Regional Operational Plan SF.2A.2016.09

Operational Plan: Kenai River Chinook Salmon Creel Survey, Inriver Gillnetting, and Age Composition Study, 2016

by

Jeff Perschbacher

May 2016

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.2016.09

OPERATIONAL PLAN: KENAI RIVER CHINOOK SALMON CREEL SURVEY, INRIVER GILLNETTING, AND AGE COMPOSITION STUDY, 2016

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SIGNATURE PAGE

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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 early- and late-run Chinook salmon in the lower Kenai River between the Warren Ames Bridge (river mile [RM] 5.1) and the Soldotna Bridge (RM 21.1) in 2016. Creel survey estimates will be geographically stratified in relation to the RM 13.7 Kenai River Chinook salmon sonar to provide angler effort, catch, and harvest upstream and downstream of RM 13.7. A standardized inriver drift gillnetting study will be conducted in the Kenai River at RM 8.6 from 16 May to 20 August to estimate the age, sex, and length composition of early- and late-run Chinook salmon. A small pilot study using tangle nets (4.0 inch stretched mesh), and a 6.0 inch stretched mesh net will examine possible ASL biases in the existing netting study. Data collected from the creel survey and inriver netting study, combined with sonar estimates of abundance, will be used for inseason management, and postseason stock assessment of Kenai River Chinook salmon.

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

INTRODUCTION

PURPOSE

The primary goal of the creel survey is to estimate sport angler effort, and catch and harvest of Kenai River Chinook salmon (*Oncorhynchus tshawytscha*). Catch and harvest estimates of Chinook salmon are required for inseason management and for postseason stock assessment. The primary goal of the inriver netting project is to provide age, sex, and length composition data for Kenai River Chinook salmon and length composition data for sockeye salmon. Data collected by the inriver gillnetting project are used inseason for sonar mixture model estimates of Chinook salmon passage as well as postseason stock assessment. Data collected by both the creel survey and inriver gillnetting study, in conjunction with sonar passage estimates, are critical to maintain sustained yield and fishing effort for this resource.

BACKGROUND

The Kenai River (Figure 1) has been 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 likely 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: “early” (late April–late June) and “late” (late June–early August) (Bendock and Alexandersdottir 1992; Burger et al. 1985; Reimer 2013). For management purposes, the early run is composed of all 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 Alaska Board of Fisheries (BOF) meeting, management policies were adopted to govern management of both runs. These policies, amended many times since, establish escapement goal ranges for both runs and specify the management actions available to achieve those goals. The early-run optimum escapement goal range (OEG) is currently 5,300 to 9,000 Chinook salmon. The late-run sustainable escapement goal range (SEG) is currently 15,000 to 30,000 Chinook salmon.

The management plans for each run require timely predictions of escapement for inseason management. The inriver gillnetting study provides daily length information necessary for the RM 13.7 sonar to estimate the number of Chinook salmon passing the sonar. Daily sonar passage estimates of abundance in conjunction with creel survey estimates of daily harvest provide fishery managers with inseason estimates of escapement. In addition to inseason management, these projects provide data used postseason to develop management plans and escapement goals for Kenai River Chinook salmon.

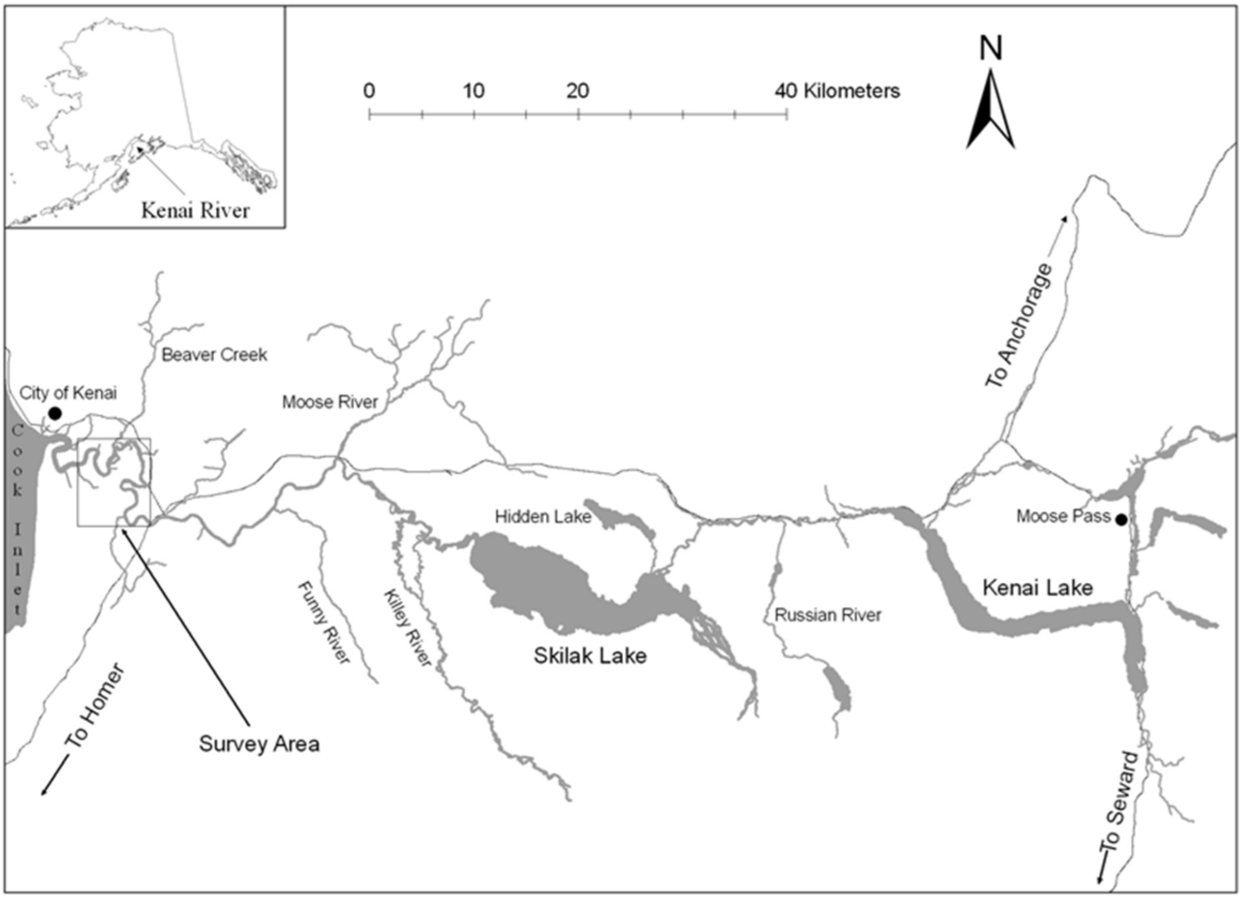

Figure 1.–Map of the Kenai River drainage.

Creel Survey

The Alaska Department of Fish and Game (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 age, sex, and length (ASL) composition of harvested Chinook salmon. The Division of Sport Fish began using sonar at RM 8.6 in 1987 to estimate the inriver run of Chinook salmon while the creel survey provided harvest estimates for managing the sport fishery to meet escapement goals. Prior to 1991, anglers were surveyed in the entire area open to Chinook salmon fishing (downstream of Skilak Lake). Since 1991, the creel survey has been used to estimate sport angler effort and harvest of Chinook salmon between the Warren Ames Bridge (RM 5.1)[1] and the

[1] Warren Ames Bridge is traditionally the demarcation point between the lower end of the sport fishery and the beginning of the personal use dipnet fishery. We assume negligible catch and harvest in sport fisheries below the Warren Ames Bridge.

Soldotna Bridge (RM 21.1) where the majority of sport fishing effort occurs[2] (Figure 2). Since 1994, catch estimates have been collected and incorporated with harvest and angler effort estimates to monitor the Chinook salmon fishery. In 2015, the Chinook salmon sonar site was relocated upstream of major tidal influence from RM 8.6 to RM 13.7 (Key et al. 2016). The new RM 13.7 sonar site is centered in the lower Kenai River sport Chinook salmon fishery and approximately 50% of late-run harvest has occurred downstream of the new sonar site (Perschbacher and Eskelin *In prep*). Continued monitoring of the Chinook salmon sport fishery by the creel survey is essential for inseason management decisions that may affect sport, commercial, and personal use fisheries.

Inriver Gillnetting

Beginning in the mid-1980s, mark–recapture studies using gillnets for the marking phase were used to estimate the inriver run of Chinook salmon. The Sport Fish Division began using sonar in 1987 to estimate the inriver run of Chinook salmon while the inriver gillnetting study provided age-sex-length (ASL) compositions of the inriver run. The gillnetting program was standardized in 1998 to include catch rates (CPUE) and further standardized in 2002 to include species composition of fish passing through the insonified (midriver) area of the RM 8.6 Chinook salmon sonar site (Reimer 2004). Recent studies found Chinook salmon were migrating shoreward of the sonar transducers during high tide (Miller et al. 2014) and these fish were on average smaller and younger than those captured midriver (Perschbacher 2015). By relocating the sonar site upstream of major tidal influence (RM 13.7), the entire river cross-section was able to be insonified in 2015 (Key et al. 2016). This location is also below over 95% of Chinook salmon spawning habitat (Eskelin and Reimer *In prep*). Ideally, the netting program would operate just downstream of the RM 13.7 sonar, but a pilot study concluded that netting in the RM 13.7 area was not conducive for an intensive inriver gillnetting study due to social issues, heavy boat traffic, and net avoidance of fish due to water clarity.

In an attempt to capture a more representative sample of returning Chinook salmon, several changes to the RM 8.6 inriver gillnetting study were incorporated during 2013 and 2014. Netting effort was doubled, the river was fished rigorously from shoreline to shoreline, panel nets were instituted, and the schedule was based on time of day rather than tidal stage. These changes were designed to examine 1) size discrepancies of Chinook salmon captured midriver vs. nearshore and vs. those sampled at tributary weirs; 2) the feasibility of netting RM 8.6 shoreline to shoreline with equal effort; and 3) the effects of tide stage on Chinook salmon catchability and size selectivity.

Findings from 2013 and 2014 were as follows: catch rates were highest during the morning hours; fish captured nearshore were on average smaller than those captured midriver; and ASL compositions of Chinook salmon were similar among all tidal stages (Perschbacher and Eskelin *In prep*.). Consequently, the 2015 inriver gillnetting study was conducted during the morning hours (7:00 AM–1:00 PM), regardless of tidal stage, with effort divided equally between nearshore and midriver areas. The study design will remain the same in 2016. In addition, a separate pilot study will investigate the use of alternative mesh sizes (4.0 inch tangle net and 6.0 inch mesh net) in an attempt to capture a more representative ASL sample of Chinook salmon while reducing incidental fish mortality.

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[2] Similar estimates are also obtained postseason from the Statewide Harvest Survey, and since 2006 from Freshwater Guide Log Books. However, the creel survey provides estimates inseason, which allows for more effective inseason management.

Inseason estimates of Kenai River Chinook salmon sport harvest, and representative ASL compositions of returning Chinook salmon are critical for accurate estimation of inriver run abundance and timing, and postseason stock assessment. This operational plan describes the creel survey and inriver gillnetting project design for the 2016 field season.

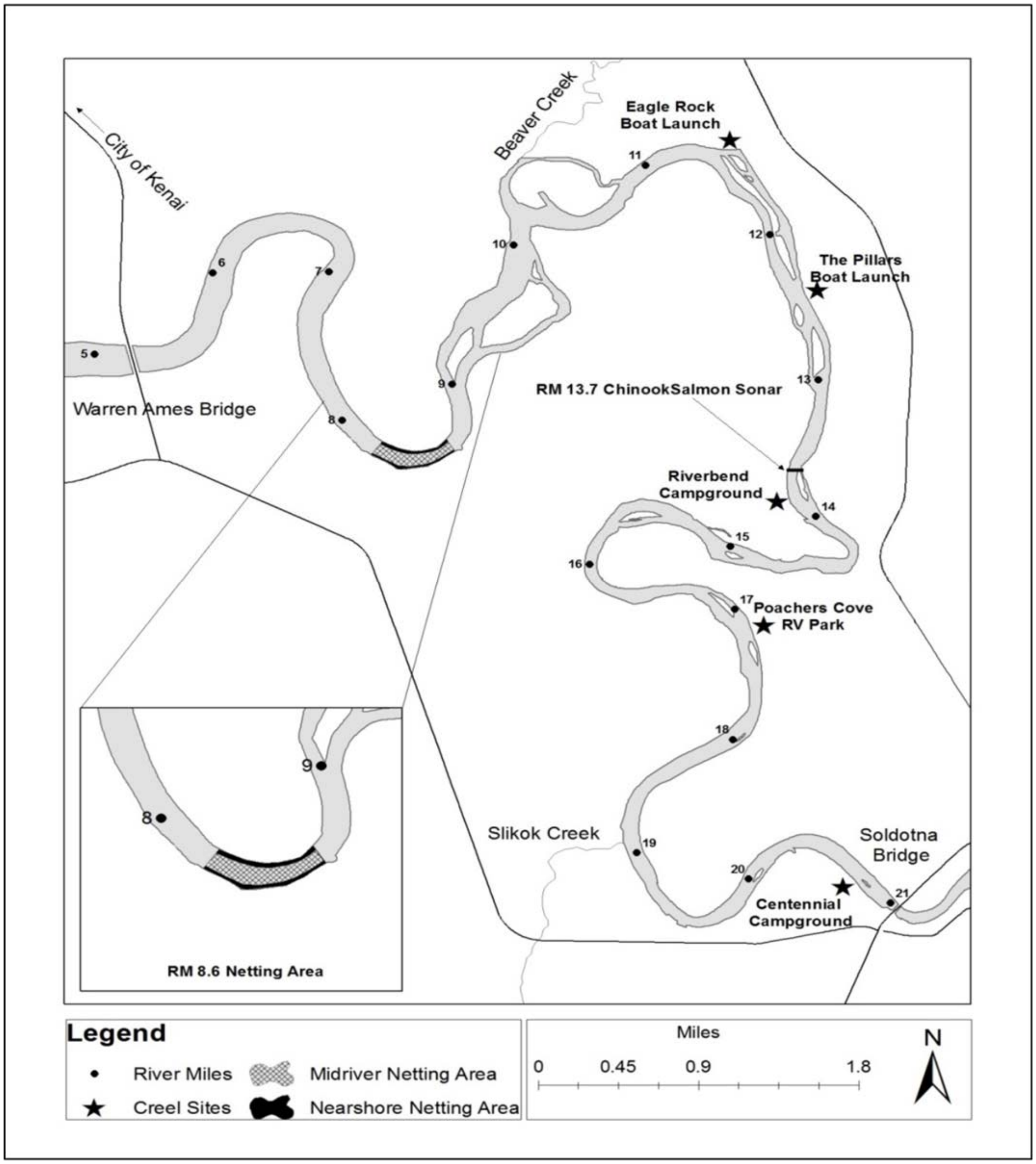

Figure 2.–Map of the Kenai River creel survey and inriver gillnetting study areas.

OBJECTIVES

This project provides parameter estimates necessary for inseason management and postseason stock-recruit analysis of Kenai River Chinook salmon. These parameters include catch and harvest of Chinook salmon by the inriver sport fishery[3] (for inseason monitoring of escapement), and size and age 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 Fleishman 2013; Fleischman and McKinley 2013).

PRIMARY OBJECTIVES

1) Estimate catch and harvest of Chinook salmon in the lower Kenai River mainstem sport fishery between the Warren Ames Bridge and the RM 13.7 sonar, and between the RM 13.7 sonar and the Soldotna Bridge from 16 May through 30 June (early run), and from 1 July through 31 July (late run) such that the estimates for each run and geographic strata are within 25%, or 1,000 fish, of the true values 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 Chinook salmon captured in inriver gillnets from 16 May through 20 August such that all age-proportion estimates for each run are within 0.1 of the true values 95% of the time[7].
    b) Estimate the proportion by age of Chinook salmon harvested by the sport fishery in the mainstem Kenai River between Warren Ames Bridge and the Soldotna Bridge such that all age-proportion estimates for each run are within 0.20 of the true values 80% of the time.

SECONDARY OBJECTIVES

Tasks are of secondary importance and can be accomplished without driving study design or sample size.

1) Estimate daily CPUE of Chinook salmon captured in inriver gillnets.
2) Provide mid eye to tail fork (METF) length data of all salmon species captured in inriver gillnets for inseason ARIS sonar mixture model species composition evaluation.
3) Insert esophageal radio transmitters into early-run Chinook salmon captured in inriver

[3] Total inriver sport fishery catch and harvest are the sum of creel survey estimates below the Soldotna Bridge, and State Wide Harvest Survey estimates reported above the Soldotna Bridge.

[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.

[5] High precision is neither possible nor necessary when the harvest is small; meeting the absolute precision goal is sufficient in this case.

[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*.

gillnets in conjunction with the *Kenai River Chinook salmon radio telemetry study*[8].

4) Collect tissue samples from Kenai River Chinook salmon sampled from inriver gillnets and the sport fish harvest for genetic analysis[9].

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) Examine Chinook salmon sampled from the sport harvest and the inriver gillnets for external sexual characteristics, presence or absence of the adipose fin, and presence of a radio tag.

7) Estimate CPUE of Chinook salmon captured in inriver gillnets in relation to tide stage.

8) During the early run, compare length distributions between Chinook salmon captured in 4.0 inch and 6.0 inch mesh nets (pilot study) to those captured in 5.0 inch and 7.5 inch mesh nets (existing study).

9) Compare length distributions between Chinook salmon captured in inriver gillnets during the early run and those sampled at the Killey River and Funny River weirs.

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 the Soldotna Bridge. First-stage sampling units will be days. Daily catch and harvest will be estimated as the product of effort (angler-hours) and catch per unit effort (CPUE) or harvest per unit effort (HPUE), respectively. Second-stage units for estimating effort will be periods, during which counts of anglers are made from a boat. Second-stage units for estimating CPUE and HPUE will be angler-trips, sampled by interviewing anglers who have completed fishing for the day and are exiting the fishery. In 2016, the early-run fishery is closed by emergency order unless data from inseason assessment projects indicate that fishing opportunity can be allowed without jeopardizing achievement of the optimal escapement goal.

The creel survey is scheduled from 1 July through 31 July on the Kenai River between the Warren Ames Bridge and the Soldotna Bridge. The creel survey will be conducted during the early run if the fishery is re-opened by emergency order. A fishing day is defined as 0400–2359 hours (20 hours); however, guided anglers are restricted to a 12-hour fishing day (0600–1800) by regulation. The following methods and schedule for the creel survey are prepared for when the fishery reopens.

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[8] Eskelin, T. *In prep*. Operational Plan: Kenai River adult Chinook salmon radio telemetry, 2016. Alaska Department of Fish and Game, Regional Operational Plan ROP.SF.2A.2016.XX, Anchorage.

[9] 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 gillnetting study due to difficulties in sampling the underside of the fish while it’s in a cradle suspended in the river.

Creel Survey Stratification

In 2016, 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 5.0) and the Chinook salmon sonar site (RM 13.7)
2) between the Chinook salmon sonar site (RM 13.7) and the Soldotna Bridge (RM 21.1)

During the angler interview process, guided and unguided CPUEs and HPUEs will also be estimated for these same geographic areas. A sufficient number of interviews will be available to accurately stratify CPUE and HPUE, and therefore catch and harvest estimates upstream and downstream of RM 13.7 will be based on stratum-specific CPUE, HPUE, and angler effort.

Angler effort, CPUE, and HPUE have differed significantly by week, between weekdays and weekend-holidays, between guided[10] 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 and weekends-holidays), and geographically stratified by location (upstream and downstream of the RM 13.7 sonar). The survey will be stratified postseason for angler type (guided and unguided). Based on these factors, the strata listed in Table 1 will be used for estimating creel statistics.

Table 1.–Strata used for estimating 2016 creel statistics.

Stratum	No. of strata	Type of strata
Geographic	2	Warren Ames Bridge to RM 13.7 sonar, and RM 13.7 sonar to Soldotna Bridge
Temporal	13	Weekly
Day type	2	Weekdays, Weekends-holiday
Angler type	2	Guided and unguided

Each week the fishery is open, 2 of the 4 available powerboat fishing weekdays (Tuesday–Friday) will be sampled. Both weekend days will be sampled each week. With a 2-person crew, the 4 days per week sampling schedule, which has been in place since 2002, has not hindered our ability to meet objective precision criteria (Table 2). The current objective criterion[11] for precision of catch and harvest estimates has been met every year except for early-run catch and harvest in 2005 and early-run catch in 2007.

[10] Guides must register and place a decal on their boat(s), making guide boats easily identifiable on the river.
[11] The current objectives are as follows: harvest and catch within 0.20, or 1000 fish, 95% of the time.

Table 2.–Estimates of harvest and catch, with estimated absolute precision (AP) and estimated relative precision (RP) based on 95% confidence intervals, for early and late runs of Kenai River Chinook salmon from the Soldotna Bridge to Warren Ames Bridge, 2002–2015.

		Harvest				Catch			
Run	Year	*N*	SE	AP	RP	*N*	SE	AP	RP
Early									
	2002	376	85	167	0.44	419	84	165	0.39
	2003	1,948	399	782	0.40	2,817	484	949	0.34
	2004	2,285	338	663	0.29	3,534	435	853	0.24
	2005	2,876	329	645	0.22	4,430	735	1,441	0.33
	2006	3,397	412	808	0.24	4,523	441	864	0.19
	2007	2,645	456	894	0.34	3,944	645	1,271	0.32
	2008	2,602	218	427	0.16	3,552	304	596	0.17
	2009	898	143	280	0.31	1,058	151	296	0.28
	2010	837	94	184	0.22	1,203	151	296	0.25
	2011	816	156	306	0.38	1,090	186	365	0.33
	2012	316	93	182	0.58	471	109	214	0.45
	2013	0	0	–	–	39	16	31	0.80
	2014	Closed to fishing							
	2015	Closed to fishing							
Late									
	2002	11,381	715	1,401	0.12	16,866	1,028	2,015	0.12
	2003	13,837	1,168	2,289	0.17	28,769	1,746	3,422	0.12
	2004	14,493	975	1,911	0.13	22,456	1,462	2,865	0.13
	2005	15,313	1,161	2,276	0.15	25,663	2,214	4,339	0.17
	2006	13,190	905	1,774	0.13	19,788	1,323	2,593	0.01
	2007	9,258	637	1,255	0.14	13,408	815	1,606	0.12
	2008	9,272	726	1,423	0.15	10,929	825	1,618	0.15
	2009	7,378	487	955	0.13	10,352	728	1,427	0.14
	2010	5,375	441	864	0.16	6,039	462	906	0.15
	2011	6,458	525	1,029	0.16	9,580	716	1,403	0.15
	2012	105	52	102	0.97	1,250	160	314	0.25
	2013	1,577	297	582	0.37	2,554	386	757	0.29
	2014	539	98	192	0.36	1,465	160	314	0.21
	2015	3,896	430	843	0.22	6,522	549	1,076	0.16

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

If the early run re-opens to fishing, the 4 days per week sampling schedule will be modified during the week of 24–30 May when 2 days will be randomly selected from the 3 weekend-holiday days available (Saturday, 28 May; Sunday, 29 May; and Monday, 30 May [Memorial Day]). Nonholiday Mondays, when only unguided fishing from drift boats is allowed, will not be sampled 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; however, angler effort will be indexed by conducting 1 angler count between the hours of 1000 and 1400. Thus, sampling during the early run in each geographic stratum will be composed of strata based on the times, day types, and angler types found in Table 3.

Table 3.–Early run sampling strata for each geographic stratum based on time, day, and angler type.

Stratum	Time stratum	Dates	Day type	Angler type
1	17–22 May	tbd, tbd	Weekday	Unguided
2				Guided
3		21, 22 May	Weekend-holiday	Unguided
4		21 May		Guided
5	24–30 May	tbd, tbd	Weekday	Unguided
6				Guided
7		tbd, tbd May	Weekend-holiday	Unguided
8				Guided
9	31 May–5 June	tbd, tbd	Weekday	Unguided
10				Guided
11		4, 5 June	Weekend-holiday	Unguided
12		4 June		Guided
13	7–12 June	tbd, tbd	Weekday	Unguided
14				Guided
15		11, 12 June	Weekend-holiday	Unguided
16		11 June		Guided
17	14–18 June	tbd, tbd	Weekday	Unguided
18				Guided
19		17, 18 June	Weekend-holiday	Unguided
20		17 June		Guided
21	21–26 June	tbd, tbd	Weekday	Unguided
22				Guided
23		25, 26 June	Weekend-holiday	Unguided
24		25 June		Guided
25	28–30 June	tbd, tbd	Weekday	Unguided
26				Guided
27		29, 30 June	Weekend-holiday	Unguided
28		29 June		Guided

Note: Angler effort and CPUE and HPUE by angler type will be geographically stratified above and below the RM 13.7 Chinook salmon sonar. Sample dates to be decided "tbd" will be randomly selected if the fishery reopens.

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 during the late run will consist of a single boat count between 1000 and 1400, to index angler effort on late run, nonholiday Mondays. Sampling during the late run in each geographic stratum will be composed of strata based on the times, day types, and angler types found in Table 4.

Table 4.–Late run sampling strata for each geographic stratum based on time, day, and angler type.

Stratum	Time stratum	Dates	Day type	Angler type
1	1–3 July	1 July	Weekday	Unguided
2				Guided
3		2, 3 July	Weekend-holiday	Unguided
4		2 July		Guided
5	5–10 July	tbd, tbd	Weekday	Unguided
6				Guided
7		9, 10 July	Weekend-holiday	Unguided
8		9 July		Guided
9	12–17 July	tbd, tbd	Weekday	Unguided
10				Guided
11		16, 17 July	Weekend-holiday	Unguided
12		16 July		Guided
13	19–24 July	tbd, tbd	Weekday	Unguided
14				Guided
15		23, 24 July	Weekend-holiday	Unguided
16		23 July		Guided
17	26–31 July	tbd, tbd	Weekday	Unguided
18				Guided
19		30, 31 July	Weekend-holiday	Unguided
20		30 July		Guided

Note: Angler effort and CPUE and HPUE by angler type will be geographically stratified above and below the RM 13.7 Chinook salmon sonar. Sample dates to be decided "tbd" will be randomly selected before the field season.

The creel survey will sample approximately 67% of days when fishing from powerboats is allowed.

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 will not bias the data because few angler interviews before the first count were missed and the mean CPUE and HPUE of anglers interviewed before 0800 were similar to the overall means when this schedule was implemented in 2001 (Reimer 2003), and when re-evaluated in 2009.

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) River Bend 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 (a public boat launch). As water levels increase, anglers begin utilizing additional access locations. Following the draft 2016 schedule, which will be implemented immediately after the fishery opens, sampling will commence at Pillars Boat Launch on 16 May, Centennial Campground on 31 May, River Bend Campground on 9 June, Poacher’s Cove on 18 June, and Eagle Rock Boat Launch on 7 July. Early in the season, modifications to the schedule may be done depending on the amount of use observed at each location.

Angler counts will be conducted from a boat and 4 counts will be made during each sample day. The start time of the first count (0400, 0500, 0600, 0700, or 0800) 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 0600–1800. 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. Results of including Mondays into the regular creel survey during 2009 and 2010 indicate less than 5% of 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 2016, a single index angler count will be conducted during the middle of the day (1000 to 1400) on nonholiday Mondays at a time and in a direction that is convenient to the project biologist.

Inriver Drift Gillnetting

Collecting a representative ASL sample of returning Chinook salmon to the Kenai River will be the primary objective of the inriver gillnetting study. Failure to collect a representative length sample of Chinook salmon with the nets could bias the mixture model estimates of Chinook salmon passage. An auxiliary pilot study in 2016, discussed separately (see Pilot Study: Alternative Mesh Size Investigation), will not interfere with the existing inriver gillnetting study design.

Gillnet Specifications

Gillnets used inriver are constructed of alternating 5.0 inch and 7.5 inch mesh panels within the same net, and will be referred to as “panel nets” hereafter. Each 60 ft long panel net will be comprised of a 30 ft long, 5.0 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).

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

1) 5.0 inch (stretched mesh) multifilament (80-meshes deep for midriver net, 40-meshes deep for nearshore net), R44 color, MS73 (14 strand) twine
2) 7.5 inch (stretched mesh) multifilament (52-meshes deep for midriver net, 26-meshes deep for nearshore net), R44 color, MS93 (18 strand) twine

Gillnetting Schedule and Area

Inriver gillnetting 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 gillnetting 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 time will be for travel to and from the work site, required maintenance, and a 0.5 hr lunch break). The gillnetting area at RM 8.6 will be approximately 0.5 mi in length (Figure 2). A small increase in area of 0.2 mi from previous years will help prevent netting in areas with large numbers of submerged trees, especially along the left bank.

The panel 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 historic comparability. Nearshore sets will be deployed from the shoreline to a point where the midriver sets begin in depths less than 15 ft deep. 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 panel net will have a 5.0 inch mesh panel on one end and a 7.5 inch mesh panel on the other, the crew will alternate choice of mesh size deployed closest to shoreline (i.e., to avoid having the 5.0 inch 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 (5.0 inch or 7.5 inch), and direction deployed (oriented facing north bank or south bank) such that each of the 8 possibilities will be completed before beginning the pattern again.

Radio Transmitter Deployment

Chinook salmon telemetry studies (Reimer et al. 2013, Eskelin and Reimer *In prep*) have been conducted since 2010 and the inriver gillnetting study at RM 8.6 has performed the marking event for these projects. During 2016, Advanced Telemetry Systems[12] (ATS, Isanti, MN) models F1835B and F1845B radio transmitters will be used. The F1835B bottle-shaped radio tags are 17 mm in diameter, 48 mm long, and weigh 16 g. The F1845B bottle-shaped radio tags are 19 mm in diameter, 56 mm long, and weigh 26 g. Given that tag weight should not exceed 2% of the fish weight (Winter 1996), fish as small as 800 g (1.75 lb) could be tagged, which is smaller than any age-.2+ Chinook salmon. Up to 120 tags will be deployed in Chinook salmon. Every other Chinook salmon captured between 16 May and 30 June will be tagged. Tag deployment rates will be monitored inseason and may be modified to ensure we radiotag Chinook salmon throughout the entire early run. Very small radiotagged Chinook salmon have suffered high rates of mortality (Eskelin and Reimer *In prep*) so Chinook salmon measuring less than 480 mm METF will be released without tagging. Chinook salmon measuring 480–600 mm will receive F1835B transmitters, while those measuring 600 mm or more will receive model F1845B transmitters. For further details see the 2016 operational plan for Kenai River Chinook salmon radio telemetry (Eskelin *In prep*)

Pilot Study: Alternative Mesh Size Investigation

Weir composition data from the Killey River and Funny River weirs, provided by the United States Fish and Wildlife Service (USFWS), has offered a unique opportunity to assess size biases of early-run Chinook salmon captured in the inriver gillnetting study (Gates and Boersma 2016, Boersma and Gates 2016). Size composition data from these tributary weirs have consistently shown a larger proportion of smaller Chinook salmon than the netting program could account for. While incorporating nearshore sets into the netting protocol has reduced the bias towards large fish, the addition of nearshore netting has not removed the bias entirely. It is likely that mesh size may also be a contributing factor of selectivity for larger fish.

A pilot study will be conducted in 2016 in an attempt to capture a more representative sample of the Chinook salmon runs. Alternative mesh sizes (4.0 inch and 6.0 inch stretched) will be used up to 5 days a week, 6 hours per day (1:00 PM–7:00 PM) during the early run. Auxiliary netting during the late run will be less rigorous (approximately 2 days per week) due to budgetary restrictions. The pilot study will not interfere with the traditional netting study because netting will be conducted by a separate crew after the traditional netting crew is done for the day.

The 4.0 inch mesh that will be used in the 2016 pilot study was chosen primarily to enhance the catch of small Chinook salmon, but also to reduce incidental fish mortality. The 4.0 inch mesh nets will be essentially “tangle nets.” Tangle nets are designed to catch fish by the teeth or fins, whereas traditional gillnets capture fish around the head or body. Research conducted by Vander Haegen et al. (2004), and Ashbrook et al. (2004) have also shown that mortality can be reduced with smaller sized mesh tangle nets. Consequently, Columbia River fishery managers instituted “selective” tangle net fisheries for hatchery Chinook salmon where wild salmon need to be released. Selective fishing, more accurately described as “live capture, selective harvest,” is the ability of a fishing operation to avoid nontarget species or stocks, or when encountered, to release those animals in a manner that results in minimal mortality (Ashbrook et al. 2004).

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

Although the 5.0 inch and 7.5 inch mesh gillnets used on the Kenai River since 2002 were chosen as undersized to entangle most adult Chinook salmon, nontarget salmon species are susceptible to being gilled, especially sockeye salmon in the 5.0 inch mesh net. The 4.0 inch mesh net with a 2:1 hanging ratio (length of stretched mesh to length of cork line) theoretically will entangle all sizes of Chinook salmon and other salmon species but prevent salmon from entering the net too far, reducing external and internal injuries. A 4.5 inch tangle net used in a 2014 pilot study was unsuccessful due to the 8:1 hanging ratio, resulting in too much mesh and possibly creating net avoidance issues, or too large of a mesh size (Perschbacher and Eskelin *In prep*.). The 6.0 inch mesh size was also chosen for the pilot study as a possible alternative to the existing 5.0 inch mesh net. The 6.0 inch mesh is considered undersized relative to most returning adult Kenai River Chinook salmon. Chinook salmon captured in the 6.0 inch mesh will also be evaluated for ASL length composition and injuries.

Length distributions of captured Chinook salmon will be estimated by mesh size (4.0, 5.0, 6.0, and 7.5 inch). Kolmogorof Smirnov (K-S) tests will be used to compare lengths of Chinook salmon captured in combinations of mesh sizes with those sampled at tributary weirs operated by the United States Fish and Wildlife Service (USFWS).

Proportion by Age: Sport Harvest and Inriver Run

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 the early and late runs except for the 2012 late run. The early-run sport fishery was closed by regulation during 2013–2015 (Table 5).

Table 5.–Number (*n*) and percentage (%) of Kenai River Chinook salmon sampled from the creel survey for ages- 1.2, 1.3, 1.4, and 1.5 fish during the early and late runs, 2002–2015.

	Early run					Late run				
Year	*n*	1.2	1.3	1.4	1.5	*n*	1.2	1.3	1.4	1.5
2002	31	12.9%	41.9%	45.2%	0.0%	275	5.0%	23.1%	67.6%	1.8%
2003	81	17.8%	42.7%	39.5%	0.0%	311	15.0%	18.5%	64.0%	0.9%
2004	99	11.1%	50.5%	38.4%	0.0%	305	8.9%	27.5%	59.3%	3.1%
2005	134	6.6%	44.1%	47.8%	0.0%	429	2.5%	18.3%	76.1%	2.7%
2006	129	15.5%	38.5%	44.8%	0.0%	313	11.5%	21.4%	60.2%	6.5%
2007	106	20.0%	57.3%	21.8%	0.0%	237	11.5%	29.9%	52.0%	6.6%
2008	198	11.4%	56.5%	31.8%	0.0%	218	5.0%	27.7%	58.7%	8.5%
2009	66	19.2%	33.5%	46.3%	0.0%	195	16.4%	20.1%	61.1%	2.4%
2010	59	22.1%	50.8%	24.9%	0.0%	184	13.9%	39.9%	38.0%	4.1%
2011	56	19.6%	35.7%	44.6%	0.0%	233	15.9%	21.5%	57.9%	3.4%
2012	38	2.6%	23.7%	73.7%	0.0%	4	–	–	–	–
2013	NA	–	–	–	–	50	28.2%	23.5%	43.0%	3.4%
2014	NA	–	–	–	–	30	26.7%	30.0%	33.3%	0.0%
2015	NA	–	–	–	–	117	18.8%	28.2%	47.0%	2.6%

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

Note: Relative precision RP80 is 1.28 times the coefficient of variation of the estimate.

Inriver Run by Age

Chinook salmon captured in 5.0 inch and 7.5 inch mesh gillnets will constitute the ASL sample for the inriver run. Samples will be stratified temporally postseason into approximately 3-week time intervals[13] (2 strata during each run), if the strata are found to be significantly different:

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

Assuming a simple random (not stratified) sample and 15% unreadable scales, a minimum of 149 fish in each run will be required to be within 10 percentage points of the true value 95% of the time (Thompson 1987). This is equivalent to 127 valid ages for each run. Since 2002, the sample size goal has been met for both the early and late runs except for the 2012, 2013, and 2015 early runs (Table 6).

Table 6.–Number (*n*) and percentage (%) of Kenai River Chinook salmon with valid ages sampled with gillnets for ages- 1.2, 1.3, 1.4, and 1.5 fish during the early and late runs, 2002–2015.

	Early run					Late run				
Year	*n*	1.2	1.3	1.4	1.5	*n*	1.2	1.3	1.4	1.5
2002	306	15.7%	37.3%	39.5%	3.6%	945	17.1%	18.7%	58.9%	3.2%
2003	724	31.6%	19.6%	46.7%	0.9%	1,114	29.5%	19.9%	48.9%	0.5%
2004	351	14.8%	33.3%	46.4%	4.3%	933	14.0%	24.6%	58.9%	1.3%
2005	362	12.4%	30.2%	52.8%	3.5%	519	6.9%	18.5%	70.5%	4.2%
2006	251	31.6%	21.2%	42.6%	3.5%	703	27.5%	14.6%	49.6%	7.0%
2007	213	30.8%	35.3%	32.6%	90.0%	437	20.4%	27.4%	43.0%	8.8%
2008	163	13.7%	42.1%	42.3%	1.1%	496	7.5%	20.6%	62.1%	7.8%
2009	128	14.8%	24.2%	56.3%	1.6%	338	29.5%	11.2%	54.8%	4.2%
2010	137	25.1%	47.5%	20.0%	0.5%	221	20.1%	34.0%	35.7%	6.2%
2011	182	25.8%	30.8%	40.7%	1.1%	327	29.9%	19.2%	46.4%	2.1%
2012	82	9.4%	35.9%	47.9%	1.3%	232	9.9%	40.1%	44.4%	3.9%
2013	41	19.5%	26.8%	43.9%	2.4%	149	19.5%	26.8%	43.9%	2.4%
2014	146	39.7%	38.4%	8.2%	0.7%	283	23.0%	34.6%	35.3%	1.8%
2015	122	41.0%	33.6%	18.0%	1.6%	238	24.4%	22.7%	44.5%	3.8%

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

Note: The 2014 and 2015 samples were collected by drifting gillnets midriver and nearshore, whereas during other years, samples were only collected midriver.

Brood Year Return Reconstruction

In practice, only major components need be sampled for age composition, and the estimates need not be overly precise[14]. This operational plan outlines 2 of 7 early-run components (McKinley and Fleischman 2013: Table 4), and 2 of 8 late-run components (Fleishman and McKinley 2013: Table 3) required for brood year reconstruction. Study design and analysis used to reconstruct

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

[14] 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.

brood years is described in this operational plan but overall results and analyses are presented in the most recent stock-recruit analysis reports: Fleischman and McKinley (2013), and McKinley and Fleischman (2013). Recent run reconstructions based upon synthesis of all relevant Chinook salmon abundance data reported in McKinley and Fleischman (2013: Table 8), and Fleischman and McKinley (2013: Table 6), estimated the total run from the 1999–2006 brood years with coefficients of variation (CVs) of 0.10 to 0.13 (early run) and 0.09 to 0.13 (late run). The stated precision objective (within 20% of true value 90% of time) was met for 7 of 8 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 channel adjacent to River Quest Resort (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 the Soldotna Bridge, 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 is tallied using 10 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
9) shore anglers fishing for sockeye salmon above and below the sockeye salmon sonar site (RM 19.2) during July.
10) active power boats (no active anglers on board, but under power at time of count).

Only the sum of count categories 1–2 and 3–4 are required for this project; categories 5–10 will be collected as auxiliary 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. Category 10 will record all boats that are under power but do not contain anglers actively fishing or preparing to fish (i.e., rigging their lines). 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 problem with the current study design is that anglers may be including 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 the Soldotna Bridge, 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)
7) location and number of Chinook salmon released in each area (downstream or upstream of RM 13.7)
8) the size of Chinook salmon released by category: below the lower limit (less than 42 inches), within the slot limit (42–54.99 inches), or above the slot limit (55 inches or greater)
9) for harvested Chinook salmon with a radio transmitter, approximate location (RM) of harvest, frequency number, and pulse code number of radio transmitter

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[15] will be sampled for METF length, total length during early run slot-limit restriction, 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 Drift Gillnetting

Primary responsibilities will be to drift gillnets in the specified areas, sample captured Chinook salmon for ASL data and genetic tissue (before radiotagging and releasing), count other captured species (measure a subset), 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 around the gills], mouth clamped [net clamping the mouth closed] or wedged [web around body posterior to the gills]) 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 5.0 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). While other fish are untangled, Chinook salmon tethered to the boat will remain in the water while 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 will 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 genetics tissue sampling. For more detail, see “Scale Sampling” and “Genetic 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 mesh size will be recorded based on the color-coded tail ties. The METF and TL[16] will be measured to the nearest 5 mm. The METF length of other salmon captured in the first 8 sets of the day will be recorded for sonar mixture model estimates of abundance. For captured nonsalmon species, the species and the number of fish will be recorded, and all captured rainbow or steelhead trout and Dolly Varden will be measured for TL.

Prior to releasing, early-run Chinook salmon will receive an esophageal radio tag. Each radio transmitter will be activated by removing a magnet taped to the side of the transmitter (thus closing a magnetic reed switch inside the capsule). Transmitters will be inserted with an applicator made from 2 concentric pipes of polyvinyl chloride. The outer pipe is three-quarter inch outside diameter with rounded edges and one end split into quarters. The inner pipe fits snugly inside the outer pipe but slides with minimal effort. Likewise, the narrow end of the transmitter fits snugly within the split end of the outer pipe. Each transmitter will be fitted with a retention device (e.g., modified hoochie lure skirt) around the diameter of the tag to prevent the salmon from regurgitating the transmitter. Transmitters, lubricated with glycerin, will be inserted by gently pressing the tag against the esophageal sphincter until the sphincter relaxes, allowing

[15] 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, sampling for age composition and genetics tissue can be slightly depensatory if data are pooled across time strata.

[16] Total length of captured Chinook salmon will be measured to update a TL-METF regression formula.

the tag to pass into the stomach. The transmitter will then be dislodged from the applicator using the inner pipe as a plunger. The mouth of each tagged fish will be inspected to ensure the transmitter is not visible and is inside of the stomach. Fish with profusely bleeding gills, missing a significant amount of scales, or observed to be lethargic will be released without tagging to minimize potential differences in survival and behavior between tagged and untagged populations. To avoid resampling Chinook salmon captured in the inriver gillnetting study, a 'hole punch' will be given to each captured Chinook salmon in the upper lobe of the caudal fin. Those observed with a hole punch in the lower caudal fin (previously sampled in pilot study) will be sampled for ASL but not genetics nor for radiotagging.

After all Chinook salmon sampled for length are 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. After sampling, the crew will download the data onto a desktop PC. 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.

Pilot Study: Alternative Mesh Size Investigation

Gillnetting conducted in the pilot study will follow the same capture techniques, sampling protocols, and collect the same type of data (number of species caught, genetics and ASL samples from Chinook salmon, deployment of radio transmitters, etc.) as are collected for the existing gillnetting study. Since only 1 mesh size will be used each day, tail-tie color will be irrelevant. To prevent resampling, all sampled Chinook salmon captured in 4.0 inch or 6.0 inch mesh nets will be given a ventral caudal hole-punch. Those observed with a hole punch in the lower caudal fin will be released without being sampled. Those observed with a hole punch in the upper caudal fin will be sampled for ASL but not genetics nor will they be radiotagged.

Scale Sampling

For all sport harvested Chinook salmon sampled in the creel survey and captured during inriver gillnetting (existing and pilot study), 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 is made of the scales on the card using a press under 25,000 pounds per square inch and then the scales growth patterns are viewed with a 40× microfiche reader to determine freshwater and marine residence times.

Genetics Sampling

In the creel survey, tissue samples (tip of axillary process) will be taken from harvested fish for genetics analysis. In the inriver gillnetting studies (existing and pilot study) tissue samples will be collected via 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 genetics tissue samples stored at the Soldotna office until the end of the season will be sent to the Anchorage ADF&G Gene Conservation Lab for archiving.

Coded Wire Tag (CWT) Recovery

All Chinook salmon sampled during the course of the creel survey and captured in inriver gillnets (existing and pilot study) will be examined for an adipose finclip. A missing adipose fin indicates the fish is either missing the fin naturally or received a coded wire tag as a juvenile. Presence of a coded wire tag 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 head of all adipose finclipped Chinook salmon encountered, 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.

Environmental Variables

A Secchi disc depth reading will be recorded at the beginning and end of each gillnetting shift to monitor river conditions that could affect netting catch rates. The Secchi disc readings will be taken at the same location, midriver near the center of the gillnetting 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 River Quest Resort (RM 15.3) during his or her first boat count to monitor river conditions that could affect sport angler catch rates.

DATA REDUCTION

Creel and netting technicians will return their scale cards, genetics samples, and field ASL data forms to the Soldotna office daily and will be responsible for ensuring the data is 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 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 gillnetting, 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 gillnetting, 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[17] website.

DATA ANALYSIS

Creel Survey: Inriver Effort, Catch, and Harvest

Estimates of angler effort, catch, and harvest of Chinook salmon downstream of Soldotna Bridge will be calculated by following the procedures outlined in Bernard et al. (1998). 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, as described in Equation 2.9 of Bernard et al. (1998) with variances estimated by Equation 2.10. Estimates of daily catch and harvest rates and will be calculated as ratios of the mean angler harvest to the mean angler effort, as described in Equation 2.11a of Bernard et al. 1998; variances will be calculated as in Equation 2.11b[18]. Daily estimates of catch and harvest are then calculated as the product of the daily estimate of angler effort and catch and harvest rates as outlined in sections 2.2.3 and 2.2.4 of 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. Additionally, 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).

Stratified estimates of angler effort as well as catch and harvest will then be calculated by Equation 2.1 of Table 2.1 in Bernard et al. (1998). The variances for these estimates are calculated following Equation 2.5 of Table 2.4 in Bernard et al. (1998).

During the early and late run, a single angler count and no interviews will be conducted on nonholiday Mondays in 2016. 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 for 2016. 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 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 derived from the index count.

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

[18] The jackknife estimating procedure as outlined in Appendix D of Bernard et al. (1998b) 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).

Inriver Gillnetting 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). Daily CPUE r of species s in mesh size m for day i will be estimated as follows:

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

with variance

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

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).

For the 2016 pilot study, a complete repetition j will consist of 4 drifts (2 midriver and 2 nearshore) for each mesh size m (4.0 inch or 6.5 inch). Daily CPUE and associated variances will follow Equations 1 and 2, respectively, for both the early and late run.

Chinook salmon CPUE by tidal stage will also be estimated using Equations 1 and 2 for each tidal stage stratum (low, rising, high, falling tidal stages) for both the early and late run. A complete tide cycle of approximately 13 hours will consist of 2.5 hours of low tide, 4 hours of rising tide, 2.5 hours of high tide, and 4 hours of falling tide.

Chinook salmon Length Comparisons

Nonparametric Kolmogorov-Smirnov (K-S) tests will be used to test for differences between length distributions of Chinook salmon captured in inriver gillnets by location (nearshore vs. midriver), between mesh sizes (4.0, 5.0, 6.0, and 7.5 inch mesh nets), and between fish captured in inriver gillnets and those sampled at Kenai River tributary weirs. The D statistics and the associated *P*-value will be reported for the following K-S test comparisons:

1) The cumulative length distribution of Chinook salmon captured in nearshore gillnets vs. the cumulative length distribution of those captured in midriver gillnets for each run (existing and pilot study, respectively).
2) The cumulative length distribution of early-run Chinook salmon sampled in 4.0 inch and 6.0 inch mesh nets (pilot study) vs. the cumulative length distribution of early-run Chinook salmon sampled in 5.0 inch and 7.5 inch mesh nets (existing study).

3) The cumulative length distributions of early-run Chinook salmon sampled in gillnets at RM 8.6 for the existing and pilot study each vs. the cumulative length distribution of Killey River weir and Funny River weir combined (Funny River and Killey River distributions will be weighted by relative abundance).

A 2-sample K-S test will compare the cumulative length distributions of 2 samples (tests 1–2) whereas a 1-sample K-S test (tests 3) will compare the cumulative length distribution of a sample with a reference distribution (Killey River weir and Funny River weir combined length distribution weighted by abundance). The Killey River and Funny River account for a majority of spawning early-run Chinook salmon, and in the 1-sample K-S tests we assume the Killey River weir and Funny River weir combined length distribution will be an adequate representation of Kenai River early-run Chinook salmon.

Total Return by Brood Year

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:

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

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. 2005), 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, and sport harvest S_a downstream of the RM 13.7 sonar (estimated by creel survey), each restricted to the appropriate age *a* and calendar year $t = y + a$:

$$\hat{R}_{t,a} = \hat{I}_{t,a} + \hat{C}_{t,a} + \hat{P}_{t,a} + \hat{M}_{t,a} + \hat{S}_{t,a} . \tag{4}$$

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:

$$\hat{C}_a = C\ \hat{p}_{Ca} \tag{5}$$

and

$$\mathrm{var}\left(\hat{C}_a\right) = C^2\ \mathrm{var}\left(\hat{p}_{Ca}\right) \tag{6}$$

where

$$\hat{p}_{Ca} = \frac{n_{Ca}}{n_C} \tag{7}$$

and

$$\mathrm{var}\left(\hat{p}_{Ca}\right) = \frac{\hat{p}_{Ca}\left(1 - \hat{p}_{Ca}\right)}{n_C - 1} \tag{8}$$

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:

$$\hat{S}_a = \hat{S}\ \hat{p}_{Sa} \tag{9}$$

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

$$\text{var}\left(\hat{S}_a\right) = \hat{S}^2\ \text{var}\left(\hat{p}_{Sa}\right) + \hat{p}_{Sa}^2\ \text{var}\left(\hat{S}\right) - \text{var}\left(\hat{p}_{Sa}\right)\text{var}\left(\hat{S}\right) \tag{10}$$

where

$$\hat{p}_{Sa} = \frac{n_{Sa}}{n_S} \tag{11}$$

and

$$\text{var}\left(\hat{p}_{Sa}\right) = \frac{\hat{p}_{Sa}\left(1 - \hat{p}_{Sa}\right)}{n_S - 1} \tag{12}$$

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 5–8 and substituting P for C. Age-specific marine sport harvest M will be estimated using Equations 9–12 and substituting M for S.

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

$$\hat{I}_a = \sum_{h=1}^{2} \hat{I}_h \hat{p}_{Iha} \tag{13}$$

with variance

$$\text{var}\left(\hat{I}_a\right) = \sum_{h=1}^{2} \left[\hat{I}_h^2\ \text{var}\left(\hat{p}_{Iha}\right) + \hat{p}_{Iha}^2\ \text{var}\left(\hat{I}_h\right) - \text{var}\left(\hat{p}_{Iha}\right)\text{var}\left(\hat{I}_h\right)\right] \tag{14}$$

where

$$\hat{p}_{Iha} = \frac{n_{Iha}}{n_{Ih}} \tag{15}$$

and

$$\text{var}\left(\hat{p}_{Iha}\right) = \frac{\hat{p}_{Iha}\left(1 - \hat{p}_{Iha}\right)}{n_{Ih} - 1} \tag{16}$$

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 6, 8, 10, 12, 14, and 16) 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 11 and 12. The point estimates and their standard errors were essentially equivalent. Based on this evidence, we continue to use the SRS equations for convenience.

SCHEDULE AND DELIVERABLES

Dates	Activity	Personnel
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 surveys	Karic, Inokuma
16 May–20 Aug	RM 8.6 inriver gillnetting	Atchley, Elkins, Duran
16 May–20 Aug	Inriver gillnetting Pilot Study	Vacant, Vacant
Daily	Inseason angler effort, harvest, and netting CPUE estimates	Perschbacher
Daily	Interview and count data edited	Perschbacher
Weekly	Interview and count data summarized	Perschbacher
15–30 Aug	Prepare equipment for winter storage	Perschbacher
1 Oct	Scales read	Perschbacher
1 Nov	Age composition summary	Perschbacher
1 Dec	Final creel estimates	Perschbacher
15 May	2017Operational Plan	Perschbacher

The results of this project will be presented in an Alaska Department of Fish and Game, Division of Sport Fish, Fishery Data Series report. The estimates of catch, harvest, and age will also be presented in separate Fishery Data Series reports describing assessment of each run of Chinook salmon.

RESPONSIBILITIES

Principle Investigators

Jeff Perschbacher, Project Leader, Fishery Biologist I (1 April–30 November)

Duties: The project leader is responsible for writing the operational plan. 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 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 be involved in any presentation that may be required at the Alaska Board of Fisheries concerning the creel survey, inriver gillnetting project, or Kenai River Chinook salmon ASL data. This position will also ensure all data is in proper format and posted on DocuShare at the completion of the field season and will be expected to generate all harvest and effort estimates and will post regular summaries inseason on DocuShare. This position is also responsible for ensuring all pressing and aging of Chinook salmon scale samples from the creel survey and inriver gillnets is accomplished and will summarize the age composition data and forward the information to the area research biologist. All related data files and scale cards will be archived. It will also be the responsibility of this position to keep the area research biologist informed of any problems with equipment or personnel affecting the completion of this project.

Vacant, Area Research Supervisor, Fishery Biologist III

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

Consulting Biometrician

Jiaqi Huang, Biometrician III

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

Project Leader Supervisor

Tony Eskelin, Fishery Biologist II

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

Creel Survey Crew

Ivan Karic and Meg Inokuma, Fish and Wildlife Technician III (12 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 strict sampling schedule, sampling harvested Chinook salmon for ASL and CWT information, 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. Primary responsibilities when the sport fishery is closed in 2016 are to aid other projects as needed until the sport fishery reopens. 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 Gillnetting Crew

Kirsten Duran and Evan Atchley, Fish and Wildlife Technician II (12 May–20 August)

Meg Inokuma, Fish and Wildlife Technician III (12 May–20 August)

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

BUDGET SUMMARY

FY 16 allocation and proposed FY17 costs:

Line item	Category	FY 16 budget	FY 17 budget ($K)
100	Personal Services	379.1	381.9
	Other	0.9	1.0
200	Travel	1.9	1.6
300	Contractual	22.1	20.9
400	Commodities	7.2	5.8
500	Equipment	0.0	0.0
Total		411.2	409.2

Funded personnel FY 17:

PCN	Name	Level	Funded man months
114023	Vacant	Fishery Biologist III	12.0
115244	Eskelin, Anthony	Fishery Biologist II	12.0
114190	Perschbacher, Jeff	Fishery Biologist I	8.0
114249	Inokuma, Meg	FWT III	2.7
114253	Karic, Ivan	FWT III	2.7
114306	Elkins, Johnna	FWT II	3.1
114213	Duran, Kirsten	FWT II	3.1
115239	Atchley, Evan	FWT II	3.1
Total			46.7

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APPENDIX A: KENAI RIVER CHINOOK SALMON CREEL SURVEY AND INRIVER GILLNETTING FORMS, 2016

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

KENAI RIVER CHINOOK CREEL COUNT FORM

Date: ______________________ Secchi one: ________ Time: ________ Secchi two: ________ Time: ________

Tech.	Time	River Section *	Non Guided				Guided				active boats	non active boats	Shore Anglers
			Power		Drift		Power		Drift				
			Boats	Anglers	Boats	Anglers	Boats	Anglers	Boats	Anglers			
Count number one													
		Warren Ames Bridge - RM 13.7 Chinook sonar											
		RM 13.7 Chinook sonar- Soldotna Bridge											
Count number two													
		Warren Ames Bridge - RM 13.7 Chinook sonar											
		RM 13.7 Chinook sonar- Soldotna Bridge											
Count number three													
		Warren Ames Bridge - RM 13.7 Chinook sonar											
		RM 13.7 Chinook sonar- Soldotna Bridge											
Count number four													
		Warren Ames Bridge - RM 13.7 Chinook sonar											
		RM 13.7 Chinook sonar- Soldotna Bridge											

Tech: Initials **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
Active boats: count all boats that are underway, and no one is currently fishing
Non-active boats: boats not underway with no active anglers but have run their boat during that day.
Shore Anglers: Count sockeye shore anglers above RM 19.2 SOCKEYE SONAR to Soldotna Bridge and below RM 19.2 SOCKEYE SONAR site to Warren Ames Bridge

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

KENAI RIVER CHINOOK CREEL INTERVIEW FORM Page ____ of ____

Date:_____________ Name:___________________

			Fishing	Boat	Angler	Angler	Time Fished		Harvest Loc.	Release Loc.	**Chinook Salmon**						**Radio Tag Information**			**Comments**
	Time	Site	Method	#	Type	#	Above 13.7	Below 13.7	**(A)** or **(B)**	**(A)** or **(B)**	# Kept	Scale #	Length	Gen.#	Sex	slot?	Freq.	PC	RM caught	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)**, Harvested below RM 13.7 **(B)** **Released Loc.:** Released above RM 13.7 (A), Released below RM 13.7 (B).

Chinook Salmon Section **Kept:** # harvested **Scale#:** scale card# and fish# (ex. 1-1, 1-2...) **Length** METF, **Genetics #**, **Sex** male/female , **Slot** Released fish less than, within, or above 42-55" TL

Radio Tag Information: **Frequency** # on tag **Pulse Code** # on tag **River Mile**: Location Chinook was caught (hole or river mile).

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 form.

KENAI RIVER CHINOOK CREEL ASL SAMPLING FORM

Date: ___________________

Sampler: ___________________

Card	Fish #	Sex	METF Length	Total Length	Genetics #	Radio TAG Information Freq #	Pulse Code	Coded Wire Tag Random/select	Strap #	Age	Comments
	1										
	2										
	3										
	4										
	5										
	6										
	7										
	8										
	9										
	10										

Card	Fish #	Sex	METF Length	Total Length	Genetics #	Radio TAG Information Freq #	Pulse Code	Coded Wire Tag Random/select	Strap #	Age	Comments
	1										
	2										
	3										
	4										
	5										
	6										
	7										
	8										
	9										
	10										

Card	Fish #	Sex	METF Length	Total Length	Genetics #	Radio TAG Information Freq #	Pulse Code	Coded Wire Tag Random/select	Strap #	Age	Comments
	1										
	2										
	3										
	4										
	5										
	6										
	7										
	8										
	9										
	10										

Appendix A4.–Kenai River inriver gillnetting sampling form.

KENAI RIVER CHINOOK NETTING FORM

DATE:__________________

PAGE ________**of** ________

CREW: __________________

	SECCHI	**TIME**
Beginning of Shift		
End of Shift		

Set #	Mesh 4, 5, 6, 7	Bank L or R	Area NS or MR	Flow u/d/s	Start Time	Stop Time	**Chinook salmon**						**Radio Tag Info**			**Other fish**			**Comments**
							Capture	Scale #	Sex	METF (mm)	TL (mm)	Gen. #	Freq	PC	Injury	Species	#	METF (mm)	King Escapes/Recap/Other

Set#: start at #1, **Bank**: Left or Right **Area:** Midriver or Nearshore **Mesh:** 4, 5, 5 or 7.5" **Start time:** start of drift **Stop time:** end of drift **Tide**: direction of drift (upstream, downstream, or slack)

Chinook salmon (use one line per fish) **Capture:** Tangle/Gill/Wedge/Clamped **,** **Scalecard#, Sex** (M/F), **Length** METF and TL, **Genetics Tissue #. Comments: KING Escape or Recapture**

Radio Tag Info: Freq.: write last 4 digit frequency #. **PC :**write 2 digit pulse code#. **Injury:** Vigorous, vig&bleading, lethargic, leth &bleeding, dead, eaten by predator

Other Fish: Species: S=sockeye, C=coho, P=pink, DV=dolly varden, H=holligan, SF=starry flounder**:** # caught and lengths if needed. **Secchi/Tide section. Time:** record **Secchi:** to nearest 0.1m

APPENDIX B: GENETICS SAMPLING INSTRUCTIONS

Appendix B1.–Genetics 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 @ **160° 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**:
  - Wipe fin prior to sampling.
  - Briefly wipe or rinse clippers with water between samples to reduce cross contaminating.
  - Using clippers, cut one axillary fin per fish.
  - 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.
  - **Only one fin clip per fish into each numbered grid space.**
  - Staple each sample to 10WGC (see photo).
  - Sampling complete, dust tissues with **1 tsp. non-iodized salt** to promote the preservation process.
  - Staple landscape cloth "rain fly" to paper edge (2 staples max).

- **Loading Pelican Case**:
  - 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.
  - 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.
  - 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 @ **160° 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. Shipping: Address the sealed mailer box for return shipment to ADF&G Genetics lab.

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 GILLNETTING STUDY, 2016.

Appendix C1.–Data map for file Kscnt2016.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 site to upper sonar site
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	58	Anglers were defined as people who had a line in the water or were rigging a line
Shore angler count	59	62	63	Anglers were defined as people who had a line in the water or were rigging a line
Active boat count	64	67	68	A boat was counted if it was under power but contained no active anglers
Nonactive boat count	69	71	End	A boat was counted if it was not under power but was under power at one time that day

[a] Count fields left blank if fishing is closed at that time for that group or a scheduled count was missed.

Appendix C2.–Data map for file Ksint2016.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)
(Blank)	13	13	14	
Interviewer	15	16	17	Initials of interviewer
Interview location	18	19	20	01=Centennial Park, 03=Riverbend, 05=Eagle Rock, 06=Pillars, 07=Poacher's Cove.
(Blank)	21	22	23	
(Blank)	24	25	26	
Survey area code	27	28	29	P0 = Kenai Pen.
Site code	30	32	33	001 = Kenai River, Cook Inlet to Soldotna Bridge
(Blank)	34	35	36	
(Blank)	37	38	39	
Boat number	40	42	43	Does not reset to 01 at start of each person shift
Angler number	44	45	46	Angler number starts at 01 for each boat
(Blank)	47	47	48	
Interview type	49	49	50	always C = completed trip interview
Boat or shore	51	51	52	B = boat, S = shore
Unguided or guided	53	53	54	U = unguided, G = guided

-continued-

Data field name	Start column	End column	Comma column	Codes and comments
Hours fished above RM 13.7	55	56	57	Total hours fished above RM 13.7
Minutes fished above RM 13.7	58	59	60	Total minutes fished above RM 13.7 (rounded to nearest .25 hour)
Hours fished below RM 13.7	61	62	63	Total hours fished below RM 13.7
Minutes fished below RM 13.7	64	65	66	Total minutes fished below RM 13.7 (rounded to nearest .25 hour)
Species harvested above RM 13.7	67	69	70	410 = Chinook salmon
Harvest	71	71	72	K = Chinook salmon harvested
Species harvested below RM 13.7	73	75	76	410 = Chinook salmon
Harvest	77	77	78	K = Chinook salmon harvested
Number of Chinook harvested above RM 13.7	79	80	81	Usually 1 (or 2 if proxy)
Number of Chinook harvested below RM 13.7	82	83	84	Usually 1 (or 2 if proxy)
Species released above RM 13.7	85	87	88	410 = Chinook salmon
Released	89	89	90	R = Chinook released
Species released below RM 13.7	91	93	94	410 = Chinook salmon
Released	95	95	96	R = Chinook salmon released
Number of Chinook released above RM 13.7	97	98	99	Typically 1, but could be more
Number of Chinook released below RM 13.7	100	101	102	Typically 1, but could be more
METF length of Harvested Chinook salmon	103	107	108	(mm's)
Sex of harvested Chinook	109	109	110	M = male, F = female
(Blank)	111	112	113	
(Blank)	114	114	115	Number of coho harvested
Species (sockeye)	116	118	119	420 = sockeye salmon
Harvest	120	120	121	Number of sockeye salmon harvested
Released	122	123	124	Number of sockeye salmon released
(Blank)	125	125	126	Number of pink salmon harvested
Species (coho)	127	129	130	430 = coho salmon
Harvested	131	131	132	Number of coho salmon harvested

-continued-

Data field name	Start column	End column	Comma column	Codes and comments
Released	133	134	135	Number of coho salmon released
Fishing location	136	136	137	"Always" set to 1 since 2000
Boat type	138	139	140	1 = power boat, 2 = drift boat, "blank" = shore
Adipose finclip strap number	141	146	147	N = no adclip, C = adclip present
Released Chinook <42 in	148	148	149	
Released Chinook 42–54.99 in	150	150	151	
Released Chinook >55 in	152	152	153	column 141 = number of released Chinook salmon 55 inches or greater
Vial number	154	157	158	
Frequency number	159	162	163	Four-digit frequency number
Pulse code number	164	165	166	Two-digit pulse code number
Location caught	167	170	171	Location where tagged Chinook salmon was caught (river mile)
Age	172	173	174	
Age err	175	175	End	”R=regenerated, “M”=missing, “I”=inverted, “A”=absorbed

Appendix C3.–Data map for file ksintage16.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, inches
Genetics sample number	77	80	81	Begins at 1 and increments with each sampled fish
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 creelsecchi2016.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 Ksawl2016.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		
	13	16	17	
Statewide location/stat code	18	19	20	"Always" = 009 (Kenai River)
(Blank)	21	23	24	
Length type	25	25	26	EF = Mid-eye-fork length, TL = Total length
Net	27	27	28	1=tangled by teeth/head, 2=gilled, 3=mouth clamped, 4=wedged (captured by body)Net mesh deployed towards shoreline (5 or 7)
	29	29	30	Mesh size Chinook was captured in (5 o 7)
Mesh size (inches)	31	33	34	
Drift start time (hour)	35	37	38	24-hour system
Drift start time (minutes)	39	41	42	
Drift stop time (hour)	43	45	46	
Drift stop time (hour)	47	49	50	24-hour system
Drift stop time (minutes)	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

-continued-

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	Millimeters
Total length	83	87	88	Millimeters
Genetics sample number	89	90	91	Begins at 1 and increments with each sampled fish
(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
Frequency number	118	121	122	Four digit frequency number of radiotagged Chinook salmon
Pulse code number	123	124	125	Two digit pulse code number of radiotagged Chinook salmon
Condition/injury status	126	127	End	1 = Vigorous, 2 = Vigorous and bleeding, 3 = lethargic, 4 = lethargic and bleeding, 5 = other

APPENDIX C: TECHNICIAN MANUAL AND SCHEDULES FOR THE KENAI RIVER CHINOOK SALMON CREEL SURVEY AND INRIVER GILLNETTING STUDY, 2016

INTRODUCTION and BACKGROUND

This manual provides the specific procedures for technicians conducting the 2016 Kenai River Chinook Salmon Creel Survey and Inriver Gillnetting 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 Soldotna Bridge 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 gillnets 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. This information is used inseason to estimate the age composition of returning Chinook salmon.

DUTIES

Creel Personnel:

- Conduct angler/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 CE 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.

-continued-

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 you 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 to be interviewed are randomly selected, 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 the sex, mid eye to tail fork (METF) length, and total length (TL) on the AWL sampling form in addition to entering all necessary data into the computer. The METF length measurement, to the nearest 1 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 and an esophageal radio transmitter. 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. If a radio transmitter is present, the creel technician will remove the tag, record the pulse code, frequency number, and the RM where the Chinook salmon was caught, and return the radio tag to 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
9) shore anglers
10) active boats (boats not on bank with no active anglers and boat that had the motor run during the day)

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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 Soldotna Bridge

For example, a count will be made from the Soldotna Bridge downstream to the Chinook salmon sonar site then entered into the handheld computer. Thumbcounters will be reset and the next count will be from upper sonar site to the lower sonar site, and so on for each area. During the late run, we will also be stratifying shore angler counts between the sockeye salmon sonar site (RM 19) and the Soldotna Bridge and from the sockeye salmon sonar site to the Warren Ames Bridge. Each creel personnel will take a secchi disc reading and water temperature (in degrees F) in front of RiverQuest 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 Gillnetting: Each day a crew of 2 people will be scheduled to net from either 0600 to 1400 hours. 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 tail) will be measured in millmeters, to the nearest 5mm. 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.). Every other Chinook salmon sampled from May 16 to June 30 will receive an esophageal radio transmitter unless directed otherwise. Magnets will be removed from the side of the tag to activate the receiver, and the tag will be coated with glycerin and a retention device (i.e., a modified hoochie skirt) will be attached before being inserted into the stomach. The frequency number and pulse code number for each tagged salmon will be recorded on the handheld computer. 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. Do not tag or sample recaptures. Chinook salmon with a ventral caudal hole punch (from the Pilot Study) will only be sampled for ASL.

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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). 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. 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.

The Pilot Study crew will follow the directions as outlined above with the exception of the 'hole punch,' which will be on the ventral side of the caudal fin instead of the dorsal side. Record a fish as a recapture and release if it has a ventral caudal punch, and only sample for ASL if it has an upper caudal fin hole punch (from the standard study).

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

3 ¼" 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, genetics sampling equipment listed in Appendix B1. Be sure and double check you have what you need before leaving the office area. The netting crew will have an additional clipboard of radio transmitters to be deployed sequentially, and 3 radio transmitter deploying devices that will be required every day.

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UNIFORMS

Your uniform is your hat. Please try and wear a 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.

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.

CELL PHONES

The netting crew and creel crew will each be issued a cell phone. At a minimum, all the numbers on the Kenai Chinook contact list should be entered into the phone book. The cell phone is to be on and easily accessible at all times when on duty. Charge the cell phone in the project biologist's office at the end of the workday and bring the phone with you when you start your workday. Limit phone use to state business, however, you can use the phone in an emergency. Please keep track of the phone while on duty and notify the project biologist if the phone is lost or is not functioning properly. The phones are not waterproof, nor do they float so keep them dry and in a zippered or snapped pocket when getting in and out of the boat. Waterproof phone bags will be supplied. You can also use your personal phone if desired.

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.

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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 will be compensated 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 p.m.). 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 p.m.) and 0559 (5:59 a.m.). 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).

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.

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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 State Parks or the Alaska Division of Wildlife Troopers (DWT). Laminated cell phone lists are provided and should 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. If you come across a Chinook salmon that is larger than 55 inches total length, needing to be sealed, contact the project biologist to make arrangements for the angler to bring the fish to the ADF&G office to be sealed.

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, suggestions, etc.

Appendix D2.–Survey schedule

Survey schedules are for internal use only and may be found at http://docushare.sf.adfg.state.ak.us/dsweb/homepage.