42,639	145	39	1	32	3	6,452	2,106
	Average	5,901	3,716	19,139	14,310	10,762	10,014	47,649	270	39,018	226	173	3	33	2	6,008	1,153
Kasilof																	
	2006	3,569	1,982	291	252	1,785	1,709	226	3	1,221	135	30	3	0	0	276	54
	2007	4,203	2,635	338	304	963	932	633	6	1,489	146	0	0	1	0	23	4
	2008	3,325	2,272	197	168	1,443	1,413	153	1	1,036	94	0	0	7	0	211	41
	2009	3,132	2,350	173	165	939	896	39	3	682	62	5	1	4	0	175	2
	2010	3,138	1,977	147	139	878	833	94	36	861	69	0	0	1	0	374	34
	2011	3,670	2,701	308	282	1,024	1,003	168	5	490	32	0	0	0	0	118	10
	2012	1,321	700	1,190	1,084	909	891	82	6	457	28	0	0	4	0	994	65
	2013	2,143	1,128	2,314	2,205	1,123	1,101	272	0	695	86	2	0	0	0	142	16
	2014	607	272	3,934	3,750	724	722	39	0	223	11	0	0	0	0	305	71
	2015	848	528	5,817	5,615	968	948	79	17	345	11	0	0	2	0	52	20
	2016	2,170	1,682	1,065	1,016	515	504	38	1	191	20	0	0	5	2	293	69
	Average	2,557	1,657	1,434	1,362	1,025	996	166	7	699	63	3	0	2	0	269	35

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Table 39.–Page 2 of 2.

River	Year	Chinook salmon		Sockeye salmon		Coho salmon		Rainbow trout		Dolly Varden		Arctic grayling		Lake trout		Other ^a	
		C	H	C	H	C	H	C	H	C	H	C	H	C	H	C	H
Other NKPMA ^b																	
	2006	24	4	390	134	134	64	2,552	83	1,460	4	527	19	0	0	858	91
	2007	5	4	346	222	109	42	1,868	22	1,275	43	198	5	7	4	829	53
	2008	2	0	628	384	78	25	1,443	17	963	17	795	126	9	1	400	19
	2009	1	0	293	110	120	49	943	17	1,192	1	911	34	1	0	31	27
	2010	0	0	248	133	23	19	937	2	1,145	1	126	9	3	3	60	3
	2011	0	0	314	68	47	38	716	8	1,104	0	367	2	0	0	209	14
	2012	0	0	475	215	150	30	899	8	867	5	352	0	48	0	169	23
	2013	1	0	676	249	133	37	1,459	18	1,654	1	565	25	0	0	202	0
	2014	0	0	687	313	142	80	1,983	49	1,077	1	460	0	0	0	628	17
	2015	0	0	380	258	126	56	2,026	148	1,313	1	161	1	0	0	270	7
	2016	2	0	153	105	60	49	1,163	106	1,076	2	228	0	12	8	119	10
	Average	3	1	417	199	102	44	1,454	43	1,193	7	426	20	7	1	343	24

Source: Freshwater Logbook Program from Sigurdsson and Powers (2009–2014) and Powers and Sigurdsson (2016); R. Powers, Program Coordinator, ADF&G, Anchorage, personal communication.

Note: 2017 and 2018 data not available at time of publication.

^a Other species include primarily pink salmon.

^b Other NKPMA fresh waters include primarily the Russian River drainage, the Swanson River drainage, and tributaries of the Kenai River.

Table 40.—Kenai River corridor shoreline land ownership summary of shoreline lands with closed/restricted sport fishing access.

Land owner	Upper section of the Kenai River ^a				Lower section of the Kenai River ^{b,c}				All Kenai River corridor		
	Miles	Percent of total miles owned	Miles closed by ADF&G	Percent of total miles closed	Miles	Percent of total miles owned	Miles closed by ADF&G	Percent of total miles closed	Miles	Miles closed by ADF&G	Percent of total miles closed
State	3.8	8.05%	0.38	10.00%	31.5	24.19%	13.45	42.70%	35.3	13.83	39.18%
Federal	40.6	86.02%	0.20	0.49%	17.9	13.75%	3.99	22.29%	58.5	4.19	7.16%
Private	0.2	0.42%	0.00	0.00%	52.6	40.40%	0.00	0.00%	52.8	0.00	0.00%
Other	2.6	5.51%	0.00	0.00%	28.2	21.66%	2.69	9.54%	30.8	2.69	8.73%
All	47.2	100.00%	0.58	1.23%	130.2	100.00%	20.13	15.46%	177.4	20.71	11.67%

Source: Kenai Peninsula Borough land ownership map data.

^a Kenai River shoreline from the Kenai Lake outlet downstream to the Skilak Lake inlet.

^b Kenai River shoreline from the Skilak Lake outlet downstream to Cook Inlet.

^c After a determination by the Alaska Board of Fisheries in 2017, an additional 0.9 miles of state-owned shoreline (River miles 13.0–13.2 and 13.3–14.0) is now closed to protect riparian habitat.

Table 41.—Kenai River personal use sockeye salmon dip net fishery summary, 1998–2019.

Year	Date opened	Date closed	Total days	Dip net harvest of sockeye salmon ^a	Sport harvest of sockeye salmon below sonar	Sockeye salmon run to sonar ^b	Percent of inriver run harvested by dip net fishery	Effort (days fished) ^c
1998	10 Jul	28 Jul	18	103,847	33,980	1,084,996	8.5	10,802
1999	10 Jul	31 Jul	22	149,504	46,043	1,137,001	11.2	13,738
2000	10 Jul	31 Jul	22	98,262	57,978	900,700	9.3	12,354
2001	10 Jul	31 Jul	22	150,766	51,374	906,333	13.6	14,722
2002	10 Jul	31 Jul	22	180,028	46,693	1,339,682	11.5	14,840
2003	10 Jul	31 Jul	22	223,580	60,722	1,656,026	11.5	15,263
2004	10 Jul	31 Jul	22	262,831	62,397	1,945,383	11.6	18,513
2005	10 Jul	31 Jul	22	295,496	58,017	1,908,821	13.1	20,977
2006 ^d	10 Jul	10 Aug	13	127,630	30,964	2,064,728	5.7	12,685
2007	10 Jul	31 Jul	22	291,270	60,623	1,229,945	18.4	21,908
2008	10 Jul	31 Jul	22	234,109	46,053	917,139	19.6	20,772
2009	10 Jul	31 Jul	22	339,993	45,868	1,090,055	23.0	26,171
2010	10 Jul	31 Jul	22	389,552	59,651	1,294,884	22.3	28,342
2011	10 Jul	31 Jul	22	537,765	92,225	1,599,217	24.1	32,818
2012	10 Jul	31 Jul	22	526,992	102,376	1,581,555	23.8	34,374
2013	10 Jul	31 Jul	22	347,222	78,837	1,359,893	19.4	33,193
2014	10 Jul	31 Jul	22	379,823	78,057	1,520,340	19.2	36,380
2015	10 Jul	31 Jul	22	377,532	83,113	1,709,051	17.4	31,487
2016	10 Jul	31 Jul	22	259,057	79,465	1,383,692	15.0	30,745
2017	10 Jul	31 Jul	22	297,049	67,234	1,308,498	17.8	27,775
2018 ^d	10 Jul	29 Jul	20	169,553	41,122	1,035,761	13.6	20,170
2019 ^d	10 Jul	31 Jul	22	NA	NA	1,848,157	NA	NA
Average								
2009–2018				362,454	72,795	1,388,295	19.6	30,418
2014–2018				296,603	69,798	1,391,468	16.6	29,856

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Table 41.–Page 2 of 2.

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>; Reimer and Sigurdsson (2004); Dunker and Lafferty (2007); Dunker (2010, 2013, 2018); A. St. Saviour, Sport Fish Biologist, ADF&G, Palmer, personal communication; W. Glick, Commercial Fish Biologist, ADF&G, Soldotna, personal communication.

Note: NA means data not available.

- ^a Reported harvest from returned permits, expanded to include permits not returned.
- ^b Bendix sonar counts were converted to DIDSON estimates (equivalents) for 1998–2006. Estimates after these dates are actual DIDSON generated estimates.
- ^c “Effort” is household-days fished. Each household-day fished may include fishing effort by more than one household member named on the household's permit.
- ^d Personal use fishery was restricted.

Table 42.—Kasilof River personal use sockeye salmon dip net fishery summary, 1998–2018.

Year	Date opened	Date closed	Total days	Dip net harvest of sockeye salmon ^a	Sport harvest of sockeye salmon below sonar	Sockeye salmon run to sonar ^b	Percent of inriver run harvested by dip net fishery	Effort (days fished) ^c
1998	10 Jul	5 Aug	27	45,161	3,449	259,045	14.7	3,421
1999	10 Jul	5 Aug	27	37,176	4,654	312,481	10.5	3,611
2000	10 Jul	5 Aug	27	23,877	5,599	263,631	8.1	2,622
2001	10 Jul	5 Aug	27	37,612	6,005	318,735	10.4	3,382
2002	25 Jun	7 Aug	44	46,769	4,424	235,731	16.3	4,020
2003	25 Jun	7 Aug	44	43,870	5,971	353,526	10.9	3,874
2004	25 Jun	7 Aug	44	48,315	7,407	523,653	8.3	4,432
2005	25 Jun	7 Aug	44	43,151	5,982	360,065	10.5	4,500
2006	25 Jun	7 Aug	44	56,144	7,723	389,645	12.4	5,763
2007	25 Jun	7 Aug	44	43,293	3,843	365,184	10.5	4,627
2008	25 Jun	7 Aug	44	54,051	7,470	327,018	13.9	5,552
2009	25 Jun	7 Aug	44	73,035	6,763	326,285	18.0	7,650
2010	25 Jun	7 Aug	44	70,774	4,470	295,265	19.1	7,588
2011	25 Jun	7 Aug	44	49,766	8,182	245,721	16.4	6,571
2012	25 Jun	7 Aug	44	73,419	6,740	374,523	16.1	6,536
2013	25 Jun	7 Aug	44	85,508	12,257	489,654	14.6	8,556
2014	25 Jun	7 Aug	44	88,513	19,819	440,192	16.1	10,236
2015	25 Jun	7 Aug	44	89,000	15,553	470,667	15.5	10,346
2016	25 Jun	7 Aug	44	58,273	8,159	239,981	19.0	9,334
2017	25 Jun	7 Aug	44	78,260	8,400	358,724	17.6	9,458
2018	25 Jun	7 Aug	44	92,034	15,978	394,309	18.3	9,377
2019	25 Jun	7 Aug	44	NA	NA	378,416	NA	NA
Average								
2009–2018				75,858		363,532	17.1	8,565
2014–2018				81,216		380,775	17.3	9,750

-continued-

Table 42.–Page 2 of 2.

Source: Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>; Reimer and Sigurdsson (2004); Dunker and Lafferty (2007); Dunker (2010, 2013, 2018); A. St. Saviour, Sport Fish Biologist, ADF&G, Palmer, personal communication; W. Glick, Commercial Fish Biologist, ADF&G, Soldotna, personal communication.

Note: NA means data not available.

- ^a Reported harvest from returned permits, expanded to include permits not returned.
- ^b Bendix sonar counts were converted to DIDSON estimates (equivalents) for 1998–2007. Estimates after these dates are actual DIDSON generated estimates.
- ^c “Effort” is household-days fished. Each household-day fished may include fishing effort by more than one household member named on the household's permit.

FIGURES

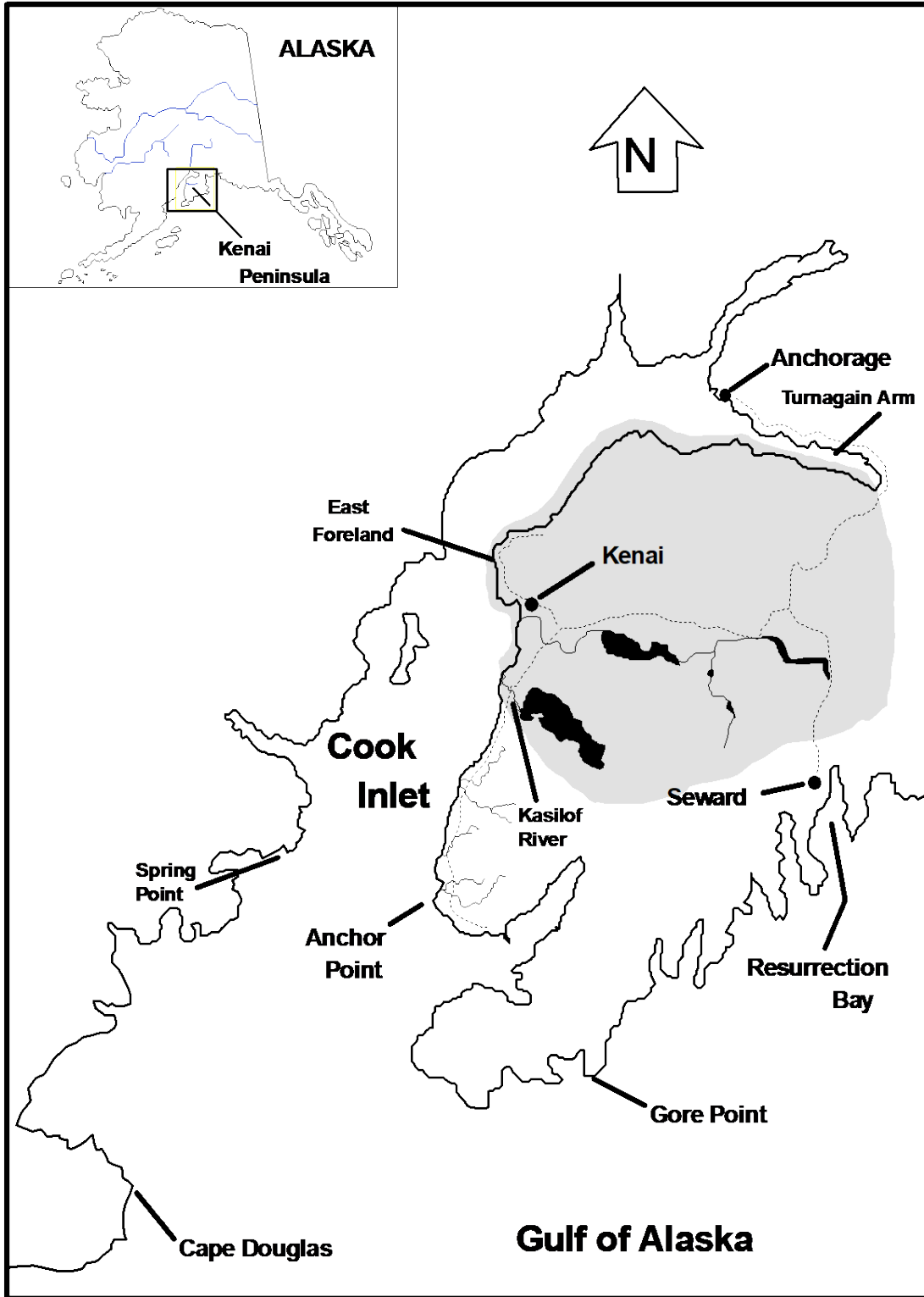


Figure 1.—The Northern Kenai Peninsula Management Area (shaded) includes all freshwater drainages and saltwater fisheries from the Kasilof River north to Turnagain Arm on the Kenai Peninsula.

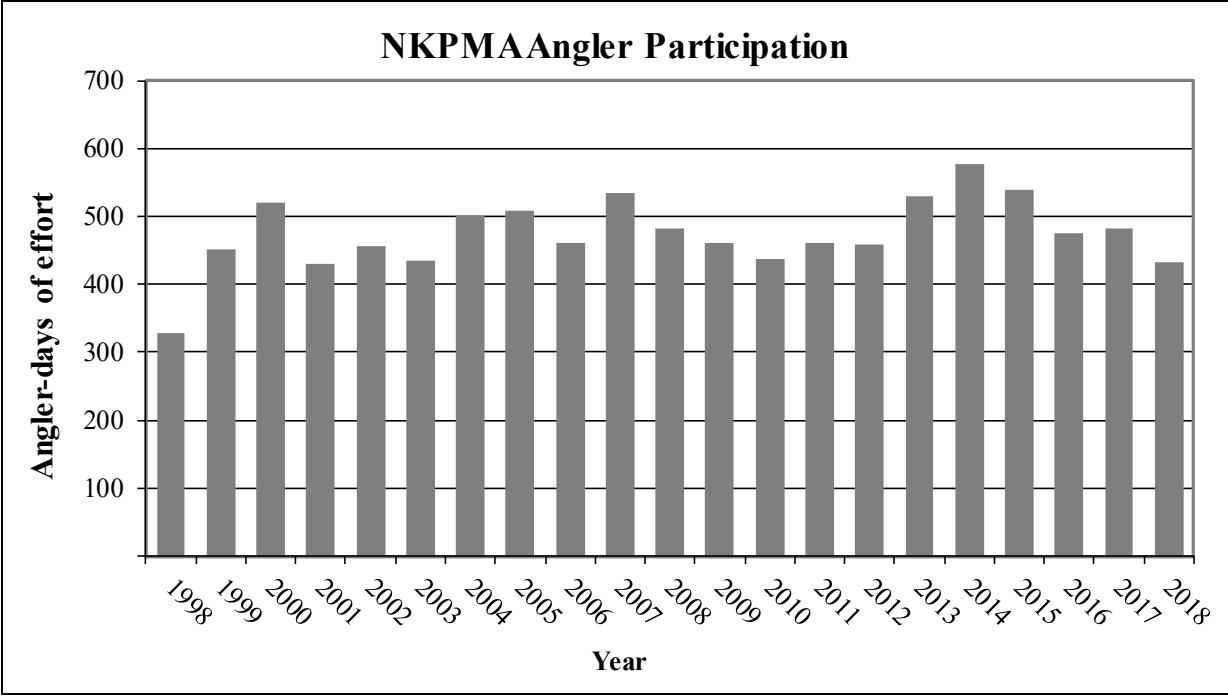


Figure 2.—Sport angler participation in the Northern Kenai Peninsula Management Area, 1998–2018.

Source: Statewide Harvest Survey (SWHS) estimates from the Alaska Sport Fishing Survey database [Intranet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2019). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>.

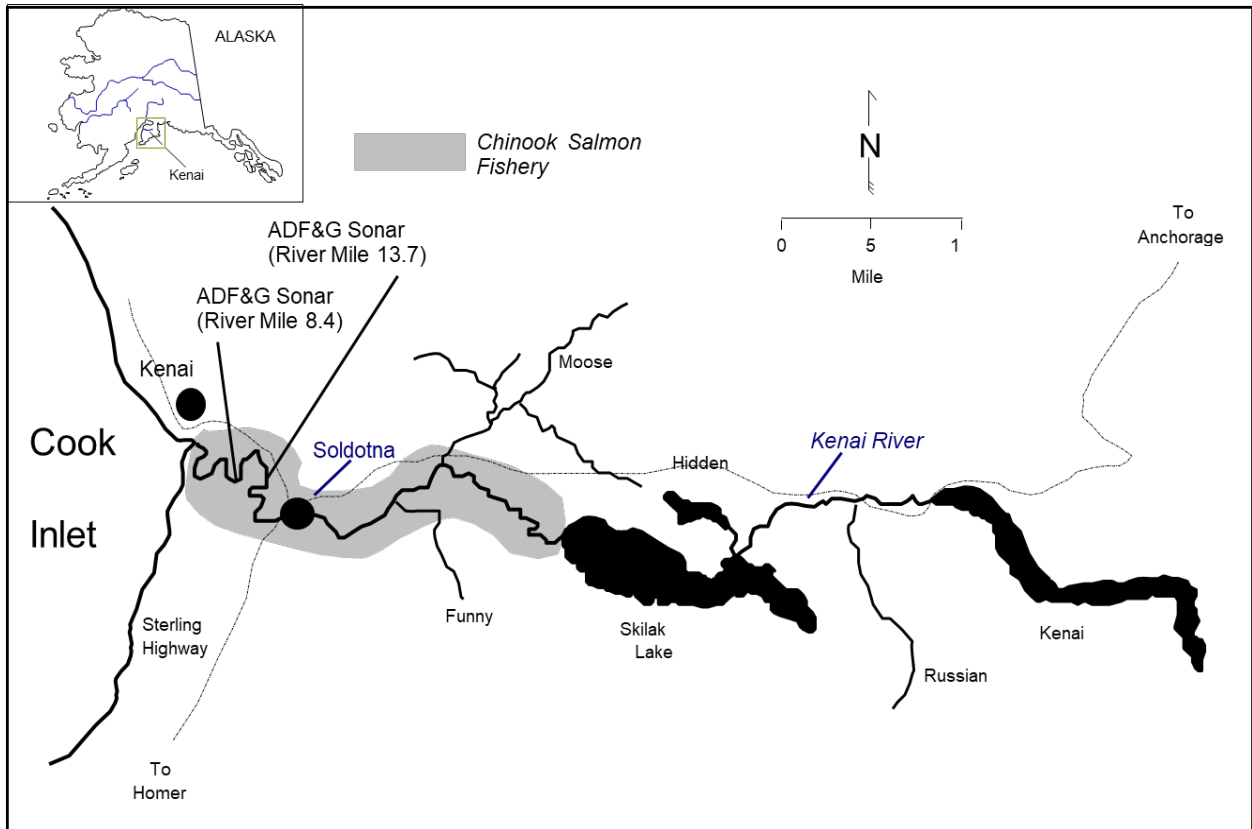


Figure 3.—Kenai River Chinook salmon fishery.

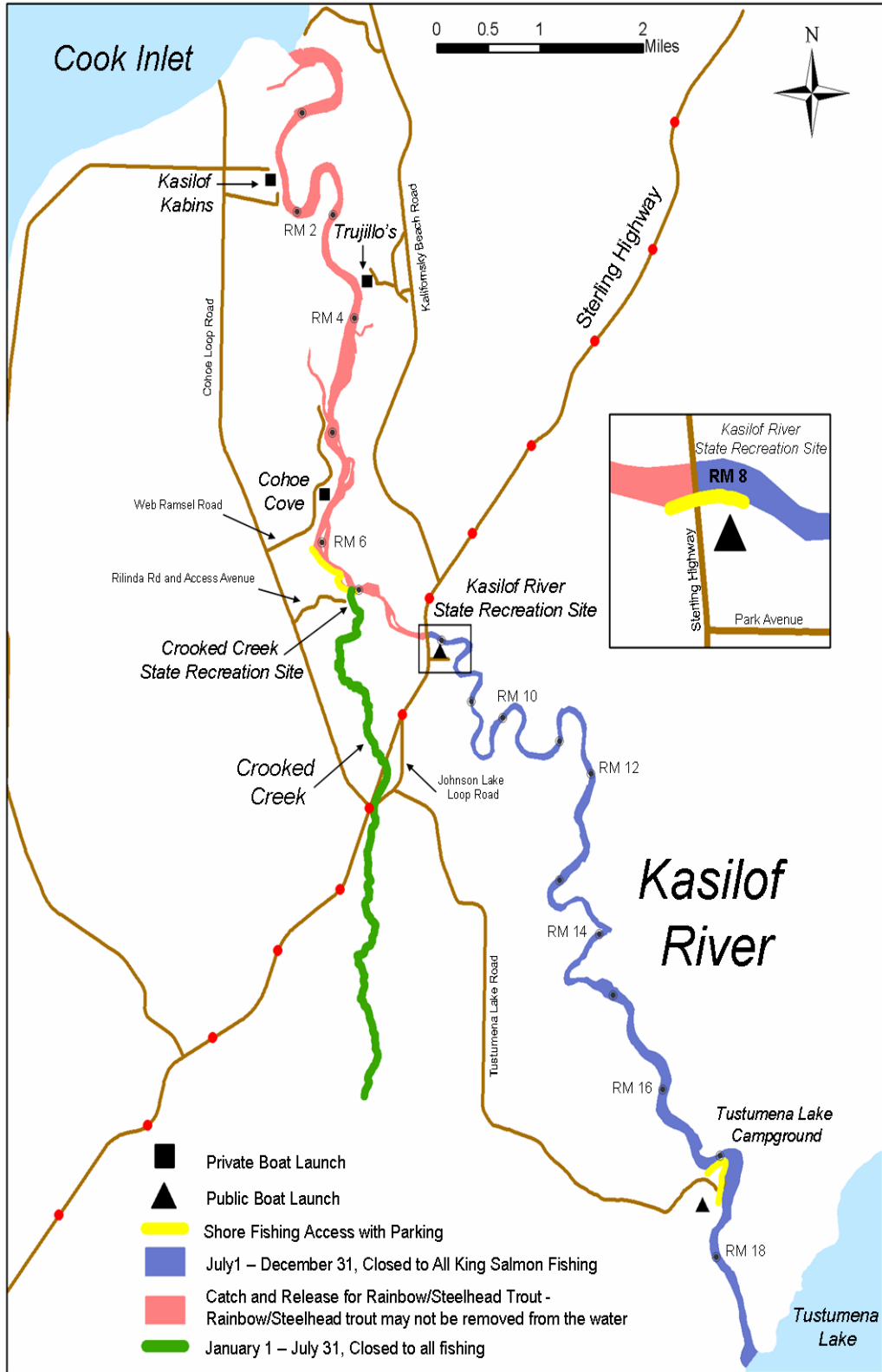


Figure 4.—Map of Kasilof River showing public access and specific regulatory areas.

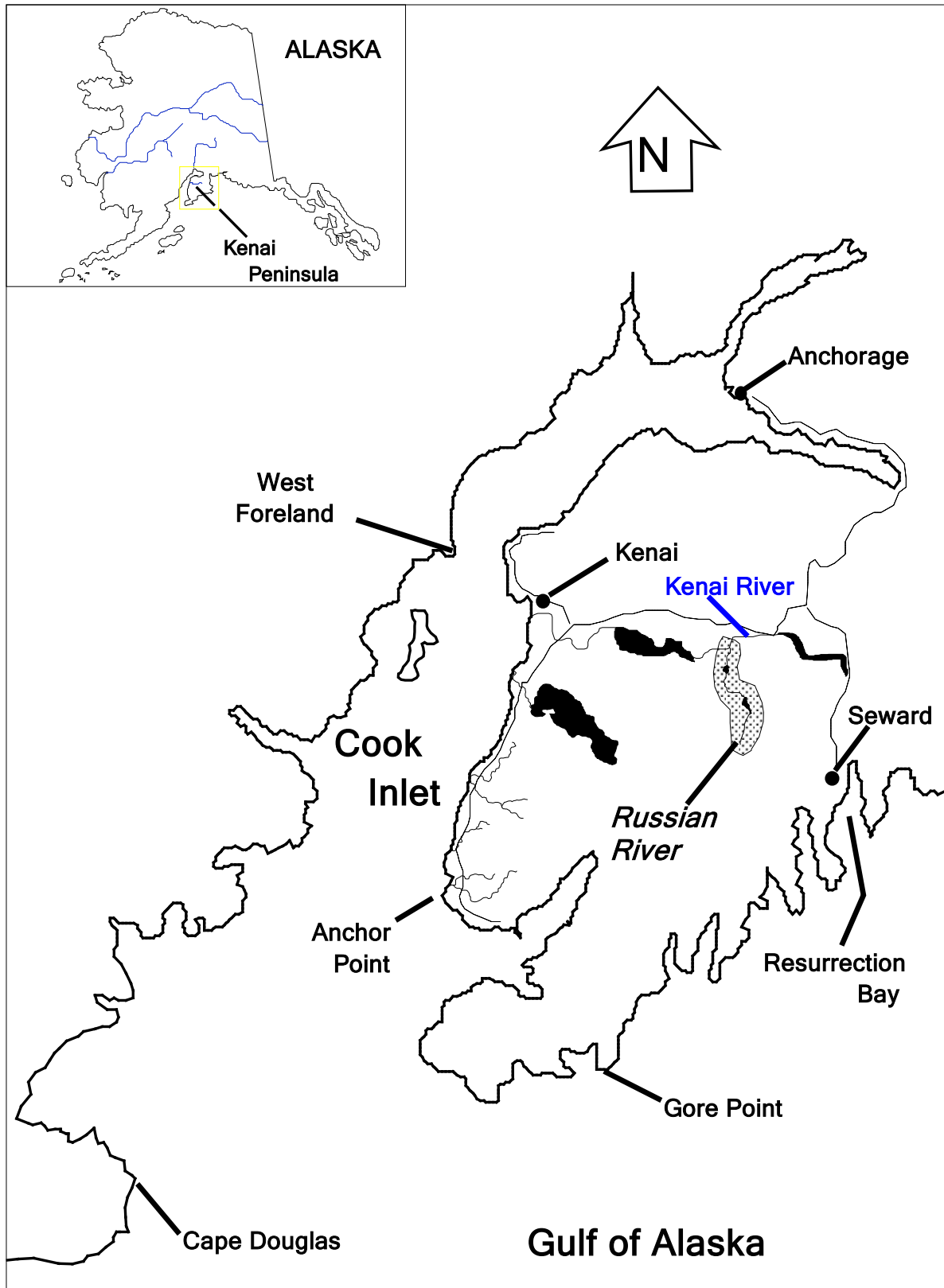


Figure 5.—Location of Russian River on the Kenai Peninsula, Alaska.

CONFLUENCE OF KENAI and RUSSIAN RIVERS

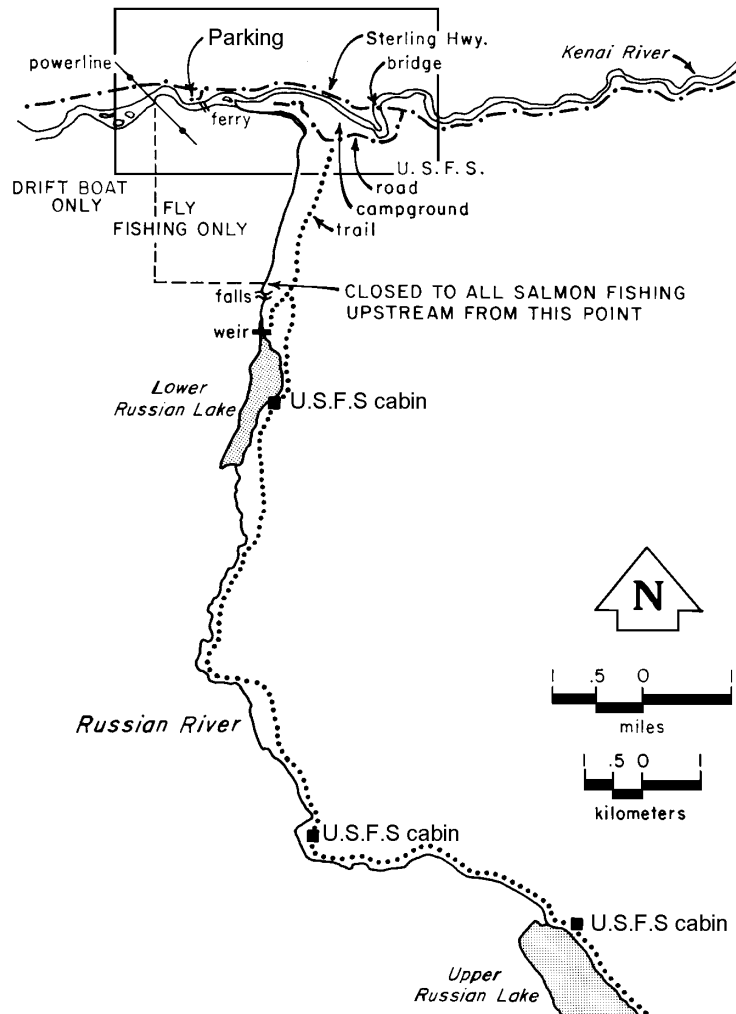
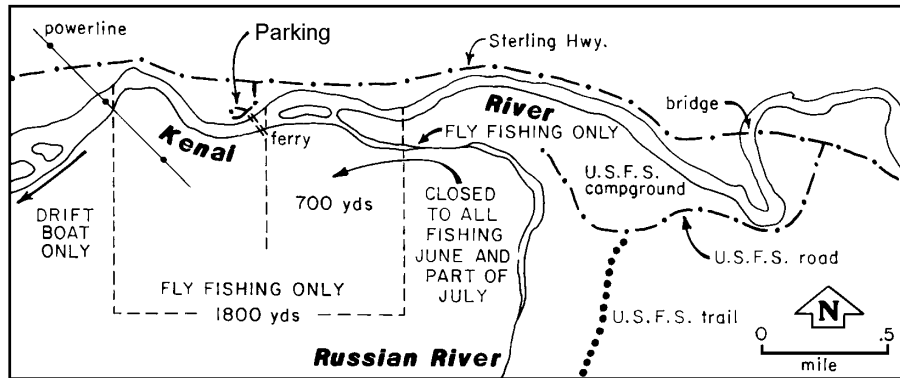


Figure 6.—Map of Russian River drainage.

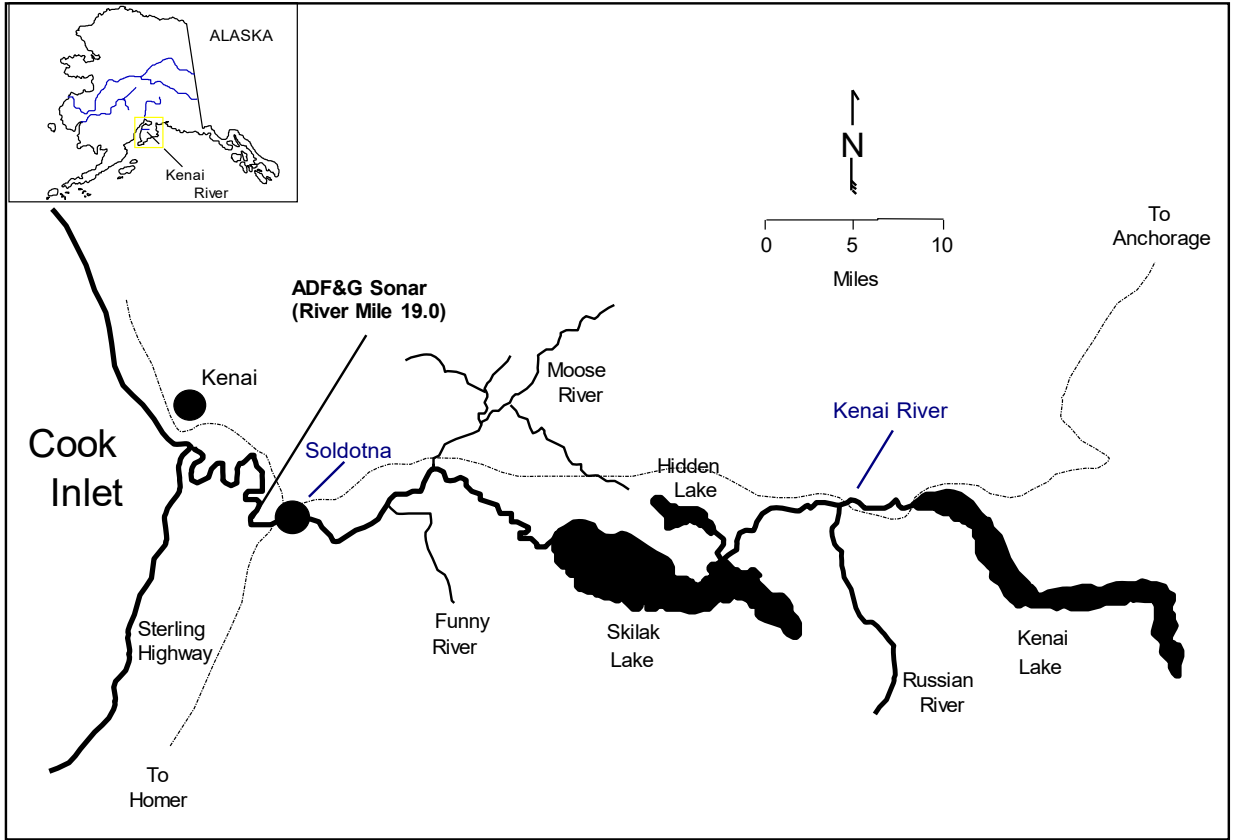


Figure 7.—Map of the Kenai River drainage showing the extent of the late-run sockeye salmon fishery from Cook Inlet to Kenai Lake.

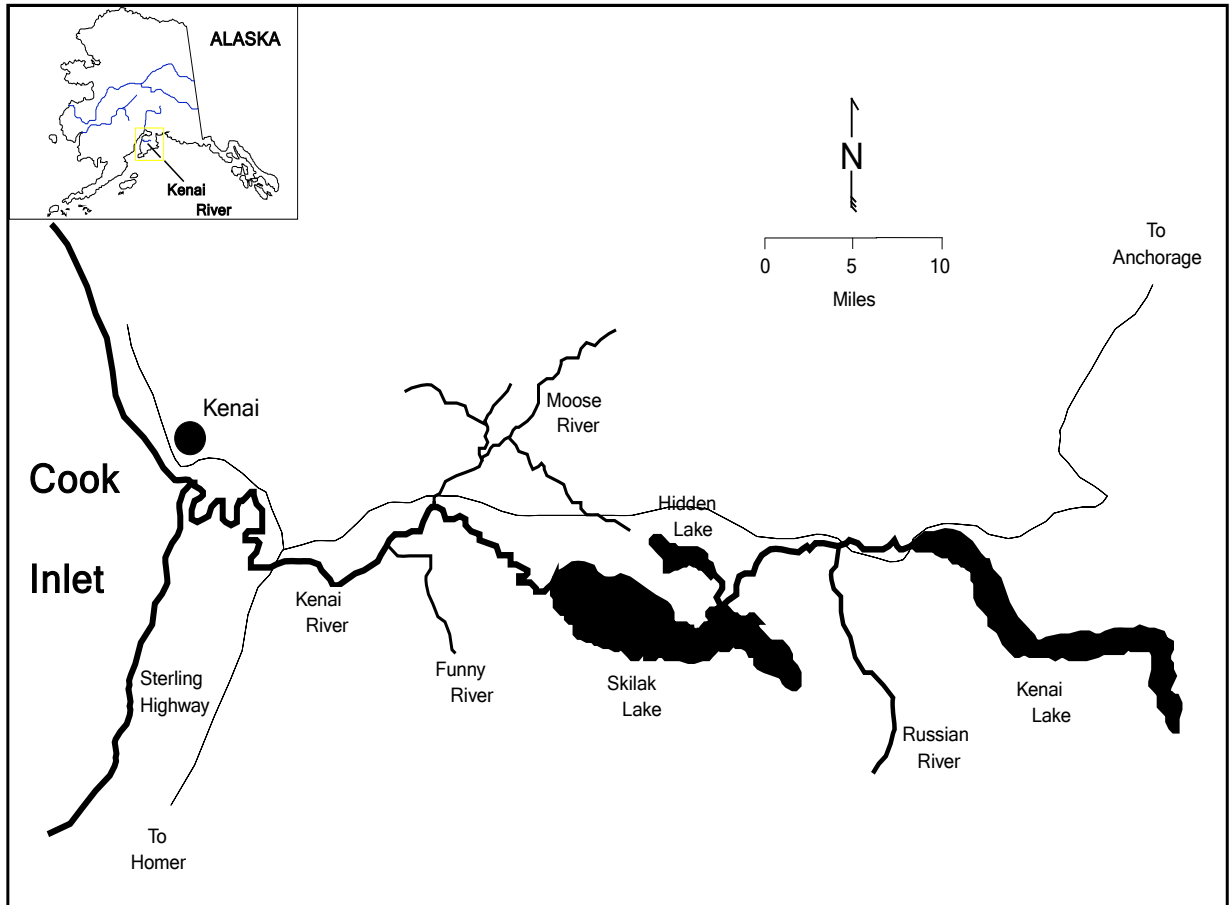


Figure 8.—Map of the Kenai River drainage showing extent of coho salmon fishery from Kenai Lake to Cook Inlet.

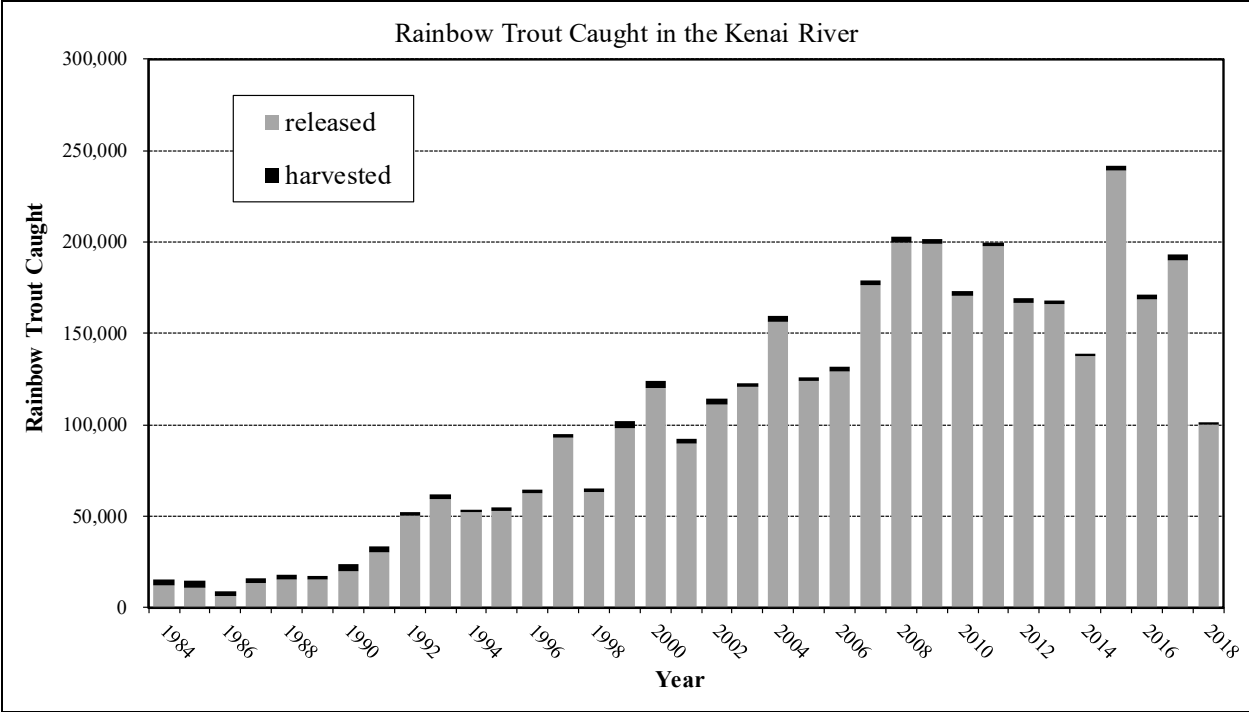


Figure 9.—Total number of rainbow trout caught, showing numbers released and harvested, for the Kenai River sport fishery, 1984–2018.

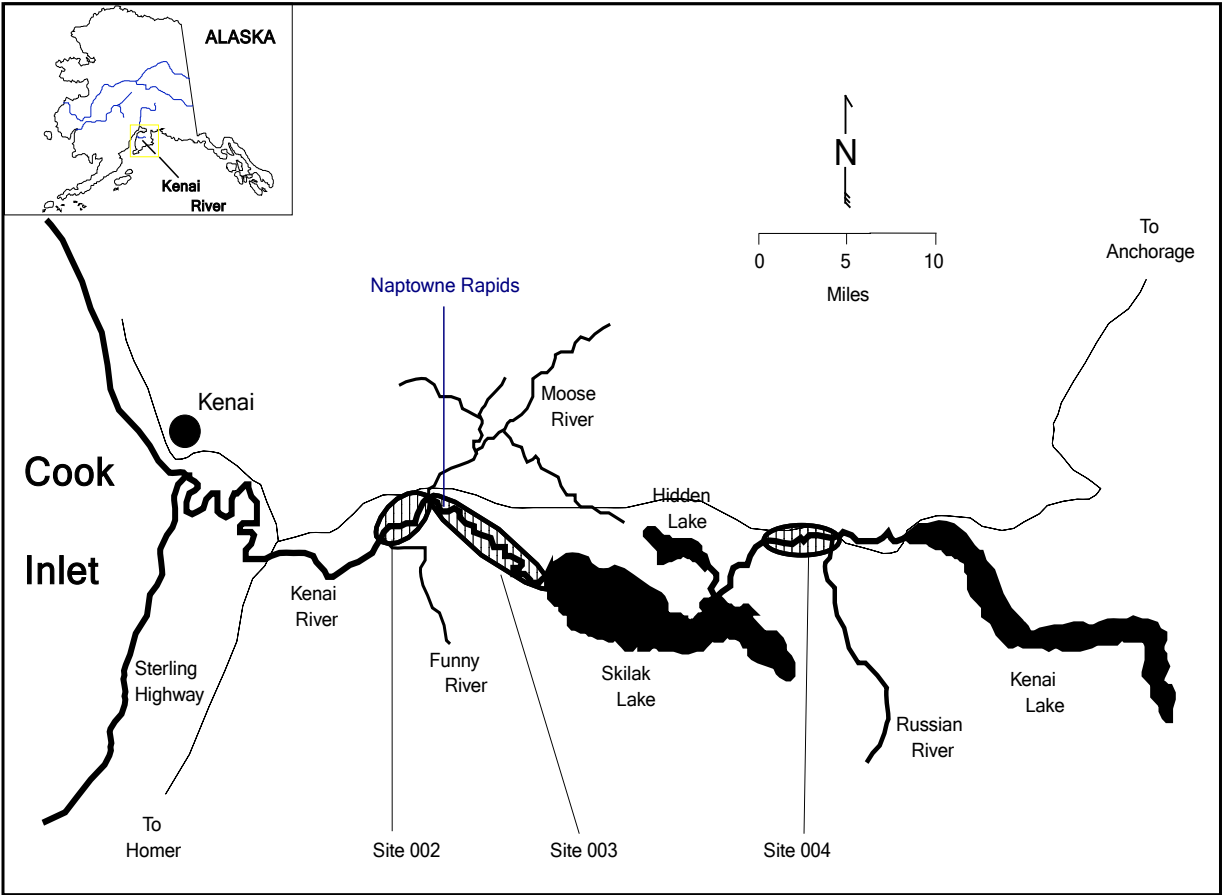


Figure 10.—Map of rainbow trout study areas in the Kenai River drainage.

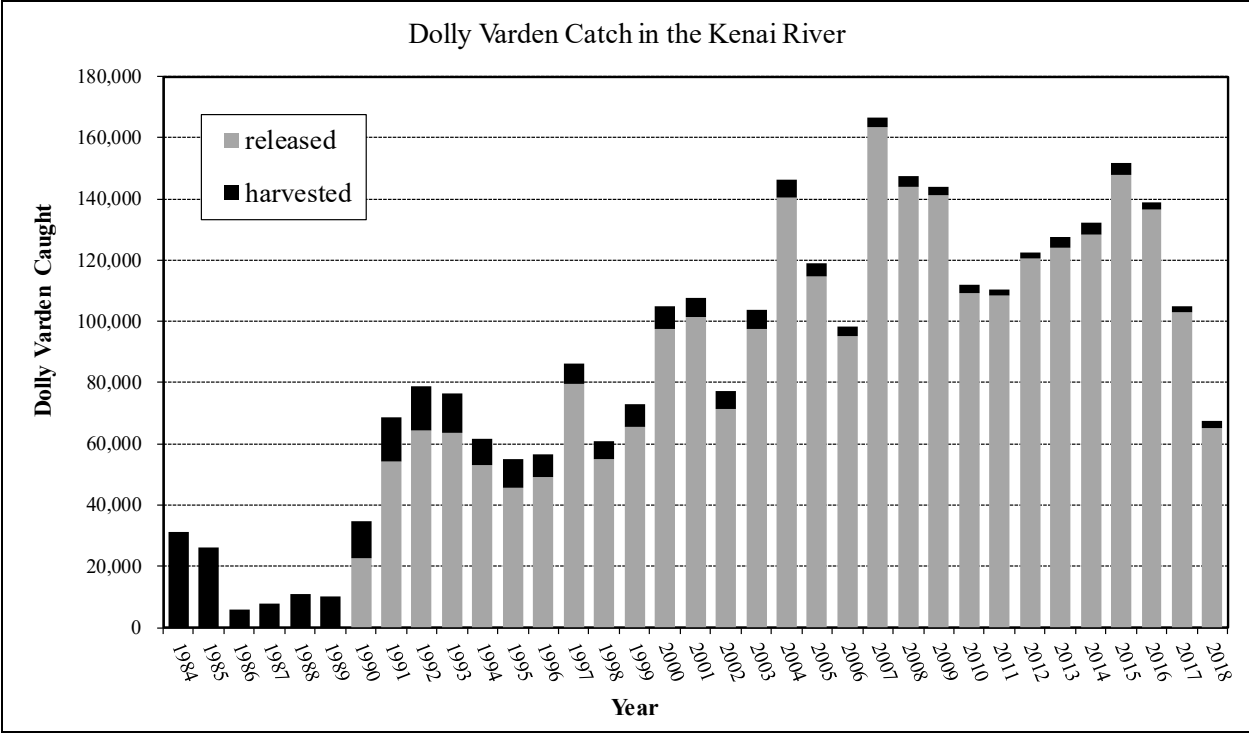


Figure 11.—Total number of Dolly Varden caught, showing number released and harvested, for the Kenai River sport fishery, 1984–2018.

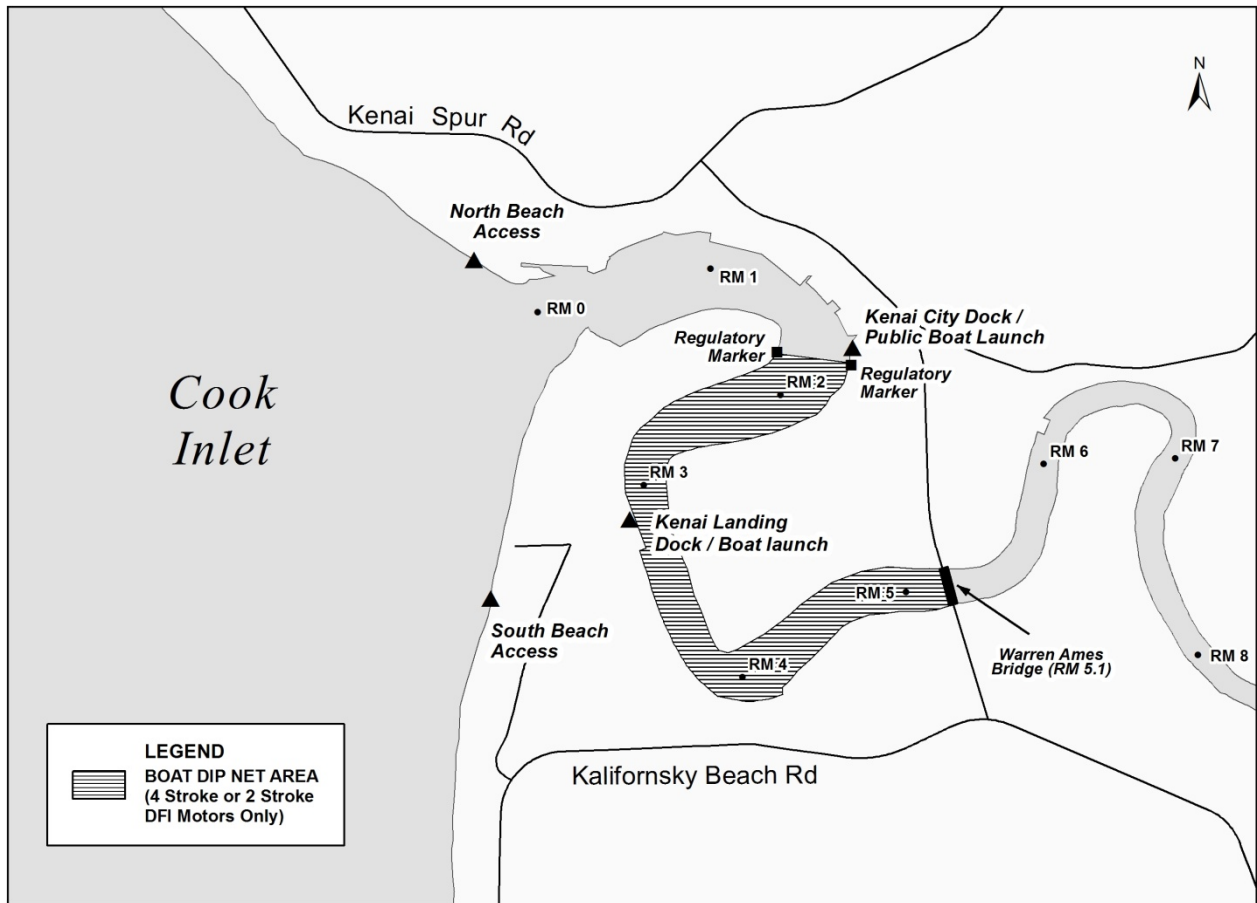


Figure 12.—Map of the Kenai River personal use fishery open to dipnetting from a boat.

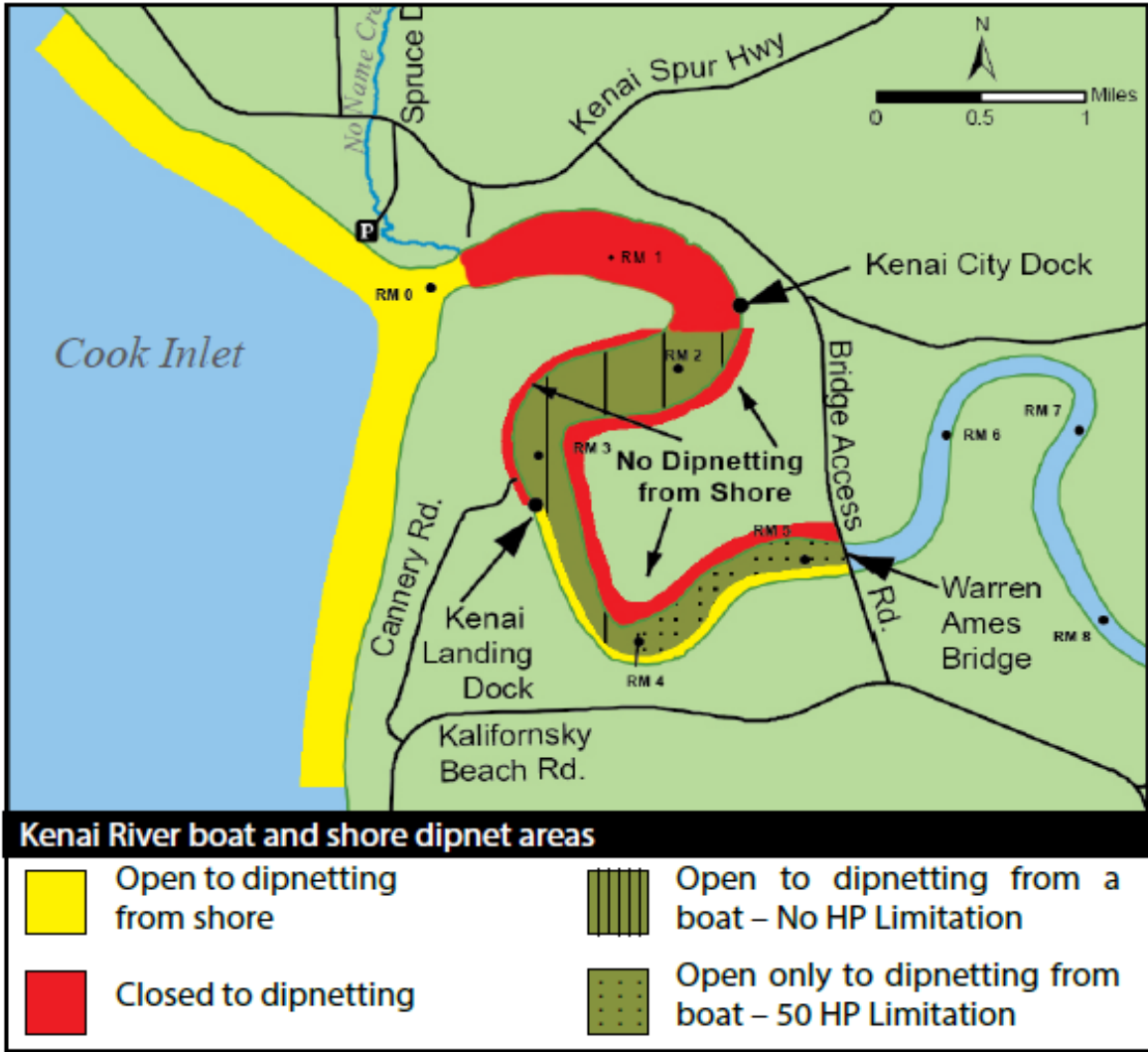


Figure 13.–Map of the Kenai River personal use dip net fishery.

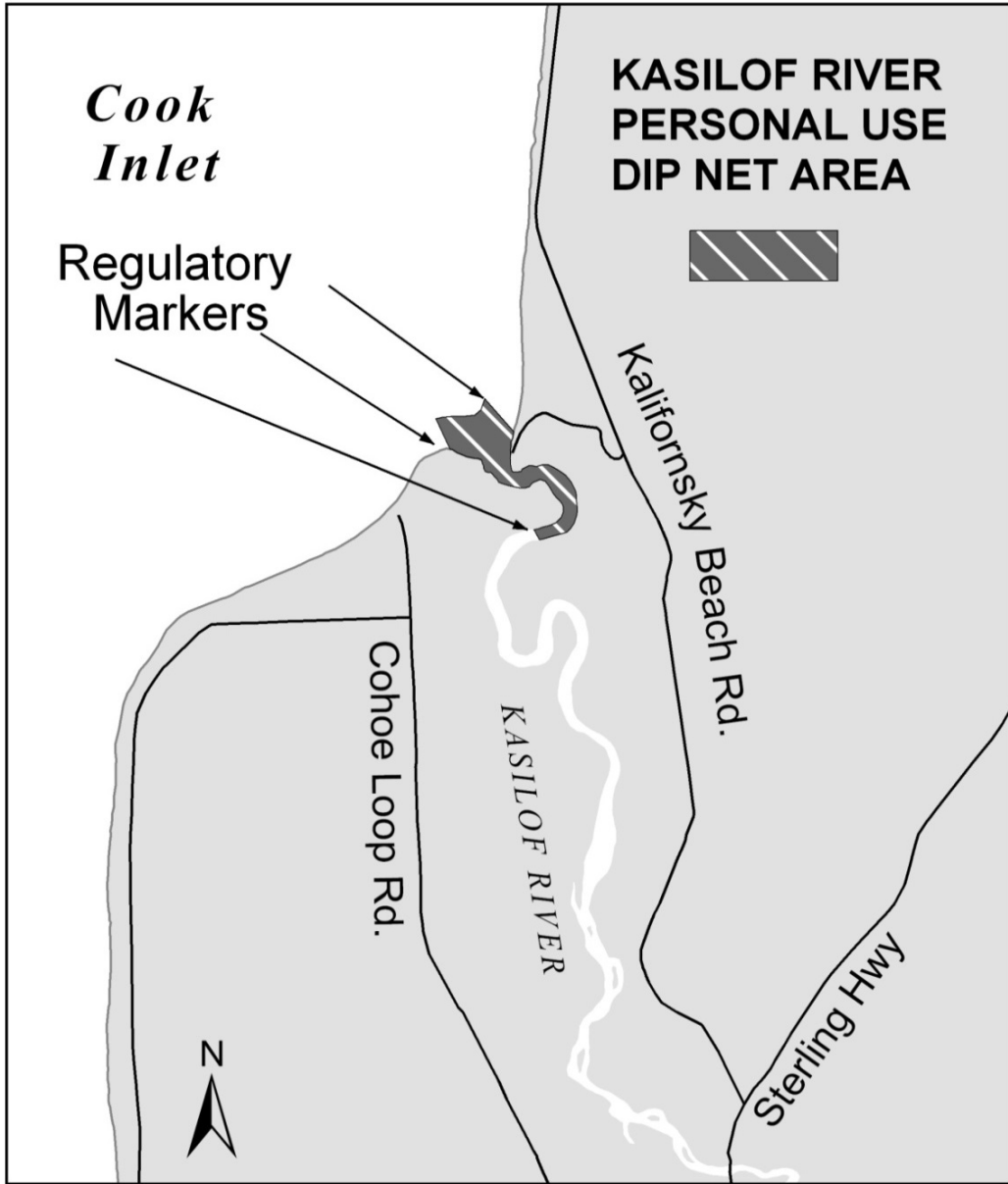


Figure 14.—Map of the Kasilof River personal use fishery area open to dipnetting from shore.

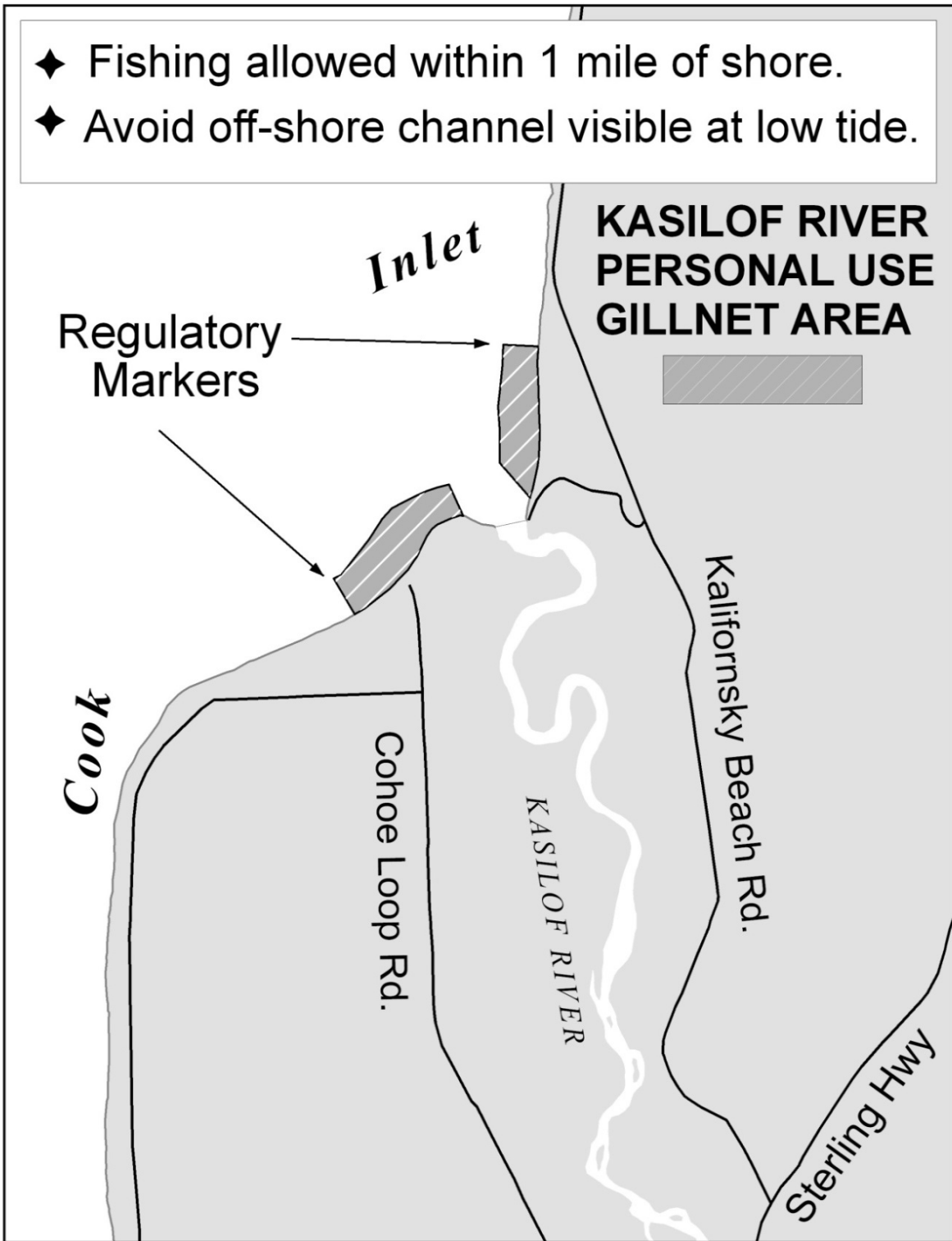


Figure 15.—Map of the Kasilof River personal use fishery area open to set gillnetting.

APPENDIX A: EMERGENCY ORDERS

Appendix A1.–Emergency orders (EOs) issued for Northern Kenai Peninsula Management Area waters in 2017.

Emergency order number	Effective date	Action and justification
2-DV-1-02-17	January 1 12:01 AM	Prohibits the retention of Arctic char–Dolly Varden in Stormy Lake. Sport fishing through the ice is permitted using 2 closely attended lines; only 1 hook or artificial lure may be used on each line. Effective 12:01 AM Sunday, January 1 through 11:59 PM Sunday, December 31, 2017.
2-NP-1-01-17	January 1 12:01 AM	Reduces the number of lines that may be used to fish through the ice and prohibits the retention of any species of fish, except northern pike, in East Mackey Lake, west Mackey Lake, Union Lake, and Derks Lake. Sport fishing through the ice is permitted using 2 closely attended lines. Anglers may still use up to 5 lines while sport fishing through the ice for northern pike in Sevena Lake, and the unnamed lakes on Tote Road. Effective 12:01 AM Sunday, January 1 through 11:59 PM, Sunday, December 31, 2017.
2-KS-1-14-17	June 13 12:01 AM	This emergency order increases the size limit for king salmon in the waters below the ADF&G marker at Slikok Creek on the Kenai River from a maximum size of less than 36 inches total length to a maximum size of less than 46 inches total length. Maximum size of king salmon harvested above the Slikok Creek markers remains limited to fish less than 36 in. Effective beginning 12:01 AM Tuesday, June 13 through 11:59 PM Friday, June 30, 2017.
2-KS-1-15-17	June 21 12:01 AM	This emergency order allows the use of bait in the Kenai River from the mouth upstream to ADF&G markers 300 yards below the mouth of Slikok Creek. The maximum size limit of less than 46 inches for king salmon remains in effect through June 30. Upstream of the Slikok Creek markers anglers remain limited to unbaited, single-hook, artificial lures with a size limit of king salmon less than 36 inches. Effective 12:01 AM Wednesday, June 21 through 11:59 PM Friday, June 30, 2017.
2-RS-1-19-17	June 24 8:00 AM	This emergency order opens the Russian River Sanctuary Area to sport fishing for sockeye salmon. Effective 8:00 AM Saturday, June 24 through 11:59 PM Friday, July 14, 2017.
2-RS-1-20-17	June 24 12:01 AM	This emergency order increases the bag and possession limits for salmon, other than king salmon, from 3 per day, 6 in possession to 6 per day, 12 in possession in that area of the Kenai River upstream from Skilak Lake to ADF&G markers located approximately 300 yards upstream of the public boat at Sportsman's Landing and the Russian River from its mouth upstream to an ADF&G marker located about 600 yards downstream from the Russian River Falls. Effective 12:01 AM Saturday, June 24 through 11:59 PM Friday, July 14, 2017.

Source: B. H. Marston, Sport Fish Biologist, ADF&G, Soldotna, personal communication.

Note: “king salmon” is Chinook salmon in the regulatory language.

Appendix A2.–Emergency orders (EOs) issued for Northern Kenai Peninsula Management Area waters in 2018.

Emergency order number	Effective date	Action and justification
2-NP-1-03-18	January 1 12:01 AM	Sportfishing will be permitted at East and West Mackey, Sevena, Union, and Derks lakes, however, the retention of all species of fish is prohibited at these lakes. Sportfishing through the ice is permitted using 2 closely attended lines. Effective 12:01 AM Monday, January 1 through 11:59 PM Monday December 31, 2018.
2-DV-1-04-18	January 1 12:01 AM	Prohibits the retention of Arctic char–Dolly Varden in Stormy Lake. Sport fishing through the ice is permitted using 2 closely attended lines; only one hook or artificial lure may be used on each line. Effective 12:01 AM Monday, January 1 through 11:59 PM Monday, December 31, 2018.
2-KS-1-13-18	June 13 12:01 AM	This emergency order prohibits the retention of king salmon of all sizes in the Kenai River from the mouth upstream to the outlet of Skilak Lake. Retention of king salmon will remain prohibited July 1 through July 15, 2018 in waters of the Kenai River drainage from an ADF&G marker located approximately 300 yards downstream from the mouth of Slikok Creek, upstream to the outlet of Skilak Lake. Effective 12:01 AM Wednesday, June 13 through 11:59 PM Friday, July 15, 2018.
2-KS-1-14-18	June 13 12:01 AM	This emergency order restricts king salmon fishing in the Kasilof River. Specifically, it prohibits retention of naturally produced king salmon, reduces the bag and possession limit of hatchery-produced king salmon 20 inches or greater in length to 1 fish, and limits sport fishing gear to 1 unbaited, single-hook, artificial lure in the Kasilof River. Naturally produced king salmon may not be removed from the water and must be released immediately. Effective 12:01 AM Wednesday, June 13 through 11:59 PM Saturday, June 30, 2018.
2-RS-1-21-18	June 19 8:00 AM	This emergency order opens the Russian River Sanctuary Area to sport fishing for sockeye salmon. Effective 8:00 AM Tuesday, June 19 through 11:59 PM Saturday, July 14, 2018.
2-KS-1-20-18	June 20 12:01 AM	This emergency order prohibits sport fishing for king salmon of all sizes in the Kenai River from its mouth upstream to an ADF&G marker approximately 300 yards downstream from the mouth of Slikok Creek, effective 12:01 AM Wednesday, June 20 through 11:59 PM Saturday, June 30, 2018. Sport fishing for king salmon of all sizes in the Kenai River is also prohibited from an ADF&G marker approximately 300 yards downstream from the mouth of Slikok Creek upstream to the outlet of Skilak Lake, effective 12:01 AM Wednesday, June 20 through 11:59 PM Tuesday, July 31, 2018.
2-KS-1-25-18	July 1 12:01 AM	This emergency order prohibits the use of bait while sportfishing in the Kenai River from its mouth upstream to an ADF&G marker located approximately 300 yards downstream from the mouth of Slikok Creek. Effective 12:01 AM Sunday, July 1 through 11:59 PM, Tuesday, July 31, 2018.

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Appendix A2.–Page 2 of 3.

Emergency order number	Effective date	Action and justification
2-RS-1-27-18	July 3 12:01 AM	This emergency order increases the bag and possession limits for salmon, other than king salmon, from 3 per day, 6 in possession to 6 per day, 12 in possession in that area of the Kenai River upstream from Skilak Lake to ADF&G markers located approximately 300 yards upstream of the public boat launch at Sportsman's Landing and the Russian River from its mouth upstream to an ADF&G marker located approximately 600 yards downstream from the Russian River Falls. Effective 12:01 AM Tuesday, July 3 through 11:59 PM Saturday, July 14, 2018.
2-KS-1-29-18	July 10 6:00 AM	This emergency order prohibits the retention of king salmon in the Kenai River personal use dip net fishery. Any king salmon caught incidentally may not be removed from the water and must be released immediately. Effective 6:00 AM Tuesday, July 10 through 11:59 PM, Tuesday, July 31, 2018.
2-KS-1-40-18	July 18 12:01 AM	This emergency order supersedes EO 2-KS-1-20-18 and EO 2-KS-1-25-18. This emergency order prohibits the retention of king salmon while sportfishing in the Kenai River from its mouth upstream to an ADF&G marker located approximately 300 yards downstream from the mouth of Slikok Creek. Only 1 unbaited, single-hook, artificial lure may be used. King salmon may not be retained or possessed, may not be removed from the water, and must be released immediately. Effective 12:01 AM Wednesday, July 18 through 11:59 PM Tuesday, July 31, 2018. The closure for sportfishing for king salmon in the Kenai River from an ADF&G marker located approximately 300 yards downstream from the mouth of Slikok Creek, upstream to an ADF&G marker located at the outlet of Skilak Lake is still in effect.
2-KS-1-41-18	July 18 12:01 AM	This emergency order prohibits the retention of king salmon while sportfishing in the Kasilof River downstream of the Sterling Highway bridge. Only 1, unbaited, single-hook, artificial lure may be used, and king salmon may not be retained or possessed, may not be removed from the water, and must be released immediately. Effective 12:01 AM Wednesday, July 18 through 11:59 PM Tuesday, July 31, 2018.
2-RS-1-45-18	July 30 12:01 AM	This emergency order closes the personal use dip net fishery at the mouth of the Kenai River. Effective 12:01 AM Monday, July 30 through 11:59 PM Tuesday, July 31, 2018.
2-RS-1-46-18	July 30 12:01 AM	This emergency order decreases the bag and possession limit for sockeye salmon 16 inches or longer from 3 per day, 6 in possession, to 1 per day, 2 in possession in the Kenai River from its mouth upstream to an ADF&G marker located at the outlet of Skilak Lake. Effective 12:01 AM Monday, July 30 through 11:59 PM Monday, December 31, 2018.
2-RS-1-49-18	August 4 12:01 AM	This emergency order supersedes EO 2-KS-1-46-18 and closes the Kenai River to fishing for sockeye salmon from its mouth upstream to the Sterling Highway bridge at the outlet of Kenai Lake, except those waters of the Upper Kenai River, Russian River and Russain River confluence areas remain open. Effective 12:01 AM Saturday, August 4 through 11:59 PM Monday, December 31, 2018.

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Appendix A2.–Page 3 of 3.

Emergency order number	Effective date	Action and justification
2-RS-1-50-18	August 4 12:01 AM	This emergency order increases the bag and possession limit for sockeye salmon 16 inches or longer, other than king salmon, from 3 per day, 3 in possession, to 6 per day, 12 in possession in all parts of the Kasilof River open to salmon fishing. No more than 2 per day and 2 in possession may be coho salmon. Effective 12:01 AM Saturday, August 4 through 11:59 PM Monday, December 31, 2018.
2-RS-1-58-18	August 23 12:01 AM	This emergency order rescinds EO 2-RS-1-49-18 and opens the Kenai River to sportfishing for sockeye salmon from its mouth upstream to the Sterling Highway bridge at the outlet of Kenai Lake and restores the bag limit to three fish, six in possession. Effective 12:01 AM Thursday, August 23 through 11:59 PM Saturday, December 31, 2018.

Source: B. H. Marston, Sport Fish Biologist, ADF&G, Soldotna, M. Miller, Management Coordinator, ADF&G, Anchorage, personal communication.

Note: “king salmon” is Chinook salmon in the regulatory language.

Appendix A3.–Emergency orders (EOs) issued for Northern Kenai Peninsula Management Area waters in 2019.

Emergency order number	Effective date	Action and justification
2-DV-1-03-19	January 1 12:01 AM	Prohibits the retention of Arctic char–Dolly Varden in Stormy Lake. Arctic char–Dolly Varden may not be retained or possessed, must be released immediately and may not be removed from the water. Effective 12:01 AM Tuesday, January 1 through 11:59 PM Tuesday, December 31, 2019.
2-NP-04-19	January 1 12:01 AM	This emergency order prohibits the retention of any species of fish in East Mackey Lake, West Mackey Lake, Sevena Lake, Union Lake, and Derks Lake. All species of fish caught must be released immediately. Effective 12:01 AM Tuesday, January 1 through 11:59 PM Tuesday, December 31, 2019.
2-KS-1-09-19	May 1 12:01 AM	This emergency order prohibits the retention of king salmon of all sizes in the Kenai River from the mouth upstream to the outlet of Skilak Lake. Retention of king salmon will remain prohibited July 1 through July 31, 2019 in waters of the Kenai River drainage from an ADF&G marker located approximately 300 yards downstream from the mouth of Slikok Creek, upstream to the outlet of Skilak Lake. Effective 12:01 AM Wednesday, May 1 through 11:59 PM Wednesday, July 31, 2019.
2-KS-1-10-19	May 1 12:01 AM	This emergency order restricts king salmon fishing in the Kasilof River. Specifically, it prohibits retention of naturally produced king salmon, reduces the bag and possession limit of hatchery-produced king salmon 20 inches or greater in length to 1 fish, and limits sport fishing gear to 1 unbaited, single-hook, artificial lure in the Kasilof River. Naturally produced king salmon may not be removed from the water and must be released immediately. Effective 12:01 AM Wednesday, May 1 through 11:59 PM Sunday, June 30, 2019.
2-RS-1-18-19	June 12 8:00 AM	This emergency order opens the Russian River Sanctuary Area to sport fishing for sockeye salmon. Effective 8:00 AM Wednesday, June 12 through 11:59 PM Sunday, July 14, 2019.
2-RS-1-19-19	June 14 12:01 AM	This emergency order increases the bag and possession limits for salmon, other than king salmon, from 3 per day, 6 in possession to 6 per day, 12 in possession in that area of the Kenai River upstream from Skilak Lake to ADF&G markers located approximately 300 yards upstream of the public boat launch at Sportsman's Landing and the Russian River from its mouth upstream to an ADF&G marker located approximately 600 yards downstream from the Russian River Falls. Effective 12:01 AM Friday, June 14 through 11:59 PM Sunday, July 14, 2019.
2-RS-1-21-19	June 19 12:01 AM	This emergency order supersedes E.O. 2-RS-1-19-19 and increases the bag and possession limits for salmon, other than king salmon to 9 per day, 18 in possession in that area of the Kenai River upstream from Skilak Lake to ADF&G markers located approximately 300 yards upstream of the public boat launch at Sportsman's Landing and the Russian River from its mouth upstream to an ADF&G marker located approximately 600 yards downstream from the Russian River Falls. Effective 12:01 AM Wednesday, June 19 through 11:59 PM Sunday, July 7, 2019.

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Emergency order number	Effective date	Action and justification
2-KS-1-22-19	July 1 12:01 AM	This emergency order prohibits the use of bait and multiple hooks while sportfishing in the Kasilof River downstream of the Sterling Highway Bridge. Effective 12:01 AM Monday, July 1 through 11:59 PM, Wednesday, July 31, 2019.
2-KS-1-23-19	July 1 12:01 AM	This emergency order prohibits the use of bait while sportfishing in the Kenai River from its mouth upstream to an ADF&G marker located approximately 300 yards downstream from the mouth of Slikok Creek. Effective 12:01 AM Monday, July 1 through 11:59 PM, Wednesday, July 31, 2019.
2-KS-1-29-19	July 4 12:01 AM	This emergency order rescinds E.O. 2-KS-1-09-19 and restores normal regulations that allow the retention of king salmon less than 36 inches in total length from an ADF&G marker located approximately 300 yards downstream from the mouth of Slikok Creek upstream to an ADF&G marker located at the outlet of Skilak Lake. Effective 12:01 AM Thursday, July 4 through 11:59 PM Wednesday, July 31, 2019.
2-KS-1-30-19	July 10 6:00 AM	This emergency order prohibits the retention of king salmon in the Kenai River personal use dip net fishery. Any king salmon caught incidentally may not be removed from the water and must be released immediately. Effective 6:00 AM Wednesday, July 10 through 11:59 PM, Wednesday, July 31, 2019.
2-RS-1-36-19	July 24 12:01 AM	This emergency order expands the personal use salmon dipnet fishing area on the Kasilof River from the shore from ADF&G markers located on Cook Inlet beaches outside the terminus of the river upstream to the Sterling Highway Bridge and from a boat from ADF&G markers located on Cook Inlet beaches outside the terminus of the river, upstream to ADF&G markers placed at approximately river mile 3. Effective 12:01 AM Wednesday, July 24 through 11:59 PM Wednesday, August 7, 2019.
2-RS-1-37-19	July 24 12:01 AM	This emergency order increases the bag and possession limit for sockeye salmon 16 inches or longer from 3 per day, 6 in possession, to 6 per day, 12 in possession, in all portions of the Kasilof River open to salmon fishing. No more than two salmon per day and two in possession may be coho salmon. Effective 12:01 AM Wednesday, July 24 through 11:59 p.m. Tuesday, December 31, 2019.
2-RS-1-41-19	July 27 11:00 PM	This emergency order increases the hours that salmon may be taken by dip net in the personal use fishery at the mouth of the Kenai River to 24 hours per day. Effective 11:00 PM Saturday, July 27 through 11:59 PM Wednesday, July 31, 2019.
2-RS-1-42-19	July 26 12:01 AM	This emergency order increases the bag and possession limit for salmon 16 inches or longer, other than king salmon and coho salmon, from 3 per day, 6 in possession, to 6 per day, 12 in possession in the Kenai River from its mouth upstream to an ADF&G marker located at the outlet of Skilak Lake. Effective 12:01 AM Sunday, July 26 through 11:59 PM Tuesday, December 31, 2019.

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Emergency order number	Effective date	Action and justification
2-KS-1-44-19	August 15 12:01 AM	This emergency order prohibits the use of bait and limits sport fishing gear to 1, unbaited, single-hook, artificial lure while sport fishing in the Kenai River from its mouth upstream to Skilak Lake. Effective 12:01 AM Tuesday, August 6 through 11:59 PM Thursday, August 15, 2019.

Source: C. Lipka, Sport Fish Biologist, ADF&G, Soldotna, M. Miller, Management Coordinator, ADF&G, Anchorage, personal communication.

Note: “king salmon” is Chinook salmon in the regulatory language.

**APPENDIX B: KENAI RIVER EARLY- AND LATE-RUN
ALL-SIZE CHINOOK SALMON POPULATION DATA**

Appendix B1.—Kenai River early-run all-sized Chinook salmon population data, 1986–2016.

Year	Cook Inlet marine harvest ^a	Misc. marine ^b	Kenaitze educational harvest ^c	Inriver run ^d	Sport harvest above sonar ^e	Catch- and- release mortality	Spawning escapement	Total run	Harvest rate
1986	144	0	ND	20,100	8,156	242	11,702	20,244	0.41
1987	181	0	ND	21,750	13,557	306	7,887	21,931	0.63
1988	212	0	ND	19,800	15,209	340	4,251	20,012	0.77
1989	193	0	73	12,290	8,394	149	3,747	12,556	0.69
1990	235	0	40	9,842	1,807	378	7,657	10,117	0.21
1991	241	0	2	10,620	1,945	152	8,523	10,863	0.20
1992	300	0	73	11,930	2,241	236	9,453	12,303	0.21
1993	407	0	118	12,490	9,342	286	2,862	13,015	0.76
1994	343	0	56	13,160	8,171	285	4,704	13,559	0.63
1995	412	0	37	12,890	10,217	357	2,316	13,339	0.80
1996	235	0	104	9,764	6,623	287	2,854	10,103	0.69
1997	282	0	122	11,140	6,429	349	4,362	11,544	0.59
1998	289	0	131	11,930	1,170	254	10,506	12,350	0.13
1999	245	0	114	13,480	8,129	261	5,090	13,839	0.61
2000	239	0	124	10,790	1,818	185	8,787	11,153	0.20
2001	184	0	198	14,020	2,399	204	11,417	14,402	0.19
2002	168	0	48	10,860	899	78	9,883	11,076	0.10
2003	202	0	126	20,450	2,839	389	17,222	20,778	0.15
2004	194	0	72	23,460	3,386	257	19,817	23,726	0.15
2005	187	341	76	20,810	3,810	253	16,747	21,414	0.21
2006	252	0	65	18,180	4,693	205	13,282	18,497	0.27
2007	201	41	16	13,630	3,493	220	9,917	13,888	0.27
2008	107	102	40	10,210	3,500	123	6,587	10,459	0.36
2009	71	16	49	7,741	1,466	97	6,178	7,877	0.20
2010	88	48	32	5,874	1,336	90	4,448	6,042	0.25
2011	110	0	42	7,366	1,337	92	5,937	7,518	0.20
2012	48	0	19	3,228	316	10	2,902	3,295	0.12
2013	102	0	11	4,530	0	5	4,525	4,643	0.02
2014	78	18	1	5,776 ^f	0	0	5,776	5,873	0.02
2015	78	72	10	6,190 ^g	0	0	6,190	6,350	0.03
2016	41	24	4	9,866 ^g	99	19	9,690	9,935	0.02
Average									
2007–2016	92	32	22	7,441	1,155	66	6,215	7,588	0.15
1986–2016	196	21	64	12,392	4,283	197	7,910	12,668	0.33

Source: Statewide Harvest Surveys from Mills (1987-1994), Howe et al. (1995, 1996), and Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>. Other data sources are Alexandersdottir and Marsh (1990); Nelson et al. (1999); Hammarstrom and Timmons (2001a); Reimer et al. (2002); Reimer (2003, 2004a–b, 2007); Eskelin (2007, 2009, 2010); Perschbacher (2012a–d, 2014, 2015); McKinley and Fleischman (2013); Perschbacher and Eskelin (2016); and A. Eskelin, Sport Fish Biologist, ADF&G, Soldotna, personal communication; 1994–2016 Educational data, Kenaitze Indian Tribe.

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- ^a Cook Inlet marine sport harvest; calculated as 5% of total Cook Inlet marine sport harvest.
- ^b 60% of commercial cost-recovery harvest and eastside setnet harvest before 25 June.
- ^c Prior to 1994, there was no educational fishery; this was considered a subsistence fishery.
- ^d Estimates for 1986–2009 are based on a run reconstruction model, McKinley and Fleischman (2013); unexpanded estimates for 2010–2012 published in Miller et al. (2013–2015). Estimates for 1986–2012 are sonar estimates at RM 8.6 expanded by the inverse of proportion midriver.
- ^e Includes creel survey estimates for the area from Cook Inlet to the Soldotna Bridge and estimates from the SWHS from the Soldotna Bridge to the outlet of Kenai Lake.
- ^f Estimate of inriver run for 2013 based on RM 13.7 ARIS sonar estimate of fish greater than or equal to 750 mm plus estimate of number of fish less than 750 mm based on weir data and radio telemetry.
- ^g Preliminary ARIS sonar estimates at RM 13.7 for 2014–2015. Values subject to change until sonar report is published.

Appendix B2.—Kenai River late-run all-sized Chinook salmon population data, 1986–2016.

Year	Cook Inlet marine harvest ^a	Eastside setnet harvest ^b	Drift gillnet harvest ^c	Kenaitze educational harvest	Subsistence	Personal use dipnet ^d	Sport harvest below sonar ^e	Inriver run ^f	Sport harvest above sonar ^g	Catch- and- release mortality ^h	Spawning escapement	Total run	Harvest rate
1986	378	13,767	1,100	ND	ND	ND	ND	62,740	9,872	316	52,552	77,986	0.32
1987	731	14,693	2,731	ND	ND	235	ND	63,550	13,100	123	50,327	81,940	0.38
1988	892	8,929	1,342	ND	ND	0	ND	61,760	19,695	176	41,889	72,923	0.42
1989	821	7,579	0	ND	22	0	ND	36,370	9,691	88	26,591	44,792	0.40
1990	963	2,874	373	ND	13	ND	ND	34,200	6,897	69	27,234	38,423	0.29
1991	1,023	3,398	148	ND	288	ND	ND	38,940	7,903	16	31,021	43,797	0.29
1992	1,269	7,443	369	ND	402	0	ND	42,290	7,556	234	34,500	51,773	0.33
1993	1,700	9,776	459	ND	27	0	ND	50,210	17,775	478	31,957	62,172	0.48
1994	1,121	10,815	278	1	392	ND	ND	47,440	17,837	572	29,031	60,048	0.51
1995	1,241	8,380	356	3	ND	712	ND	44,770	12,609	472	31,689	55,462	0.42
1996	1,223	8,030	233	1	ND	295	ND	42,790	8,112	337	34,341	52,572	0.34
1997	1,759	7,864	376	20	ND	364	ND	41,120	12,755	570	27,795	51,503	0.45
1998	1,070	3,532	201	2	ND	254	ND	47,110	7,515	595	39,000	52,169	0.24
1999	602	6,571	345	4	ND	488	1,170	43,670	12,425	682	30,563	52,850	0.41
2000	631	2,558	162	6	ND	410	831	47,440	14,391	499	32,550	52,038	0.36
2001	552	4,173	371	8	ND	638	1,336	53,610	15,144	825	37,641	60,688	0.37
2002	256	6,582	249	6	ND	606	1,929	56,800	10,678	665	45,457	66,428	0.31
2003	120	10,284	744	11	ND	1,016	823	85,110	16,120	1,803	67,187	98,108	0.30
2004	996	15,057	662	10	ND	792	2,386	79,690	14,988	1,019	63,683	99,594	0.35
2005	624	14,997 ⁱ	1,175	11	ND	997	2,287	77,440	15,927	1,267	60,246	97,531	0.37
2006	563	6,913 ⁱ	1,669	11	ND	1,034	3,322	62,270	12,490	830	48,950	75,783	0.34
2007	478	8,536 ⁱ	547	6	0	1,509	1,750	47,370	9,690	670	37,010	60,196	0.37
2008	310	5,259 ⁱ	392	15	0	1,362	1,011	42,840	10,128	370	32,342	51,188	0.36
2009	154	3,880	515	4	0	1,189	1,132	29,940	7,904	626	21,410	36,815	0.40
2010	335	4,611	323	21	0	865	445	18,401	6,762	264	11,375	25,001	0.53
2011	528	5,144	356	5	0	1,243	458	23,713	6,894	479	16,340	31,447	0.47
2012	30	490	131	0	0	40	2	21,613	101	95	21,417	22,305	0.04
2013	369	2,293	296	8	0	11	37	19,931	512	77	19,342	22,945	0.15

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Year	Cook Inlet marine harvest ^a	Eastside setnet harvest ^b	Drift gillnet harvest ^c	Kenaitze educational harvest	Subsistence	Personal use dipnet ^d	Sport harvest below sonar ^e	Inriver run ^f	Sport harvest above sonar ^g	Catch-and-release mortality ^h	Spawning escapement	Total run	Harvest rate
2014	591	1,405	229	1	0	0	4	17,815	293	71	17,451	20,045	0.13
2015	500	6,007	334	10	0	66	392	24,694	1,823	229	22,642	32,003	0.29
2016	36	4,972	383	6	1	638	3,712	27,035	1,012	116	22,420	32,432	0.31
Average													
2007–2016	333	4,260	351	8	0	692	894	27,335	4,512	300	22,175	33,438	0.30
1986–2016	705	6,994	544	7	72	547	1,279	44,925	9,955	472	34,386	54,289	0.35

Source: Statewide Harvest Surveys from Mills (1987–1994), Howe et al. (1995, 1996), and Alaska Sport Fishing Survey database [Internet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 2018). Available from: <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>. Other sources of data from Hammarstrom and Timmons (2001b); Brannian and Fox (1996); Ruesch and Fox (1996); Reimer and Sigurdsson (2004); Dunker and Lafferty (2007); Dunker (2010, 2013, 2018); Shields and Frothingham (2018); Fleischman and McKinley (2013); K. J. Dunker, Sport Fish Biologist, ADF&G, Anchorage, personal communication; J. Perschbacher, Sport Fish Biologist, ADF&G, Soldotna, personal communication; T. McKinley, Sport Fish Biologist, ADF&G, Anchorage, personal communication; R. Begich, Sport Fish Biologist, ADF&G, Soldotna, personal communication.

^a 60% of SWHS estimates of Cook Inlet marine sport harvest after 24 June.

^b Estimates for 1986–2009 are from Fleischman and McKinley (2013). Estimates for 2010–2015 from Eskelin et al. (2013b), Eskelin and Barclay (2015, 2016).

^c Estimates for 1986–2009 are from Fleischman and McKinley (2013). Estimates for 2010–2015 are from ESSN GSI allocation.

^d Estimates for 1986–1994 from SWHS, estimates for 1995 are from Ruesch and Fox (1996), estimates for 1996–present are from returned permits.

^e Creel survey estimates are from below RM 8.6 prior to 2013 and below RM 13.7 since 2013.

^f Estimates for 1986–2009 inriver run are model derived RM 8.6 estimates from Fleischman and McKinley (2013). Estimates for 2010–2012 inriver run are RM 8.6 sonar estimates published in Miller et al. (2013–2015) and expanded by inverse of proportion midriver. Estimates for 2013–2015 inriver run are preliminary Adaptive Resolution Imaging Sonar (ARIS) estimates at RM 13.7 plus spawning downstream of RM 13.7 based on radio telemetry. Values for 2013–2015 are subject to change prior to publishing.

^g Creel survey and SWHS estimates are from above RM 8.6 sonar prior to 2013 and above RM 13.7 sonar since 2013.

^h Some catch-and-release mortality (usually less than 100 fish) occurs below the sonar and is not counted towards escapement.

ⁱ Harvest estimate does not include Kasilof River terminal fishery which occurred 2005–2008, 2015.

**APPENDIX C: ESTIMATED AGE AND SEX COMPOSITION
OF SOCKEYE SALMON AT RUSSIAN RIVER WEIR,
2017–2019**

Appendix C1.—Estimated age and sex composition and length-at-age of early-run sockeye salmon at the Russian River weir, 2017.

Sex	Statistic	Age (freshwater ocean years)					Total
		1.2	1.3	2	2.2	2.3	
Female							
	Sample size	12	19	0	4	72	107
	Percent	6.3	9.9	0.0	2.1	37.7	56.0
	SE (percent)	1.8	2.2	0.0	1.0	3.5	3.6
	Escapement	1310	2,058	0	437	7,837	20,789
	SE (escapement)	366	451	0	216	732	748
	Mean length (mm)	537	583	0	570	583	577
	SE (mean length)	5.8	4.5	0.0	8.9	2.1	2.2
Male							
	Sample size	5	16	0	5	58	84
	Percent	2.6	8.4	0.0	2.6	30.4	44.0
	SE (percent)	1.2	2.0	0.0	1.2	3.3	3.6
	Escapement	425	1,372	0	425	4,966	16,334
	SE (escapement)	189	328	0	189	546	588
	Mean length (mm)	551	590	0	560	581	580
	SE (mean length)	7.8	3.9	0.0	4.5	1.8	1.8
Combined							
	Sample size	17	35	0	9	130	191
	Percent	8.9	18.3	0.0	4.7	68.1	100
	SE (percent)	2.1	2.8	0.0	1.5	3.4	NA
	Escapement	3,304	6,794	0	1,745	25,281	37,123
	SE (escapement)	768	1,043	0	572	1,255	NA
	Mean length (mm)	541	586	0	564	582	578
	SE (mean length)	4.8	3.0	0.0	4.7	1.4	1.5

Source: S. Simons, Fish and Wildlife Technician III ADF&G, Soldotna, unpublished data, 2017.

Note: NA means not applicable.

Appendix C2.—Estimated age and sex composition and length-at-age of late-run sockeye salmon at Russian River weir, 2017.

	Age (freshwater ocean years)								Total
	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	
Female									
Sample size	0	2	7	0	51	27	0	0	87
Percent	0.0	1.1	3.8	0.0	27.9	14.8	0.0	0.0	47.6
SE (percent)	0.0	0.8	1.4	0.0	3.3	2.6	0.0	0.0	3.7
Escapement	0	198	684	0	5,025	2,666	0	0	18,010
SE (escapement)	0	139	256	0	598	474	0	0	666
Mean length (mm)	0	540	578	0	531	570	0	0	547
SE (mean length)	0.0	5.0	6.6	0.0	3.4	2.7	0.0	0.0	3.1
Male									
Sample size	5	4	11	31	24	21	0	0	96
Percent	2.7	2.2	6.0	16.9	13.1	11.5	0.0	0.0	52.5
SE (percent)	1.2	1.1	1.8	2.8	2.5	2.4	0.0	0.0	3.7
Escapement	536	437	1,192	3,357	2,602	2,284	0	0	19,864
SE (escapement)	240	215	350	552	497	469	0	0	735
Mean length (mm)	407	518	579	402	535	581	0	0	500
SE (mean length)	5.6	15.5	5.4	3.4	6.6	3.0	0.0	0.0	8.3
Combined									
Sample size	5	6	18	31	75	48	0	0	183
Percent	2.7	3.3	9.8	16.9	41.0	26.2	0.0	0.0	100.0
SE (percent)	1.2	1.3	2.2	2.8	3.7	3.3	0.0	0.0	NA
Escapement	1,022	1,249	3,708	6,394	15,513	9,913	0	0	37,837
SE (escapement)	458	499	836	1,052	1,381	1,233	0	0	NA
Mean length (mm)	407	525	578	402	532	575	0	0	522
SE (mean length)	5.6	11.0	4.1	3.4	3.1	2.1	0.0	0.0	4.9

Source: S. Simons, Fish and Wildlife Technician III, ADF&G, Soldotna, unpublished data, 2017.

Note: NA means not applicable.

Appendix C3.—Estimated age and sex composition and length-at-age of early-run sockeye salmon at Russian River weir, 2018.

	Age (freshwater ocean years)						Total
	1.2	1.3	2.1	2.2	2.3	2.4	
Female							
Sample size	18	35	0	38	7	0	98
Percent	9.5	18.5	0.0	20.1	3.7	0.0	51.8
SE (percent)	2.1	2.8	0.0	2.9	1.4	0.0	3.6
Escapement	2171	4,227	0	4,593	845	0	22,849
SE (escapement)	489	647	0	667	315	0	832
Mean length (mm)	541	573	0	545	591	0	558
SE (mean length)	3.1	2.7	0.0	2.2	6.9	0.0	2.2
Male							
Sample size	12	53	0	20	5	1	91
Percent	6.3	28.0	0.0	10.6	2.6	0.5	48.0
SE (percent)	1.8	3.3	0.0	2.2	1.2	0.5	3.6
Escapement	1,334	5,928	0	2,244	550	0	21,173
SE (escapement)	377	694	0	474	248	0	771
Mean length (mm)	545	581	0	537	589	590	567
SE (mean length)	4.7	2.2	0.0	2.8	6.6	0.0	2.7
Combined							
Sample size	30	88	0	58	12	1	189
Percent	15.9	46.6	0.0	30.7	6.3	0.5	100
SE (percent)	2.7	3.6	0.0	3.4	1.8	0.5	NA
Escapement	7,013	20,555	0	13,542	2,779	0	44,110
SE (escapement)	1,178	1,606	0	1,482	785	0	NA
Mean length (mm)	543	578	0	542	590	590	562
SE (mean length)	2.6	1.7	0.0	1.8	4.7	0.0	1.8

Source: S. Simons, Fish and Wildlife Technician III, ADF&G, Soldotna, unpublished data, 2018.

Note: NA means not applicable.

Appendix C4.—Estimated age and sex composition and length-at-age of late-run sockeye salmon enumerated at the Russian River weir, 2018.

		Age (freshwater ocean years)							Total	
		1.1	1.2	1.3	2.1	2.2	2.3	3.1		3.2
Female										
	Sample size	0	30	7	2	87	9	0	0	135
	Percent	0.0	10.7	2.5	0.7	31.1	3.2	0.0	0.0	48.2
	SE (percent)	0.0	1.9	0.9	0.5	2.8	1.1	0.0	0.0	3.0
	Escapement	0	3,664	856	240	10,651	1,096	0	0	34,247
	SE (escapement)	0	634	318	171	949	363	0	0	1,024
	Mean length (mm)	0	518	560	435	521	557	0	0	523
	SE (mean length)	0.0	4.6	5.0	5.0	2.3	9.6	0.0	0.0	2.4
Male										
	Sample size	2	22	8	61	48	4	0	0	145
	Percent	0.7	7.9	2.9	21.8	17.1	1.4	0.0	0.0	51.8
	SE (percent)	0.5	1.6	1.0	2.5	2.3	0.7	0.0	0.0	3.0
	Escapement	258	2,908	1,067	8,023	6,294	515	0	0	36,805
	SE (escapement)	184	593	368	909	832	261	0	0	1,100
	Mean length (mm)	390	514	584	412	521	583	0	0	477
	SE (mean length)	5.0	6.3	9.0	4.3	4.7	9.2	0.0	0.0	5.7
Combined										
	Sample size	2	52	15	63	135	13	0	0	280
	Percent	0.7	18.6	5.4	22.5	48.2	4.6	0.0	0.0	100.0
	SE (percent)	0.5	2.3	1.4	2.5	3.0	1.3	0.0	0.0	NA
	Escapement	497	13,216	3,837	15,987	34,247	3,268	0	0	71,052
	SE (escapement)	355	1,656	959	1,776	2,124	895	0	0	NA
	Mean length (mm)	390	516	573	412	521	565	0	0	500
	SE (mean length)	5.0	3.7	6.1	4.2	2.3	7.8	0.0	0.0	3.5

Source: S. Simons, Fish and Wildlife Technician III, ADF&G, Soldotna, unpublished data, 2018.

Note: NA means not applicable.

Appendix C5.—Preliminary estimated age and sex composition and length-at-age of early-run sockeye salmon at Russian River weir, 2019.

		Age (freshwater ocean years)					Total
		1.2	1.3	2.1	2.2	2.3	
Female							
	Sample size	12	146	0	10	76	244
	Percent	2.6	31.2	0.0	2.1	16.2	52.1
	SE (percent)	0.7	2.1	0.0	0.7	1.7	2.3
	Escapement	1706	20,472	0	1,378	10,630	65,616
	SE (escapement)	479	1,404	0	440	1,122	1,516
	Mean length (mm)	554	576	0	553	579	575
	SE (mean length)	4.9	1.5	0.0	7.5	2.0	1.2
Male							
	Sample size	27	105	0	27	65	224
	Percent	5.8	22.4	0.0	5.8	13.9	47.9
	SE (percent)	1.1	1.9	0.0	1.1	1.6	2.3
	Escapement	3,499	13,513	0	3,499	8,385	60,326
	SE (escapement)	652	1,164	0	652	965	1,394
	Mean length (mm)	576	581	0	568	581	579
	SE (mean length)	2.8	1.6	0.0	4.1	2.0	1.2
Combined							
	Sample size	39	251	0	37	141	468
	Percent	8.3	53.6	0.0	7.9	30.1	100
	SE (percent)	1.3	2.3	0.0	1.3	2.1	NA
	Escapement	10,453	67,505	0	9,949	37,909	125,942
	SE (escapement)	1,612	2,909	0	1,574	2,670	NA
	Mean length (mm)	569	578	0	564	580	577
	SE (mean length)	2.9	1.1	0.0	3.7	1.4	0.8

Source: S. Simons, Fish and Wildlife Technician III, ADF&G, Soldotna, unpublished data, 2019.

Note: NA means not applicable.

Appendix C6.—Preliminary estimated age and sex composition and length-at-age of early-run sockeye salmon at Russian River weir, 2019.

	Age (freshwater ocean years)								Total
	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	
Female									
Sample size	0	43	21	1	27	6	0	0	98
Percent	0.0	18.9	9.2	0.4	11.8	2.6	0.0	0.0	43.0
SE (percent)	0.0	2.6	1.9	0.4	2.1	1.1	0.0	0.0	3.3
Escapement	0	5,249	2,555	111	3,277	722	0	0	27,772
SE (escapement)	0	722	533	122	594	294	0	0	914
Mean length (mm)	0	519	559	440	531	568	0	0	533
SE (mean length)	0.0	2.6	3.2	0.0	3.9	7.9	0.0	0.0	2.7
Male									
Sample size	36	38	19	15	18	4	0	0	130
Percent	15.8	16.7	8.3	6.6	7.9	1.8	0.0	0.0	57.0
SE (percent)	2.4	2.5	1.8	1.7	1.8	0.9	0.0	0.0	3.3
Escapement	5,817	6,148	3,056	2,430	2,908	663	0	0	36,813
SE (escapement)	891	909	674	607	659	320	0	0	1211
Mean length (mm)	406	507	560	410	522	579	0	0	480
SE (mean length)	3.6	8.2	5.6	6.4	8.0	4.3	0.0	0.0	6.2
Combined									
Sample size	36	81	40	16	45	10	0	0	228
Percent	15.8	35.5	17.5	7.0	19.7	4.4	0.0	0.0	100.0
SE (percent)	2.4	3.2	2.5	1.7	2.6	1.4	0.0	0.0	NA
Escapement	10,204	22,928	11,302	4,521	12,723	2,842	0	0	64,585
SE (escapement)	1,563	2,054	1,628	1,098	1,705	878	0	0	NA
Mean length (mm)	406	513	560	412	527	573	50	0	503
SE (mean length)	3.6	4.1	3.1	6.3	4.0	5.1	0.0	0.0	4.1

Source: S. Simons, Fish and Wildlife Technician III, ADF&G, Soldotna, unpublished data, 2019.

Note: NA means not applicable.

**APPENDIX D: HISTORY OF REGULATORY CHANGES
FOR THE KENAI RIVER RAINBOW TROUT SPORT
FISHERY**

Appendix D1.—History of regulations adopted by the Alaska Board of Fisheries for the Kenai River rainbow trout sport fishery.

Year	Extent	Type of regulatory change	Detail
1959–1964	Areawide	Season	Spring closure from April 1 to about May 26.
		Bag limit	Combined trout/char/grayling/salmon under 16 inches: 10/day, only 2 over 20 inches.
1965–1977	Kenai River	Season	Changes to no closed season.
1978	Areawide	Daily bag limit	Combined trout/char/grayling/salmon under 16 inches: 10/day, only 1 over 20 inches.
1979	Areawide	Annual bag limit	Harvest record required for rainbow/steelhead trout over 20 inches, only 2/year.
1980–1981	Areawide	Annual bag limit	Increased to 5 rainbow/steelhead trout over 20 inches.
	Kenai River	Gear restriction	In flowing waters upstream from the Moose River to Kenai Lake only single-hook, artificial lures allowed from January 1 to May 31.
1982–1983	Kenai River	Season	Spring closure from January 1 to June 14 (excludes Skilak Lake).
	Areawide	Bag limit	Changed to 5 rainbow trout with only 1 over 20 inches.
1984–1986	Kenai River	Season	Spring and fall closure from November 1 to June 14 (includes Skilak Lake).
	Kenai River	Bag limit	Changed to 3/day, only 1 over 20 inches.
	Areawide	Annual bag limit	Rainbow/steelhead trout over 20 inches—changed to 2/year.
	Kenai River	Gear restriction	In addition to spring single-hook, artificial lure restriction, only artificial lures may be used between Skilak and Kenai lakes from January 1 to December 31.
1987–1988	Kenai River	Season	Spring and fall closure from November 1 through June 14 (includes Skilak Lake).
	Kenai River	Bag limit	Reduced to 2/day; 1 daily over 20 inches.
	Areawide	Annual bag limit	Rainbow/steelhead trout over 20 inches—remained at 2/year.
	Kenai River	Gear restriction	Artificial lures only upstream from Skilak to Kenai Lake. Single hook restriction repealed. No bait permitted in Skilak Lake and in the Kenai River downstream to Moose River from November 1 through May 31.
1989–1990	Kenai River	Area and size	Between Skilak and Kenai lakes designated a trophy trout area. Only trout 20 inches or larger could be retained.
	Areawide	Bag limit	Susitna-West Cook Inlet annual limit remained at 2 trout over 20 inches.
	Kenai River	Gear restriction	Terminal tackle in upper Kenai River limited to single-hook artificial lures.
1991	Kenai River	Area and size	Trophy trout area extended to include half-mile radius of Skilak Lake inlet. Minimum length of trophy trout increased to 24 inches.
1993	Kenai River	Area and size	The trophy trout area was closed to all fishing from April 15 through June 10. Length at which a trout in the trophy trout area could be retained increased to 30 inches.
	Kenai River	Bag limit	Bag and possession limits for trout in Skilak Lake and the Kenai River downstream from Skilak Lake were reduced to 1 fish.

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Year	Extent	Type of regulatory change	Detail
1997	Kenai River	Area	Former trophy trout area becomes catch-and-release area. Area extended 1/4 mile into Kenai Lake. No retention of trout permitted in this area and no retention permitted in the flowing waters upstream of Kenai Lake.
	Kenai River	Season	Trout season in all waters of the Kenai River drainage is now June 15 through April 15.
	Killey River	Area	All flowing waters upstream of the Upper Killey River closed to all fishing from April 15 through June 14.
	Kenai Lake and tributary lakes	Bag limit	From June 15 through October 31 in all lakes tributary to Kenai Lake supporting wild trout, the bag and possession limits are 2 trout, only 1 of which may be 20 inches or greater.
	Areawide	Bag limit	From November 1 through April 14 the bag and possession limits in lakes supporting wild trout are 5; only 1 may be 20 inches or greater. The bag and possession limits were not changed in stocked lakes.
1998	Kenai River	Gear restriction	The use and placement of beads was regulated in all flowing waters of the Kenai River drainage. Beads must be either fixed to the line or hook, or be free moving on the line or leader. A bead not attached to the hook was defined as an attractor, not a fly.
	Slikok Creek	Season	In Slikok Creek a tributary of the lower Kenai River, the fishing season for rainbow trout was established as August 16 through April 14.
2002	Kenai River	Bag limit	Established a maximum size limit of less than 18 inches in all waters of the Kenai River from the mouth of the Moose River upstream to Skilak Lake with a limit of 1 daily/1 in possession. Allowed the use of beads fixed on the line within 2 inches of fly, lure, or hook throughout the drainage and clarified the single-hook regulation to mean one single hook.
2005	Kenai River	Bag limit	Rescinded the catch-and-release only regulation for rainbow trout in the upper Kenai River area by establishing a bag limit for rainbow trout of 1 day/1 in possession under a maximum size limit of less than 16 inches in flowing waters of the Kenai River drainage above Skilak Lake (upper river) and established a bag limit of rainbow trout 1 daily/1 in possession under a maximum size limit of less than 18 inches in all waters of the Kenai River downstream of and including Skilak Lake.
	Kenai River	Season	The spring spawning seasonal closure was aligned throughout the drainage, designated from May 2 through June 10.
	Moose River	Bag limit	Reduced the bag limit in the Moose River drainage lakes and ponds from 5 day/5 in possession to 2 day/2 in possession and in flowing waters of the Moose River drainage from 2 day/2 in possession to 1 day/1 in possession under a maximum size limit of less than 18 inches.
2008	Kenai River	Area	Skilak Lake outlet downstream to the Upper Killey River closed to all fishing from May 2 through June 10.

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Year	Extent	Type of regulatory change	Detail
2014	Kenai River	Area	From the mouth of the Kenai River upstream to ADFG markers one mile upstream of Lower Killey River, open entire year. From one mile upstream of the Lower Killey River upstream to Skilak Lake, including Skilak Lake, open June 11 through May 1.
2017	Kenai River	Season and Size	Regulations adopted for aligning spring rainbow trout spawning closure dates for the Kenai River drainage (excluding Skilak and Kenai lakes). Sport fishing closed from May 1 through June 10 from the ADFG markers 1 mile upstream of Lower Killey River and tributaries. Rescinded size restriction for the lower Kenai River and established maximum size limit of 16 inches.
	Swanson River	Season	Swanson River rainbow trout spawning closure aligned with Kenai River drainage.