Regional Operational Plan SF.2A.SF.2015.07

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

by

Jeff Perschbacher

May 2015

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.2015.07

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

by
Jeff Perschbacher
Alaska Department of Fish and Game, Division of Sport Fish, Soldotna

Alaska Department of Fish and Game
Division of Sport Fish, Research and Technical Services
333 Raspberry Road, Anchorage, Alaska, 99518-1565

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Jeff Perschbacher,
Alaska Department of Fish and Game, Division of Sport Fish,
43961 Kalifornsky Beach Road, Suite B, Soldotna, AK 9966-8367, USA

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SIGNATURE PAGE

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Approval

Title	Name	Signature	Date
Project Leader	Jeff Perschbach		5/4/15
Biometrician	Jiaqi Huang		5/5/15
Area Research Supervisor	Adam Reimer		4/15
Area Manager	Robert Begich		5/4/2015
Regional Research Supervisor	Tim McKinley		5/6/15
Fish and Game Coordinator	Tom Vania		5/5/15

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

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 2015. Creel survey estimates will be geographically stratified in relation to the RM 13.7 Kenai River Chinook salmon sonar to provide estimates upstream and downstream of RM 13.7. A standardized inriver gillnetting study will be conducted in the Kenai River at RM 8.6 from 16 May to 15 August to estimate the age, sex, and length composition of early- and late-run Chinook salmon. Data collected from the creel survey and inriver gillnetting study, combined with sonar estimates of abundance, will be used for inseason management of Kenai River Chinook salmon.

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

PURPOSE

The primary goal of the creel survey is to estimate daily catch and harvest of Chinook salmon (*Oncorhynchus tshawytscha*). This information is used for inseason management decisions 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 Kenai River sockeye salmon. This information is used in conjunction with sonar data to estimate inriver abundance and for postseason stock assessment.

BACKGROUND

The Kenai River (Figure 1) has been one of the largest and most intensively managed sport fisheries in Alaska (Jennings et al. 2011). Angler effort is distributed among the Chinook salmon fishery from mid-May through July, the sockeye salmon fishery from June through early August, the coho salmon fishery in August through October, and a rainbow trout and Dolly Varden fishery 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. Age composition data is used postseason to develop brood tables necessary for stock-recruit analysis.

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. Prior to 1991, anglers were surveyed in the entire area open to Chinook salmon fishing (downstream of Skilak Lake).

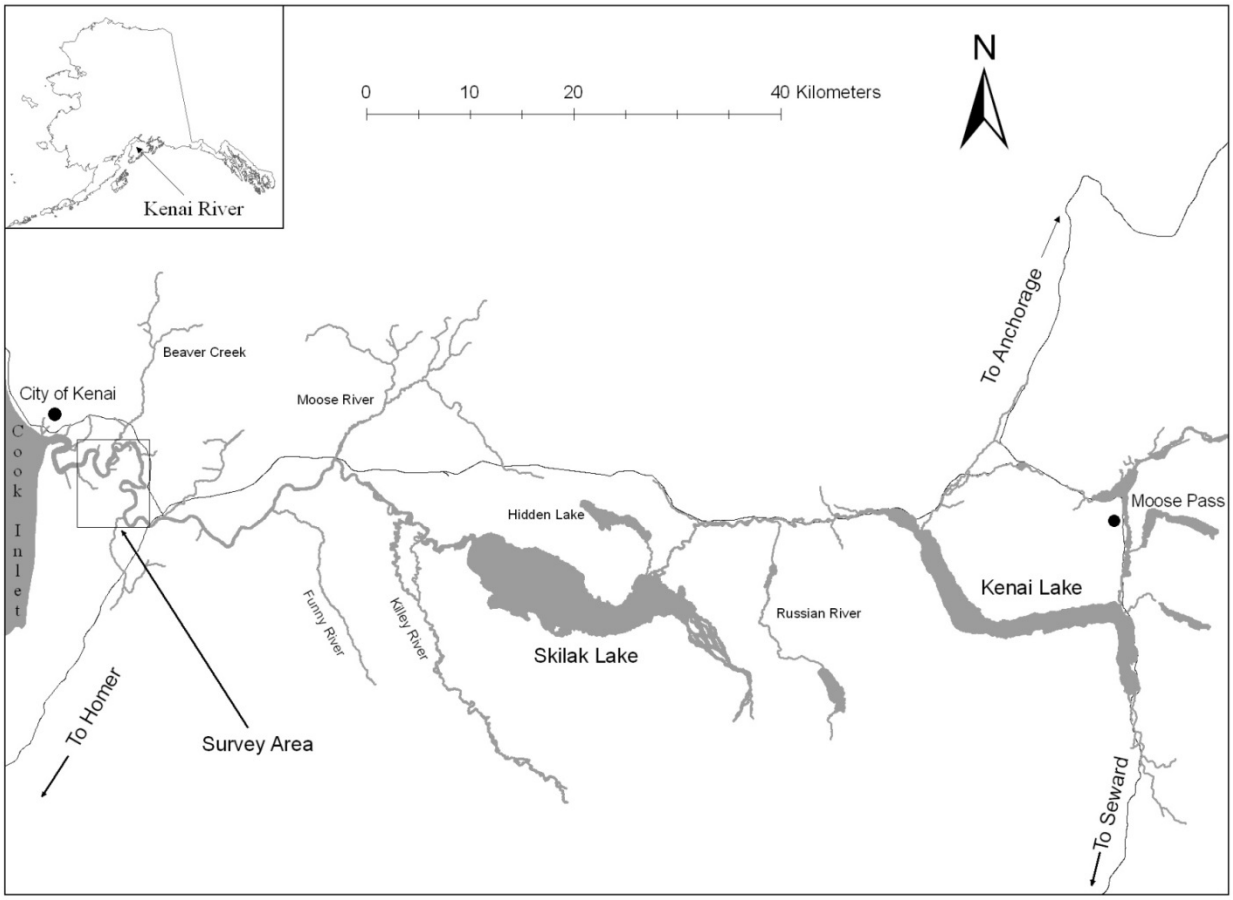

Figure 1.–Map of the Kenai River drainage.

Since 1991, the creel survey has been limited to the downstream section of the Kenai River (between the Warren Ames Bridge at RM 5.1)[1] and the Soldotna Bridge (RM 21.1) (see Figure 2)[2], while the Statewide Harvest Survey has been used to estimate harvest upstream of the Soldotna Bridge.

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 Division of Sport Fish (SF) began using sonar to estimate the inriver run of Chinook salmon in 1987 while the inriver gillnetting study provided age-sex-length (ASL) compositions of the inriver run. Inriver gillnetting was standardized to allow estimation of catch rates in 1998 near the sonar site at RM 8.6, and further standardized in 2002 to allow estimation of species composition passing the insonified (midriver) area of the Chinook salmon sonar.

[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.

[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.

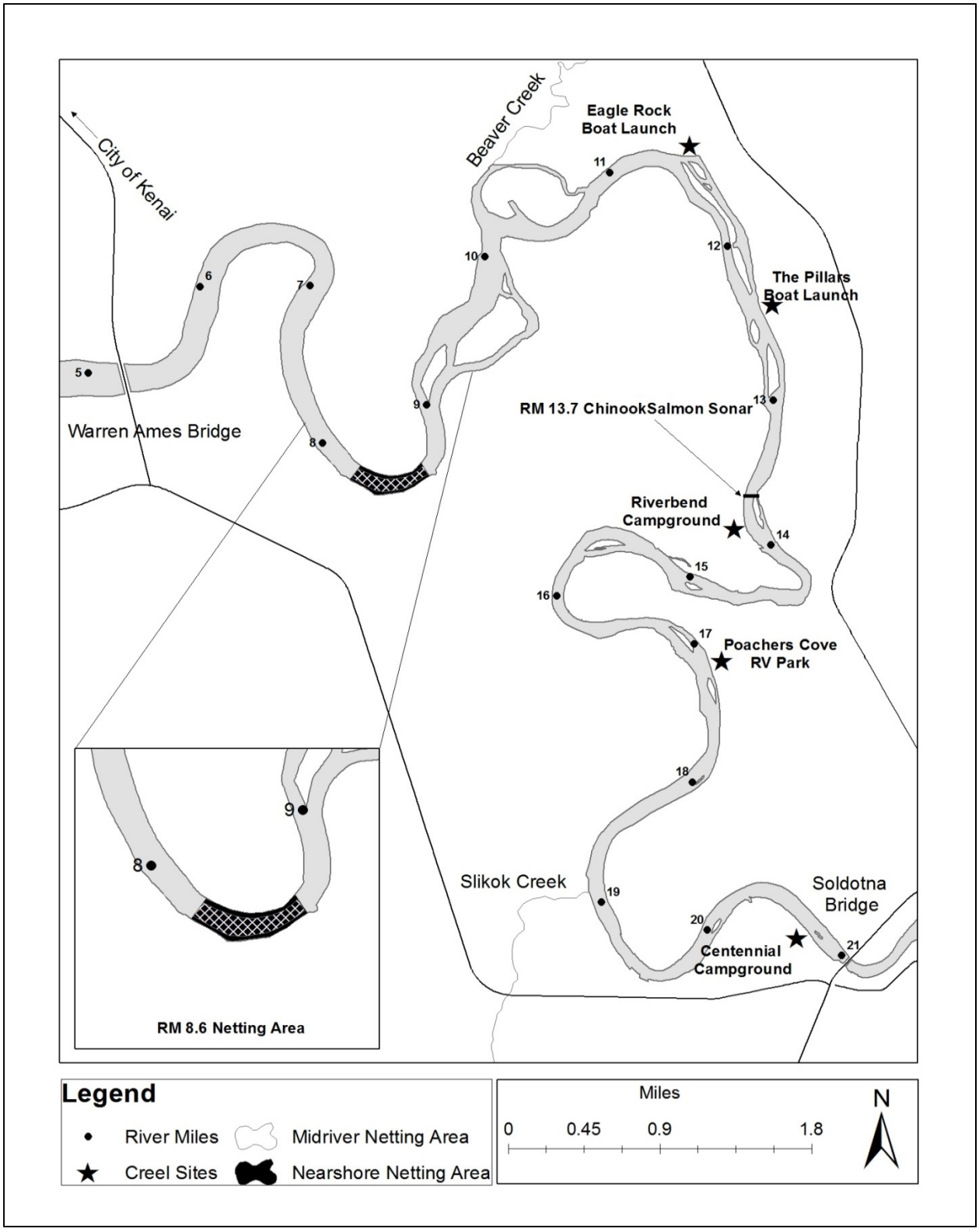

Figure 2.–Map of the Kenai River creel survey and inriver gillnetting study areas.

During 2013 and 2014, auxiliary netting studies were conducted to investigate catch rates during different tidal stages, as well as catch rates and the size of Chinook salmon passing behind the sonar (nearshore between the sonar transducers and the shoreline) (Perschbacher and Eskelin *In prep*[3]).

In 2015, the Kenai River Chinook salmon sonar site will relocate from RM 8.6 to RM 13.7 (upstream of major tidal influence) to insonify the water column bank-to-bank. The new sonar site is located in the center of the lower Kenai River Chinook salmon sport fishery and inseason harvest estimates upstream and downstream of the sonar are required for accurate estimation of inriver run strength and timing. The RM 13.7 sonar site is not conducive for an intensive inriver gillnetting study due to social issues, heavy boat traffic, and inherent risks associated with increased current. For these reasons the inriver gillnetting study will continue to be conducted at RM 8.6. This operational plan describes the creel survey and inriver gillnetting project design for the 2015 field season.

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 (for inseason monitoring of escapement), size and age of the harvest and inriver run, and total return of Chinook salmon by brood year (for stock-recruit analysis). Specific primary objectives[4] are as follows:

1) Estimate catch and harvest of Chinook salmon[5] by the sport fishery in the mainstem Kenai River between Warren Ames to Soldotna Bridges[6] from 16 May through 30 June (early run) and from 1 July through 31 July (late run), such that the estimates for each run is within 20% of the true value of catch and harvest 95% of the time, or 1,000 fish, of the true values 95% of the time[7].
2) Estimate total return for the early and late runs, by brood year, such that the estimates are within 20% of the true values 90% of the time. Total return consists of the inriver run as estimated by the sonar at RM 13.7, plus all commercial[8] and sport harvest downstream of the sonar. Total return originating from 1 brood year is the sum of age-specific total runs across several calendar years. Subobjectives[9] associated with each of the major components of total return are as follows:
    a) Estimate the proportion by age of the Chinook salmon population passing RM

[3] Perschbacher, J., and A. Eskelin. *In prep.* Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2014. Alaska Department of Fish and Game, Fisheries Data Series, Anchorage.

[4] Objective 2 related to estimation of total returns by brood year and stock recruit analysis are reported in ADF&G Fishery Data Series (FDS) reports for the early run (McKinley and Fleischman 2013) and late run (Fleischman and McKinley 2013).

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

[6] Catch and harvest upstream of the Soldotna Bridge are not estimated directly by this project. However, preliminary inseason estimates are obtained indirectly, using paired historical estimates above and below the bridge.

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

[8] The ESSN commercial fishery sampling design is described in another operational plan (Eskelin FY15/FY16 Operational Plan Upper Cook Inlet Commercial Eastside Set Gillnet Chinook Salmon Harvest Composition Study).

[9] These subobjectives lead to sample sizes that, on average, satisfy the precision criterion for historical estimates of total return listed in primary objective 2.

13.7, from 16 May through 15 August such that all age-proportion estimates, for each run, are within 0.1 of the true values 95% of the time[10].

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 RM 13.7 Chinook salmon sonar, and the RM 13.7 sonar and the Soldotna Bridge[11] 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 midriver and nearshore gillnets at RM 8.6.
2) Provide mid eye to tail fork (METF) length data of all salmon species captured in inriver gillnets for inseason ARIS[12] sonar mixture model species composition evaluation.
3) Insert esophageal radio transmitters into Chinook salmon captured in inriver gillnets between 16 May and 30 June, in conjunction with *Kenai River King Salmon Abundance and Migratory Timing Study*[13].
4) Collect tissue samples from Kenai River Chinook salmon sampled from inriver gillnets and the sport fish harvest for genetic analysis[14].
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 drift 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 drift gillnets in relation to tide stage.
8) Examine length distributions between Chinook salmon captured in midriver and nearshore nets at RM 8.6 and those sampled at the Killey River and Funny River weirs.

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[10] '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*.

[11] Age proportions from the sport fishery below the Soldotna bridge (RM 21) are used as a proxy for age proportions below the sonar (RM 13.7).

[12] Adaptive resolution imaging sonar (ARIS) is the next generation of multi-beam sonar technology producing images comparable to dual-frequency identification sonar (DIDSON) or better.

[13] Eskelin, T. *In prep*. Operational plan: Kenai River adult Chinook salmon monitoring. Alaska Department of Fish and Game, Soldotna.

[14] 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.

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 periodic counts of anglers done 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 2015, the fishery will be closed until data from inseason assessment projects indicate that fishing opportunity can be allowed without jeopardizing achievement of the optimal escapement goal[15]. The following methods and schedule for the creel survey are prepared for when the fishery reopens.

A significant amount of harvest occurring downstream of the sonar site would cause the inriver run to be underestimated by the sonar. Historically, Chinook salmon sport harvest and catch estimates above and below the RM 8.6 sonar were a product of pooled estimates of CPUE or HPUE (Warren Ames Bridge to Soldotna Bridge) and stratified estimates of angler effort (Warren Ames Bridge to RM 8.6, and RM 8.6 to Soldotna Bridge). Efforts to stratify CPUE and HPUE in relation to RM 8.6 during 1996–1998 were unsuccessful because 1) there were too few interviews of anglers that fished below RM 8.6, 2) gathering additional information complicated the interview process and the information was considered unreliable, and 3) catch and harvest estimates represented less than 1% of the inriver run (Reimer et al. 2002). As the sonar site is moved further upstream into the sport fishery, a significant amount of harvest below the new RM 13.7 Chinook salmon sonar site is anticipated. During 2013 and 2014, harvest downstream of RM 13.7 was estimated to be approximately 68% and 45%, respectively, of the total late-run harvests (Perschbacher and Eskelin *In prep*[16]) with a majority of anglers reporting to spend a portion of their trip fishing below RM 13.7. During 2015, angler counts will be geographically stratified from Warren Ames Bridge to RM 13.7 sonar, and RM 13.7 sonar to Soldotna Bridge. A sufficient number of interviews will be available to accurately stratify CPUE and HPUE, catch, and harvest estimates upstream and downstream of RM 13.7. To reduce confusion during the angler interview process, anglers will be asked to approximate what portion (e.g., 0%, 25%, 50%, 75%, or 100%) of their trip was spent actively fishing below RM 13.7.

A potential problem with the current study design is that the criteria for recording angler effort during angler interviews are not necessarily equivalent to the criteria used during angler counts. For example, an angler that took numerous short trips between fishing holes might be observed as "inactive" during the angler boat count for a greater fraction of the fishing trip than he or she would recall during an interview; reporting angling time (hours actively fishing) greater than it actually was would result in underestimation of catch or harvest rates. The tendency to overestimate effort may be greater for unguided anglers than guided anglers (Perschbacher

[15] Emergency Order No. 2-KS-1-05-15, effective 12:01AM, Friday, 1 May 2015.

[16] Perschbacher, J., and A. Eskelin. *In prep.* Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2014. Alaska Department of Fish and Game, Fisheries Data Series, Anchorage.

2014b). During 2015, 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.

The creel survey is scheduled from 16 May through 31 July on the Kenai River between the Warren Ames Bridge and the Soldotna Bridge. 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.

Creel Survey Stratification

Guided and unguided anglers will be counted separately and geographically stratified into the following 2 areas:

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)

Angler effort, CPUE, and HPUE have differed significantly by week, between weekdays and weekend-holidays, between guided[17] 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). Angler type (guided and unguided), and CPUE and HPUE for guided and unguided anglers (upstream and downstream of the RM 13.7 sonar) will be poststratified to improve precision and to minimize bias. Based on these factors, the following strata will be used for estimating creel statistics:

Table 1.–Types and numbers of strata planned for analysis of creel survey data.

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
Catch type	2	CPUE and HPUE

Note: Angler effort and C/HPUE by angler type will be geographically stratified above and below the RM 13.7 Chinook sonar.

During the early and late runs, 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).

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

Table 2.–Estimates of harvest and catch, with estimated absolute precision (AP) and estimated relative precision (RP) for early and late runs of Kenai River Chinook salmon from the Soldotna Bridge to Warren Ames Bridge, 2002–2011.

		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							
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

Source: Reimer et al. (2002); Reimer (2003, 2004a-b, 2007); Eskelin (2007, 2009, 2010); Perschbacher (2012a-d, 2014a, *In prep*[18]; Perschbacher and Eskelin *In prep*[19]).

The current objective criterion[20] for precision[21] of catch and harvest estimates have been met every year except for early-run catches in 2005 and 2007. The early- and late-run Chinook salmon sport fisheries were restricted by emergency order(s) during 2012–2014.

[18]Perschbacher, J. *In prep.* Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2013. Alaska Department of Fish and Game, Fisheries Data Series, Anchorage

[19] Perschbacher, J., and A. Eskelin. *In prep.* Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2014. Alaska Department of Fish and Game, Fisheries Data Series, Anchorage

[20] The current objectives are as follows: harvest and catch within 0.20, or 1000 fish, 95% of the time.

[21] Absolute and relative precision levels were based on 95% confidence intervals.

The 4 days per week sampling schedule will be modified during the early run the week of 19–25 May when 2 days will be randomly selected from the 3 weekend-holiday days available [Saturday, 23 May; Sunday, 24 May; and Monday, 25 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, the early run in each geographic stratum will be composed of strata based on the times, day types, angler types, and catch types found in Table 3.

Table 3.–Early run sampling strata based on time, day, angler, and catch.

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

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.

During the late run, the sampling design is the same as the early run: a random sample of 2 of the 4 available powerboat fishing weekdays and both weekend days sampled. Nonholiday 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.

Table 4.–Late run sampling strata based on time, day, angler, and catch.

Stratum	Time stratum	Dates	Day type	Angler type	Catch Type
1	1–5 July	tbd, tbd Jul	Weekday	Unguided	CPUE and HPUE
2				Guided	CPUE and HPUE
3		4, 5 Jul	Weekend-holiday	Unguided	CPUE and HPUE
4		4 Jul		Guided	CPUE and HPUE
5	7–12 July	tbd, tbd Jul	Weekday	Unguided	CPUE and HPUE
6				Guided	CPUE and HPUE
7		11, 12 Jul	Weekend-holiday	Unguided	CPUE and HPUE
8		11 Jul		Guided	CPUE and HPUE
9	14–19 July	tbd, tbd Jul	Weekday	Unguided	CPUE and HPUE
10				Guided	CPUE and HPUE
11		18, 19 Jul	Weekend-holiday	Unguided	CPUE and HPUE
12		18 Jul		Guided	CPUE and HPUE
13	21–26 July	tbd, tbd Jul	Weekday	Unguided	CPUE and HPUE
14				Guided	CPUE and HPUE
15		25, 26 Jul	Weekend-holiday	Unguided	CPUE and HPUE
16		25 Jul		Guided	CPUE and HPUE
17	28–31 July	tbd, tbd Jul	Weekday	Unguided	CPUE and HPUE
18				Guided	CPUE and HPUE

Note: Angler effort and CHPUE 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.

During the early run, the creel survey is scheduled to sample 26 of 40 (65%) days that fishing from powerboats is allowed. During the late run, the creel survey will sample 18 of 27 (67%) possible powerboat fishing days. The creel survey could sample up to 44 of 67 (66%) possible powerboat fishing days if the fishery is open from 16 May to 31 July.

Creel Survey Sampling

Completed-trip angler interviews will be conducted at access locations between angler counts and will not begin until after the first count of the day has been completed. Few interviews will be lost by not interviewing until after the first count of the day because 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 with 2009 interview data (the most recent season without fishery restrictions). Technicians will attempt to interview all anglers exiting the fishery at their interview location. Only rare circumstances occur when technicians are not able to interview all anglers at their location.

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

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

Due to shallow water, most anglers access the early-run fishery in May at Pillars Boat Launch (a public boat launch) and Stewart's Landing (private boat launch). Sampling at Stewart's Landing was allowed during the early run in 2012–2013, but the launch operator has denied access to sample since then. As water levels increase, anglers begin utilizing other access locations. Following the draft 2015 schedule, which will be implemented immediately after the fishery opens, sampling will commence at Pillars Boat Launch on 16 May, Centennial Campground on 28 May, River Bend Campground on 9 June, Poacher's Cove on 17 June, and Eagle Rock Boat Launch on 7 July.

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 during the guided-angler hours of 0600–1800. Although each angler count may take up to 1 hour to complete, they are 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 are always available between angler counts, plus 1 possible additional period after the last count. Scheduling of interviews at access locations will proceed as follows. During May to early June (when fewer than 4 access locations are being sampled) each location will be sampled at least once before any are repeated, with time and access location paired randomly. Beginning in mid-June (when there are more available access locations than sampling periods) 3–4 access locations will be sampled without replacement from the 5 available, with time and access location paired randomly.

Nonholiday Mondays are excluded from the regular creel study. Results of including Mondays into the 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 mid-day, compared to angler counts conducted in 1999–2001, warranted recalibration of the index (Perschbacher 2012c). In 2015, due to budgetary constraints and historically low angler effort, a single index angler count will be conducted during the middle of the day (1000 to 1400), at a time and in a direction that is convenient to the project biologist.

INRIVER DRIFT GILLNETTING: PROPORTION BY AGE OF CHINOOK SALMON AT RM 8.6

Gillnet Specifications

During 2002–2013, single mesh (60 ft long by 30 ft deep) gillnets were used midriver to estimates species composition, CPUE, and to collect biological samples from Chinook salmon passing within the midriver area insonified by the RM 8.6 Chinook salmon sonar (Perschbacher

2014b). Nets with either 5.0-inch mesh or 7.5-inch mesh were alternately deployed. The nets were 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) multi-fiber, Shade 1 (clear-steel blue), MS73 (14 strand) twine
2) 7.5 inch (stretched mesh) multi-fiber, Shade 1, MS93 (18 strand) twine

In 2014, single mesh nets were replaced with a panel net system to investigate fish passage, and Chinook salmon size passing nearshore (behind the sonar transducers) was compared to midriver (between the sonar transducers) (Perschbacher and Eskelin *In prep*[22]). Without panel nets, 4 nets could be kept in the boat, whereas the use of panel nets kept the number of nets in the boat to 2 (a 15 ft deep panel net for nearshore, and a 30 ft deep panel net for midriver). The 60 ft long panel nets were constructed of four 15 ft panels alternating between 5.0 inch and 7.5 inch mesh panels seamed together. During the field season, the net depths (15 ft nearshore and 30 ft midriver) worked well in the respective nearshore and midriver areas, but it was difficult to remove fish from the 4-paneled mesh system because fish often became entangled within both meshes at the same time (Perschbacher and Eskelin *In prep*[23]).

During 2015, net length (60 ft), mesh size (5.0 and 7.5 inches), and depth (15 ft and 30 ft) will be retained, but nets will modified into a 2-panel net system consisting of two 30 ft panels instead of four 15 ft panels. The 2-panel nets will help reduce the amount of time spent removing the fish from the net and will be less expensive to build and repair.

Tide Stage and Schedule

Since 2002, the netting schedule has undergone several changes in both length of time and stage of tide from 4 hours before to 4 hours after low tide (2002–2003), to 3 hours before to 3 hours after low tide (2004–2006), to 5 hours before low tide to 1 hour after low tide (2007–2013). The change from 8 hours per day in 2003 to 6 hours per day in 2004 was due to budgetary constraints, whereas in 2007, the tidal schedule was changed in an attempt to intercept more fish based on previous hourly sonar passage estimates by tide stage (Eskelin 2010). However, after the schedule change in 2007, Chinook salmon and sockeye salmon catch rates in relation to tidal stage differed significantly between years and between midriver and nearshore areas during auxiliary netting during 2013 (Perschbacher *In prep*[24]).

In 2014, netting effort was doubled with 2 crews scheduled to net in succession regardless of tide stage from 0700 to 1300 hours (morning crew) and from 1300 to 1900 hours (afternoon crew). Each crew netted both nearshore and midriver areas equally. Chinook salmon and sockeye salmon catch rates in relation to tidal stage differed significantly; the highest catch rates of both species occurred during the rising and falling tides, while the lowest catch rates occurred during low and high tides (Perschbacher and Eskelin *in prep*). Catch rates were higher during the morning shift for both the early and late runs. Although catch rates differed by tidal stage, the size of Chinook salmon captured in inriver gillnets did not differ by tidal stage in either the early

[22]Perschbacher, J., and A. Eskelin. *In prep.* Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2014. Alaska Department of Fish and Game, Fisheries Data Series, Anchorage.

[23] Ibid.

[24]Perschbacher, J. *In prep.* Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2013. Alaska Department of Fish and Game, Fisheries Data Series, Anchorage.

or late run. This was an important component in developing the 2015 inriver gillnetting schedule to prevent biased length and age compositions of the inriver run.

During 2015, a single inriver gillnetting crew will follow a fixed schedule (i.e., 0700–1300) and net bank-to-bank, 6 hours per day, 7 days per week, with equal effort divided between nearshore and midriver sets. There will be short amounts of time when gillnetting may be ineffective due to strong upstream current during extreme tidal swings. The inriver gillnetting schedule may be modified inseason to avoid times when it is ineffective to net. Because ineffective netting is rare, major inseason schedule modifications are not anticipated. Also, there should be no bias in the collection of ASL data due to any scheduling changes because those parameters did not differ by tide stage in 2014.

Gillnetting Area

During 2002–2014, the netting area was approximately 0.3 mi in length, beginning just downstream of the RM 8.6 Chinook salmon sonar site. In 2015, inriver gillnetting will continue at RM 8.6, although the netting configuration will be from bank-to-bank and moved slightly upstream from its previous location. The netting area will remain 0.3 mi in length but will be centered where the RM 8.6 sonar transducers were previously located (Figure 2). A small upstream shift in the netting area will help prevent nets from becoming snagged in areas with large amounts of submerged trees, especially along the left bank. The panel nets will be fished with equal frequency both nearshore (in waters less than 15 ft deep) and midriver, similar to 2014. Midriver sets will be deployed in the middle of the channel that was previously insonified by the RM 8.6 sonar. Nearshore sets will be deployed from the shoreline to a point where the midriver sets begin in depths less than 15 ft deep to ensure the net is on the river bottom. Rangefinders will be used to ensure sets are either within or outside of each area. Nets will be deployed perpendicular to the river current and a maximum time per drift will be determined inseason to standardize effort among sets (approximately 5–7 min). A drift will be terminated if any of the following occur: 1) a Chinook salmon is 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.

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. Drifts will always begin at the upstream end of the study area.

Radio Transmitter Deployment

A separate *Kenai River Chinook salmon Abundance and Migratory Timing* study has been conducted since 2010 and the inriver gillnetting study at RM 8.6 has performed the marking event for this project. During 2015, Advanced Telemetry Systems[25] (ATS, Isanti, MN) models F1835B and F1845B radio transmitters will be deployed in all Chinook salmon sampled for ASL from 16 May through 30 June or until 80 radio transmitters are deployed. Chinook salmon

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

measuring 495–600 mm METF will receive radio transmitter model F1835B, while those measuring 600 mm or more will receive model F1845B transmitters. 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.

Inriver Drift Gillnetting: Size Selectivity

During 2012, the U.S. Fish and Wildlife Service (USFWS) operated weirs on both the Funny and Killey rivers and sampled large fractions of the weir passage for ASL information. This data provided a unique opportunity to assess the bias of our inriver run size composition estimates because the Funny and Killey rivers are destinations for a majority of the early run, and because the weirs, unlike gillnets, are not size selective. Approximately 62% of Chinook salmon sampled at the Funny River weir were small (<650 mm METF) and approximately 20% of Killey River Chinook salmon were small (Boersma and Gates 2013; Gates and Boersma 2013) compared to 12% captured in the early-run midriver netting study. When multiplying weir and sonar length compositions by weir and sonar passage estimates, respectively, more small fish passed the two weirs than were estimated to have passed RM 8.6 during the early run. Because Chinook salmon less than 650 mm MEFT should be captured efficiently in the 5.0 inch net, we suspected smaller fish may be traveling nearshore. The tendency for small Chinook salmon to swim closer to the bank than large Chinook salmon is consistent with "the wave drag hypothesis" (Hughes 2004). Failure to get a representative sample of Chinook salmon with the nets biases the mixture model estimates of Chinook passage (Steve Fleischman, ADF&G, personal communication). Under-sampling small Chinook salmon would underestimate the total number of Chinook salmon and the fraction of fish that are small. The amount of bias depends on how different the length distributions are between nearshore and midriver Chinook salmon.

In 2013, auxiliary gillnetting (nearshore) in the early run showed a significant difference between length distributions of Chinook salmon captured nearshore and midriver, and between Chinook salmon captured midriver and those sampled at the Funny River and Killey River weirs (Perschbacher *In prep*[26]). In 2014, there was negligible difference between length distributions of early-run Chinook salmon captured in the modified gillnetting program (nearshore and midriver netting during all tidal stages) and the tributary weirs, but radiotagged Chinook salmon that migrated into the Funny and Killey rivers were of larger size than those sampled at the weirs (Perschbacher and Eskelin *In prep*[27])

The 2015 the length composition of early-run Chinook salmon captured midriver and nearshore, and radiotagged Chinook salmon bound for the Funny River and Killey River weirs will be compared with the length composition of migrants past the Funny and Killey weirs using Kolmogrov-Smirnov (KS) tests.

[26]Perschbacher, J. *In prep.* Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2013. Alaska Department of Fish and Game, Fisheries Data Series, Anchorage.

[27] Perschbacher, J., and A. Eskelin. *In prep.* Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2014. Alaska Department of Fish and Game, Fisheries Data Series, Anchorage.

TOTAL RETURN BY BROOD YEAR

Total return by brood year for each run is the sum of age-specific returns across multiple calendar years. For example, the total return from the 1990 brood year consists of 3-year-old fish returning in 1993, 4-year-olds returning in 1994, 5-year-olds returning in 1995, 6-year-olds returning in 1996, and 7-year-olds returning in 1997. The age-specific return is the sum of the age-specific inriver run (RM 13.7) as estimated by sonar, age-specific commercial harvest (marine, late run only), age-specific personal-use harvest below the Warren Ames bridge, and age-specific sport harvest below the sonar at RM 13.7.

Inriver Run by Age

Chinook salmon captured in inriver gillnets (nearshore and midriver) will constitute the ASL sample for the inriver run. Samples will be stratified temporally, postseason, into approximately 3-week time intervals[28] (2 strata during each run), if found to be significantly different:

1) 16 May–6 June
2) 7 June–30 June
3) 1 July–20 July
4) 21 July–15 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 and 2013 early runs (Table 5). We are unlikely to meet this goal for the early run in 2015 if the 2015 run size is similar to the 2012–2014 run sizes.

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

Table 5.–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, 2002–2014.

	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	41.0%	39.3%	9.4%	0.9%	283	20.5%	35.6%	39.3%	2.1%

Source: Reimer 2003, 2004a-b, 2007; Reimer et al. 2002; Eskelin 2007, 2009, 2010; Perschbacher 2012a-d, 2014, *In prep*[1]*;* Perschbacher and Eskelin *In prep*[2].

Note: The sample size goal of 127 readable scales was not met during the 2012–2013 early runs. The 2002–2013 samples were collected by 1 crew netting midriver, whereas the 2014 samples were collected by 2 crew netting midriver and nearshore.

Commercial Harvest by Age

A separate study will be conducted in 2015 to estimate Kenai River Chinook salmon harvest in the ESSN fishery (Eskelin and Barclay *In prep*[3]).

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. Angler type (guided or unguided), length (METF), and sex will be recorded for each Chinook salmon encountered. Assuming a simple random (not stratified) sample and 15% unreadable scales, 22 fish are required to be within 20 percentage points of the true value 80% of the time (Thompson 1987). This is equivalent to 19 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 late run and 2013 early run (Table 6).

[1] Perschbacher, J. *In prep.* Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2013. Alaska Department of Fish and Game, Fisheries Data Series, Anchorage.

[2] Perschbacher, J., and A. Eskelin. *In prep.* Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2014. Alaska Department of Fish and Game, Fisheries Data Series, Anchorage.

[3] Eskelin, T., and A. W. Barclay. *In Prep.* 2015 Upper Cook Inlet commercial eastside set gillnet Chinook salmon harvest composition study. Alaska Department of Fish and Game, Regional Operational Plan.

Table 6.–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, 2002–2014.

	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	–	–	–	–	50	26.7%	30.0%	33.3%	0.0%

Source: Reimer 2003, 2004a-b, 2007; Reimer et al. 2002; Eskelin 2007, 2009, 2010; Perschbacher 2012a-d, 2014, *In prep*[1]*;* Perschbacher and Eskelin *In prep*[2].

Note: Relative precision RP80 is 1.28 times the coefficient of variation of the estimate. The sample size goal of 19 was not met during 2012 late run, the 2013 early run due to sport fishery restrictions, and the 2014 early run due to sport fishery closure.

Brood Year Return Reconstruction

Theoretically, to reconstruct returns for each run by brood year, age composition must be estimated for each component of total return. In practice, only major components need be sampled for age composition, and the estimates need not be overly precise[3]. Recent run reconstructions based upon synthesis of all relevant Chinook salmon abundance data (McKinley and Fleischman 2013: Table 8; 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 with both technicians working each sampling day. The Chinook salmon creel survey is scheduled to be conducted from 16 May

[1] Perschbacher, J. *In prep.* Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2013. Alaska Department of Fish and Game, Fisheries Data Series, Anchorage.

[2] Perschbacher, J., and A. Eskelin. *In prep.* Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2014. Alaska Department of Fish and Game, Fisheries Data Series, Anchorage.

[3] 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 sufficiently precise age composition for total run.

through 31 July. 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 unique 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. A count is usually accomplished in less than 1 hour.

The total number for each of the following categories is tallied using 10 thumb counters:

1) unguided power boats
2) unguided drift boats
3) guided power boats
4) guided drift boats
5) unguided anglers fishing from power boats
6) unguided anglers fishing from drift boats
7) guided anglers fishing from power boats (excluding the guide)
8) guided anglers fishing from drift boats (excluding the guide)
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 Numbers 5 and 6, and 7 and 8 are required for this project; Numbers 1–4, and 9–10 are collected as auxiliary information for management and historical comparisons. A person is 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 are considered to be angling. Count Number 10 will record 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 location, 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). The technician will attempt to interview all anglers leaving the fishery at their location. 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 <u>not</u> based on their success (in harvesting or catching fish). 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 fished downstream of the Soldotna Bridge, not including travel time or time spent in the boat after the angler has harvested a Chinook salmon, rounded to the nearest one-quarter hour
5) percentage (i.e., 0%, 25%, 50%, 75%, or 100%) of time spent actively angling below RM 13.7
6) location and number of Chinook salmon harvested downstream of the Soldotna Bridge[4]
7) location and number of Chinook salmon released downstream of the Soldotna Bridge
8) for each Chinook salmon released, size of fish (total length) 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[5]

Data will be recorded electronically on the field computer and 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[6] will be sampled for METF length, total length during early run slot-limit restriction, sex, and genetic tissue. Scales will be sampled following the procedures described under "Scale Sampling for Inriver Gillnetting and Sport Harvest" below. Biological data will be recorded on data forms (Appendix A3).

INRIVER DRIFT GILLNETTING

The RM 8.6 gillnetting crew will be composed of 3 fishery technicians, with 2 technicians working each shift (0600–1400 hours). Sampling will be conducted from an outboard-powered skiff. Primary responsibilities are to capture Chinook salmon in a drift gillnet, sample captured Chinook salmon for ASL data and genetic tissue (before radiotagging and releasing), count other species captured, and record data directly into a handheld computer. Each technician will be scheduled 5 days per week for 8 hours per day of which 6 hours 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 inriver netting study will sample every day during the entire season (16 May–15 August). Panel nets of 2 different depths (15 ft deep for nearshore, and 30 ft deep for

[4] Location of harvested (Question 6) or released (Question 7) Chinook salmon will be recorded as (1) upstream of RM 13.7, or (2) downstream of RM 13.7.

[5] This information will be used as described in another operational plan: Eskelin, T. *In prep*. Operational plan: Kenai River adult Chinook salmon monitoring. Alaska Department of Fish and Game, Soldotna.

[6] Very rarely, during the peak of the late run, it may become difficult to sample all boats at some exit locations. To the extent that this occurs, sampling for age composition and genetic tissue can be slightly depensatory if data are pooled across time strata.

midriver) will be 60 ft in length and will contain 2 different mesh sizes (5.0 and 7.5 inches). 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 sets by mesh size closest to shoreline (i.e., to avoid having the 5.0-inch mesh panel always set closest to the shoreline). One sampling 'replicate' will then 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 starting bank, starting area (nearshore or midriver), and starting mesh size will alternate daily. The start and stop time will be recorded for each drift. The start time is the time the crew begins setting the net. The stop time is the time the crew begins pulling the net.

All Chinook salmon captured in nets will be examined for the presence of an adipose fin during both runs. 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. If a fish without an adipose fin is found, the fish's head will be removed and examined later for a coded wire tag. In addition, crews will be instructed to record a Chinook salmon as an escape if they visually inspected the Chinook salmon and found a missing adipose fin. All other captured salmon species will be counted each day, and sampled for length every third day. For other captured nonsalmon species, the species and the number of fish captured will be recorded, and all rainbow or steelhead trout and Dolly Varden captured will be measured.

All captured Chinook salmon will be sampled for ASL and genetics. As the net is retrieved after a set, fish will be untangled from the net and measured for length, if required. If the fish is a Chinook salmon, it will be untangled from the nets and have 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. While other fish are untangled, Chinook salmon tethered to the boat will remain in the water. Because small Chinook salmon (approximately 600 mm METF or less) have a 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, tethered Chinook salmon will be sampled 1 at a time. The capturing mesh size will be recorded for each Chinook salmon based on the color-coded tail ties . Tethered Chinook salmon will be placed in a padded, restraint cradle (Larson 1995) to immobilize the captured fish while biological data are collected. 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 METF length (measured to the nearest 5 mm) and sex of each sampled Chinook salmon will be recorded. The METF length (measured to the nearest 5 mm) of other salmon will be recorded every third day. Scales samples will be collected, and mesh size where it was caught will be recorded. To avoid resampling, a 'hole-punch' will be given to each captured Chinook salmon in the upper lobe of the caudal fin before it is released.

Prior to tagging Chinook salmon, 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 or rubber band) 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 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.

Radio tags for this project are esophageal implant models F1835B and F1845B fabricated by Advanced Telemetry Systems and broadcasting between 151.200 and 151.525 MHz. 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 1.5 lbs could be tagged, which is smaller than any age-.2+ Chinook salmon.

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 data forms (Appendices A3–A4) and given to their supervisor. In addition, crews will also fill out a field notebook daily to document observations not covered by the electronic data entry system, and will be instructed to contact their supervisor about all complaints or negative contacts they field during the course of their shift, which will get forwarded to the Soldotna ADF&G Area Research Biologist and Area Managers.

Scale Sampling for Inriver Gillnetting and Sport Harvest

For all Chinook salmon sampled in the RM 8.6 inriver gillnetting study, and the sport harvest (creel survey), 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 PSI and then the scales growth patterns are viewed with a 40× microfiche reader to determine freshwater and marine residence times.

Coded Wire Tag (CWT) Recovery

All Chinook salmon sampled during the course of the creel survey and all fish captured during inriver gillnetting will be examined for an adipose finclip. Technicians will remove the head of all adipose finclipped Chinook salmon encountered, provided permission can be obtained from the angler in possession of the fish. A numerical cinch strap will be attached to the head, which will be returned to the office for storage in a freezer. 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. Data collected during the creel survey or the inriver gillnetting survey will be returned to the project leader.

Genetic Sampling

Genetic tissue samples will be taken from every Chinook salmon sampled for ASL in the creel survey and inriver gillnetting study. A one-half inch piece of tissue from the anterior portion of the dorsal fin will be removed from each fish sampled from the inriver gillnets, placed in a 2 ml

plastic vial (Nalgene, VWR Cat. # 66008-710) and completely covered with a Sigma Reagent Grade 95% Alcohol (Sigma Cat. # R 8382) buffered solution such that the liquid to tissue ratio is approximately 3:1. A one-half inch piece from the tip of an axillary process will be taken from Chinook salmon sampled in the creel survey and will be stored in the same way as genetic samples taken from Chinook salmon sampled from the inriver gillnets. Each plastic tube will be sequentially numbered and the vial number will be recorded in the field computer. All plastic vials will be stored at the Soldotna office until the end of the season, when all tubes will be sent to the Gene Conservation Laboratory for analysis.

Water Clarity and Temperature

A Secchi disc depth reading will be recorded at the beginning and end of each gillnetting shift to monitor river conditions that affect netting catch rates at RM 8.6. The Secchi readings will be taken at the same location, midriver near the center of the gillnetting area. 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) at the beginning of his or her shift to monitor river conditions that might affect sport angler catch rates.

Tidal Conditions at RM 8.6

The RM 8.6 netting crew will collect 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 stream bank. Each set will be recorded as either a downstream, slack, or upstream set.

DATA REDUCTION

Creel and netting technicians will return their scale cards and field ASL data forms to the Soldotna office daily and will be responsible for ensuring the data is legible and accurate. Technicians are also responsible for entering most data (except for age data) into the field computer and downloading data to the project biologist desktop computer that can output the datasets into a comma separated text (.txt) format for analysis. Netting data will be entered electronically in the field. Paper forms will be available as a backup in the event the field computer fails. Age data are keypunched directly into master electronic data files after age is determined by scale reading. The project biologist will ensure all data are returned, are legible, and are entered correctly. Data maps for all of the information collected in this project are shown in Appendices B1–B5.

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 the Division of Sport Fish Fishery Data Series report. All creel survey, inriver gillnetting, and biological data will be in computer files and edited by 1 December. Data files (and relevant data maps) of interest to project staff will be posted to the Alaska Department of Fish and Game Research and Technical Services (RTS) DocuShare[7] website.

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

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 and their variances will be calculated using equation 2.9 and 2.10 from Bernard et al. (1998). Estimates of daily catch and harvest rates and their variances will be calculated using equations 2.11a and 2.11b in (Bernard et al. 1998)[8]. Daily estimates of catch and harvest are then calculated by combining the daily estimate of angler effort with the 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. Because the correct angler type can be determined for anglers as they are counted, no prorating of angler counts will be necessary to reduce bias caused by the different catch and harvest rates of guided and unguided anglers. 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).

Stratum 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 stratum variances for these estimates are calculated following equation 2.5 of Table 2.4 in Bernard et al. (1998).

During the early run, a single angler count and no interviews will be conducted on nonholiday Mondays in 2015. 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 2015. 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.

Creel survey estimates of CPUE and HPUE for nonholiday Mondays, during 2009 and 2010, did not show a significant difference compared to the ad hoc method in step 3, above (Perschbacher 2012c). Therefore, the only change to estimate nonholiday Monday effort, catch, and harvest will be in using the recalibrated proportion of anglers observed during the index in step 1, above.

[8] 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).

TOTAL RETURN BY BROOD YEAR

Total return originating from brood year, *y*, is the sum of age-specific total returns across 5 calendar years bracketing 3- through 7-year-old fish:

$$\hat{R}_y = \sum_{a=3}^{7} \hat{R}_{y+a,a} \tag{1}$$

where $\hat{R}_{y+a,a}$ is the sum of the estimates of inriver run I_a at RM 8.6 (estimated by sonar; Miller et al. 2005), plus commercial harvest *C* (late run, censuses from Eastside setnet and Upper Cook Inlet drift gillnet fisheries), the Kenai River personal use harvest *P* (late run), the late-run marine sport harvest *M*, and sport harvest *S* downstream of the RM 13.7 sonar (estimated by creel survey), each restricted to the appropriate age *a* and calendar year $t = y + a$.

$$\hat{R}_{t,a} = \hat{I}_{t,a} + \hat{C}_{t,a} + \hat{P}_{t,a} + \hat{M}_{t,a} + \hat{S}_{t,a} \tag{2}$$

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:

$$\hat{C}_a = C\ \hat{p}_{Ca} \tag{3}$$

and

$$\mathrm{var}\left(\hat{C}_a\right) = C^2\ \mathrm{var}\left(\hat{p}_{Ca}\right) \tag{4}$$

where

$$\hat{p}_{Ca} = \frac{n_{Ca}}{n_C} \tag{5}$$

and

$$\mathrm{var}\left(\hat{p}_{Ca}\right) = \frac{\hat{p}_{Ca}\left(1 - \hat{p}_{Ca}\right)}{n_C - 1} \tag{6}$$

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:

$$\hat{S}_a = \hat{S}\ \hat{p}_{Sa} \tag{7}$$

with variance

$$\mathrm{var}\left(\hat{S}_a\right) = \hat{S}^2\ \mathrm{var}\left(\hat{p}_{Sa}\right) + \hat{p}_{Sa}^2\ \mathrm{var}\left(\hat{S}\right) - \mathrm{var}\left(\hat{p}_{Sa}\right)\mathrm{var}\left(\hat{S}\right) \tag{8}$$

where

$$\hat{p}_{Sa} = \frac{n_{Sa}}{n_S} \tag{9}$$

and

$$\mathrm{var}\left(\hat{p}_{Sa}\right)=\frac{\hat{p}_{Sa}\left(1-\hat{p}_{Sa}\right)}{n_S-1} \tag{10}$$

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 3–6 and substituting P for C. Age-specific marine sport harvest M will be estimated using Equations 7–10 and substituting M for S.

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

$$\hat{I}_a=\sum_{h=1}^{2}\hat{I}_h\hat{p}_{Iha} \tag{11}$$

with variance

$$\mathrm{var}\left(\hat{I}_a\right)=\sum_{h=1}^{2}\left[\hat{I}_h^2\ \mathrm{var}\left(\hat{p}_{Iha}\right)+\ \hat{p}_{Iha}^2\ \mathrm{var}\left(\hat{I}_h\right)-\mathrm{var}\left(\hat{p}_{Iha}\right)\mathrm{var}\left(\hat{I}_h\right)\right] \tag{12}$$

where

$$\hat{p}_{Iha}=\frac{n_{Iha}}{n_{Ih}} \tag{13}$$

and

$$\mathrm{var}\left(\hat{p}_{Iha}\right)=\frac{\hat{p}_{Iha}\left(1-\hat{p}_{Iha}\right)}{n_{Ih}-1} \tag{14}$$

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 4, 6, 8, 10, 12, and 14) assume that each fish sampled is an independent observation (i.e., that simple random sampling [SRS] was employed). In reality, the sport harvest is 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 9 and 10. The point estimates and their standard errors were essentially equivalent. Based on this evidence, we continue to use the SRS equations for convenience.

TECHNICIAN MANUAL

An explanation and background of the project are detailed in the Technician Manual (Appendix C1). The manual also has expectations, responsibilities, and general operating procedures for crewmembers to reference and follow. Crews will be required to read this manual and keep it in their clipboard for reference while on duty.

SCHEDULES AND DELIVERABLES

A general schedule for completion of tasks is outlined below.

	Tasks	Schedule	Personnel
1)	Prepare equipment for the field season	1 Apr–10 May	Perschbacher
2)	Field season preparation and preseason training	1 Apr–15 May	All staff
3)	Creel survey	16 May–31 Jul	Karic, Chase
4)	RM 8.6 inriver gillnetting	16 May–15 Aug	Amend, Atchley, Inokuma
5)	Inseason angler effort, harvest, and netting CPUE estimates	Daily	Perschbacher
6)	Interview and count data edited	Daily	Perschbacher
7)	Interview and count data summarized	Daily	Perschbacher
8)	Prepare equipment for winter storage	15–30 Aug	Perschbacher
9)	Scales read	15 Oct	Perschbacher
10)	Age composition summary	15 Oct	Perschbacher
11)	Final creel estimates	15 Oct	Perschbacher
12)	Chinook salmon stock assessment report	1 Mar	Reimer
13)	Annual report submitted to Regional Staff	30 Nov	Perschbacher
14)	2016 operation plan	1 May	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

PRINCIPAL INVESTIGATORS

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

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 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 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 data will be entered into a mark sense format file for archiving and scale cards will be archived as well. It will also be the responsibility of this position to keep the area research biologist informed of any problems with equipment and/or personnel affecting the completion of this project.

Adam Reimer, Area Research Supervisor, Fishery Biologist III, 1 January–31 December:

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, 1 January–31 December:

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

PROJECT LEADER SUPERVISOR

Tony Eskelin, Fishery Biologist II, 1 January–31 December:

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, Fish and Wildlife Technician III: 11 May–31 July.

Caleb Chase, Fish and Wildlife Technician III: 12 May–31 July.

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 2015 are to aid other projects as needed until the sport fishery reopens.

Further duties are to carefully document fishery violations observed during the course of normal duties and forward the information to the project leader and potentially other enforcement agencies and preventative maintenance and/or repair of assigned equipment.

INRIVER GILLNETTING CREW

Averee Amend, Fish and Wildlife Technician II: 11 May–17 August.

Evan Atchley, Fish and Wildlife Technician II: 11 May–17 August.

Meg Inokuma, Fish and Wildlife Technician III: 11 May–17 August.

Responsibilities of these positions include capturing Chinook salmon in gillnets while adhering to strict sampling schedules and protocols, sampling captured Chinook salmon for ASL and CWT information, recording data accurately, and entering data into a computerized database in a timely manner. Further duties are preventative maintenance and repair of assigned equipment.

BUDGET SUMMARY

Proposed FY15 and FY16 Costs:

Line Item	Category	FY15 Budget ($K)	FY 16 Budget ($K)
100	Personnel	361.4	358.9
200	Travel	1.9	1.9
300	Contractual	21.8	22.1
400	Commodities	7.1	7.2
500	Equipment	0	0
Total		392.2	390.1

Funded Personnel FY15:

PCN	Name	Level	Funded man months
114023	Reimer, Adam	Fishery Biologist III	12.0
115244	Eskelin, Anthony	Fishery Biologist II	12.0
114190	Perschbacher, Jeff	Fishery Biologist I	8.0
114133	Chase, Caleb	FWT III	2.7
114253	Karic, Ivan	FWT III	2.7
114249	Inokuma, Meg	FWT III	3.1
114213	Amend, Averee	FWT II	3.1
115239	Atchley, Evan	FWT II	3.1
Total			46.7

REFERENCES CITED

Bendock, T. N., and M. Alexandersdottir. 1992. Mortality and movement behavior of hooked-and-released Chinook salmon in the Kenai River recreational fishery, 1989-1991. Alaska Department of Fish and Game, Fishery Manuscript No. 92-02, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fms92-02.pdf

Bernard, D. R., A. E. Bingham, and M. Alexandersdottir. 1998. The mechanics of onsite creel surveys in Alaska. Alaska Department of Fish and Game, Special Publication No. 98-01, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/sp98-01.pdf

Boersma, J. K., and K. S. Gates. 2013. Abundance and run timing of adult Chinook salmon and steelhead in the Funny River, Kenai Peninsula, Alaska, 2012. U.S. Fish and Wildlife Service, Alaska Fisheries Data Series Report Number 2013-4, Soldotna. http://www.fws.gov/alaska/fisheries/fish/Data_Series/d_2013_4.pdf

Burger, C. V., R. L. Wilmot, and D. B. Wangaard. 1985. Comparison of spawning areas and times for two runs of Chinook salmon (*Oncorhynchus tshawytscha*) in the Kenai River, Alaska. Canadian Journal of Fisheries and Aquatic Sciences 42(4):693-700.

Clutter, R., and L. Whitesel. 1956. Collection and interpretation of sockeye salmon scales. International Pacific Salmon Commission, Bulletin 9. Westminster, British Columbia, Canada.

Cochran, W. G. 1977. Sampling techniques. 3rd edition. John Wiley and Sons, New York.

Eskelin, A. 2007. Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2005. Alaska Department of Fish and Game, Fishery Data Series No. 07-87, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds07-87.pdf

Eskelin, A. 2009. Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2006. Alaska Department of Fish and Game, Fishery Data Series No. 09-38, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FDS09-38.pdf

Eskelin, A. 2010. Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2007. Alaska Department of Fish and Game, Fishery Data Series No. 10-63, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/FDS10-63.pdf

Fleischman, S. J., and T. R. McKinley. 2013. Run reconstruction, spawner–recruit analysis, and escapement goal recommendation for late-run Chinook salmon in the Kenai River. Alaska Department of Fish and Game, Fishery Manuscript Series No. 13-02, Anchorage. http://www/adfg/alaska.gov/FedAidpdfs/FMS13-02

Gates, K. S., and J. K. Boersma. 2013. Abundance and run timing of adult Chinook salmon in the Killey River, Kenai Peninsula, Alaska, 2012. U.S. Fish and Wildlife Service, Alaska Fisheries Data Series Report Number 2013-5, Soldotna. http://www.fws.gov/alaska/fisheries/fish/Data_Series/d_2013_5.pdf

Jennings, G. B., K. Sundet, and A. E. Bingham. 2011. Estimates of participation, catch, and harvest in Alaska sport fisheries during 2010. Alaska Department of Fish and Game, Fishery Data Series No. 11-60, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/FDS11-60

Larson, L. 1995. A portable restraint cradle for handling large salmonids. North American Journal of Fisheries Management 15:654-656.

McKinley, T. R., and S. J. Fleischman. 2013. Run reconstruction, spawner–recruit analysis, and escapement goal recommendation for early-run Chinook salmon in the Kenai River. Alaska Department of Fish and Game, Fishery Manuscript Series No. 13-03, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMS13-03.pdf

Perschbacher, J. 2012a. Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2008. Alaska Department of Fish and Game, Fishery Data Series No. 12-70, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/FDS12-70

Perschbacher, J. 2012b. Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2009. Alaska Department of Fish and Game, Fishery Data Series No. 12-61, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/FDS12-61

Perschbacher, J. 2012c. Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2010. Alaska Department of Fish and Game, Fishery Data Series No. 12-75, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FDS12-75.pdf

Perschbacher, J. 2012d. Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2011. Alaska Department of Fish and Game, Fishery Data Series No. 12-84, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FDS12-84.pdf

Perschbacher, J. 2012c. Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2010. Alaska Department of Fish and Game, Fishery Data Series No. 12-75, Anchorage http://www.adfg.alaska.gov/FedAidPDFs/FDS12-75.pdf

REFERENCES CITED (Continued)

Perschbacher, J. 2014a. Chinook salmon creel survey and inriver gillnetting study, Lower Kenai River, Alaska, 2012. Alaska Department of Fish and Game, Fishery Data Series No. 14-37, Anchorage., Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FDS14-37.pdf

Perschbacher, J. 2014b. Kenai River Chinook salmon creel survey, inriver gillnetting, and age composition study. Alaska Department of Fish and Game, Regional Operational Plan ROP.SF.2A.2014.05, Soldotna. http://www.adfg.alaska.gov/FedAidPDFs/ROP.SF.2A.2014.05.pdf

Reimer, A. 2003. Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2001. Alaska Department of Fish and Game, Fishery Data Series No. 03-01, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds03-01.pdf

Reimer, A. 2004a. Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2002. Alaska Department of Fish and Game, Fishery Data Series No. 04-28, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds04-28.pdf

Reimer, A. 2004b. Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2003. Alaska Department of Fish and Game, Fishery Data Series No. 04-32, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds04-32.pdf

Reimer, A. M. 2007. Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 2004. Alaska Department of Fish and Game, Fishery Data Series No. 07-65, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds07-65.pdf

Reimer, A. M. 2013. Migratory timing and distribution of Kenai River Chinook salmon, 2010–2013, a report to the Alaska Board of Fisheries, 2014. Alaska Department of Fish and Game, Division of Sport Fish, Regional Information Report 2A13-06, Anchorage. http://www.adfg.alaska.gov/FedAidpdfs/RIR.3A.2013.06

Reimer, A. M., W. W. Jones, and L. E. Marsh. 2002. Chinook salmon creel survey and inriver gillnetting study, lower Kenai River, Alaska, 1999 and 2000. Alaska Department of Fish and Game, Fishery Data Series No. 02-25, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds02-25.pdf

Thompson, S. K. 1987. Sample size for estimating multinomial proportions. The American Statistician 41(1):42-46.

Welander, A. D. 1940. A study of the development of the scale of Chinook salmon *Oncorhynchus tshawytscha*. Master's thesis. University of Washington, Seattle.

Winter, J. D. 1996. Advances in Underwater biotelemetry. . Pages 555-590 *in* Murphy, B. R. and D. W. Willis (eds), Fisheries Techniques, 2nd cdn. American Fisheries Society, Bethesda, Maryland.

APPENDIX A: KENAI RIVER CHINOOK SALMON CREEL SURVEY AND INRIVER GILLNETTING FORMS, 2015.

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:_____

	Time	Site	Fishing Method	Boat #	Angler Type	Angler #	Hours Fished	% Below RM 13.7	Harvest Loc. **(A)** or **(B)**	Release Loc. **(A)** or **(B)**	**Chinook Salmon**						**Radio Tag Information**			**Comments**
											# Kept	Scale #	Length	Vial #	Sex	slot?	Frequency	Pulse Code	River Mile	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.
Hours Fished: time line was in the water **actively fishing** to the nearest 15 minutes **% Below RM 13.7:** % of time spent actively fishing below RM 13.7 (e.g. 0%, 25%, 50%, 75%, 100%)
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** mef to nearest 5mm **Vial: #**: **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 ASL sampling form.

KENAI RIVER CHINOOK CREEL ASL SAMPLING FORM

Date:

Sampler:

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

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

Card			MEF	Total	Vial	Radio TAG Information		Coded Wire Tag			Comments
	Fish #	Sex	Length	Length	#	Freq #	Pulse Code	Random/select	Strap #	Age	
	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	Bank	Mesh	Area	Start	Stop	Tide	Chinook salmon					Radio Tag Info			Other fish		Comments
#	L or R	5 or 7.5	Mid or Near	Time	Time	Up, Down, Slack	Fish #	Scale #	Sex	Length	Vial #	Freq	PC	Injury	Species	#/length	King Escapes or Recaptures

Set#: start at #1, **Bank**: Left or Right **Area:** Midriver or Nearshore **Mesh:** 5.0 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) write in **Fish#, Scalecard#, Sex:** (M/F), **Length**: mid-ey-fork in mm's, **Vial#: recorded on vial. IF ESCAPE OR RECAPTURED CHINOOK: RECORD IN COMMENTS**

Radio Tag Info: Freq.: write last 4 digit frequency #. **PC :**write 2 digit pulse code#. **Injury:** ok, bleading gill, cut, slow, harvested.

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: DATA MAPS FOR KENAI RIVER CHINOOK SALMON CREEL SURVEY AND INRIVER GILLNETTING STUDY, 2015.

Appendix B1.–Data map for file Kscnt2015.dta.

Data Field Name	Start Column	End Column	Comma Column	Codes/ 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 [a]	19	22	23	A boat was counted if it contained at least one angler
Unguided Power Angler Count [a]	24	27	28	Anglers were defined as people who had a line in the water or were rigging a line
Unguided Drift Boat Count [a]	29	32	33	A boat was counted if it contained at least one angler
Unguided Drift Angler Count [a]	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 [a]	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
Non Active 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 B2.–Data map for file Ksint2015.txt.

Data Field Name	Start Column	End Column	Comma Column	Codes/ 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/Shore	51	51	52	B = Boat, S = Shore
Unguided/Guided	53	53	54	U = Unguided, G = Guided

-continued-

Appendix B2.–Page 2 of 3.

Data Field Name	Start Column	End Column	Comma Column	Codes/ Comments
Fishing Time (Hours)	55	56	57	Total Hours fished
Fishing Time (Minutes)	58	59	60	Total Minutes fished (rounded to nearest .25 hour)
Hours fished below RM 13.7	61	63	64	% of time actively fished below RM 13.7 (e.g. 0–100%)
Species (Chinook)	65	67	68	410 = Chinook
Harvest	69	69	70	K = Chinook harvested
Number Harvested	71	72	73	Number of Chinook harvested (generally 1 although 2 possible w/ proxy)
Location of Harvest	74	74	75	1=Harvested below RM 13.7 Chinook sonar, 2=Harvested above RM 13.7 Chinook sonar
Species (Chinook)	76	78	79	410 = Chinook
Released	80	80	81	R = Chinook released
Number Released	82	82	83	Number of Chinook released
Location of Release	84	84	85	1=Released below RM 13.7Chinook sonar, 2=Released above RM 13.7 Chinook sonar
Species (sockeye)	86	88	89	420 = sockeye
Harvest/Released	90	90	91	Number of sockeye harvested
Number Harvested/Released	92	93	94	Number of sockeye released
(Blank)	95	95	96	
Species (coho)	97	99	100	430 = coho
Harvest/Released	101	101	102	Number of coho harvested
Number Harvested/Released	103	104	105	Number of coho released
(Blank)	106	106	107	
Species (pink)	108	110	111	440 = pink
Harvest/Released	112	112	113	Number of pink harvested
Number Harvested/Released	114	115	116	Number of pink released
(Blank)	117	117	118	

-continued-

Data Field Name	Start Column	End Column	Comma Column	Codes/ Comments
Species (rainbow)	119	121	122	511 = Rainbow
Harvest/Released	123	123	124	Number of rainbow harvested
Number Harvested/Released	125	126	127	Number of rainbow released
Fishing Location	128	129	130	"Always" set to 1 since 2000
Boat Type	131	132	133	1 = power boat, 2 = drift boat, "blank" = shore
Adipose Finclip	134	135	136	N = no adclip, C = adclip present
Released Chinook <46 in	137	137	138	
Released Chinook 46–54.99 in	139	139	140	
Released Chinook >55 in	141	141	142	column 141=# of released Chinook 55 inches or greater
Vial #	143	146	147	
Frequency #	148	151	152	Four digit Frequency #
Pulse Code #	153	154	155	Two digit Pulse Code #
Location Caught	156	159	160	Location where tagged Chinook was caught (river mile)
Age	161	162	163	
Age Err	164	164	End	”R=regenerated, “M”=missing, “I”=inverted, “A”=absorbed

Appendix B3.–Data map for file ksintage15.txt.

Data Field Name	Start Column	End Column	Comma Column	Codes/ 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
(Blank)	32	44	35,39,43,45	
(Blank)	46	57	47,49,58	
Collector	59	60	61	Initials of sampler
Sex	62	62	63	#NAME?
(Blank)	64	64	65	
MEF length	66	69	70	MEFL, millimeters
Total length	71	75	76	TL, inches
Vial	77	80	81	
	82	89	84,87,90	
Angler Type	91	95	96	G = guided, NG = unguided
Harvest Location	97	98	99	1 = Below RM 13.7, 2 = Above RM 13.7
Scale Card Number	100	103	104	
Fish Number	105	106	107	Number on scale card (Values 110)
Age	108	109	110	column 104 = freshwater age, column 105 = marine age
Age Error	110	111	End	R = regen, M = missing, I = inverted, A = absorbed

Appendix B4.–Data map for file creelsecchi2015.txt.

Data Field Name		Start Column	End Column	Comma Column	Codes/ Comments
Date Code		1	8	9	
	Year	1	4		Four digit year
	Month	5	6		
	Day	7	8		
Time		10	13	14	Military time
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 B5.–Data map for file Ksawl2015.txt.

Data Field Name	Start Column	End Column	Comma Column	Codes/ 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		
(Blank)	13	23	15,17,21,24	
Statewide Location/Stat Code	25	28	29	"Always" = 009 (Kenai River)
(Blank)	30	54	32,39,47,51,55	
Length Type	56	57	58	EF = Mid-eye-fork length, TL = Total length
(Blank)	59	68	62,64,67,69	
Mesh Size (Inches)	70	70	71	
Drift Start Time (Hour)	72	74	75	Military hours
Drift Start Time (Minutes)	76	78	79	
Drift Start Time (Seconds)	80	82	83	
Drift Stop Time (Hour)	84	86	87	Military hours
Drift Stop Time (Minutes)	88	90	91	
Drift Stop Time (Seconds)	92	94	95	
Scale Card Number	96	98	99	
Fish Number	100	102	103	Number on scale card (Values 1–10)
Age	104	105	106	Column 104 = Freshwater, Column 105 = Marine
Age Error	107	108	109	R = regen, M = missing, I = inverted, A = absorbed, D = dirty
Repetition Number	110	117	118	Begins at 1 each day and increments by 1 every 4 drifts
Drift Number	119	120	121	Begins at 1 each day and increments with every drift
Sex	122	122	123	= M or F
Length	124	127	128	MEFL, millimeters
Genetics Vial Number	129	133	134	Begins at 1 and increments with each sampled fish

-continued-

Data Field Name	Start Column	End Column	Comma Column	Codes/ Comments
Fin Punch	135	136	137	Not used in 2004-2006
Fate	138	138	139	R = release, E = escape, Y = recap, H = harvested
Bank	140	140	141	R = right bank, L = left bank that drift was set
Area	142	142	143	M = Midriver, N = Nearshore
Species Code	144	146	147	410 = Chinook, 420 = sockeye, 430 = coho, 440 = pink, etc.
Number Caught	148	149	150	
Adipose Finclip	151	156	157	Coded Wire Tag #
Frequency #	158	161	162	Four digit Frequency # of radiotagged Chinook
Pulse Code #	163	164	165	Two digit Pulse Code # of radiotagged Chinook
Condition/Injury Status	166	168	End	1 = OK, 2 = bleeding gills, 3 = cut or scraped, 4 = lethargic, 5 = other

APPENDIX C: TECHNICIAN MANUAL FOR THE KENAI RIVER CHINOOK SALMON CREEL SURVEY AND INRIVER GILLNETTING STUDY, 2015

INTRODUCTION and BACKGROUND

This manual provides the specific procedures for technicians conducting the 2015 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 gill nets to collect species composition information and relative abundance (CPUE) and as well as biological information from captured Chinook salmon (i.e., genetic 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 being turning into the immediate supervisor.
- Maintain and repair state equipment provided 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 State Department of Transportation for highway vehicles.
- Complete time sheets no later than the 15th and 30th/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 yourself as working for the Alaska Department of Fish and Game and only interview boats that are leaving the fishery and anglers that are done fishing for that trip (completed trip anglers). Anglers 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 tail fork (METF) length and total length 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 1 mm, is from the snout to tip of tail. Lying the tape stretched out on the ground above the fish will prevent the girth of the body from overestimating the total length. Collect three 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 vials filled with ethyl alcohol and stored in the project biologist's office.

Boat and angler counts: Counts are to begin on the whole hour as designated on the schedule and should not take more than one 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:

a. guided power boats
b. guided power anglers
c. guided drift boats
d. guided drift anglers
e. unguided power boats
f. unguided power anglers
g. unguided drift boats
h. unguided drift anglers
i. shore anglers
j. active boats (boats not on bank with no active anglers and boat had motor run during the day)

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

a. between Warren Ames Bridge (RM 5.2) and Chinook salmon sonar site (RM 13.7)
b. between Chinook salmon sonar site (RM 13.7) and upper sonar site (RM 21.1)

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For example, a count will be made from the Soldotna Bridge downstream to 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/her shift.

Inriver Gillnetting: Each day a crew of two people will be scheduled to net from either 0600 to 1400 hours. Netting will take place in the 0.3 m section of river at RM 8.6. The mesh size deployed from the boat and 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 area is 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 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. On each sampled Chinook salmon, collect three scales and place them on the scale card concave side down, oriented vertical from 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.). All 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 coated with glycerin and a retention device (e.g. rubber band) before insertion into the stomach. The frequency # and pulse code # for each tagged salmon will be recorded on the handheld computer. Before releasing the fish, mark the 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 recaptures. Also be sure to examine all captured Chinook salmon for the presence of an adipose fin and sacrifice all Chinook salmon without at an adipose fin. Once the fish 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, midpoint and end of their shift and enter it in the handheld computer.

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Each week one crewmember will spend one day mending nets, repairing equipment and 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.

Radio Transmitter Deployment and retrieval: During 2015 the inriver gillnetting and creel survey crews will be collaborating with a separate study that is estimating Kenai River Chinook salmon abundance. The inriver netting crew will have additional responsibilities of tagging early run Chinook salmon with radio transmitters and recording tag information (frequency #, and pulse code #), as well as collecting genetics samples from all captured Chinook salmon in the early and late runs. The creel survey crews additional responsibilities will be recording information (frequency #, pulse code #, and location caught) for all tagged Chinook salmon sampled during angler interviews.

EQUIPMENT NEEDED

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

Cell phone (either provided by state, or use of personal phone)

20–30 scale cards and acetates in a ziplock bag

3 sets of tweezers

2 standard pencils

2 cloth 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 booklet

Copy of State Parks Permit for over-horsepower motors (netting crew)

A copy of this manual

In addition, you will need the handheld Allegro computer, a box of genetics vials, a bottle of ethyl alcohol, and a camera as well as extra hole punches on the boat. 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 three 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 Fish and Game issued hat during your fieldwork. Fish and Game patches sewn on your 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 PDF, 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 per 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. If you need something, let the project biologist know and get what you need to do your job effectively (ie, 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 five consecutive days with two consecutive days off. The creel crew will work four out of seven days per week with no guarantee of two consecutive days off. The creel crew will work all weekend days (unless the fishery is closed), two of the four 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 Fish and Game 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 professional and communicate regularly with your supervisor and crewmembers to discuss problems, suggestions, etc**.**

APPENDIX D: SURVEY SCHEDULES, 2015

Appendix D1.–Survey schedules are for internal use only and may be found at http://docushare.sf.adfg.state.ak.us/dsweb/homepage.