Regional Operational Plan No. ROP.SF.2A.2023.05

Operational Plan: Sockeye Salmon Escapement Studies at the Russian River, 2023–2026

by

Jenny L. Gates

May 2023

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 NO. ROP.SF.2A.2023.05

OPERATIONAL PLAN: SOCKEYE SALMON ESCAPEMENT STUDIES AT THE RUSSIAN RIVER, 2023–2026

by
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SIGNATURE/TITLE PAGE

Project Title:	Sockeye Salmon Escapement Studies at the Russian River
Project leader(s):	*Jenny L. Gates, Fishery Biologist II*
Division, Region and Area	Sport Fish, Region II, Soldotna
Project Nomenclature:	F-10-37 to 41, S-2-07
Period Covered	January 2023 through December 2026
Field Dates:	June 1 through September 11
Plan Type:	Category II

Approval

Title	Name	Signature	Date
Project leader	Jenny Gates		
Biometrician	Michael Martz		
Research Coordinator	Tim McKinley		

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABSTRACT

The Russian River sockeye salmon escapement assessment project, which began in 1962, is one of the oldest stock assessment projects in the state of Alaska. During 2023–2026, the Russian River weir will be operated annually from early June through the first 7 to 10 days of September. All species of fish seen passing the weir through the fish chute will be enumerated daily. Sampling of sockeye salmon for age, sex, and length data will be done each Friday, and the sample size each week will be based on the previous week's fish passage. Sockeye and Chinook salmon spawning downstream of the Russian River weir to the confluence of the Russian River and the Kenai River will be assessed by a foot survey during the fourth week of August. Multiple foot surveys will also be conducted from mid-May to 10 June to assess spawning rainbow trout.

Keywords: Russian River, sockeye salmon, Chinook salmon, weir, escapement, age, sex, and length composition, foot surveys, rainbow trout, spawning surveys

INTRODUCTION

PURPOSE

The Russian River sockeye salmon escapement assessment project, which began in 1962, is one of the oldest stock assessment projects in the state of Alaska. This project will continue gathering biological and fishery data obtained from operation of the weir to add to the historical database of the salmon resources of the Russian River. This database benefits the angling public by providing sockeye (*Oncorhynchus nerka*) and Chinook (*O. tshawytscha*) salmon information for sound biological management based on maximum sustained harvest. These data have been used to set appropriate levels of sockeye salmon escapement and for determining if escapement goals (EG) are achieved annually (early-run EG range is 22,000–42,000; late-run EG range is 44,000–85,000 fish).

BACKGROUND

The Russian River (Figure 1) supports one of the largest sport fisheries for sockeye salmon in Alaska. Mean effort on the Russian River for recreational anglers during 2012–2021 averaged 49,357 angler-days and mean annual sport harvest of sockeye salmon during this period exceeded 21,000 fish (Alaska Department of Fish and Game, Division of Sport Fish Statewide Harvest Survey (SWHS) http://www.adfg.alaska.gov/sf/sportfishingsurvey/; accessed April 2023). There are 5 main access locations to the Russian River fishery; these include the Russian River Ferry access at the confluence and 4 river access trails, which connect the United States Forest Service Russian River Campground with the Russian River (Figure 2).

The Russian River sockeye salmon run exhibits a bimodal entry pattern with the modes referred to as the early and late runs. Escapement goal (EG) ranges are established for both the early and late runs (early-run biological BEG[1] is 22,000–42,000 fish and late-run sustainable SEG[2] is 44,000–85,000 fish).

[1] A BEG is the number of salmon in a particular stock that ADF&G has determined should be allowed to escape the fishery to spawn to achieve the maximum sustained yield.

[2] An SEG is an estimate based on historical performance and other factors known to conserve stock over a 5 to 10 year period.

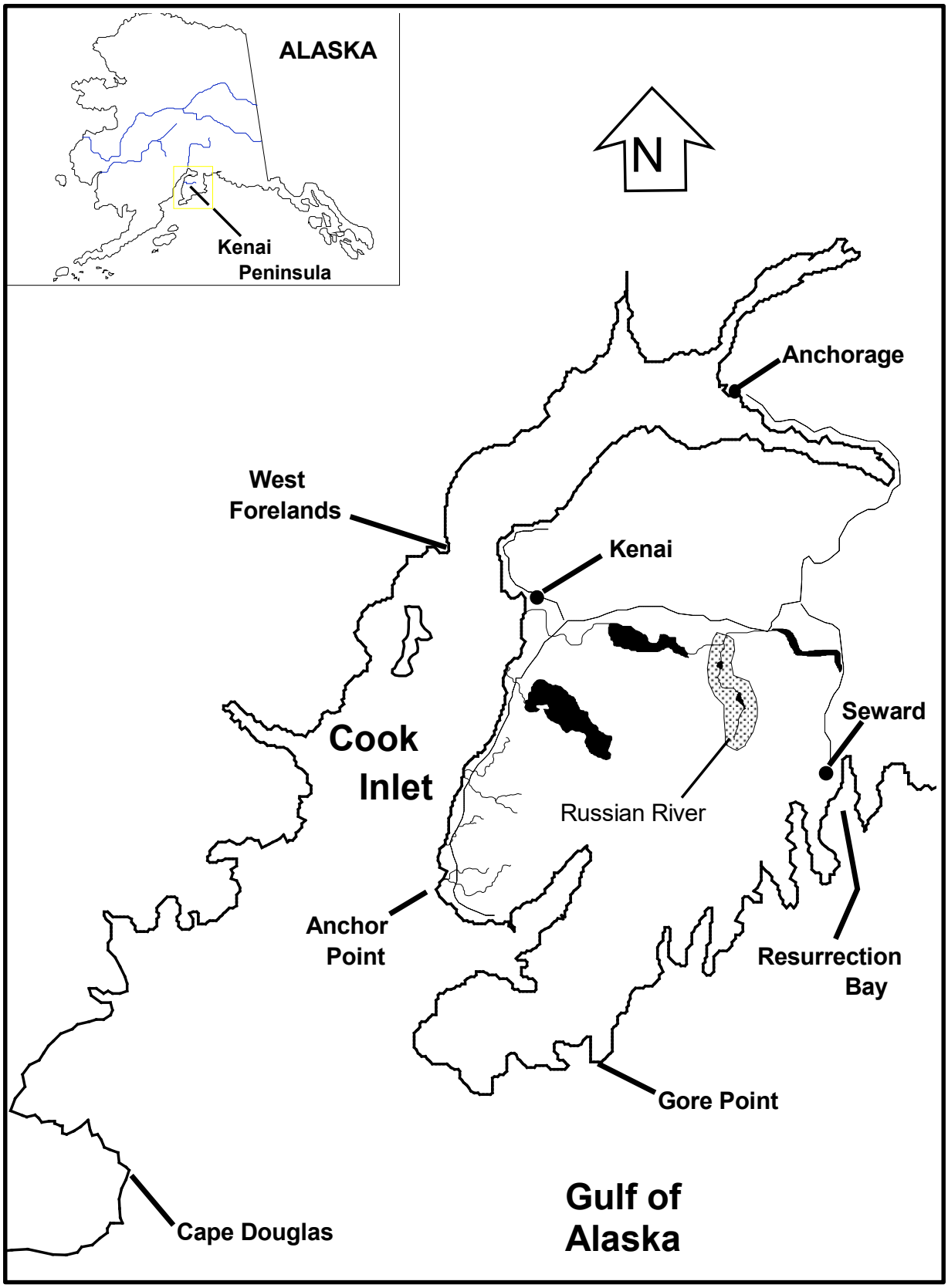


Figure 1.–Location of the Russian River.

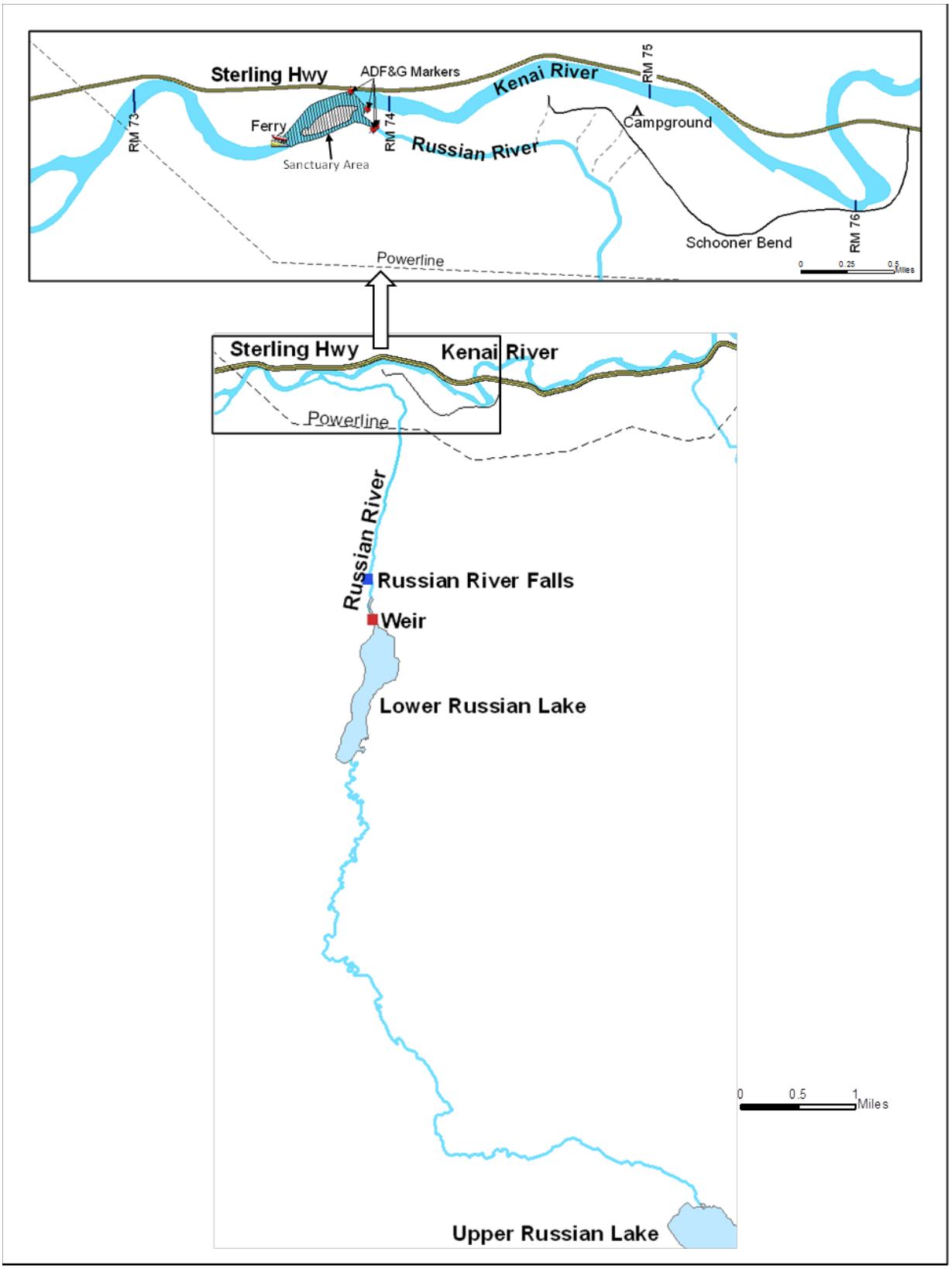


Figure 2.–Map of the Russian River sockeye salmon recreational fishing areas and fishing access locations.

Early-run sockeye salmon in the Kenai River drainage are almost exclusively of Russian River origin, are harvested primarily in the Russian River area sport fishery, and are easily assessed at the Russian River weir. The population dynamics of the Kenai River late run are not well understood. The late run is composed of stocks returning to numerous locations throughout the Kenai River drainage (including the Russian River) and are harvested in Upper Cook Inlet commercial fisheries, Cook Inlet personal use fishery, Kenaitze educational fishery, mainstem Kenai River sport fishery, and Russian River area sport fishery. A small subsistence harvest also occurs from the waters of the Kenai River adjacent to federal lands and at the Russian River Falls.

Despite restrictions on the sport fishery, including a Sanctuary Area near the confluence of the Kenai and Russian Rivers (Figure 2) where fishing is closed May 1 to July 14 (unless opened earlier by emergency order) and is fly-fishing only on other dates, recreational demands on the Russian River sockeye salmon resource have occasionally been greater than the stocks could sustain. The Division of Sport Fish has closed all or part of the fishery on 28 occasions since 1969 to achieve escapement goals. The most recent fishery restriction was in 2020, when an emergency order, which opened the Sanctuary Area early, was rescinded. In subsequent years, however, the fishery has been liberalized by opening the Sanctuary Area early and by liberalizing the daily bag limit from 3 per day, 6 in possession to 6 per day, 12 in possession or 9 per day, 18 in possession from the Russian Fly Fishing Only area downstream to Skilak Lake. These numerous EOs to the sockeye salmon fishery in the Russian River make it one of the most actively managed sport fisheries in Alaska.

The Russian River weir research program was first initiated on the Russian River in 1963 and provides information necessary for inseason management and refinement of management objectives for Russian River sockeye salmon. This program manages a weir located at the outlet of Lower Russian Lake to enumerate the sockeye salmon spawning escapement as well as provide a means to trap fish to collect age, sex, and length information. Since 1997, estimates of harvest have been obtained exclusively from the Division of Sport Fish mailout statewide harvest survey (SWHS) with estimates available in the fall of the following year. Estimates of sport harvest, inriver run, and the age–sex composition of each run provide information to evaluate spawner–return relationships. These data are necessary to estimate appropriate levels of spawning escapement. This operational plan covers 4 years of weir operation: 2023, 2024, 2025, and 2026.

OBJECTIVES

PRIMARY OBJECTIVES

1) Census the escapements of early-run and late-run sockeye salmon past the Russian River weir between early June and early September.
2) Estimate the age, sex, and age-by-sex compositions of early-run and late-run sockeye salmon spawning upstream of the Russian River weir such that the estimates for each run are within 10 percentage points of the actual values 95% of the time.

SECONDARY OBJECTIVES

1) Index the escapement of Chinook salmon and late-run sockeye salmon spawning downstream between the weir and Russian River Falls and the area downstream of the Russian River Falls extending to the Russian River and Kenai River confluence based on foot survey data collected during the peak spawning period.

2) Record the number of fish observed for each species passed upstream of the weir.
3) Use foot survey data to index and date the peak number of spawning rainbow trout from 100 yards above the powerline crossing on the Russian River downstream to the Russian River and Kenai River confluence.

METHODS

WEIR PROCEDURES

A weir at the outlet of Lower Russian Lake will be used to census the spawning escapements of sockeye salmon and to count other salmon (coho [*O.* kisutch] and Chinook salmon) and nonsalmon sport fish species that utilize the upper reaches of the drainage. Due to water clarity and low water depth in the Russian River, salmonid species are easily differentiated by weir attendants. Biological samples (age, sex, and mid eye to tail fork length) of sockeye salmon will be collected at the weir. In addition, weir personnel will collect climatological and river discharge data, operate the Russian River fish pass when necessary, and visually count late-run sockeye salmon that spawn downstream from the weir site.

The weir will be installed and the field camp opened the first week of June. The weir site will be staffed by 2 permanent seasonal Fishery Technicians. Several supplemental personnel from the Soldotna office will be assigned to the weir as needed for weir installation, maintenance, scale sampling, etc. Weir operations for the late run will terminate when the daily count of fish through the weir is less than 1% of the cumulative seasonal count for 3 consecutive days. Historically, this has occurred in early September. This period also provides the necessary window for conducting 1 to 2 foot surveys for sockeye and Chinook salmon spawning downstream of the weir. Hence, all data collection and winterization of the field camp should be complete by the second week of September.

Weir counts by species will be communicated daily by weir technicians using a Garmin InReach Explorer and cellular smartphone to call or text message Soldotna office staff. Sockeye salmon counts will be tabulated and compared with historical migratory timing data to produce inseason estimates of the proportion of each run that has escaped past the weir. These estimates will be used inseason as a management tool to project total escapement by run. The projected estimates will then be used in conjunction with foot survey estimates of spawning sockeye salmon present in the Russian River below the weir (see *Foot Surveys* below) for making inseason management decisions.

Weir technicians will sample sockeye salmon at the weir for biological data every Friday. Age, sex, and length data will be collected to estimate the age, sex, and age-by-sex composition of the escapements for each run. Because the age composition of each run of sockeye salmon may change over time (Carlon and Vincent-Lang 1990; Carlon et al. 1991; Marsh 1992a, 1992b, 1993a, 1993b, 1994a, 1994b, 1995a, 1995b, 1996, 1997, 1998a, 1998b; Nelson et al. 1999; Bethe et al. 2002; Gamblin et al. 2004), proportional weekly sampling will be done to ensure a representative sample. A sample size of 141 (Thompson 1987) is required for each run to meet the objective criteria, assuming a scale regeneration rate of 10% (4–6% has been observed historically when taking 3 scales per fish; P. Berkhahn, Fishery Biologist [retired], ADF&G, Soldotna, pers. comm.).

Sampling fractions for 2023 were calculated based on conservative estimates of run size from the average of the lowest 2 escapements during 2017–2022 (the prior 6 years): 32,113 sockeye salmon

for the early-run and 61,922 for the late-run (Lipka et al. 2020: p. 107; unpublished 2020–2022 escapement data, Division of Sport Fish, Soldotna). These sampling fractions were 0.0044 (141/32,113) for the early-run and 0.0023 (141/61,922) for the late-run. Every Friday and on the last day of what is defined as the early run (14 July), the number of sockeye salmon that passed through the weir since the previous sample will be multiplied by the appropriate sampling fraction and rounded up to the nearest whole number to obtain the necessary sample size for each sampling day (Table 1). Sampling fractions for 2024, 2025, and 2026 will be recalculated using the prior 6 years' (updated) escapement data prior to each field season.

Table 1.–Sampling dates and fractions for age, sex, and length sampling at the Russian River weir, 2023.

Sampling date	Use weir count between these times		Sampling fraction
9 Jun	first fish to pass weir	before sampling on 9 Jun	0.0044
16 Jun	after sampling on 9 Jun	before sampling on 16 Jun	0.0044
23 Jun	after sampling on 16 Jun	before sampling on 23 Jun	0.0044
30 Jun	after sampling on 23 Jun	before sampling on 30 Jun	0.0044
7 Jul	after sampling on 30 Jun	before sampling on 7 Jul	0.0044
14 Jul	after sampling on 7 Jul	before sampling on 14 Jul	0.0044
21 Jul	after sampling on 14 Jul	before sampling on 21 Jul	0.0023
28 Jul	after sampling on 21 Jul	before sampling on 28 Jul	0.0023
4 Aug	after sampling on 28Jul	before sampling on 4 Aug	0.0023
11 Aug	after sampling on 4 Aug	before sampling on 11 Aug	0.0023
18 Aug	after sampling on 11 Aug	before sampling on 18 Aug	0.0023
25 Aug	after sampling on 18 Aug	before sampling on 25 Aug	0.0023
1 Sep	after sampling on 25 Aug	before sampling on 1 Sep	0.0023
8 Sep	after sampling on 1 Sep	before sampling on 8 Sep	0.0023

FOOT SURVEYS

Foot surveys of spawning rainbow trout will be conducted in May and early June to index the number of spawning rainbow trout in the lower Russian River. The survey area extends from approximately 100 yards upstream of the power line crossing on the Russian River (Figure 2), downstream to the confluence of the Russian River and Kenai River. At least 2 surveys will be completed per week beginning after 15 May and extending to 10 June. At least 2 surveys will be conducted along the entire survey area (usually later in the season) and the remaining surveys will be conducted from near the Rainbow access point 23 to the confluence. Typically, the peak index count occurs during the last week in May or the first week in June, and this count is compared with historical index counts for reviewing the stock status of spawning rainbow trout in the lower Russian River.

Foot surveys to estimate the number of early- and late-run sockeye salmon in the Russian River may be required inseason at several critical periods during the runs. If the projected escapement is below the sustainable escapement goal, an estimate of the number of fish present in the Russian River approximates the minimum number of fish expected to pass through the weir if the Russian River sport fishery were closed or restricted by emergency order; this information is used inseason to make emergency order decisions. The project leader and field crew leader will visually survey the river if such additional information is required to formulate a management decision.

The number of late-run sockeye salmon spawning downstream from the Russian River Falls will be visually enumerated during stream foot surveys because, unlike the early-run fish, these fish spawn in the Russian River below the weir. If necessary, 2 surveys, the first made near the end of August, will be used to accurately index the spawning escapement in that area of the Russian River. In some years, high water can preclude counts and every effort will be made to obtain an early count to ensure at least a minimum index of the escapement downstream of the falls. Chinook salmon mortalities and spawning fish will also counted during these surveys.

DATA COLLECTION

All fish passed through the weir will be counted by species. Daily counts and season totals for all species will be recorded and maintained in the weir data logs as well as Soldotna office files. Diel timing of sockeye salmon passage varies but is usually confined to the morning and evening hours. The field camp has a Garmin InReach Explorer device that uses satellite messaging and a cellular smartphone for transmitting data to Soldotna office staff. Escapement counts of sockeye salmon and other salmonids will be called in at least once daily (0900 and [or] 1500) to the project leader or field crew leader.

Early- and late-run sockeye salmon will be enumerated separately. Early-run fish will be counted from early June through 14 July. Late-run sockeye salmon will be counted from 15 July until such time that the daily count is less than 1% of the cumulative seasonal count of late-run sockeye salmon for 3 consecutive days, usually occurring by early September. Both counts will be recorded on a daily weir count form (Appendix A1).

Biological sampling of sockeye salmon will occur every Friday and on 14 July. If necessary, additional staff will assist the weir operator to achieve sampling goals. On a given sampling day, the downstream gate on the weir fish trap will be opened and the upstream gate will remain closed. Fish will be allowed to enter the trap and when sufficient numbers have entered, the downstream gate will be closed, capturing the fish. All sockeye salmon in the trap will be sampled for age, sex, and length; other fish will be released. Sockeye salmon will be restrained utilizing a covered measuring cradle to reduce handling stress during scale (age) sampling. Three scales will be removed from the preferred area (Clutter and Whitesel 1956) using forceps. Scales will be affixed to appropriately labeled gum cards. Sex will be determined by examining the vent and kype. Length will be measured to the nearest 5 millimeters from mid eye to tail fork. Detailed biological data collection procedures will be provided to the weir technician (Appendix B1). All data will be recorded on a data form (Appendix A2).

Climatological and hydrological data will be collected daily and recorded on standard forms (Appendix A1). These data, collected between 0800 and 0900 hours, include rainfall, minimum and maximum water temperatures, minimum and maximum air temperatures, and water depth at the weir. In previous years, stream velocity had been estimated at Russian River and Rendezvous Creek because both contribute to total stream discharge at the Russian River Falls. These stream discharge estimates were calculated using the head rod method of flow measurement. In 2003, staff began revising the historical database for stream velocity and discharge. Using a FP-101 Global Flow Probe and following prescribed methodology (Appendices C1–C2), project staff will measure stream velocities and calculate the discharge for Russian River and nearby Rendezvous Creek. The velocity estimates for each stream will be recorded for half-inch stream depth intervals. The newer equipment and methodology have provided project staff with the means to better define the stage-discharge curves for seasonal flow rates experienced at the Russian River Falls. The

Russian River stream measurement transect is located approximately 75 feet upstream of the weir. The Rendezvous Creek transect is located near the junction of Winter Trail and Russian River Falls Trail.

The fish pass at Russian River Falls allows sockeye salmon and other species access to the spawning grounds during periods of high water. Nelson (1978) concluded that discharges of 400 cubic feet per second (cfs) present a significant barrier to fish migration. The fish pass will be opened by the weir attendant upon direction from the project leader when discharge over the falls (Rendezvous Creek plus Russian River) meets or exceeds 400 cfs (this coincides with an approximate 19-inch water level measurement at the weir staff gauge). Dates and times of opening and closing the fish pass will be recorded on the Hourly Weir Counts data forms (Appendix A1).

Rainbow trout foot surveys will be conducted in May and June by a variety of staff, and the peak count will serve as the index. At the peak of late-run sockeye salmon instream spawning, approximately the last week of August, a foot survey will be conducted to index the number of fish spawning between Russian River weir and the Kenai River confluence. If timing of the count appears to result in an incorrect assessment of the peak, subsequent foot surveys may need to be conducted to obtain the index count. The index survey(s) will be made by the project leader along with the field crew leader and other staff.

DATA REDUCTION

Daily escapement counts of both early- and late-run sockeye salmon reported to the Soldotna office will be tabulated inseason and compared to historical run timing data to project the final escapement by run. These data and foot survey counts of sockeye salmon will be used to evaluate possible management actions to meet the escapement goals.

Daily escapement counts will be added to linked EXCEL spreadsheets that contain historical daily counts (Early-run files: 2023_ER_Russian_Workbook; Late-run files: 2023_LR_Russian_Workbook). These files will provide graphical and quantitative tools to visually compare the 2023 daily and cumulative escapements with historical values. A final copy of the clean EXCEL files (2023_ER_Russian_Workbook, 2023_LR_Russian_Workbook and LowerRussianSpawners93-23.xls), and EXCEL scale, age, sex and length compositions (2023_Russian_Scale_Data and 2023_Russian_Age_Comp_Summary) along with the data maps, will be sent to the Division of Sport Fish Research and Technical Services for archiving (Appendix D1).

Data forms containing length and sex data from sampled fish will be returned to the Soldotna office at the end of each week. The forms will be checked by project staff for obvious errors. Scale sample gum cards will accompany each form, and scale impressions from each card will be made on acetate cards. Age interpretations will be made from projections of the acetate scale impressions using a microfiche reader (Clutter and Whitesel 1956). Age determination from the scale impressions will be delineated by the pattern of annuli formed during successive winter months when the circuli of the scales become crowded and finely etched (Clutter and Whitesel 1956). The electronic data files will be further checked for data entry errors (i.e., checked for impossible dates, locations, species, length, age, and length-age relationships).

Final copies of the clean data files, along with the data map, will be stored on the Soldotna LAN server. Following final approval of written reports, the data files and data maps will be archived on the Division of Sport Fish Intranet Sharepoint site (Appendix D1).

DATA ANALYSIS

The proportion of adult sockeye salmon of age, sex, or age-by-sex category *g* migrating through the weir during run *x* will be estimated as p_{xg}:

$$\hat{p}_{xg} = \frac{n_{xg}}{n_x} \tag{1}$$

where:

n_{xg} = the number of sockeye salmon sampled belonging to age, sex, or age-by-sex category *g*, and

n_x = the total number of sockeye salmon sampled[3] at the weir during run *x*.

The number of salmon of age, sex, or age-by-sex category *g* passing through the weir will be estimated for run *x* as follows:

$$\hat{N}_{xg} = N_x \hat{p}_{xg} \tag{2}$$

where

N_x = the total number of sockeye salmon enumerated during run *x* at the weir.

The variance of $\hat{N}_{xg}$ will be estimated as follows:

$$\widehat{\mathrm{Var}}\left(\hat{N}_{xg}\right) = N_x^2 \widehat{\mathrm{Var}}\left(\hat{p}_{xg}\right) \tag{3}$$

where

$$\widehat{\mathrm{Var}}\left(\hat{p}_{xg}\right) = \frac{\hat{p}_{xg}\left(1 - \hat{p}_{xg}\right)}{n_x - 1} \tag{4}$$

Mean length-at-ages and their associated variances will be estimated for each run using standard sample summary statistics (Cochran 1977).

[3] When calculating age composition, the number of sockeye salmon sampled would only include those with legible scales.

SCHEDULE AND DELIVERABLES

Dates	Activity	Personnel
1 May	Operational plan completed.	Jenny Gates
1 May–15 Sep	Crew leader (FWTIII) on duty.	Vacant
3 Jun–13 Sep	Weir personnel on duty.	Tom Rhyner
3 Jun–13 Sep	Weir personnel on duty.	Tom Johnson
5 Jun–10 Sep	Weir operational.	
20 Aug–1 Sep	Downstream spawner surveys.	Gates/Vacant
1 Aug and 31 Oct	Scales read.	Key
1 Aug	Annual report submitted.	Gates

Results from this project will be reported in the annual Federal Aid Performance Report and an Alaska Department of Fish and Game, Division of Sport Fish Fishery Management Report for the North Kenai Peninsula Management Area.

RESPONSIBILITIES

Jenny Gates, Fishery Biologist II, Project Leader
Duties: Supervise and oversee reporting activities of Fish and Wildlife Technician IIIs. Oversee and assist with daily data entry and posting online. Conduct rainbow trout and salmon stream foot surveys. Communicate inseason escapement status with Area Manager. Lead escapement project, provide project support, write annual reports, prepare budget requests and mid-year audits, and write operational plan.

Vacant, Fishery Technician III, Crew Leader
Duties: Relieve weir operators as needed, enumerate salmon, collect biological samples, conduct rainbow and salmon stream surveys, maintain daily contact with crew, receive weir counts, enter into Excel files, and post online, review and edit electronic data files, and determine ages from scale samples.

Tom Rhyner, Fishery Technician III, Weir Technician
Duties: Enumerate salmon, collect biological samples, record climatological data, measure and calculate stream flows, operate Russian River Fish Pass, and conduct salmon stream surveys.

Tom Johnson, Fishery Technician III, Weir Technician
Duties: Enumerate salmon, collect biological samples, record climatological data, measure and calculate stream flows, operate Russian River Fish Pass, and conduct salmon stream surveys.

Mike Martz, Biometrician II
Duties: Biometric support.

BUDGET SUMMARY FY24

Line 100: Personnel Services (in thousands). Add 3% increase for FY23–24 budgets.

PCN	Name	Title	Dates	MM	Months	Cost/month	Cost
4195	Vacant	FT III	07/01/23–09/15/23 06/01/24–06/30/24	2.3 1	3.3	8.3	24.3
5188	Johnson	FT III	07/01/23–09/10/23 06/01/24-06/30/24	2.3 1	3.3	9.9	27.6
5219	Rhyner	FT III	07/01/23–09/10/23 06/01/24–06/30/24	2.3 1	3.3	10.6	28.7
						Total	77.7

Includes premium pay.

Line 200: Travel

Item		Cost
Employee Instate Lodging		0
Employee Instate Meals & Incidentals		0
	Total	0

Line 300: Contractual (in thousands)

Item		Cost
Training/Conferences		0
Cellular Phone Costs		0.3
Satellite Phone Costs		0.5
Other Repairs		0.5
Marine		0
Aircraft Charters		1.5
	Total	2.8

Line 400: Commodities (in thousands)

Item		Cost
Food & Non Food Items		2.9
Clothing & Uniforms		0.5
Firearms & Ammunition		0.1
Other Safety		0.3
Bottled Gas		0.4
Parts & Supplies		0.6
Small Tools and Minor Equipment		0.7
Paint & Preservatives		0.2
Other Business		0.2
	Total	5.9

Line 500: Equipment

Item	Cost
Total	0

GRAND TOTAL $89.6

REFERENCES CITED

Bethe, M. L., L. E. Marsh, P. Berkhahn, and S. Sonnichsen. 2002. Area management report for the recreational fisheries of the Northern Kenai Peninsula, 1998-1999. Alaska Department of Fish and Game, Fishery Management Report No. 02-01, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fmr02-01.pdf

Carlon, J. A., and D. Vincent-Lang. 1990. Catch and effort statistics for the sockeye salmon sport fishery in the Russian River with estimates of escapement, 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-21, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds90-21.pdf

Carlon, J. A., D. Vincent-Lang, and M. Alexandersdottir. 1991. Catch and effort statistics for the sockeye salmon sport fishery in the Russian River with estimates of escapement, 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-26, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds91-26.pdf

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.

Gamblin, M., L. E. Marsh, P. Berkhahn, and S. Sonnichsen. 2004. Area management report for the recreational fisheries of the Northern Kenai Peninsula, 2000 and 2001. Alaska Department of Fish and Game, Fishery Management Report No. 04-04, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fmr04-04.pdf

Lipka, C. G., J. L. Gates, and S. K. Simons. 2020. Sport Fisheries of the Northern Kenai Peninsula Management Area, 2016-2018, with overview for 2019. Alaska Department of Fish and Game, Fishery Management Report No. 20-01, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/FMR20-01.pdf

Marsh, L. E. 1992a. Catch and effort statistics for the sockeye salmon sport fishery during the early run to the Russian River with estimates of escapement, 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-22, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds92-22.pdf

Marsh, L. E. 1992b. Catch and effort statistics for the sockeye salmon sport fishery during the late run to the Russian River with estimates of escapement, 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-39, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds92-39.pdf

Marsh, L. E. 1993a. Catch and effort statistics for the sockeye salmon sport fishery during the early run to the Russian River with estimates of escapement, 1992. Alaska Department of Fish and Game, Fishery Data Series No. 93-28, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds93-28.pdf

Marsh, L. E. 1993b. Catch and effort statistics for the sockeye salmon sport fishery during the late run to the Russian River with estimates of escapement, 1992. Alaska Department of Fish and Game, Fishery Data Series No. 93-35, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds93-35.pdf

Marsh, L. E. 1994a. Catch and effort statistics for the sockeye salmon sport fishery during the early run to the Russian River with estimates of escapement, 1993. Alaska Department of Fish and Game, Fishery Data Series No. 94-16, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds94-16.pdf

Marsh, L. E. 1994b. Catch and effort statistics for the sockeye salmon sport fishery during the late run to the Russian River with estimates of escapement, 1993. Alaska Department of Fish and Game, Fishery Data Series No. 94-15, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds94-15.pdf

Marsh, L. E. 1995a. Catch and effort statistics for the sockeye salmon sport fishery during the early run to the Russian River with estimates of escapement, 1994. Alaska Department of Fish and Game, Fishery Data Series No. 95-11, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds95-11.pdf

Marsh, L. E. 1995b. Catch and effort statistics for the sockeye salmon sport fishery during the late run to the Russian River with estimates of escapement, 1994. Alaska Department of Fish and Game, Fishery Data Series No. 95-10, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds95-10.pdf

Marsh, L. E. 1996. Catch and effort statistics for the sockeye salmon sport fishery during the early run to the Russian River with estimates of escapement, 1995. Alaska Department of Fish and Game, Fishery Data Series No. 96-38, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds96-38.pdf

REFERENCES CITED (Continued)

Marsh, L. E. 1997. Catch and effort statistics for the sockeye salmon sport fishery during the late run to the Russian River with estimates of escapement, 1995. Alaska Department of Fish and Game, Fishery Data Series No. 97-1, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds97-01.pdf

Marsh, L. E. 1998a. Catch and effort statistics for the sockeye salmon sport fishery during the early run to the Russian River with estimates of escapement, 1996. Alaska Department of Fish and Game, Fishery Data Series No. 98-1, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds98-01.pdf

Marsh, L. E. 1998b. Catch and effort statistics for the sockeye salmon sport fishery during the late run to the Russian River with estimates of escapement, 1996. Alaska Department of Fish and Game, Fishery Data Series No. 98-7, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fds98-07.pdf

Nelson, D. C. 1978. Russian River sockeye salmon study. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1977-1978(19)AFS 44-4, Juneau. http://www.adfg.alaska.gov/FedAidPDFs/fredF-9-10(19)AFS-44-4.pdf

Nelson, D. C., D. Athons, P. Berkhahn, and S. Sonnichsen. 1999. Area management report for the recreational fisheries of the Kenai Peninsula, 1995-1997. Alaska Department of Fish and Game, Fishery Management Report No. 99-3, Anchorage. http://www.adfg.alaska.gov/FedAidPDFs/fmr99-03.pdf

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

APPENDIX A: DATA FORMS

Appendix A1.–Daily form for Lower Russian Lake hourly weir counts.

LOWER RUSSIAN LAKE HOURLY WEIR COUNTS, _____ _____, 2023

	1st Run	2nd Run			
	Adult	Adult			
Time	Sockeye	Sockeye	Kings	Coho	Remarks (include tag data here also)
00-06					
06-08					
08-10					
10-12					
12-14					
14-16					
16-18					
18-20					
20-22					
22-24					
TOTALS					
Cumulative					

H_2O DEPTH:

***H_2O TEMP:**

***AIR TEMP:**

RAIN:

COMMENTS:

* note minimum/maximum temperatures. Weather should be recorded by 9 am every day.
Minumum temps are the morning low for todays date, maximum temps are afternoon high for yesterdays date.

Fish Pass: note if open

note times **opened / closed**_____

Appendix A2.–Russian River sockeye salmon age-sex-length sampling form.

RUSSIAN RIVER SOCKEYE SALMON ASL SAMPLING FORM

Collector: ______________________

Date: ______________________

Run: ______________________

Card No.	Fish #	Sex	Length	Age	Notes
	1	M or F			
	2	M or F			
	3	M or F			
	4	M or F			
	5	M or F			
	6	M or F			
	7	M or F			
	8	M or F			
	9	M or F			
	10	M or F			

Card No.	Fish #	Sex	Length	Age	Notes
	1	M or F			
	2	M or F			
	3	M or F			
	4	M or F			
	5	M or F			
	6	M or F			
	7	M or F			
	8	M or F			
	9	M or F			
	10	M or F			

Card No.	Fish #	Sex	Length	Age	Notes
	1	M or F			
	2	M or F			
	3	M or F			
	4	M or F			
	5	M or F			
	6	M or F			
	7	M or F			
	8	M or F			
	9	M or F			
	10	M or F			

APPENDIX B: PROCEDURES SUMMARY FOR THE RUSSIAN RIVER WEIR TECHNICIAN

Daily passage of fish through the weir is more successfully facilitated during the morning and evening hours when the fish seem to be more active and therefore, inclined to migrate through the weir. However, fish may move through the weir at any hour, especially when high numbers are present near the peak of each run. A good indicator that fish are ready to move through the weir is when they are "rattling" the weir pickets by pushing their noses into the spaces between the weir pickets while attempting to swim upstream and causing the pickets to clank and rattle. Fish should be allowed to pass through the weir whenever they are actively working to swim through the weir pickets in such a manner.

Adult sockeye salmon, Chinook salmon, coho salmon, and nongame species will be counted by species. Hourly totals will be recorded in the Weir Count form. At the end of each day, the hourly counts and the fish species totals will be recorded on the Weir Count form. Daily contact with the Soldotna office is maintained via Garmin InReach Explorer satellite messaging device utilizing a cellular smartphone. Daily escapement counts and any other pertinent information should be reported at that time.

Climatological data will be recorded every day at approximately 0900 on the Weir Count form. Climatological observations are summarized by date and recorded on the Weir Count form; air maximum and minimum temperatures (°F), water maximum and minimum temperatures (°F), the water gauge height in inches to nearest one-eighth inch, and rainfall in millimeters.

At the beginning of the season, the depth gauge will be calibrated using a line and level. On the north side of the gabion on the cabin side of the river, a green mark has been established at $21^{1}/_{8}$ inches (top of the wire wrap to bottom of the "V"). Stream velocities for Russian River and Rendezvous Creek will be measured using an Fp-101 Global Flow Probe, following the prescribed methodology in Appendices C1–C2. Measurement techniques will be demonstrated by the project leader or field crew leader and standard measurement sites will be placed in the stream channel. Measurements will be taken at half-inch intervals as water depths change. This information provides data points within half-inch intervals and will be used to establish a stage-discharge curve. Record all data on the Stream Discharge form (Appendix C2) and sum the discharge rates (cfs) for both Rendezvous Creek and the Russian River. This will yield a total discharge over the Russian River Falls. When this total discharge approaches 350 cfs, notify the project leader or field crew leader during a standard 0900 contact. Discharge for each stream should be added to the Weir Count form.

Fish pass operation is typically necessary at discharges of about 400 cfs (water level ~19 inches on staff gauge located at the weir). The weir operator will be instructed on proper fish pass operation by the project leader or field crew leader. Date and time will be recorded on the Daily Log when the fish pass is opened and closed.

A minimum of 141 fish will be sampled proportionally from both early- and late-runs for age, sex, and age-by-sex composition estimates. The weir technician(s) will sample sockeye salmon for biological data every Friday and 14 July (last day of the early-run). Every Friday and 14 July, the number of sockeye that passed through the weir since the previous sample will be multiplied by the appropriate sampling fraction and rounded up to the nearest whole number to obtain the necessary sample size (Table 1 of operational plan).

Record data as indicated on the sampling form provided in Appendices A1–A2. Record your name, location, and date. Prepare a corresponding scale gum card by recording the appropriate data on the yellow side of the card. IMPORTANT: the gum card and the data form must both be numbered identically to ensure that the length and sex data is correctly matched with the corresponding scales.

-continued-

When fish are to be sampled, the downstream gate on the weir fish trap will be opened and the upstream gate will remain closed. Fish will be allowed to enter the trap and when sufficient numbers have entered, the downstream gate will be closed, capturing the fish. All fish in the trap will be sampled for the appropriate biological data. Fish will be restrained utilizing a measuring cradle that is partially covered with canvas to secure the head of the sampled fish to reduce handling stress.

Remove 3 scales from each fish and affix them to the gum card. Make sure that the "inner surface" of the scale (toward the inside of the fish) is placed against the gum card.

Scales should be clean before they are affixed to the gum card. Place scales on the gum card with the anterior portion of the scale pointing up. Place the 3 scales from a fish in 3 vertical boxes on the gum card. Boxes 1, 11, and 21 correspond to line 1 (fish 1) on the ASL sampling form, boxes 2, 12, and 22 correspond to line 2 (fish 2) on the ASL sampling form, and so on.

Record mid eye to tail fork length to the nearest 5 millimeters and the sex on the data form.

When sampling is complete, gently place the fish in calm water to allow for recovery. Make sure the fish does not wash downstream onto the weir panels during recovery.

APPENDIX C: STREAM VELOCITY MEASUREMENT

Appendix C1.–Procedures summary for stream velocity measurement.

PROCEDURES SUMMARY FOR STREAM FLOW VELOCITY MEASUREMENT

To turn on flow meter, press right button three times = V ^{AV}

If MX shows instead of AV, scroll with left button until AV appears. Calibration should always be set at 33.31; this must be reset when batteries are changed by pushing left button.

(Other problems check with FP101-FP 201 Global Flow Probe manual in files on shelf in cabin.)

TAKING MEASUREMENTS

1) Make sure propeller turns freely.
2) Face arrow inside prop housing downstream when taking velocity.
3) Scroll with right button until "V" for velocity appears on screen.
4) Push left button to toggle to average (AV) velocities.
5) Take a depth measurement and velocity average at waterline, then at 6' and every 6' thereafter. Begin at cabin side, end at waterline at far side.
6) Note depth and average velocity (bottom number) at each station in write-in-rain book.
7) When taking velocity move probe slowly up and down in water column for 40 seconds to obtain average velocity.
8) Measure depth, remove probe from water, and push both buttons simultaneously to zero velocities. Now you are ready for velocity measurements.

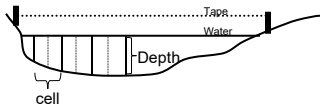
Shut off probe by putting it into "sleep mode". Hold both buttons simultaneously for 8 seconds. Push right button two times until sleep appears on screen.

Transfer measurements to worksheet in black notebook and the Stream Discharge form. Send completed form to Soldotna office to be entered into Discharge 03-19.xls workbook.

*** For Rendezvous Creek take measurements every 3 feet.**

Appendix C2.–Data form for recording stream velocity measurements.

Stream Discharge Form



Date: _____
Stream: _____
Staff gauge depth: _____
Collector: _____

Cell Boundaries[1]	Location of Depth Measurement[1]	Depth (ft)	Velocity (ft/s)	Cell Width (ft)	Cell Area (ft^2)	Cell Discharge (ft^2/s)	Notes
	-	0	0	-	-	-	Waterline[2]
							Variable cell width [3]
3-9	6			6			
9-15	12			6			
15-21	18			6			
21-27	24			6			
27-33	30			6			
33-39	36			6			
39-45	42			6			
45-51	48			6			
51-57	54			6			
57-63	60			6			
63-69	66			6			
69-75	72			6			
75-81	78			6			
81-87	84			6			
87-93	90			6			
93-99	96			6			
99-105	102			6			
105-111	108			6			
111-117	114			6			
117-123	120			6			
123-129	126			6			
129-135	132			6			
135-141	138			6			
							Variable cell width [3]
		0	0	-	-	-	Waterline[2]
			Totals:	**Strm Width**	**XS Area**	**Discharge**	

[1] Distance (in feet) from left bank.

[2] For the cell boundary, enter the distance from the left bank to the waterline.

[3] For the first and last cells, the cell boundary is the distance from the waterline to the next (or last) cell.
For the cell depth, the measurement is taken midway in the cell.

APPENDIX D: ARCHIVAL DATA MAPS

Appendix D1.–Data archival maps.

The following files will be used for the 2023 early- and late-run Russian River escapement counts and scale sampling data obtained at the weir. The same data archival procedures will be followed for 2024, 2025, and 2026. The filenames will change only to reflect the year in which the data were collected.

2023 Early- and Late-run Russian River Escapement Counts

File	Description
2023_ER_Russian_Workbook.xls	Daily and accumulated early-run sockeye salmon counts and projection model for the Russian River weir, 2023. Regression projection model for early-run sockeye at the Russian River weir.
2023_LR_Russian_Workbook.xls	Daily and accumulated late-run salmon counts, including sockeye, coho and Chinook, and projection model for the Russian River weir, 2023. Regression projection model for late-run sockeye at the Russian River weir.
LowerRussianSpawners93-23.xls	Stream survey for lower river spawners, 2023.
2023_Russian_Scale_Data.xls	Raw scale, sex and length data, 2023.
2023_Russian_Age_Comp_Summary.xls	Age, sex and length compositions, 2023.