Regional Operational Plan SF.2A.2018.09

Operational Plan: Kenai River Chinook Salmon Creel Survey and Inriver Netting Study, 2018–2020

by

Jeff Perschbacher

May 2018

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

Symbols and Abbreviations

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

Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Mathematics, statistics

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

REGIONAL OPERATIONAL PLAN SF.2A.2018.09

OPERATIONAL PLAN: KENAI RIVER CHINOOK SALMON CREEL SURVEY AND INRIVER NETTING STUDY, 2018–2020

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Approval

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ABSTRACT

A creel survey will be conducted to estimate sport angler effort, catch, and harvest of large (≥75 cm mid eye to tail fork [METF] length) early- and late-run Chinook salmon in the lower Kenai River between the Warren Ames Bridge (river mile [RM] 5.1) and Slikok Creek (RM 18.9). Creel survey estimates will be geographically stratified in relation to the RM 13.7 Kenai River Chinook salmon sonar to provide angler effort, and the catch and harvest of large Chinook salmon. A standardized inriver netting study will be conducted in the Kenai River at RM 8.6 to index abundance and estimate the age, sex, and length (ASL) composition of large early- and late-run Chinook salmon. Inseason estimates of Chinook salmon catch and harvest, used in conjunction with sonar passage estimates, and inseason catch rates and the lengths of returning Chinook salmon from the inriver netting study are used by fisheries managers for inseason management decisions to achieve escapement goals. This plan covers the creel survey and inriver netting studies for the 2018–2020 seasons.

Key words: Kenai River, *Oncorhynchus tshawytscha*, Chinook salmon, creel survey, effort, harvest, gillnet, CPUE, age composition, tangle net

INTRODUCTION

PURPOSE

The management plans for early-run and late-run Kenai River Chinook salmon, adopted by the Alaska Board of Fisheries (BOF), require timely predictions of escapement for inseason management. The primary goal of the creel survey is to estimate sport angler effort, and the catch and harvest of large Kenai River Chinook salmon (*Oncorhynchus tshawytscha*)[1]. "Large" is defined as a Chinook salmon measuring ≥75 cm mid eye to tail fork (METF) length or ≥34 inches total length (TL). Sport harvest and catch-and-release mortality estimates occurring upstream of the RM 13.7 Chinook salmon sonar are deducted from sonar passage estimates to monitor inseason escapement. Alaska Department of Fish and Game (ADF&G) managers use these data to determine if restrictions or liberalizations to regulations are warranted to achieve escapement goals. The primary goal of the inriver netting project is to collect Chinook salmon age, sex, and length (ASL) data and to index inseason abundance of large Kenai River Chinook salmon. Escapement estimates provided by the creel survey and RM 13.7 sonar, and ASL data collected by both the creel survey and inriver netting study, are critical to management for maintaining sustained yield and fishing opportunities for Kenai River Chinook salmon.

BACKGROUND

The Kenai River (Figure 1) is one of the largest and most intensively managed sport fisheries in Alaska (Jennings et al. 2015). Anglers fish for Chinook salmon (*Onchorhynchus tshawytscha*) during mid-May through July, sockeye salmon (*O. nerka*) from June through early August, coho (*O. kisutch*) and pink salmon (*O. gorbusha*) from August through October, and rainbow trout (*O. mykiss*) and Dolly Varden (*Salvelinus malma*) from mid-June through April. The Kenai River will receive substantial angler effort into the foreseeable future due to its proximity to major population centers, relative ease of access, and large-sized Chinook salmon.

Chinook salmon returning to the Kenai River exhibit 2 distinct run-timing patterns: an early run and a late run. Telemetry and genetic studies have shown Chinook salmon that spawn in tributaries primarily enter the river during the early run (prior to 1 July), whereas Chinook salmon that spawn in the Kenai River mainstem primarily enter the river during the late run (on or after 1 July) (Burger et al. 1985; Bendock and Alexandersdottir 1992; McKinley et al. 2013;

[1] Harvest is the number of fish caught and retained whereas catch is the total number of fish caught (including those intentionally released).

Reimer 2013; Reimer and Fleischman 2016; Eskelin and Reimer 2017). For management purposes, the early run is composed of Chinook salmon entering the river before 1 July and the late run is composed of those entering on or after 1 July.

During the 1988 BOF meeting, management policies were adopted to govern management of both runs. These policies, amended many times since, established escapement goal ranges for both runs and specify the management actions available to achieve those goals. During the 2017 BOF meeting, management policies were changed from "total-fish" to size-based "large fish" escapement goals (≥34 in TL) primarily because "large fish" estimates of abundance constitute the most reliable information available for inseason management (Fleischman and Reimer 2017). The BOF adopted the early-run optimum escapement goal range (OEG) of 3,900 to 6,600 Chinook salmon ≥34 in TL (*5 AAC 57.160 Kenai River and Kasilof River Early-run King Salmon Management Plan*), and the late-run OEG of 13,500 to 27,000 Chinook salmon ≥34 in TL (*5 AAC 21.359 Kenai River Late-run King Salmon Management Plan*).

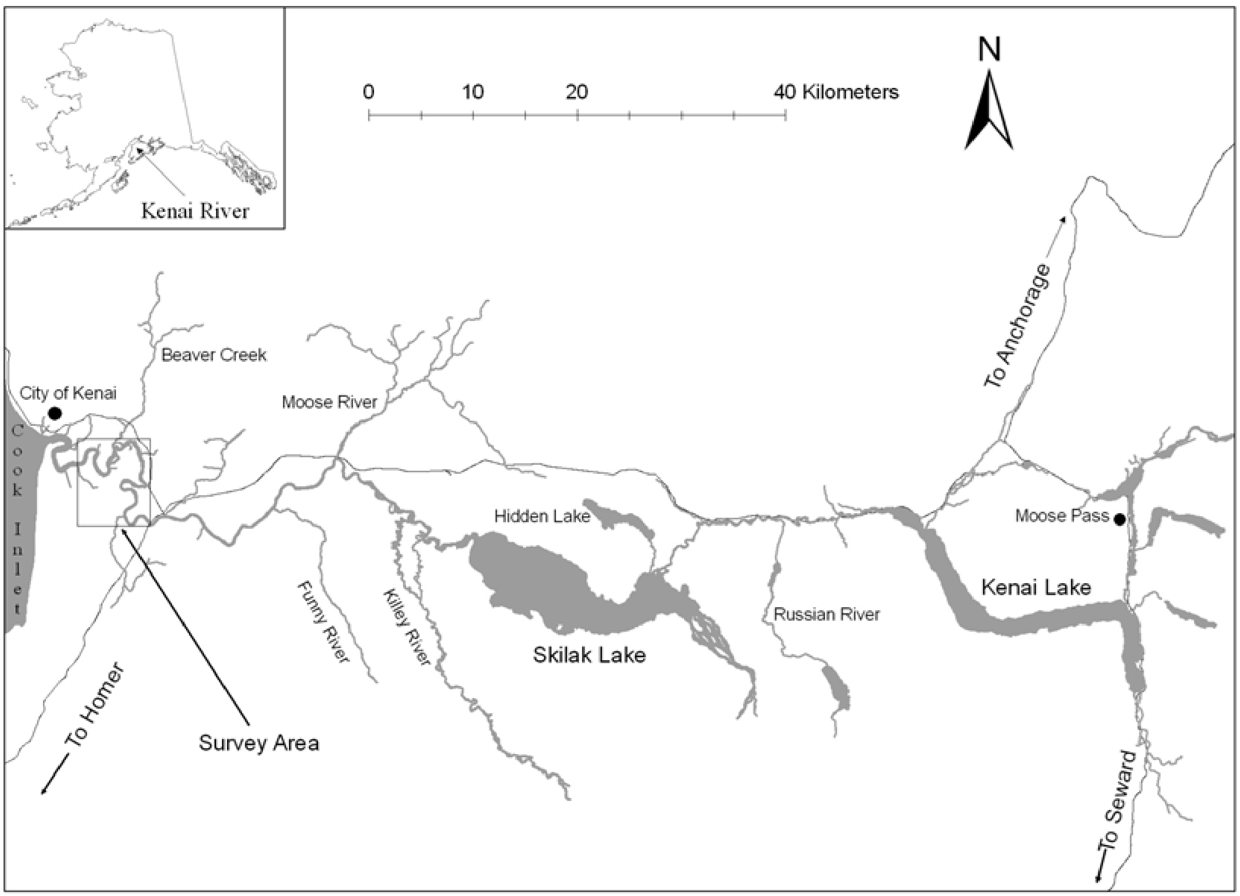

Figure 1.–Map of the Kenai River drainage.

Inseason Management

Since 2015, the Division of Sport Fish (SF) began using adaptive resolution imaging sonar (ARIS) at RM 13.7 to estimate the inriver runs of large Kenai River Chinook salmon (Figure 2). Prior to 2015, sonar estimates of abundance were estimated for all sizes of Chinook salmon by relating sonar passage data with inriver netting ASL data using complex statistical methods. Key et al. (2016), and Miller et al. (2016) provide comprehensive histories of sonar research and development at Kenai RMs 8.6 and 13.7, respectively. Attempts to differentiate small Chinook salmon from other species of similar size using complex statistical methods was found to be imprecise, time consuming, and too difficult to obtain for inseason management (Fleischman and Reimer 2017). These difficulties precipitated the change in management of Kenai River Chinook salmon from total-fish to size-based large-fish escapement goals.

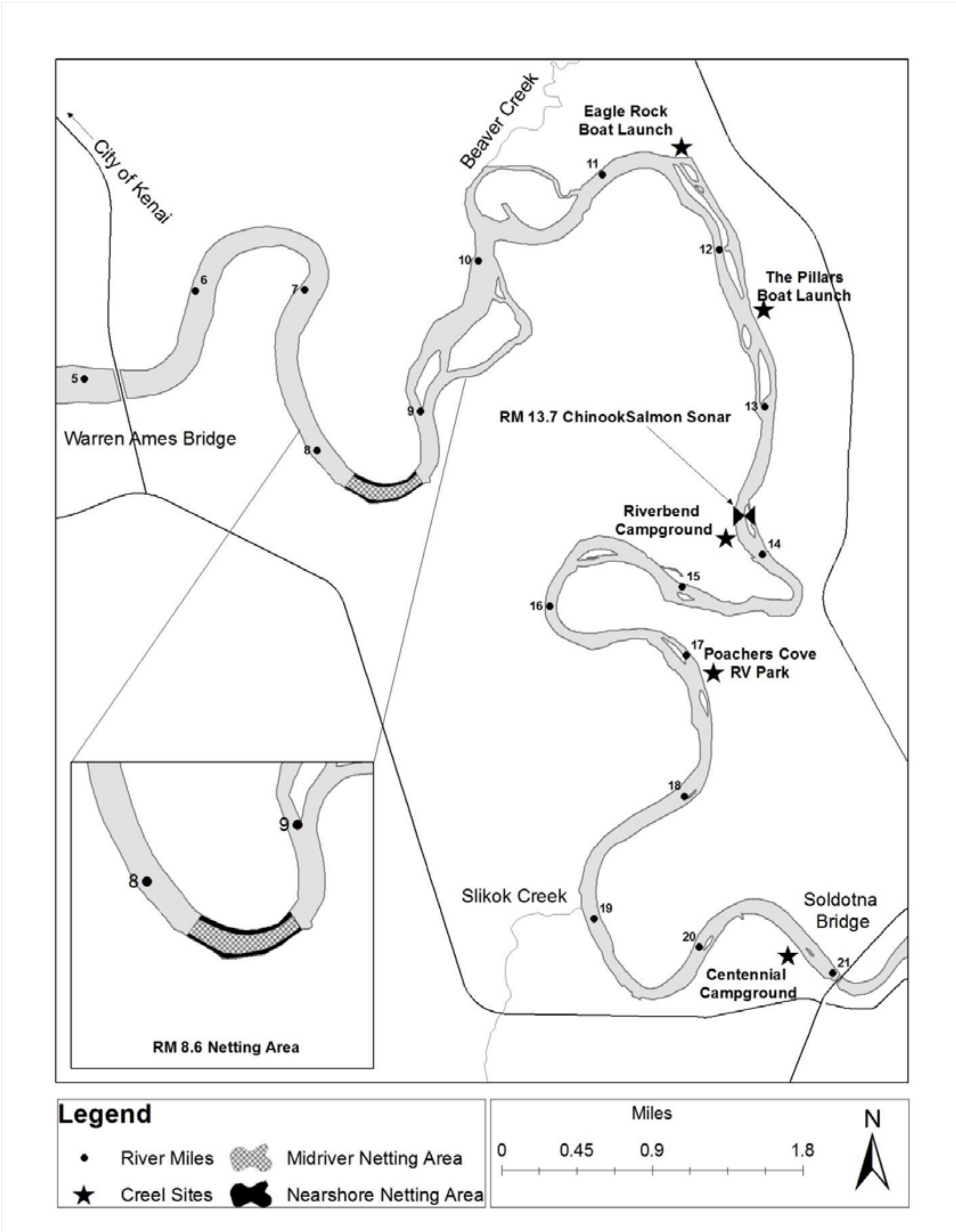

Figure 2.–Map of the Kenai River creel survey and inriver netting study areas.

The management plans for each run require timely predictions of escapement for inseason management. Therefore, one purpose of this project is to provide information to estimate escapement inseason for managers. During 2018–2020, run timing and harvest timing models developed from previous years' creel survey and sonar project data are used with current inseason creel and sonar estimates to project the end of season escapement. The inseason escapement estimate will be the difference of the projected RM 13.7 sonar passage of large Chinook salmon and projected creel sport-harvest estimates of large Chinook salmon occurring upstream of RM 13.7. Sport harvest occurring upstream of the creel survey area (demarcated by the RM 18.6 Slikok Creek sanctuary area) will be estimated postseason from the ADF&G Statewide Guide Logbook (for guided anglers) and Statewide Harvest Survey (for unguided anglers) programs. Harvest and catch estimates occurring upstream of the RM 13.7 sonar site are used for monitoring escapement, whereas riverwide harvest and catch will be used to estimate total runs of Kenai River Chinook salmon.

Additional information made available to managers for inseason management includes sport-fishery catch rates (CPUE), harvest rates (HPUE), and inriver netting CPUE occurring at RM 8.6[2]. These estimates are used as indices to monitor relative abundance, run timing of early- and late- run Chinook salmon and to corroborate sonar estimates. Because small Chinook salmon (<750 mm METF length) provide yield and affect stock productivity by competing and spawning with large Chinook salmon, the creel survey and inriver netting study will also collect data about Chinook salmon of all sizes from both runs for postseason assessment. In addition to inseason management, these projects provide the data necessary to develop escapement goals, annual preseason forecasts, and management plans for Kenai River Chinook salmon.

Creel Survey

ADF&G implemented a creel survey in 1974 in response to an increase in the number of boat anglers targeting Chinook salmon, and to monitor the ASL composition of harvested Chinook salmon. Since 1974, management of the Kenai River Chinook salmon fishery has evolved and the creel survey has been modified with respect to data collected and areas surveyed in order to meet the objectives required for effective fisheries management (Perschbacher and Eskelin 2016).

During 2018–2020, the creel survey will focus on Chinook salmon sport fishing from the Warren Ames Bridge (RM 5.1) to the Slikok Creek sanctuary area (RM 18.5) where most sport fishing occurs (Figure 2). Within the study area, the creel survey will conduct periodic angler counts of Chinook salmon anglers to estimate angler effort, and will interview anglers to collect ASL samples of harvested fish and angling information to estimate harvest and catch for both runs. The 2018–2020 creel survey study plan will remain relatively unchanged from the 2017 study plan (Perschbacher 2017) aside from the daily sampling schedule available online[3], and amendments to the creel survey if management policies change.

Inriver Netting

Beginning in the mid-1980s, mark–recapture studies used drift gillnets to collect ASL samples and to estimate the inriver run of Kenai River Chinook salmon. Various adult Chinook salmon

[2] Catch and harvest per unit efforts are measured by angler-hours in the creel survey and drift-minutes in the inriver netting study.

[3] The respective year's creel survey sampling schedule will be available to ADF&G staff on the DocuShare© website located at: http://docushare.sf.adfg.state.ak.us/dsweb/View/Collection-8457.

capture techniques have been evaluated since including, but not limited to, fish wheels and fyke-type traps (Hammarstrom and Larson 1984), smaller mesh-sized nets to reduce bias in species selectivity (Reimer 2004b), different net configurations used in different locations and tidal stages to reduce bias in size-selective sampling (Perschbacher and Eskelin 2016), and incorporating tangle nets to further reduce bias in size-selective sampling while reducing harm to fish (Perschbacher 2017).

Research conducted by Vander Haegen et al. (2004), and Ashbrook et al. (2004) have shown that the use of smaller-sized mesh tangle nets can reduce incidental mortality by capturing fish by the teeth, fins, or body, whereas traditional gillnets capture fish around the head or gills. Similar results were found in 2016 and 2017 pilot studies on the Kenai River, where a 4.0-inch mesh tangle net captured similar ASL compositions of Chinook salmon compared to the existing joined 5.0-inch and 7.5-inch mesh panel net used in the study. At the same time, the percentage of gilled sockeye salmon in the tangle netwas reduced by approximately 64% in 2016 (Perschbacher *In prep* b) and 71% in 2017 (Perschbacher *In prep* c) compared to sockeye salmon gilled in the 5.0-inch mesh. A joined 4.0-inch and 7.5-inch mesh panel net tested against the existing joined 5.0-inch and 7.5-inch mesh panel net in the 2017 late run also found no significant difference ($D = 0.13$, $P = 0.91$) between the 2 length compositions of sampled Chinook salmon. At the same time, the joined 4.0-inch and 7.5-inch mesh net reduced incidental harm to other species by over 70% compared to the other net (Perschbacher *In prep* c). The 7.5-inch mesh size was retained because ASL results can be compared to historical ASL results dating back to 1985, it captures some of the largest Chinook salmon, which have a tendency to roll out of the 4.0-inch mesh, and because it allows smaller species to pass through the large mesh.

During 2018–2020, a joined 4.0- and 7.5-inch mesh panel net will replace the joined 5.0- and 7.5-inch mesh panel net in both the early and late runs. All other aspects of the RM 8.6 inriver netting study will be the same as in 2017 (Perschbacher 2017); panel nets will be drifted from shoreline to shoreline to index relative abundance, assess run timing, and collect ASL samples of Chinook salmon returning to the Kenai River for inseason management and postseason stock assessment.

OBJECTIVES

This project provides parameter estimates required for inseason management and postseason stock-recruit analysis of large Kenai River Chinook salmon. These parameters include catch and harvest of large Chinook salmon by the inriver sport fishery, and ASL of the harvest and inriver run required in part for estimating the total return[4] of Chinook salmon by brood year for stock-recruit analysis (McKinley and Fleischman 2013; Fleischman and McKinley 2013).

PRIMARY OBJECTIVES

1) Provide inseason catch and harvest estimates of large Chinook salmon (≥75 cm METF length) in the lower Kenai River sport fishery between the Warren Ames Bridge and the RM 13.7 sonar, and between the RM 13.7 sonar and Slikok Creek (RM 18.6) from 16 May through 30 June (early run) and from 1 July through 31 July (late run) such that the

[4] Total return for each brood year consists of the inriver run as estimated by the sonar at RM 13.7 plus all commercial, subsistence, and sport harvest.

estimates for each geographic strata are within 30%, or 1,000 fish, of the true value 90% of the time[5].

2) Provide age compositions required in part to estimate total return for the early and late runs by brood year. Subordinate objectives[6] for the components of this operational plan that are associated with total run estimation are as follows:
    a) Estimate the proportion by age of large Chinook salmon captured in inriver nets from 16 May through 20 August such that all age-proportion estimates for each run are within 15 percentage points of the true values 95% of the time[7].
    b) Estimate the proportion by age of large Chinook salmon harvested by the sport fishery in the mainstem Kenai River between Warren Ames Bridge and Slikok Creek such that all age-proportion estimates for each run are within 20 percentage points of the true values 90% of the time.

SECONDARY OBJECTIVES

Secondary objectives can be accomplished without altering the current study design or sample sizes.

1) Estimate daily angler effort, and catch and harvest of all-sized Chinook salmon for each geographic stratum during each run.
2) Estimate daily CPUE of large and all-sized Chinook salmon captured in inriver nets for each run.
3) Collect tissue samples from sockeye salmon captured in inriver nets during the early run (Eskelin *In prep*).
4) Collect tissue samples from Kenai River Chinook salmon sampled from inriver nets and the sport fish harvest for genetic analysis[8].
5) Collect Secchi disk and water temperature readings midchannel at RM 15.3 during creel survey sampling days, and collect daily Secchi disk readings and tidal conditions at RM 8.6.
6) Remove the heads of Chinook salmon with missing adipose fins sampled in the sport harvest and inriver nets and send to the ADF&G Mark, Tag, and Age laboratory for coded wire tag (CWT) examination.

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5 High precision is neither possible nor necessary during the early run. Catch and harvest of large early-run Chinook salmon will only include fish approximately 34 in TL (75 cm METF) to 36 in TL. By regulation, all early-run Chinook salmon measuring 36 in TL or greater must be released.

6 Sample sizes required to meet these subordinate objective criteria are sufficient to meet the primary objective of total return estimation (McKinley and Fleishman 2013; Fleischman and McKinley 2013).

7 'Within *d* of the true value *A*% of the time' implies: $P(p_i - d \le \hat{p}_i \le p_i + d) = A/100$ for all *i*, where p_i denotes population age proportion for age class *i*.

8 Standard protocol for collecting genetics tissue is removal of the axillary process. The tip of the dorsal fin will be taken from Chinook salmon sampled in the inriver netting study due to difficulties in sampling the underside of the fish while it's in a cradle suspended in the river.

METHODS

STUDY DESIGN

Creel Survey: Inriver Sport Effort, Catch, and Harvest

A stratified 2-stage roving-access creel survey (Bernard et al. 1998) will be used to estimate sport fishing effort, catch, and harvest of Chinook salmon from the Warren Ames Bridge to Slikok Creek. First-stage sampling units will be days. Daily catch and harvest of Chinook salmon by size (≥75 cm) will be estimated as the product of effort (angler-hours) and CPUE or HPUE, respectively. Second-stage units for estimating effort will be counting trips, during which counts of anglers are made from a boat. Second-stage units for estimating CPUE and HPUE will be angler-trips; samples will be obtained by interviewing anglers who have completed fishing for the day and are exiting the fishery.

The creel survey is scheduled from 16 May through 31 July between the Warren Ames Bridge and the Slikok Creek sanctuary area (Figure 2). A fishing day is defined as 4:00 AM–11:59 PM (20 hours); however, guided anglers are restricted to a 12-hour fishing day (6:00 AM–6:00 PM) by regulation.

Creel Survey Stratification

In 2018–2020, angler counts to estimate effort (angler-hours) for guided and unguided anglers will be counted separately and geographically stratified into the following 2 areas related to the RM 13.7 sonar:

1) between the Warren Ames Bridge (RM 5.1) and the Chinook salmon sonar site (RM 13.7)
2) between the Chinook salmon sonar site (RM 13.7) and Slikok Creek (RM 18.6)

During the angler interview process, guided and unguided CPUEs and HPUEs will also be estimated for these same geographic areas. Angler effort, CPUE, and HPUE have differed significantly by week, between weekdays and weekend-holidays, between guided[9] and unguided user groups, and geographic location (Reimer 2004b; Perschbacher 2014a). Therefore, the creel survey will be temporally stratified into weekly intervals by day type (weekdays vs. weekends-holidays), geographically stratified by location (upstream vs. downstream of the RM 13.7 sonar), and stratified by fish size (large ≥75 cm vs. small <75 cm METF length). The survey will be stratified postseason for angler type (guided vs. unguided). Based on these factors, the strata listed in Table 1 will be used for estimating creel statistics.

Each week the fishery is open, 2 of the 4 available powerboat fishing weekdays (Tuesday–Friday) will be sampled, and both weekend days will be sampled each week. The current objective criterion[10] for precision of catch and harvest estimates has been met for each run since 2015, when precision estimates were estimated upstream and downstream of the RM 13.7 sonar (Table 2).

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[9] Guides must register and place a decal on their boat(s), making guide boats easily identifiable on the river.

[10] Harvest and catch within 0.25, or 1,000 fish, 90% of the time.

Table 1.–Strata used for estimating 2018–2020 creel statistics.

Stratum	No. of strata	Description
Fish size	2	Catch and harvest of large (≥75 cm) and small (<75 cm) Chinook salmon
Geographic	2	Warren Ames Bridge to RM 13.7 sonar, and RM 13.7 sonar to Slikok Creek
Temporal	13	Weekly
Day type	2	Weekdays, Weekends-holiday
Angler type	2	Guided and unguided

Table 2.–Estimates of harvest, catch, absolute precision (AP), and estimated relative precision (RP) for early- and late-run Kenai River Chinook salmon occurring upstream and downstream of the RM 13.7 Chinook salmon sonar, 2015–2017.

		Harvest								Catch							
		Upstream of RM 13.7				Downstream of RM 13.7				Upstream of RM 13.7				Downstream of RM 13.7			
Run	Year	*N*	SE	AP	RP	*N*	SE	AP	RP	*N*	SE	AP	RP	*N*	SE	AP	RP
Early																	
	2015	-closed-															
	2016	99	42	69	0.83	13	11	18	1.38	351	105	173	0.49	33	16	26	0.79
	2017	462	131	215	0.47	93	38	63	0.67	764	144	237	0.31	244	55	90	0.37
Late																	
	2015	1,823	279	548	0.30	2,073	327	641	0.31	3,495	401	786	0.22	3,027	375	735	0.24
	2016	2,469	420	691	0.28	3,712	497	818	0.22	3,130	502	826	0.26	4,683	516	849	0.18
	2017	2,082	433	712	0.34	3,921	472	776	0.20	2,326	455	748	0.32	4,214	487	801	0.19

Source: Perschbacher (*In prep* a,b,c).

Note: RPs for 2015 were based on 95% confidence intervals; RPs for 2016 and 2017 were based on 90% confidence intervals. Harvest and catch estimates for 2017 were based on large (≥ 75cm METF length) Chinook salmon.

The 4 days-per-week sampling schedule will be modified during the week of 21–28 May when 2 days will be randomly selected from the 3 weekend-holiday days available (Saturday, 26 May; Sunday, 27 May; and Monday, 28 May [Memorial Day]). Nonholiday Mondays, when only unguided fishing from drift boats is allowed, will not be sampled nor indexed during the early run because angler effort, catch, and harvest have been observed to be less than 1% of total early-run angler effort, catch, and harvest. Thus, sampling during the early run in each geographic stratum will be composed of strata based on time, day type, and angler type (Table 3). The creel survey will sample approximately 66% of the days when fishing from powerboats is allowed.

During the late run, the sampling design will be the same as the early run: 2 of the 4 available powerboat fishing weekdays will be randomly selected and both weekend days sampled. Mondays sampled during the late run, when only unguided drift-boat fishing is allowed, will consist of a single boat count between 10:00 AM and 2:00 PM to index angler effort, catch, and harvest. Sampling during the late run in each geographic stratum will be composed of strata based on time, day types, and angler types (Table 4). The creel survey will sample approximately 69% of days when fishing from powerboats is allowed.

Table 3.–The 2018 early-run sampling strata that will be used for sampling in each geographic stratum (upstream or downstream of RM 13.7) based on time, day, and angler type.

Sampling stratum	Time stratum	Dates	Day type	Angler type
1	16–20 May	tbd, tbd	Weekday	Unguided
2				Guided
3		19, 20 May	Weekend-holiday	Unguided
4		19 May		Guided
5	22–28 May	tbd, tbd	Weekday	Unguided
6				Guided
7		tbd, tbd May	Weekend-holiday	Unguided
8				Guided
9	29 May–3 June	tbd, tbd	Weekday	Unguided
10				Guided
11		2, 3 June	Weekend-holiday	Unguided
12		2 June		Guided
13	5–10 June	tbd, tbd	Weekday	Unguided
14				Guided
15		9, 10 June	Weekend-holiday	Unguided
16		9 June		Guided
17	12–17 June	tbd, tbd	Weekday	Unguided
18				Guided
19		16, 17 June	Weekend-holiday	Unguided
20		16 June		Guided
21	19–24 June	tbd, tbd	Weekday	Unguided
22				Guided
23		23, 24 June	Weekend-holiday	Unguided
24		23 June		Guided
25	26–30 June	tbd, tbd	Weekday	Unguided
26		30 June	Weekend-holiday	Unguided
27		30 June		Guided

Note: Sample dates to be decided "tbd" will be randomly selected prior to field season. Sampling strata will be created in similar fashion for years 2019 and 2020.

Table 4.–The 2018 late-run sampling strata that will be used for sampling in each geographic stratum (upstream or downstream of RM 13.7) based on time, day, and angler type.

Sampling stratum	Time stratum	Dates	Day type	Angler type
1	1 July	1 July	Weekend-holiday	Unguided
2		1 July		Guided
3	3–8 July	tbd, tbd	Weekday	Unguided
4				Guided
5		7, 8 July	Weekend-holiday	Unguided
6		7 July		Guided
7	10–15 July	tbd, tbd	Weekday	Unguided
8				Guided
9		14, 15 July	Weekend-holiday	Unguided
10		14 July		Guided
11	17–22 July	tbd, tbd	Weekday	Unguided
12				Guided
13		21, 22 July	Weekend-holiday	Unguided
14		21 July		Guided
15	24–29 July	tbd, tbd	Weekday	Unguided
16				Guided
17		28, 29 July	Weekend-holiday	Unguided
18		28 July		Guided
19	31 July	31 July	Weekday	Unguided
20		31 July		Guided

Note: Sample dates to be decided "tbd" will be randomly selected prior to the field season. Sampling strata will be created in similar fashion for years 2019 and 2020.

Creel Survey Sampling

Completed-trip angler interviews will be conducted at access locations between angler counts. Angler interviews will not begin until after the first count of the day has been completed. This should not introduce bias; when this schedule was implemented in 2001, few angler interviews were missed before the first count, and the mean CPUE and HPUE of anglers interviewed before 8:00 AM were similar to the overall means (Reimer 2003). This was also true when the schedule was re-evaluated in 2009. Furthermore, creel estimates of Chinook salmon catch and harvest for guided anglers have been similar to the catch and harvest reported in guide logbooks since 2001 (Perschbacher *In prep* b).

Technicians will attempt to interview all anglers exiting the fishery at the scheduled locations. If more anglers are leaving the fishery than can be interviewed, the technician will select anglers to interview in the order they arrived at the launch. It is critical that the decision to interview an angler is not based on fishing success.

Unguided and guided anglers that are randomly sampled within the current study design will be interviewed at the following 5 access locations:

1) Pillars Boat Launch (RM 12.3)
2) Centennial Campground (RM 20.3)
3) Riverbend Campground (RM 14.0)
4) Poacher's Cove (RM 17.4)
5) Eagle Rock Boat Launch (RM 11.4)

Due to shallow water, anglers primarily access the early-run fishery in May at Pillars Boat Launch. As water levels increase, anglers begin utilizing the other access locations listed above. Early in the season, modifications to the schedule may be done depending on the amount of use observed at each access location. Typically, all access locations are used during late June and July.

Angler counts will be conducted from a boat and 4 counts will be made during each sampling day. The start time of the first count (4:00 AM, 5:00 AM, 6:00 AM, 7:00 AM, or 8:00 AM) will be chosen at random, and all remaining counts in a day will be done systematically every 5 hours thereafter. This schedule guarantees at least 2 counts will occur during the guided-angler hours of 6:00 AM–6:00 PM. Although each angler count may take up to 1 hour to complete, they will be treated as instantaneous counts of the entire study area. To maximize interview time, the direction (upstream or downstream) that the technician travels to conduct angler counts will be selected to minimize travel distance and time.

With 4 equally spaced angler counts per day, 3 periods for conducting angler interviews will always be available between the angler counts, plus 1 possible additional period after the last count. When fewer than 4 access locations are available because of low water levels, each location will be sampled before any are repeated, with time and location paired randomly. When there are more available access locations than sampling periods, access locations will be sampled without replacement, with time and access location paired randomly.

Nonholiday Mondays will be excluded from the regular creel survey. The results from surveys conducted during 2009 and 2010, when Mondays were included into the regular creel survey, indicate that less than 5% of the harvest occurs on nonholiday Mondays during the late run. A shift in angler effort towards midday, compared to angler counts conducted in 1999–2001, warranted recalibration of the index (Perschbacher 2012c). In 2018–2020, a single index angler count will be conducted during the middle of the day (10:00 AM–2:00 PM) on nonholiday Mondays at a time and in a direction that is convenient to the project biologist.

Inriver Netting

During 2018–2020, collection of representative ASL samples of large Chinook salmon returning to the Kenai River with the joined 4.0-inch and 7.5-inch mesh net is the primary objective of the inriver netting study. The joined 4.0-inch and 7.5-inch mesh nets used for inseason management and postseason stock assessment will be referred to as “panel nets” hereafter.

Net Specifications

Panel nets are constructed of 4.0-inch mesh and 7.5-inch mesh panels within the same net. Each 60 ft long panel net will comprise a 30 ft long, 4.0-inch mesh panel seamed to a 30 ft long, 7.5-inch mesh panel. To ensure each net maintains contact with the bottom of the river, panel nets fished midriver in deeper water will be approximately 30 ft deep, and nearshore panel nets fished in shallow water will be approximately 15 ft deep. Depths of nets were determined based on river bottom profiles of the RM 8.6 sonar area conducted by ADF&G during 2013 (Jim Miller, Fishery Biologist, ADF&G, Anchorage, personal communication).

Inriver nets are multi-fiber mesh in colors that closely match Kenai River water. Specifications of each mesh type are shown below:

1) 7.5 inch (stretched mesh) multifilament (52-meshes deep for midriver net, 26-meshes deep for nearshore net), R44 color, MS93 (18 strand) twine

2) 4.0 inch (stretched mesh) multifilament (90-meshes deep for midriver net, 45-meshes deep for nearshore net), HJ65 color, (8 strand) twine

Netting Schedule and Area

Inriver netting will be conducted every day from 16 May through 20 August, unless daily sonar passage declines to less than 1% of the total late run for 3 consecutive days before 20 August. The netting crew will be composed of 3 fishery technicians, with 2 technicians working each shift (6:00 AM–2:00 PM). Each technician will be scheduled 5 days per week for 8 hours per day of which approximately 6 hours (7:00 AM–1:00 PM) will be spent netting. The remainder of the time will be for travel to and from the work site, required maintenance, and a 0.5 hr lunch break.

The RM 8.6 netting study area will be approximately 0.5 mi in length (Figure 2). Inriver nets will be fished with equal frequency both nearshore and midriver. Midriver sets will be deployed in the section of the channel that was previously insonified by the RM 8.6 sonar to maintain historical comparability. Nearshore sets will be deployed from the shoreline to a point where the midriver sets begin in depths less than 15 ft. Rangefinders will be used to ensure the net is within the specified area. Nets will be deployed perpendicular to each bank and a drift will be terminated if any of the following occur: 1) a Chinook salmon is known to be captured in the net, 2) the net becomes snagged on the bottom or is not fishing properly, 3) the net is not fishing in the appropriate area (midriver or nearshore), 4) the end of the study area is reached, 5) the maximum drift time is reached, or 6) the net is determined to be saturated with sockeye or pink salmon (usually greater than 10 fish).

Because each net will have a 4.0-inch mesh panel on one end and a 7.5-inch mesh panel on the other, the crew will alternate the mesh size deployed closest to shoreline (i.e., to avoid having the same size mesh panel always set closest to the shoreline). One sampling “replicate” will consist of 8 drifts: 2 nearshore drifts alternating the mesh size closest to the north bank, 2 nearshore drifts alternating the mesh size closest to south bank, 2 midriver drifts alternating the mesh size closest to the north bank, and 2 midriver drifts alternating the mesh size closest to the south bank. The first drift for each day will alternate by location (nearshore or midriver), mesh size deployed closest to shoreline (4.0 inch or 7.5 inch), and bank deployed (left bank or right bank) such that each of the 8 possibilities will be completed before beginning the pattern again.

SAMPLE SIZE

Catch and Harvest (Objective 1)

During 2015–2016, when creel estimates of catch and harvest were geographically stratified upstream and downstream of the RM 13.7 Chinook salmon sonar site, objective criteria of catch and harvest of all-sized Chinook salmon within 30%, or 1,000 fish, 90% of the time was met for both early and late runs except for the 2015 early run, which was closed by regulation. During 2017, objective criteria of catch and harvest of large Chinook salmon (≥75cm METF length) within 30%, or 1,000 fish, 90% of the time was met for both early and late runs. During the 2017 early run, anglers caught 244 (SE 55) and harvested 93 (SE 38) large Chinook salmon between Warren Ames Bridge and RM 13.7, and caught 764 (SE 144) and harvested 462 (SE 131) large Chinook salmon between RM 13.7 and Slikok Creek (Table 2). During the 2017 late run, anglers caught 4,214 (SE 487) and harvested 3,921 (SE 472) large Chinook salmon between Warren Ames Bridge and RM 13.7, and caught 2,326 (SE 455) and harvested 2,082 (SE 433) large Chinook salmon between RM 13.7 and Slikok Creek. Assuming similar Chinook salmon early- and late-run abundance, similar sport fishing activities, and the same effort to interview anglers, a simulation predicted the total catch and harvest estimates of large Chinook salmon during the 2018–2020 early and late runs should be within 30%, or 1,000 fish, of the true value 90% of the time. Thus the criterion in Objective 1 should be met.

Proportion by Age (Objective 2)

Inriver Run by Age

Large Chinook salmon captured in 4.0-inch and 7.5-inch mesh panel nets will constitute the ASL sample for the inriver run. Samples will be stratified temporally postseason into approximately 3-week time intervals[11] (2 strata during each run) if the age compositions between each stratum are found to be significantly different within each run:

1) 16 May–6 June
2) 7 June–30 June
3) 1 July–26 July
4) 26 July–20 August

Since 2002, the sample size goal of 127 fish has been met for both the early and late runs except for the 2012, 2013, 2015, and 2017 early runs (Table 5). Since 2017, the inriver netting ASL composition will include only large fish and the precision criterion of Objective 2 (a) for 2018–2020 will be set to within 15 percentage points 95% of time. According to the criteria developed by Thompson (1987) for multinomial proportions, a minimum of 67 large Chinook salmon from each run need to be sampled for age in order to meet the precision criteria in Objective 2 (a). Assuming 15% unreadable scales, this is equivalent to 57 valid ages for each run. If the sampling efforts remain the same as in 2017, enough fish will be sampled for age in each year of 2018–2020 to meet the objective precision criteria.

Sport Harvest by Age

The sport harvest will be sampled for age composition by collecting scale samples from Chinook salmon encountered during creel survey angler interviews. Since 2002, objective criteria have been met for both runs except for the 2012 late run, the 2013–2015 early runs that were closed by regulation, and the 2016 early run when sport harvest was restricted (Table 5).

To estimate age compositions by run of large Chinook salmon harvested by the sport fishery between Warren Ames Bridge and Slikok Creek, a minimum of 29 large Chinook salmon in each run will be required for age class estimates to be within 20 percentage points of the true value 90% of the time (Thompson 1987). Assuming 15% unreadable scales, this is equivalent to 25 valid ages for each run. In 2017, 32 and 143 large Chinook salmon were successfully sampled for age in the early and late runs, respectively (Table 5). If the sampling efforts remain the same as in each year of 2018–2020, enough fish will be sampled for age to meet the precision criteria in Objective 2 (b).

[11] Previous experience has shown that age composition changes relatively slowly; thus, 2 strata per run are sufficient to reduce bias.

Table 5.–Number of valid-aged Kenai River Chinook salmon sampled in the inriver netting study and creel survey during the early and late runs, 2002–2017.

	Inriver netting		Creel survey	
Year	Early run	Late run	Early run	Late run
2002	306	945	31	275
2003	724	1114	81	311
2004	351	933	99	305
2005	362	519	134	429
2006	251	703	129	313
2007	213	437	106	237
2008	163	496	198	218
2009	128	338	66	195
2010	137	221	59	184
2011	182	327	56	233
2012	82	232	38	4
2013	41	149	NA	50
2014	146	283	NA	30
2015	122	238	NA	117
2016	143	258	NA	189
2017	62	240	32	143

Source: Reimer et al. (2002); Reimer (2003, 2004 a, 2004 b, 2007); Eskelin (2007, 2009, 2010); Perschbacher (2012 a-d, 2014, 2015, *In prep* a-c); Perschbacher and Eskelin (2016).

Note: Inriver netting samples during 2014–2017 were collected midriver and nearshore, whereas during other years, samples were only collected midriver. The inriver netting and creel survey samples during 2017 samples were of Chinook salmon measuring ≥75 cm METF only.

Brood Year Return Reconstruction

In practice, only major components need be sampled for age composition, and the estimates need not be overly precise[12]. This operational plan outlines 2 of 7 early-run components (McKinley and Fleischman 2013: Table 4), and 2 of 8 late-run components (Fleischman and McKinley 2013: Table 3) required for brood year reconstruction. Study design and analysis used to reconstruct brood years is described in this operational plan, but overall results and analyses are presented in Fleischman and Reimer (2017), the most recent stock-recruit analysis report. Recent run reconstructions based upon synthesis of all relevant Chinook salmon abundance data reported in Fleischman and Reimer (2017: Tables 1 and 4), estimated the total run from the 1999–2010 brood years with coefficients of variation (CVs) of 0.10 to 0.28 (early run) and 0.09 to 0.24 (late run). The stated precision objective (within 20% of true value 90% of time) was met for 10 of 12 years for both the early and late runs.

DATA COLLECTION

Creel Survey of Inriver Sport Fishery

The creel survey crew will be composed of 2 fishery technicians working each sampling day. Each technician is responsible for conducting angler interviews and angler counts during their shift. Each technician will also take Secchi disk and water temperature readings in the main river

[12] Simulation studies show that stock–recruit analysis is relatively insensitive to moderate errors in age composition estimates. For example, a simple random sample size of less than 100 has been shown to produce a sufficiently precise age composition for each run.

channel adjacent to Ciechanski State Park (RM 15.3) at the beginning of their shift to monitor river conditions that affect the sport fishery. Information regarding any other condition that technicians think is noteworthy or might otherwise affect the fishery will be recorded in a field notebook. Finally, technicians will return their data sheets and field computer to the Soldotna office daily to be downloaded into a computer database.

Angler Counts

Angler counts are conducted as the boat is driven through the entire length of the survey area. Upon arrival at Slikok Creek (RM 18.9), RM 13.7 Chinook salmon sonar, or Warren Ames Bridge, the technician will record the count data for that river section. Each technician will conduct 2 angler counts during their scheduled shift, for a total of 4 angler counts per day. A count is usually accomplished in approximately 1 hour.

The total number for each of the following categories will be tallied using 8 thumb counters:

1) unguided anglers fishing from power boats
2) unguided anglers fishing from drift boats
3) guided anglers fishing from power boats (excluding the guide)
4) guided anglers fishing from drift boats (excluding the guide)
5) unguided power boats
6) unguided drift boats
7) guided power boats
8) guided drift boats

Only the sum of count categories 1–2 and 3–4 are required for this project; categories 5–8 will be collected as ancillary information for management and historical comparisons. A person will be tallied as an angler if he or she is fishing or rigging a rod. If a boat is traveling with no lines in the water, none of the people in that boat will be considered to be angling. Upon completion of each angler count for a given area, the values will be recorded electronically using data entry software on a Juniper Systems Inc. Allegro CX field computer. If the field computer is not functioning properly, angler count data will be recorded manually on an angler count data form (Appendix A1).

Angler Interviews

Between angler counts, the technician will travel by boat to the scheduled access location and interview anglers who have finished angling for the day (completed-trip interviews). A potential bias with the current study design is that anglers may include time they spent not actively fishing (short trips between fishing holes, time spent launching boat, bathroom breaks, etc.). This would result in overestimating angling time (hours actively fishing), leading to underestimation of catch or harvest rates. The amount of time an angler is considered actively fishing for Chinook salmon is the total time the angler’s line is in the water or being rigged, but does not include travel time or time after an angler has harvested a fish. Due to differences in angling experience, the tendency to overestimate effort may be greater for unguided anglers than guided anglers (Perschbacher 2014b). Creel survey technicians will stress that “actively fishing for Chinook salmon” does not include time spent launching the boat, traveling upstream or downstream, fishing for other species, or other activities that do not include actively fishing.

During each completed-trip interview, the following information will be recorded from each angler contacted:

1) time of interview
2) boat type (power or drift)
3) angler type (guided or unguided)
4) total hours actively fishing downstream of the RM 13.7 sonar, rounded to the nearest one-quarter hour
5) total hours actively fished upstream of the RM 13.7 sonar to Slikok Creek, rounded to the nearest one-quarter hour
6) location and number of Chinook salmon harvested in each area (downstream or upstream of RM 13.7 to Slikok Creek)
7) location and number of Chinook salmon released in each area (downstream or upstream of RM 13.7 to Slikok Creek)
8) the number of Chinook salmon released by length category: less than 34 in TL (<75 cm METF), or 34 in TL or greater

Data will be recorded electronically on a field computer. If the computer is not working properly, data will be entered on an angler interview data form (Appendix A2).

Chinook salmon present during angler interviews[13] will be sampled for METF length, total length, sex, and genetic tissue. For more details on biological sampling, see "Scale Sampling" and "Genetic Sampling" sections below. Biological data will be recorded on data forms (Appendix A3).

Inriver Netting

Primary responsibilities will be to drift nets in the specified areas, sample captured Chinook salmon for ASL data and genetic tissue, count other captured species (measure a subset for length), and record data directly into a handheld computer. The start and stop time will be recorded for each drift. The start time will be the time the crew begins setting the net. The stop time will be the time the crew begins pulling the net.

As the net is retrieved after a set, fish will be untangled and the "manner of capture" (e.g., tangled by teeth or mouth, gilled [net past the gill plate], mouth clamped [net clamping the mouth closed] or wedged [web around body or past pectoral fins]) will be recorded for all salmon sampled for length.

If the captured fish is a Chinook salmon, it will be untangled from the net and tethered to the boat with a cotton color-coded "tail tie" (e.g., red for capture in 4.0 inch mesh, blue for capture in 7.5 inch mesh) placed around the caudal peduncle with the other end affixed to the boat gunwale with a bungee cord (to minimize handling effects). This will allow tethered Chinook salmon to remain in the water while other fish are untangled and the boat drifts downstream. Because small Chinook salmon (approximately 600 mm METF or less) have a higher tendency to escape from a tail tie, they may be placed into a water-filled tote on the boat for sampling purposes. Once all fish are untangled and the net is inside of the boat, each Chinook salmon will be placed in a padded restraint cradle (Larson 1995) for ASL and genetic tissue sampling. For more detail, see "Scale Sampling" and "Tissue Sampling" sections below. During sampling, the cradle will hang from the side of the boat with its base approximately 15 cm below the water line; thus, tethered Chinook salmon will not be removed from the water at any time. The capture

[13] Very rarely, during the peak of the late run, it may become difficult to sample all harvested fish leaving at some access locations. To the extent that this occurs, these samples will underrepresent the population.

mesh size will be recorded based on the color-coded tail ties. The METF length will be measured to the nearest 5 mm. The METF length and “manner of capture” will be recorded for other salmon species captured in the first 8 sets of the day. For captured nonsalmon species, the species and the number of fish will be recorded, and all captured rainbow trout or steelhead and Dolly Varden will be measured for TL.

To prevent resampling, all sampled Chinook salmon captured in the panel net will be given an upper caudal fin hole-punch. Fish recaptured with a hole-punch in the upper caudal fin will be released without being sampled.

After Chinook salmon are sampled and released, the condition in which it swam away will be recorded as either: vigorous, vigorous and bleeding, lethargic, lethargic and bleeding, cut or scraped, or other (e.g., seal bite).

Data will be recorded electronically using data entry software on a Juniper Systems Inc. Allegro CX field computer[14]. After sampling, the crew will download the data onto a desktop computer. If the field computer is not functioning properly, data will be recorded on a data form (Appendix A4). In addition, crews will also fill out a field notebook daily to document observations not covered by the electronic data entry system.

Scale Sampling

For all sport-harvested Chinook salmon sampled in the creel survey and captured during inriver netting, 3 scales will be taken from the left side of the body of each sampled fish at a point on a diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin, 2 rows above the lateral line (Clutter and Whitesel 1956; Welander 1940), and placed on an adhesive-coated card. An impression will be made of the scales on the card using a press under 25,000 pounds per square inch and then the scales growth patterns will be viewed with a 40× microfiche reader to determine freshwater and marine residence times.

Tissue Sampling

In the creel survey, tissue samples (tip of axillary process) will be taken from harvested fish for genetics analysis. In the inriver netting study, tissue samples will be collected from dorsal finclips because the axillary process, on the ventral side of the fish, is difficult to remove from Chinook salmon held in a cradle suspended in the water. Detailed methods including those prior to sampling and during sampling, and those related to postsampling storage, shipping, and supplies are given in Appendix B1. The tissue samples will be stored at the Soldotna office until the end of the season and then sent to the Anchorage ADF&G Gene Conservation Lab for archiving.

Sockeye salmon tissue samples will be collected in the inriver netting study during the early run for a separate project investigating Kenai River early run sockeye salmon genetics (Eskelin *In prep.*). During 2018–2020, sockeye salmon tissue samples (axillary processes) will be collected from all sockeye salmon captured in May, and from all sockeye salmon that are measured for length in June (first 8 sets each day), although the collection rate may change inseason depending on the number of tissue samples that are collected. Tissue samples will be batch sampled into 125 ml plastic bottles filled with ethyl alcohol (ETOH). A separate bottle appropriately labeled

[14] Product names used in this publication are included for completeness and do not constitute product endorsement.

with date and location will be used each day and bottles with tissue samples will be given to the sockeye salmon genetics study project leader.

Coded Wire Tag (CWT) Recovery

All Chinook salmon sampled during the course of the creel survey and captured in inriver nets will be examined for the absence of the adipose fin. A missing adipose fin indicates the fish is either missing the fin naturally or received a CWT as a juvenile. Presence of a CWT may identify a hatchery-produced Chinook salmon stray or a wild Chinook salmon tagged in another river system that strayed to the Kenai River. Technicians will remove the heads of all Chinook salmon missing the adipose fin, affix a numerical cinch strap to the jaw, and store it in a Soldotna office freezer. Permission must be obtained from anglers if encountered during the creel survey. All data, including the number of Chinook salmon examined and the number observed missing the adipose fin, will be recorded. The cinch strap number will also be recorded alongside ASL data to enable cross-referencing between datasets. At the end of the field season, head samples and collected data will be sent to the ADF&G Mark, Tag and Age Laboratory located in Juneau for dissection and CWT recovery.

Environmental Variables

A Secchi disc depth reading will be recorded at the beginning and end of each netting shift to monitor river conditions that could affect netting catch rates. All Secchi disc readings will be taken at the same location, midriver near the center of the netting area. The netting crews will also record the direction of river flow for each midriver and nearshore set. Once the net is deployed, the crew will record the direction the net drifts in relation to the shoreline. Each set will be recorded as either a downstream, slack, or upstream set.

Each creel technician will take a Secchi disk and water temperature (°F) reading in the main river channel adjacent to Ceichanski State Park (RM 15.3) during his or her first boat count of the day to monitor river conditions that could affect sport angler catch rates.

DATA REDUCTION

Creel and netting technicians will return their scale cards, tissue samples, and field ASL data forms to the Soldotna office daily and will be responsible for ensuring the data are legible and accurate. Technicians will also be responsible for entering most data (except for age data) into the field computer and downloading data to the project biologist desktop computer that will output the datasets into a comma separated text (.txt) format for analysis. Age data will be entered directly into master electronic data files after age is determined by scale reading. Data maps for all the information to be collected in this project are shown in Appendices C1–C5.

The Technician Manual (Appendix D1) has expectations, responsibilities, and general operating procedures for creel survey and netting crews to reference and follow. Crews will be required to read this manual and keep it in their clipboard for reference while on duty.

The project biologist will edit creel survey, inriver netting, and biological data to ensure values of counts, interview data, age, and length-at-age are within regular bounds. The biologist will also edit the data for obvious coding errors, prepare inseason data summaries daily, conduct postseason data analyses, and write a Division of Sport Fish Fishery Data Series report. All creel survey, inriver netting, and biological data will be kept in computer files and edited by 1

December. Data files (and relevant data maps) of interest to project staff will be posted to the ADF&G Research and Technical Services (RTS) DocuShare[15] website.

DATA ANALYSIS

Creel Survey: Inriver Effort, Catch, and Harvest

Estimates of angler effort, catch, and harvest of Chinook salmon downstream of Slikok Creek will be calculated by following the procedures outlined in Bernard et al. 1998). Angler effort estimates, estimates of catch and harvest rates, and estimates of catch and harvest will be conducted in a poststratified manner for each angler type. The adjustments in the variance estimates for covariances due to poststratifying by angler type are expected to be minor and will be ignored (Bernard et al. 1998).

Angler Effort

The mean number of anglers on day *i* in stratum *h* will be estimated as follows:

$$\bar{x}_{hi} = \frac{\sum_{g=1}^{r_{hi}} x_{hig}}{r_{hi}}, \tag{1}$$

where

x_{hig} = the number of anglers observed in the *g*th count of day *i* in stratum *h*, and

r_{hi} = the number of counts on day *i* in stratum *h*.

Stratum *h* is parameterized in Table 1.

Angler counts will be conducted systematically within each sample day. The variance of the mean angler count will be estimated as follows:

$$\mathrm{var}(\bar{x}_{hi}) = \frac{\sum_{g=2}^{r_{hi}} \left(x_{hig} - x_{hi(g-1)}\right)^2}{2r_{hi}(r_{hi}-1)}. \tag{2}$$

Daily estimates of angler effort (angler-hours) will be the product of total hours in the sampled period (12 for guided and 20 for unguided) and the average number of anglers over the counting survey. Effort (angler-hours) during day *i* in stratum *h* will be estimated as follows:

$$\hat{E}_{hi} = L_{hi}\bar{x}_{hi}, \tag{3}$$

where L_{hi} is the length of the sample day (20 hours for unguided anglers, 12 hours for guided anglers).

The within-day variance (effort) will be estimated as follows:

$$\mathrm{var}(\hat{E}_{hi}) = L_{hi}^2 \,\mathrm{var}(\bar{x}_{hi}). \tag{4}$$

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[15] http://docushare.sf.adfg.state.ak.us/dsweb/HomePage

The mean effort for stratum *h* will be estimated as follows:

$$\overline{E}_h = \frac{\sum_{i=1}^{d_h} \hat{E}_{hi}}{d_h}, \tag{5}$$

where d_h is the number of days sampled in stratum *h*.

The sample variance of daily effort for stratum *h* will be estimated as follows:

$$S^2(E_h) = \frac{\sum_{i=1}^{d_h} \left(\hat{E}_{hi} - \overline{E}_h\right)^2}{\left(d_h - 1\right)}. \tag{6}$$

Total effort for stratum *h* will be estimated as follows:

$$\hat{E}_h = D_h \overline{E}_h, \tag{7}$$

where D_h is the total number of days the fishery will be open in stratum *h*.

The variance of total effort for each stratum in a 2-stage design, omitting the finite population correction factor for the second stage, will be estimated as follows (Bernard et al. 1998):

$$\text{var}\left(\hat{E}_h\right) = \left(1 - f\right) D_h^2 \frac{S^2(E_h)}{d_h} + f D_h^2 \frac{\sum_{i=1}^{d_h} \text{var}\left(\hat{E}_{hi}\right)}{d_h^2}, \tag{8}$$

where *f* is the fraction of days sampled (d_h / D_h).

Catch and Harvest

Catch and harvest per unit (hour) of effort (CPUE and HPUE) for day *i* will be estimated from angler interviews for large Chinook salmon (≥75 cm METF length) and all Chinook salmon, respectively. The estimate of CPUE (similarly HPUE) on day *i* in stratum *h* will be estimated as follows[16]:

$$CPUE_{hi} = \frac{\sum_{a=1}^{m_{hi}} c_{hia}}{\sum_{a=1}^{m_{hi}} e_{hia}}, \tag{9}$$

where

c_{hia} = catch of angler *a* interviewed on day *i* in stratum *h*,

e_{hia} = effort (hours fished) by angler *a* interviewed on day *i* in stratum *h*, and

[16] The jackknife estimating procedure as outlined in Bernard et al. (1998: Appendix D) may be used in lieu of these procedures if sample sizes are deemed to be low (i.e., less than 5 anglers interviewed in a day).

m_{hi} = number of anglers interviewed on day *i* in stratum *h*.

The variance of CPUE (similarly HPUE) on day *i* in stratum *h* will be estimated as follows:

$$\mathrm{var}(CPUE_{hi}) = \frac{\sum_{a=1}^{m_{hi}} (c_{hia} - e_{hia} \cdot CPUE_{hi})^2}{m_{hi}(m_{hi}-1)\bar{e}_{hi}^{\,2}}, \tag{10}$$

where $\bar{e}_{hi}$ is the average of effort (hours fished) of all anglers interviewed on day *i* in stratum *h*.

Daily estimates of catch (similarly for harvest) will then be calculated as the product of the daily estimate of angler effort and catch (or harvest) rates:

$$\hat{C}_{hi} = \hat{E}_{hi} CPUE_{hi}. \tag{11}$$

Its variance will be estimated as follows (Goodman 1960):

$$\mathrm{var}\left(\hat{C}_{hi}\right) = \mathrm{var}\left(\hat{E}_{hi}\right)\left(CPUE_{hi}\right)^2 + \mathrm{var}\left(CPUE_{hi}\right)\hat{E}_{hi}^{\,2} - \mathrm{var}\left(\hat{E}_{hi}\right)\mathrm{var}\left(CPUE_{hi}\right). \tag{12}$$

HPUE for large Chinook salmon (≥75 cm METF length) and all Chinook salmon will be estimated by substituting angler harvest for angler catch in Equations 9–10, respectively. Harvest during sample day *i* will be estimated by substituting the appropriate $HPUE_{hi}$ statistics into Equations 11 and 12. Mean catch and harvest for both large fish and all fish during stratum *h* will be estimated using Equations 5–8, substituting estimated catch ($\hat{C}_{hi}$) and harvest ($\hat{H}_{hi}$) during sample day *i* for the estimated effort ($\hat{E}_{hi}$) during day *i*.

Angler Effort, Catch, and Harvest on Mondays

During the late run, a single angler count and no interviews will be conducted on nonholiday Mondays in 2018–2020. The following ad hoc estimation procedure will be used to obtain rough estimates of Monday effort, catch, and harvest; these estimates are not intended to conform to the same standard of statistical rigor as those for the remainder of the week:

1) The relationship between index counts and mean count on Mondays for 2009–2010 will be used to estimate the relationship between index counts and mean counts on Mondays during the late runs in 2018–2020. Based on previous studies, the mean number of anglers is approximately 52% of the number of anglers counted during the "index" period (1000–1400 hours).

2) To estimate angler-hours of effort *E*, the estimated mean count will be multiplied by the length of the unguided angler day (20 hours).

3) To estimate CPUE and HPUE on Mondays without angler interviews, we will exploit the tendency for angler success to exhibit an autocorrelated time trend. CPUE and HPUE will be plotted versus time for days sampled with angler interviews, and then we will impute CPUE and HPUE values for each Monday.

4) Catch and harvest will be estimated as the product of the imputed values of CPUE and HPUE and the estimate of E_i derived from the index count.

Inriver Netting CPUE

Two midriver (and nearshore) drifts, originating from each side (k) of the river, will be conducted with 1 mesh size deployed from the boat; the sequence will then repeated with the other mesh size deployed from the boat. A repetition j consists of a complete set of 8 drifts (4 midriver and 4 nearshore) with the panel net. Daily CPUE r of species s in mesh size m for day i will be estimated as follows:

$$\hat{r}_{smi} = \frac{\sum_{j=1}^{J_i}\sum_{k=1}^{2} c_{smijk}}{\sum_{j=1}^{J_i}\sum_{k=1}^{2} e_{mijk}}, \tag{13}$$

with variance

$$\mathrm{var}(\hat{r}_{smi}) = \frac{\sum_{j=1}^{J_i}\left(c_{smij} - \hat{r}_{smi} e_{mij}\right)^2}{\bar{e}_{mi}^{\,2} J_i (J_i - 1)}, \tag{14}$$

where c_{smijk} is the catch of species s in mesh m during a drift originating from bank k during repetition j on day i, e_{mijk} is the effort (soak time in minutes) for that drift, J_i is the number of repetitions completed on day i, c_{smij} is the catch of species i in mesh m summed across drifts on both banks conducted during repetition j of day i, $e_{mij.}$ is the effort for mesh m summed across drifts on both banks conducted during repetition j of day i, and $\bar{e}_{mi}$ is the mean of e_{mij} across all repetitions j for mesh m on day i. The variance follows Cochran (1977: page 66).

Age and Sex Composition of Sport Harvest and Inriver Netting

Age and sex compositions of the Chinook salmon harvest, and RM 8.6 midriver and nearshore netting were estimated for each run by time or geographic stratum t. The proportion of Chinook salmon in age or sex group b in stratum t was estimated as follows:

$$\hat{p}_{bt} = \frac{n_{bt}}{n_t} \tag{15}$$

where

n_{bt} = the number of Chinook salmon of age or sex group b sampled during stratum t, and

n_t = the number of successfully aged Chinook salmon sampled during stratum t.

The variance of $\hat{p}_{bt}$ was approximated as follows (Cochran 1977):

$$V(\hat{p}_{bt}) = \frac{\hat{p}_{bt}(1-\hat{p}_{bt})}{(n_t - 1)}. \tag{16}$$

Total Return by Brood Year

Data analysis used to reconstruct brood years is described in this operational plan but overall results and analyses will be presented in separate stock-recruit analysis reports. Total return originating from brood year y for each of the early and late runs will be the sum of age-specific total returns across 5 calendar years bracketing 3- through 7-year-old fish:

$$\hat{R}_y = \sum_{a=3}^{7} \hat{R}_{y+a,a}, \tag{17}$$

where $\hat{R}_{y+a,a}$ is the sum of the estimates of inriver run I_a at RM 13.7 (estimated by sonar; Miller et al. 2016), plus commercial harvest C_a (late run censuses from Eastside setnet and Upper Cook Inlet drift gillnet fisheries), the Kenai River personal use harvest P_a (late run), the late-run marine sport harvest M_a, sport harvest S_a downstream of the RM 13.7 sonar (estimated by creel survey), and Kenaitze educational gillnet fishery harvest K_a each restricted to the appropriate age a and calendar year $t = y + a$:

$$\hat{R}_{t,a} = \hat{I}_{t,a} + \hat{C}_{t,a} + \hat{P}_{t,a} + \hat{M}_{t,a} + \hat{S}_{t,a} + K_{t,a}. \tag{18}$$

Omitting t for simplicity, age-specific commercial harvest and its variance will be estimated as the product of the commercial harvest C and the estimate of age proportion p as follows:

$$\hat{C}_a = C\ \hat{p}_{Ca} \tag{19}$$

and

$$\mathrm{var}\left(\hat{C}_a\right) = C^2\ \mathrm{var}\left(\hat{p}_{Ca}\right), \tag{20}$$

where

$$\hat{p}_{Ca} = \frac{n_{Ca}}{n_C} \tag{21}$$

and

$$\mathrm{var}\left(\hat{p}_{Ca}\right) = \frac{\hat{p}_{Ca}\left(1 - \hat{p}_{Ca}\right)}{n_C - 1}, \tag{22}$$

where n_C is the number of valid ages sampled from the commercial harvest, of which n_{Ca} are age a.

Similarly, age-specific sport harvest below the sonar will be estimated as follows:

$$\hat{S}_a = \hat{S}\ \hat{p}_{Sa}, \tag{23}$$

where $\hat{S}$ is the estimate of sport harvest below the sonar from the creel survey, with variance

$$\mathrm{var}\left(\hat{S}_a\right) = \hat{S}^2\ \mathrm{var}\left(\hat{p}_{Sa}\right) + \hat{p}_{Sa}^2\ \mathrm{var}\left(\hat{S}\right) - \mathrm{var}\left(\hat{p}_{Sa}\right)\mathrm{var}\left(\hat{S}\right), \tag{24}$$

where

$$\hat{p}_{Sa} = \frac{n_{Sa}}{n_S} \tag{25}$$

and

$$\text{var}(\hat{p}_{Sa}) = \frac{\hat{p}_{Sa}(1-\hat{p}_{Sa})}{n_S - 1} \quad (26)$$

and n_S is the number of valid ages sampled from the sport harvest, of which n_{Sa} are age a.

Age-specific personal use P will be estimated using Equations 19–22 and substituting P for C. Age-specific marine sport harvest M will be estimated using Equations 23–26 and substituting M for S.

Finally, the estimate of age-specific inriver return will be stratified into two 3-week periods (subscript h):

$$\hat{I}_a = \sum_{h=1}^{2} \hat{I}_h \hat{p}_{Iha} \quad (27)$$

with variance

$$\text{var}(\hat{I}_a) = \sum_{h=1}^{2} \left[\hat{I}_h^2 \,\text{var}(\hat{p}_{Iha}) + \hat{p}_{Iha}^2 \,\text{var}(\hat{I}_h) - \text{var}(\hat{p}_{Iha}) \text{var}(\hat{I}_h) \right] \quad (28)$$

where

$$\hat{p}_{Iha} = \frac{n_{Iha}}{n_{Ih}} \quad (29)$$

and

$$\text{var}(\hat{p}_{Iha}) = \frac{\hat{p}_{Iha}(1-\hat{p}_{Iha})}{n_{Ih} - 1} \quad (30)$$

and n_{Ih} is the number of valid ages sampled from the inriver run during stratum h, of which n_{Iha} are age a. All analyses will be conducted separately for the early and late runs. Variance estimates for species proportions (Equations 20, 22, 24, 26, 28, and 30) assume that each sampled fish is an independent observation (i.e., that simple random sampling [SRS] was employed). In reality, the sport harvest will be sampled with a multistage design (creel survey), and the inriver return with a cluster design (netting), and technically, the age proportion variances should be estimated in the context of those designs. However, age composition changes very slowly over time, and in the past we have assumed that variability between sampling stages and among clusters is negligible. To verify this, we re-analyzed the 2006 netting data, calculated the age proportions (equivalently Equations 3.31 to 3.34 in Cochran 1977: p. 66) and compared them to the simple random sampling estimators in Equations 25 and 26. The point estimates and their standard errors were essentially equivalent. Based on this evidence, we will continue to use the SRS equations for convenience.

SCHEDULE AND DELIVERABLES

Dates	Activity	Personnel
15 May	2018–2020 Operational Plan	Perschbacher and Begich
1 Apr–15 May	Prepare equipment for the field season	Perschbacher
1 Apr–15 May	Field season preparation and preseason training	All staff
16 May–31 Jul	Creel survey sampling	Karic, Mallette
16 May–20 Aug	RM 8.6 inriver netting sampling	Elkins, Malone, Watkins
16 May–20 Aug	Inseason angler effort, harvest, and netting CPUE estimates	Perschbacher
16 May–31 Jul	Interview and count data edited	Perschbacher
16 May–31 Jul	Interview and count data summarized	Perschbacher
20–30 Aug	Prepare equipment for winter storage	Perschbacher
1 Oct	Scales read	Perschbacher
1 Nov	Age composition summary	Perschbacher
1 Dec	Final creel survey and inriver netting estimates	Perschbacher

The results for each year of this 3-year operational plan will be presented in Alaska Department of Fish and Game, Division of Sport Fish, Fishery Data Series reports. The estimates of catch, harvest, and age will also be presented in separate Fishery Data Series reports describing stock assessments for each run of Chinook salmon.

RESPONSIBILITIES

Project Leaders

Jeff Perschbacher, Fishery Biologist I (1 April–31 December)

Duties: This position will serve as the project biologist and will be responsible for removing equipment from winter storage, readying it for use, for hiring and training any new personnel, and completion of Monday index boat counts. The project biologist will be responsible for inseason data reduction and conducting daily data analysis, postseason data analysis, and writing the ADF&G fishery data series report. This position will also ensure all data are in proper format and will generate inseason creel and inriver netting summaries to be posted on DocuShare. This position is also responsible for ensuring all pressing and aging of Chinook salmon scale samples from the creel survey and inriver nets is summarized and posted on DocuShare. All related data files, scale cards, and tissue samples will be archived. It will also be the responsibility of this position to keep the area managers informed of any problems with equipment, personnel, or the public affecting the completion of this project.

Robert Begich, Fishery Biologist III

Duties: This position will serve as the overall supervisor for the project. When necessary, the Area Research Supervisor will assist project personnel with all aspects of this project.

Consulting Biometrician

Jiaqi Huang, Biometrician III

Duties: Provides guidance on sampling design and data analysis; assists with preparation of operational plan and report.

Project Biologist Supervisor

Tony Eskelin, Fishery Biologist II

Duties: This position will serve as the direct supervisor of the project biologist and will assist when necessary with hiring, crew supervision, field season preparation, collection of data, data analysis, report writing, and operational planning.

Creel Survey Crew

Ivan Karic and Stacie Mallette, Fish and Wildlife Technician III (10 May–31 July)

Duties: Primary responsibilities of these positions when the sport fishery is open include interviewing and counting sport anglers and boats while adhering to a strict sampling schedule, sampling harvested Chinook salmon for ASL, tissue, and CWT information, and recording data accurately, entering data into a computerized database in a timely manner, and answering questions from the public on a variety of subjects such as sport fishing regulations and local fishery issues. Fishery violations observed during the course of normal duties will be documented and forwarded to the project leader and other enforcement agencies as needed.

Inriver Netting Crew

Johnna Elkins, Wilson Malone, and Cody Watkins, Fish and Wildlife Technician II (10 May–20 August)

Duties: Capturing and sampling salmon in nets while adhering to strict sampling schedules and protocols. Further duties are preventative maintenance and repair of assigned equipment.

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APPENDIX A: KENAI RIVER CHINOOK SALMON CREEL SURVEY AND INRIVER NETTING FORMS, 2018–2020

Appendix A1.–Kenai River Chinook salmon creel count form.

KENAI RIVER CHINOOK CREEL COUNT FORM

Water Conditions by Ciechanski State Park

Date: ______________________

Morning shift time: ________ Evening shift time: ________

Secchi (m): ________ Secchi (m) : ________

Water Temp (F): ________ Water Temp (F): ________

Technician	Count	River	**Non Guided**				**Guided**			
		Section *	Power		Drift		Power		Drift	
Initials	Time		Boats	Anglers	Boats	Anglers	Boats	Anglers	Boats	Anglers
Count #1										
		Warren Ames Bridge - RM 13.7 Chinook sonar								
		RM 13.7 Chinook sonar- Slikok Creek								
Count #2										
		Warren Ames Bridge - RM 13.7 Chinook sonar								
		RM 13.7 Chinook sonar- Slikok Creek								
Count #3										
		Warren Ames Bridge - RM 13.7 Chinook sonar								
		RM 13.7 Chinook sonar- Slikok Creek								
Count #4										
		Warren Ames Bridge - RM 13.7 Chinook sonar								
		RM 13.7 Chinook sonar- Slikok Creek								

Time: Military time at start of count **River Section:** reset counters at each section. **Angler:** count a person as an angler if actively fishing or rigging a line.

Do not count Guides as anglers, <u>only</u> fisherman <u>actively fishing or rigging a line</u>

Appendix A2.–Kenai River Chinook salmon creel interview form.

KENAI RIVER CHINOOK CREEL INTERVIEW FORM

Page_______ of ________

Date:____________ Crew Name(s): ________________________

	Time	Site	Fishing Method	Boat #	Angler Type	Angler #	Hours Fished		Harvest Loc.	Release Loc.	Release size	**Chinook Salmon**					**Comments**
							Above 13.7	**Below 13.7**	**(A)** or **(B)**	**(A)** or **(B)**	**(≥34")** or **(<34")**	Card #	Fish #	Length (metf)	Sex	Genetics #	Ad. Clip #, other...
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	

Site: 1=Centennial, 3=Riverbend, 5= Eagle rock, 6=Pillar's, 7=Poachers Cove **Fishing method:** Power (P) or Drift (D) **Angler type**: Guided (G) or Unguided (U) **Angler #:** Restart at 1 with each new boat.

Time Fished: time line was in the water **actively fishing** to the nearest 15 minutes **Below RM 13.7 and Above RM 13.7**

Harvest Loc.: Harvested above RM 13.7 **(A)**, or below RM 13.7 **(B)** **Released Loc.:** Released above RM 13.7 (A) or below RM 13.7 (B). **Release Size:** >=34 inches, or <34 inches Total Length

Chinook Salmon Section **Scale Card #** and **Fish#** (ex. 1-1, 1-2...) **Length** METF, **Genetics #**, **Sex** male/female

Comments: Adipose fin clipped AFC# or "no head" collected or other relevant comments regarding the interview or fish kept or released.

Appendix A3.–Kenai River Chinook salmon age, sex, and length (ASL) sampling forms.

KENAI RIVER CHINOOK CREEL ASL SAMPLING FORM

CREEL

Date: ____________________

Crew: IVAN/STACIE

Card	Fish #	Sex	METF Length (mm)	Total Length (inches)	Genetics #	Coded Wire Tag Cinch Strap #	Age	Comments
	1							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							

Card	Fish #	Sex	METF Length (mm)	Total Length (inches)	Genetics #	Coded Wire Tag Cinch Strap #	Age	Comments
	1							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							

Card	Fish #	Sex	METF Length (mm)	Total Length (inches)	Genetics #	Coded Wire Tag Cinch Strap #	Age	Comments
	1							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							

-continued-

Appendix A3.–Page 2 of 2.

KENAI RIVER CHINOOK NETTING ASL SAMPLING FORM

NETTING RM 8.6

Date: ____________________

Crew: ____________________

Card	Fish #	Sex	Length METF (mm)	TL (mm)	Genetics Card	Coded Wire Tag Cinch Strap #	Age	Comments
	1							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							

Card	Fish #	Sex	Length METF (mm)	TL (mm)	Genetics Card	Coded Wire Tag Cinch Strap #	Age	Comments
	1							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							

Card	Fish #	Sex	Length METF (mm)	TL (mm)	Genetics Card	Coded Wire Tag Cinch Strap #	Age	Comments
	1							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							

Appendix A4.–Kenai River inriver netting sampling form.

KENAI RIVER CHINOOK NETTING FORM

DATE:_________________

PAGE _______**of** _______

CREW: _________________

	SECCHI	TIME
Beginning of Shift		
End of Shift		

Set	Net	Bank	Area	Flow	Start	Stop	Chinook salmon							Other fish				Comments
#	4 or 7	L or R	NS or MR	u/d/s	Time	Time	Capture	Mesh 4, 7	Scale #	Sex	METF (mm)	TL (mm)	Gen. #	Species	#	Capture	METF (mm)	King Escapes/Recap/Other

Set#: start at #1, **Bank**: Left or Right **Area:** Midriver or Nearshore **Mesh:** 4 or 7.5" **Start time:** start of drift **Stop time:** end of drift **Tide**: direction of drift (upstream, downstream, or slack)

<u>**Chinook salmon (use one line per fish)**</u> **Capture:** Tangle/Gill/Wedge/Clamped **, Mesh:** 4 or 7**, Scalecard#, Sex** (M/F), **Length** Mid eye to tail fork (mm) and Total Length (mm), **Genetics Tissue #.**

Other Fish: Species: S=sockeye, C=coho, P=pink, DV=dolly varden, H=holligan, SF=starry flounder**: # caught, capture type,** and **length** if needed. **Secchi/Tide section. Time:** record **Secchi:** to nearest 5 cm

APPENDIX B: TISSUE SAMPLING INSTRUCTIONS

Appendix B1.–Tissue sampling instructions.

Adult Finfish Tissue Sampling for DNA Analysis

ADF&G Gene Conservation Lab, Anchorage

I. General Information

We use fin tissues as a source of DNA to genotype fish. Genotyped fish are used to determine the genetic characteristics of fish stocks or to determine stock compositions of fishery mixtures. The most important thing to remember in collecting samples is that **only quality tissue samples give quality results**. If sampling from carcasses: tissues need to be as "fresh" and as cold as possible.

Preservative used: Silica desiccant bead packet and salt dries and preserves tissues for later DNA extraction. Quality DNA preservation requires **Fast drying** (under 5 hours at 65°F); **Dry storage** (with 2 desiccant packs) in weathertight file box.

II. Sampling Method

III. Sampling Instructions

- **Every morning**: before sampling, rotate 3 desiccant packs (2-Pelican micro, 1-file box) into dehydrator @ **160⁰ F** for 12 hrs. **(NOT SAMPLES)!**
- **Prior to sampling**: Set up work space, fill out required collection information (upper left hand corner only) and place Whatman genetics card (10WGC) flat for easy access; ready to sample.
- **Sampling**:
  - o Wipe fin prior to sampling.
  - o Briefly wipe or rinse clippers with water between samples to reduce cross contaminating.
  - o Using clippers, cut one axillary fin per fish.
  - o Place one clipped fin tissue onto appropriate grid space. Follow sampling order printed on card - do not deviate. If large tissue sample, center tissue diagonally on grid space.
  - o **Only one fin clip per fish into each numbered grid space**.
  - o Staple each sample to 10WGC (see photo).
  - o Sampling complete, dust tissues with **1 tsp. non-iodized salt** to promote the preservation process.
  - o Staple landscape cloth "rain fly" to paper edge (2 staples max).
- **Loading Pelican Case:**
  - o 1st card: Remove blotter papers and desiccant packs from Pelican case. Place first card in Pelican case with tissues facing up. Next, place blotter paper directly over card and place one desiccant pack on top. Close and secure lid so drying begins.
  - o Up to 4 cards can be added per case. Add them so **tissue samples always face the desiccant pack** through blotter paper: 2nd card facing down between desiccant packs; 3rd card facing up between desiccant packs; and 4th card facing down on top of second desiccant pack. Close and secure Pelican case after inserting each card.
  - o All Whatman cards **remain in Pelican overnight** to dry flat.
- **Post-sampling storage**: Every morning, store dried tissue cards in weathertight file box at room temperature. Two desiccant packs are allocated for file box: every morning rotate 3 desiccant packs (2-Pelican, 1-file box) into dehydrator @ **160⁰ F** for 12 hours. **(NOT SAMPLES)!**
- **Shipping at end of the season**: Pack 10 **dried cards** per plastic photo page, slide in manila envelope; pack inside priority mailing box. Tape box shut and tape return address on box.

IV. Supplies included in sampling kit:

1. Clippers - for cutting a portion of selected fin.
2. Whatman genetics card – holds 10 fish/card.
3. Pelican case - 1st stage of drying and holding card samples.
4. Non-iodized salt – distribute 1 tsp. non-iodized salt over each card.
5. Silica packs – desiccant removes moisture from samples.
6. Blotter paper – covers full sample card for drying; multiple use.
7. Watertight file box – dry storage prior to return shipment.
8. Plastic photo page – 10 cards per page for return shipment.
9. Manila envelope – pack dried cards in manila envelope.
10. Shipping box – put sealed manila envelope inside box.
11. Stapler – extra protection, secure sample to numbered grid.
12. Staples – only use staples provided, specific for stapler.
13. Dehydrator – oven-dry desiccant packs overnight (share w/CF).
14. Laminated "return address" labels.
15. Sampling instructions.
16. Pencil

V. <u>**Shipping:** Address the sealed mailer box for return shipment to ADF&G Genetics lab.</u>

Return to ADF&G Anchorage lab:	ADF&G – Genetics 333 Raspberry Road Anchorage, Alaska 99518	Lab staff: 907-267-2247 Judy Berger: 907-267-2175 **Freight code:** ___________

APPENDIX C: DATA MAPS FOR KENAI RIVER CHINOOK SALMON CREEL SURVEY AND INRIVER NETTING STUDY, 2018–2020

Appendix C1.–Data map for file Kscnt2018–2020.dta.

Data field name	Start column	End column	Comma column	Codes and comments
Month	1	2	3	
Day	4	5	6	
Year	7	10	11	Four digit year
Location	12	12	13	1 = Warren Ames Bridge to RM 13.7 Chinook salmon sonar site, 2 = RM 13.7 sonar to Slikok Creek
Count time	14	17	18	Military time when count began
Unguided power boat count	19	22	23	A boat was counted if it contained at least one angler
Unguided power angler count	24	27	28	Anglers were defined as people who had a line in the water or were rigging a line
Unguided drift boat count	29	32	33	A boat was counted if it contained at least one angler
Unguided drift angler count	34	37	38	Anglers were defined as people who had a line in the water or were rigging a line
Guided power boat count [a]	39	42	43	A boat was counted if it contained at least one angler
Guided power angler count [a]	44	47	48	Anglers were defined as people who had a line in the water or were rigging a line
Guided drift boat count [a]	49	52	53	A boat was counted if it contained at least one angler
Guided drift angler count [a]	54	57	End	Anglers were defined as people who had a line in the water or were rigging a line

[a] Count fields will be left blank if fishing was closed at that time for guided anglers, or a scheduled count was missed.

Appendix C2.–Data map for file Ksint2018–2020.txt.

Data field name	Start column	End column	Comma column	Codes and comments
Date Code	1	8	9	
Year	1	4		Four digit year
Month	5	6		
Day	7	8		
Interview time	10	11	12	Time of interview (truncated to nearest hour prior to 2005)
Interviewer	13	13	15	Initials of interviewer
Interview location	16	17	18	01=Centennial Park, 03=Riverbend, 05=Eagle Rock, 06=Pillars, 07=Poacher’s Cove.
Survey area code	19	20	21	P0 = Kenai Pen.
Site code	22	24	25	001 = Kenai River, Cook Inlet to Soldotna Bridge
(Blank)	26	27	28	
Boat number	29	31	32	Does not reset to 01 at start of each person shift
Angler number	33	34	35	Angler number starts at 01 for each boat
Interview type	36	36	37	always C = completed trip interview
Boat or shore	38	38	39	B = boat, S = shore
Angler Type	40	40	41	U = unguided, G = guided
Hours fished above RM 13.7	42	43	44	Total hours fished above RM 13.7
Minutes fished above RM 13.7	45	78	47	Total minutes fished above RM 13.7 (rounded to nearest .25 hour)
Hours fished below RM 13.7	48	49	50	Total hours fished below RM 13.7
Minutes fished below RM 13.7	51	52	53	Total minutes fished below RM 13.7 (rounded to nearest .25 hour)
Species harvested above RM 13.7	54	56	57	410 = Chinook salmon
Harvest	58	58	59	K = Chinook salmon harvested
Species harvested below RM 13.7	60	62	63	410 = Chinook salmon
Harvest	64	64	65	K = Chinook salmon harvested
Number of Chinook harvested above RM 13.7	66	67	68	Usually 1 (or 2 if proxy)
Number of Chinook harvested below RM 13.7	69	70	71	Usually 1 (or 2 if proxy)

-continued-

Appendix C2.–Page 2 of 2.

Data field name	Start column	End column	Comma column	Codes and comments
METF length of Harvested Chinook salmon	72	76	77	(mm's)
Sex of harvested Chinook	78	78	79	M = male, F = female
Species released above RM 13.7	80	82	83	410 = Chinook salmon
Released	84	84	85	R = Chinook released
Species released below RM 13.7	86	88	89	410 = Chinook salmon
Released	90	90	91	R = Chinook salmon released
Number of Chinook released above RM 13.7	92	93	94	Typically 1, but could be more
Number of Chinook released below RM 13.7	95	96	97	Typically 1, but could be more
Number released <34 in	98	98	99	Released Chinook salmon estimated to be < 34 in total length
Number released ≥34 in	100	100	101	Released Chinook salmon estimated to be ≥ 34 in total length
Fishing location	102	102	103	Has been set to "1" since 2000
Boat type	104	105	106	1 = power boat, 2 = drift boat, "blank" = shore
Adipose fin clip #	107	112	113	N = no adclip, C = adclip present
Age	114	115	116	Postseason age of Chinook salmon (11, 12, 13…)
Age error	117	117	118	R = regen, M = missing, I = inverted, A = absorbed
Genetics sample	119	123	End	5-digit Whatman Card #

Appendix C3.–Data map for file ksintage2018–2020.txt.

Data field name	Start column	End column	Comma column	Codes and comments
(Blank)	1	1	2	
Date code	3	8	9	
Year	3	4		Two digit year
Month	5	6		
Day	7	8		
(Blank)	10	13	12,14	
Survey area code	15	16	17	P0 = Kenai Peninsula fresh water (not Kenai/Kasilof)
Site code	18	20	21	001 = Kenai River, Cook Inlet to Soldotna Bridge
(Blank)	22	23	24	
	25	26	27	
Species	28	30	31	410 = Chinook salmon
(Blank)	32	44	35,39,43,45	
(Blank)	46	57	47,49,58	
Collector	59	60	61	Initials of sampler
Sex	62	62	63	M = male, F = female
(Blank)	64	64	65	
METF length	66	69	70	METF, millimeters
Total length	71	75	76	TL, in
Genetics sample	77	80	81	5-digit Whatman Card #
Chinook harvested above RM 13.7	82	83	84	1 = Chinook was harvested above RM 13.7
Chinook harvested below RM 13.7	85	86	87	1 = Chinook was harvested below RM 13.7
(Blank)	88	93	94	
Angler type	95	97	98	G = guided, NG = unguided
Scale card number	99	99	100	Scale cards collected per day (1 scale card holds 10 fish samples)
Fish number	101	102	103	Fish number on scale card (Values 1-10)
Age	104	105	106	column 104 = freshwater age, column 105 = marine age
Age error	107	107	End	R = regen, M = missing, I = inverted, A = absorbed

Appendix C4.–Data map for file creelsecchi2018–2020.txt.

Data field name	Start column	End column	Comma column	Codes and comments
Date Code	1	8	9	
Year	1	4		Four digit year
Month	5	6		
Day	7	8		
Time	10	13	14	24-hour time system
Secchi	15	18	19	Secchi depth (meters) midchannel at RM 15.3, #.## format
Water temperature	20	23	End	Water temperature (degrees C) midchannel at RM 15.3 ##.# format

Appendix C5.–Data map for file Ksawl2018–2020.txt.

Data field name	Start column	End column	Comma column	Codes and comments
Crew number	1	2	3	1,2,3 or 4
Date code	4	11	12	
Year	4	7		Four digit year
Month	8	9		
Day	10	11		
Statewide location/stat	13	16	17	"Always" = 009 (Kenai River)
Length type	18	19	20	EF = Mid-eye-fork length, TL = Total length
(Blank)	21	23	24	
Manner of capture	25	25	26	1=tangled by teeth/head, 2=gilled, 3=mouth clamped, 4=wedged (captured by body)
Net mesh size deployed	27	27	28	Net mesh deployed towards shoreline (4, 5, or 7 inch mesh)
Mesh size captured in	29	29	30	Mesh size fish was captured in (4, or 7 inch mesh)
Drift start time (hour)	31	33	34	24-hour system
Drift start time (minutes)	35	37	38	
Drift start time (seconds)	39	41	42	
Drift stop time (hour)	43	45	46	24-hour system
Drift stop time (minutes)	47	49	50	
Drift stop time (seconds)	51	53	54	
(Blank)	55	56	57	
Scale card number	58	58	59	Scale card of the day (1 scale card holds 10 fish samples)
Fish number	60	62	63	Number on scale card (Values 1–10)
Age	64	65	66	Column 104 = Freshwater, Column 105 = Marine
Age error	67	68	69	R = regen, M = missing, I = inverted, A = absorbed, D = dirty
Repetition number	70	70	71	Begins at 1 each day and increments by 1 every 8 drifts
Drift number	72	73	74	Begins at 1 each day and increments with every drift

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Appendix C5.–Page 2 of 2.

Data field name	Start column	End column	Comma column	Codes and comments
Sex	75	75	76	M or F
METF length	77	81	82	(mm)
Total length	83	87	88	(mm)
(Blank)	89	90	91	
(Blank)	92	94	95	
Fate	96	96	97	R = release, E = escape, Y = recap, H = harvested
Bank	98	98	99	R = right bank, L = left bank that drift was set
Area	100	101	102	M = Midriver, N = Nearshore
Species code	103	105	106	410 = Chinook, 420 = sockeye, 430 = coho, 440 = pink, etc.
Number caught	107	108	109	
Adipose finclip	110	116	117	Coded wire tag number
(Blank)	118	121	122	
(Blank)	123	124	125	
Condition/injury status	126	126	127	1 = Vigorous, 2 = Vigorous and bleeding, 3 = lethargic, 4 = lethargic and bleeding, 5 = other
Genetics sample #	128	132	End	5-digit Whatman Card #

APPENDIX D: TECHNICIAN MANUAL AND SCHEDULES FOR THE KENAI RIVER CHINOOK SALMON CREEL SURVEY AND INRIVER NETTING STUDY, 2018–2020

Appendix D1.–Technician manual for the 2018–2020 Kenai River Chinook salmon creel survey and inriver netting study.

INTRODUCTION and BACKGROUND

This manual provides the specific procedures for technicians conducting the 2018–2020 Kenai River Chinook Salmon Creel Survey and Inriver Netting Project. These projects are critical to effective inseason and postseason management of Chinook salmon in the Kenai River. The data collected from these projects are highly scrutinized and used daily in projecting returns, assessing run strength, harvest, effort, and escapement of Kenai River Chinook salmon.

Creel survey personnel will be counting boats and anglers, interviewing sport anglers, and collecting biological samples from harvested Chinook salmon. The information collected in this survey will be used to estimate the sport harvest of Kenai River Chinook salmon between the Slikok Creek closed area and Warren Ames Bridge. The harvest estimate is used to make both inseason and postseason management decisions regarding the Kenai River Chinook salmon fishery.

The netting crew will be capturing salmon using nets to collect species composition information and relative abundance (CPUE) as well as biological information from captured Chinook salmon (i.e., genetics samples, sex, age, length, and CWT information) and length and abundance information from other salmon species including tissue samples from sockeye salmon. This information is used inseason to estimate the age composition of returning Chinook salmon.

DUTIES

Creel Personnel:

- Conduct angler and boat counts and interview anglers on the Kenai River while adhering to a rigid sampling schedule.
- Sample Chinook salmon harvested by sport anglers for ASL and CWT information and record the appropriate information on a handheld computer and sampling forms.
- Download collected data on the Allegro CX handheld computer to the project biologist's personal computer. This is to be done at the end of the day after returning to the office.
- Answer questions from the public on a variety of subjects such as sport fishing regulations and local fishery information.
- Carefully document fishery violations observed during the course of normal duties and forward information to the project leader and other enforcement agencies.

Both Creel and Inriver Netting Personnel:

- Carefully edit all data forms and computer-entered data before turning in to the immediate supervisor.
- Maintain and repair provided state equipment such as boats, motors, trailers, and state highway vehicles. Only minor maintenance and repair will be done at the discretion of the project biologist. Major maintenance and repair will be forwarded to the maintenance supervisor for boats, motors, and trailers and the Alaska Department of Transportation for highway vehicles.
- Complete time sheets no later than the 15th and 30th or 31st of each month.
- Clean and maintain appropriate areas of the ADF&G warehouse and shed.
- Ensure all boats and vehicles are kept clean.
- Report any problems to your immediate supervisor.

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SAMPLING, INTERVIEWS, and ANGLER COUNTS

Interviews: Interviews are to be conducted at the times and locations in the interview schedule. When conducting interviews, always identify yourself as working for the Alaska Department of Fish and Game and only interview boats that are leaving the fishery and anglers that are done fishing for that trip (completed trip anglers). Anglers should be randomly selected for interview; i.e., **do not target only anglers with fish**, but do attempt to interview all anglers exiting the fishery at your selected location. If you cannot interview all anglers, then document the number and type of anglers that you missed.

While completing the interview, record the information into the handheld computer. When sampling harvested Chinook salmon, record sex, mid eye to tail fork (METF) length, and total length (TL) on the ASL sampling form in addition to entering all necessary data into the computer. The METF length measurement, to the nearest 5 mm, is from the mid eye to the fork of tail. The total length measurement, to the nearest one-quarter inch, is from the snout to tip of tail. Laying the tape stretched out on the ground above the fish will prevent the girth of the body from overestimating the total length. Collect 3 scales on the left side of the fish 3 rows above the lateral line at a 45 degree line posterior of the dorsal fin to the tail; place them concave (curled) side down on the scale card and label each fish with the METF length. Be sure to label the form and card correctly (date, location, sampler, species, etc.). In addition, a genetics sample will be taken from the axillary process of all sampled fish. Genetics sample numbers will be entered into the computer and samples will be stored in the project biologist's office.

All sampled Chinook salmon will be inspected for a missing adipose fin. If the adipose fin is missing, the technician will collect the head of the Chinook salmon (provided the angler approves), affix the supplied cinch strap, and store it in an ADF&G freezer at the Soldotna office.

Boat and angler counts: Counts are to begin on the whole hour as designated on the schedule and should not take more than 1 hour to complete. Plan your schedule so that you are at the designated end of the study area at the designated time and location. Direction of travel is labeled in the schedule to minimize travel distance.

Categories to be tallied during each count include the following:

1) guided power boats
2) guided power anglers
3) guided drift boats
4) guided drift anglers
5) unguided power boats
6) unguided power anglers
7) unguided drift boats
8) unguided drift anglers

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Four individual counts will be conducted during each scheduled count period. These areas include the following:

1) between Warren Ames Bridge and the Chinook salmon sonar site (RM 13.7)
2) between Chinook salmon sonar site (RM 13.7) and Slikok Creek Closed area (RM 18.9)

For example, a count will be made from Slikok Creek downstream to the RM 13.7 Chinook salmon sonar site then entered into the handheld computer. Thumbcounters will be reset and the next count will be from the RM 13.7 sonar site to Warren Ames Bridge. Each creel personnel will take a Secchi disc reading and water temperature (°F) in front of Ciechanski State Park during their shift and enter it into the computer. If the handheld computer is not functioning properly, data will be entered onto data forms and turned into the project biologist at the end of his or her shift.

Inriver Netting: Each day, a crew of 2 people will be scheduled from 0600 to 1400 hours with netting occurring from approximately 0700 to 1300. Netting will take place in the 0.5 m section of river at RM 8.6. The mesh size to be deployed from the boat and the bank from which to set the net will be specified by the handheld computer. It is critical that the net is only drifted in the area that would be deemed nearshore or midriver. This will be stressed to you all season and if you have any questions regarding where the nearshore or midriver areas are do not hesitate to ask the project biologist. The time that each set begins and ends is automated and recorded on the handheld computer as well as all the biological information on sampled salmon. If the computer is functioning properly, the only writing you will have to do for sampling will be to record the length on the scale card and to fill out the back of the scale card. The METF length measurement, to the nearest 5 mm, is from the mid eye to the fork of tail on Chinook salmon and is the length that is recorded on the scale card. The total length (tip of snout to end of tail) will also be measured to the nearest 5 mm. On each sampled Chinook salmon, collect 3 scales and place them on the scale card concave side down, oriented vertically from the scale insertion point of the fish. If the Chinook salmon is small (i.e., <600 mm), then put the fish in a water-filled tote on your boat. Small Chinook salmon have a tendency to slip out of tail ties and we want to reduce the number of escapes. Be sure to label the form and card appropriately (date, location, sampler, species, etc.). Before releasing the fish, mark every fish with a “hole punch” on the dorsal side of the caudal fin, and do not sample a fish that already has a hole punched in that area; record it as a recapture. Be sure to examine all captured Chinook salmon for the presence of an adipose fin and sacrifice all Chinook salmon without an adipose fin. Once a fish without an adipose fin is on board, cut the head off and affix a cinch strap to the head. There won’t be many Chinook salmon without an adipose fin so be sure to examine every one. An escape is a fish that got out of the net without being sampled only if it was positively identified as a Chinook salmon (e.g., 4 bobbing corks do not count if you did not visually see that it was a Chinook salmon). Sockeye salmon lengths will be collected from all sockeye captured in the first 8 sets of each day throughout the season. Tissue samples will be collected from all sockeye salmon captured in May of 2018 (subsequent years 2019 and 2020 dependent on funding), and from sockeye captured during the first 8 sets each day during June. Each day, the netting crew will take both a Secchi disc reading at the beginning and end of their shift and enter it in the handheld computer.

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Each week 1 crewmember will spend 1 day mending nets, repairing equipment, and conducting various odd tasks such as scale pressing, editing data, and potentially working on other projects as time allows. This office day will be alternated so that each crewmember will have an office day every third week.

EQUIPMENT NEEDED

At the start of the season, each crew member will be issued and responsible for a clipboard. At the start of each sampling period, you should make sure that it contains the following at a minimum:

- Cell phone (either provided by state, or use of personal phone)
- 20–30 scale cards and acetates in a ziplock bag
- 3¼ in hole punches
- 3 sets of tweezers
- 2 standard pencils
- 2 measuring tapes
- Sampling forms (At least 5 of each)
- 1 *rite in the rain* logbook
- 2 pair of sharp scissors
- 2 knife (heads)
- 5 statement forms
- Laminated State Parks, ABWE, and ADF&G contact list
- Sport fish regulation booklets
- Copy of State Parks Permit for over-horsepower motors (netting crew)
- A copy of this manual
- Digital camera

In addition, you will need the handheld Allegro computer and genetics sampling equipment listed in Appendix B1. Be sure and double check you have what you need before leaving the office area.

UNIFORMS

Your uniform is your hat. Please try and wear an ADF&G issued hat during your fieldwork. ADF&G patches sewn on your personal floatation device (PFD) may be another form of identification. You will be held to a higher standard than the public, so when on duty, act professional, represent the department well, and be aware that you are being watched a lot closer than you may think.

PERSONAL FLOATATION DEVICES (LIFE JACKETS)

Life jackets are to be worn at all times when on the boat. There will be no exceptions to this rule and crews are instructed to notify the project biologist if there is any noncompliance to this rule. You may take off your PFD to change clothes but must promptly put your life jacket back on.

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SAMPLING GEAR

You will be issued a high quality rain coat and bibs, rubber boots, a PFD, both arm length and short rubber coated gloves, as well as a dry bag for each crewmember. You will be instructed to turn in all sampling gear at the end of the field season.

SAFETY

Safety is the utmost priority. Please try and be safe and aware of your surroundings. Do not do anything to jeopardize your or members of your crews' safety. There is no piece of data that is worth jeopardizing safety. If you feel uncomfortable doing a task that could potentially jeopardize your safety, do not do it and contact your supervisor.

TIME SHEETS

Time sheets must be completed twice monthly, one for the 1st through the 15th and one for the 16th through the 30th or 31st. This is your responsibility and you will be reminded when they are due. You will be instructed as to how to properly fill out your timesheet online. Save and review the timesheet with your supervisor, but do not press the submit button. The website address is http://www.tears.adfg.state.ak.us/tears/help/#. Print out both the timesheet and project accounting detail sheet. Don't forget to sign your timesheet. You do not need to sign the project accounting detail sheet but turn in both to the project biologist. You will be paid for grave and swing shifts if you work during these times along with regular time and you will be compensated for overtime if you work more than 37.5 hours per week. You need to fill in start/stop times and the number of hours worked each day. Lunch is one-half hour per day and is not compensable. There are two 15-minute compensable breaks per day. The payroll officer will determine how many hours of grave, etc. that you have worked. The netting crew should try and take lunch at different times of day. The creel crew should try and take lunch at a break in sampling.

OVERTIME is any time worked in excess of 37.5 hours per week. The workweek always begins on Monday and ends on Sunday at midnight.

SWING shift pay is any shift that begins between 1200 (noon) and 1959 (7:59 PM). Employees working this shift are entitled to an additional 0.0375 times their hourly rate for the hours worked.

GRAVE shift pay is any shift that begins between 2000 (8:00 PM) and 0559 (5:59 AM). Employees working this shift are entitled to an additional 0.075 times their hourly rate for the hours worked.

PURCHASING and INVOICES

You may be instructed to make purchases at various local stores. You must sign the invoice when you receive the goods. Make sure the ***itemized*** invoice or receipt states exactly what you purchased (i.e., sporting goods is not specific enough). You should also print your name below your signature, put Kenai River Chinook somewhere on the invoice, and turn it in promptly to the appropriate bin in the project biologist's office. Let the project biologist know if you need something to do your job effectively (e.g., gloves, boots, sampling equipment, rain gear).

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TIMELINESS and TIME OFF

It is very important to show up on time for your scheduled workday; timing is critical and it is important to follow the specified sampling schedule. Please notify the project biologist if for some reason you will not be able to complete your regular workday at the times specified by your schedule. The netting crew will work 5 consecutive days with 2 consecutive days off. The creel crew will work 4 out of 7 days per week with no guarantee of 2 consecutive days off. The creel crew will work all weekend days (unless the fishery is closed), 2 of the 4 days between Tuesday through Friday and will not work Mondays. If you need time off, contact the project biologist and he will try and find someone to fill in for you. Please try and give some time in advance if you know you need the time off and most of the time it shouldn’t be a problem. In an emergency, contact the project biologist.

SPORTFISHING VIOLATIONS

Fish and wildlife law enforcement is not a primary job responsibility of ADF&G employees; however, during the course of your fieldwork you may come across sport fishing violations. If you come across violations, you are instructed to promptly call the project biologist; in the event that you cannot contact him, call either Alaska State Parks or the Alaska Division of Wildlife Troopers (DWT). Laminated cell phone lists of crewmembers, supervisors, and enforcement professionals are provided and will be in the sampling clipboard. You are not to check fishing licenses or do any type of enforcement. The creel crew will be taking total length on fish and may come across harvested fish within the restricted slot limit in the early run. In this situation, promptly notify the project biologist. Carefully note what you witnessed and take down boat numbers, license plates, physical descriptions, and document all witnessed violations in your logbook. Enforcement is not your responsibility, so use discretion and should you come across violations, promptly notify your supervisor and an enforcement officer(s) provided on the contact list.

EVALUATION

Data collection and editing are the primary duties of these positions. Each person will be evaluated on the quality, cleanliness, and thoroughness of the data that they turn in as well as dependability and timeliness arriving to work. Also, it is important to act professionally and communicate regularly with your supervisor and crewmembers to discuss problems or suggestions relative to achieving success of the respective studies.