Regional Operational Plan No. ROP.SF.2A.2023.11

Operational Plan: Kenai River Coho Salmon Radiotelemetry, 2023–2024

by

Tony Eskelin

and

Ken Gates

August 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

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SIGNATURE/TITLE PAGE

Project Title:	Kenai River Coho Salmon Radiotelemetry, 2023–2024
Project leader(s):	Tony Eskelin (ADF&G), Ken Gates (USFWS)
Division, Region and Area	*Division of Sport Fish, Region II, Soldotna*
Project Nomenclature:	
Period Covered	August 2023–April 2025
Field Dates:	August 1–November 30
Plan Type:	Category III

Approval

Title	Name	Signature	Date
Project leader	Tony Eskelin		
Co-Project Leader	Ken Gates		
Biometrician	Matt Tyers		
Research Coordinator	Tim McKinley		

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ABSTRACT

This study will describe the geographic spawning distribution of radiotagged coho salmon in the Kenai River drainage for 2 years (2023 and 2024). Drift gillnets will be employed in the Kenai River to capture and tag adult coho salmon with radio transmitters. Radiotelemetry will be used to uniquely identify and track tagged coho salmon to spawning destinations. Up to 490 radio transmitters will be deployed annually between August 1 and October 31 each year. Movements of radiotagged coho salmon will be documented using a combination of fixed data-logging receiver stations and mobile tracking using boats and fixed-wing aircraft. This project will be the 2nd and 3rd year of a 3-year collaboration between the Alaska Department of Fish and Game (ADF&G) and the U.S. Fish and Wildlife Service (USFWS). The USFWS conducted the first year of the project in 2022, and ADF&G and USFWS will be collaborating on the radiotelemetry project in 2023 and 2024.

Keywords: coho salmon, *Oncorhynchus kisutch,* Kenai River, radio tag, transmitter, gillnetting

INTRODUCTION

PURPOSE

The purpose of this study is to describe the geographic distribution of spawning coho salmon in the Kenai River drainage by estimating the proportions of spawners in each spawning area for 2 years. This study will also describe the migration behaviors and patterns of coho salmon in the mainstem Kenai River and may allow geographic identification of spawning groups absent from the current Kenai River coho salmon genetic baseline.

BACKGROUND

The Kenai River supports the largest freshwater sport fishery in Alaska and its proximity near major population centers indicate the drainage will see heavy use and development into the foreseeable future. Coho salmon returning to the Kenai River are utilized in many fisheries including commercial, sport, subsistence, personal use, and educational fisheries and in return, represent a significant portion of the local economy.

Kenai River coho salmon were studied by the Alaska Department of Fish and Game (ADF&G) in the 1990s and early 2000s to assess harvest patterns in Cook Inlet and to estimate smolt and adult abundance (Massengill and Carlon 2004a, 2004b; Carlon and Evans 2007; Massengill 2007a, 2007b, 2007c, 2008, 2013; Massengill and Carlon 2007a, 2007b; Massengill and Evans 2007). Despite the plethora of studies that have been conducted on Kenai River coho salmon, not much is known about their drainage-wide distribution and run timing of discrete stocks. Anecdotal evidence suggests that 2 runs (tributary and mainstem) of coho salmon migrate into the Kenai River and that run timing may be later than other Cook Inlet stocks. However, spawning distribution and run timing of stocks within the drainage have not been studied in detail. Therefore, Kenai River coho salmon are managed as a single stock due to lack of information. Because of the potentially high exploitation by multiple users, there is a need to assess Kenai River coho salmon spawning distribution and run timing in the Kenai River drainage. Knowing this information will aid in managing the population for sustained yield and the development of future projects that may assess harvest by stock and determine total run size.

The United States Fish and Wildlife Service (USFWS) conducted an extensive radiotelemetry study of Kenai River coho salmon in 2022, which was the first year of this collaborative study with ADF&G. This operational plan describes the final 2 years of the 3-year study and outlines general responsibilities for each agency.

OBJECTIVES

Primary Objectives

1) Estimate the proportions of coho salmon spawning in each major spawning area from each temporal stratum for 2023 and 2024, such that estimates are within 16 percentage points of the true values 90% of the time.
2) Document geographic spawning groups absent from the Kenai River coho salmon genetic baseline database.

Secondary Objectives

3) Describe the migration behaviors and patterns of coho salmon in the mainstem Kenai River, expressed in terms of travel time to spawning destinations and dates at respective destinations.

METHODS

Study Design

Fish Capture

Drift gillnets will be employed in the Kenai River between river kilometer (RKM) 28 and RKM 45 to capture and tag adult coho salmon with radio transmitters. This capture and tagging area is downstream of any major coho salmon spawning but upstream of the intertidal and adjacent area where previous studies have shown that post-tagging mortality is high (Carlon and Evans 2007).

Gillnet deployment methods will follow those used to capture coho salmon for radiotelemetry studies in the Holitna and Kenai Rivers (Chythlook and Evenson 2003; Carlon and Evans 2007) and most recently in the Kasilof River between 2007 and 2009 (Gates et al. 2009). A 3-person crew will deploy a single gillnet using a 5.5 m long boat. One crew member will pilot the boat while 2 crewmembers are positioned on the bow of the boat tending the net. Gillnets will be constructed from either Miracle (MS-43) or Nagaura (LS-14) brand twisted nylon webbing with 11.4 cm stretched mesh, 29 meshes deep, and up to 18.3 m long. Drift gillnets will be fished until the end of the drift is reached or a fish becomes entangled in the net. Drift times will be monitored with a stopwatch, starting when the net first enters the water and ending when all the net is pulled from the water. Once a fish becomes entangled in the net, the net will be immediately pulled from the water until the fish is brought on board the boat. As the net is pulled from the water, the portion of the net containing a fish will be placed in a large tote filled with river water at which time the fish will be disentangled or cut from the net. Once freed from the net, coho salmon will be placed in a submerged fish cradle and radiotagged. These methods minimize stress associated with capture and handling. Fish will not be sedated prior to tagging. Previous studies on coho salmon including those conducted on the Kenai and Kasilof Rivers have been successful without the need to sedate coho salmon prior to tagging (Gates et al. 2010; Massengill and Evans 2007).

Radiotagging

Coho salmon will be tagged using radio transmitters (Model MCFT-3A) developed by Lotek Wireless Incorporated. Radio transmitters measuring 16 × 46 mm will be digitally encoded, equipped with a motion sensor, and outfitted with a 293 to 700-day battery programmed to shut off after 240 days. These radio transmitters are similar in size to those used by Ramstad and Woody

(2003) and Gates et al. (2009) while testing transmitter retention and tag-related mortality in adult sockeye salmon and radiotagging coho salmon in the Kasilof River, respectively. Each transmitter weighs 16 g in air and will not exceed 2% of the fish's body weight (Winter 1983). Radio transmitters will be dispersed over 6 radio frequencies between 162 and 166 MHz and programmed for 2.5 s and 5 s burst intervals. Motion sensors within each tag will aid in determining fates of radiotagged fish (i.e., lack of motion indicates death or tag regurgitation). Radio transmitters will be gastrically implanted through the esophagus using methods following Burger et al. (1985) and Gates et al. (2009). Radiotagged fish will be immediately released into the river after tagging.

Radio transmitters will be deployed every day between 1 August and 9 September and every other day between 10 September and the end of tagging, which will likely be in early to mid-October each year (Table 1).

Table 1.–Schedule for allocating radiotransmitter deployments in coho salmon in 2023 and 2024.

Date	Number of tags to deploy	Date	Number of tags to deploy	Date	Number of tags to deploy
1 Aug	1	1 Sep	12	1 Oct	5
2 Aug	1	2 Sep	11	2 Oct	–
3 Aug	1	3 Sep	11	3 Oct	1
4 Aug	1	4 Sep	10		
5 Aug	1	5 Sep	10		
6 Aug	1	6 Sep	9		
7 Aug	1	7 Sep	9		
8 Aug	1	8 Sep	9		
9 Aug	2	9 Sep	8		
10 Aug	3	10 Sep	–		
11 Aug	4	11 Sep	16		
12 Aug	5	12 Sep	–		
13 Aug	6	13 Sep	16		
14 Aug	7	14 Sep	–		
15 Aug	8	15 Sep	15		
16 Aug	9	16 Sep	–		
17 Aug	10	17 Sep	16		
18 Aug	11	18 Sep	–		
19 Aug	12	19 Sep	16		
20 Aug	13	20 Sep	–		
21 Aug	13	21 Sep	16		
22 Aug	13	22 Sep	–		
23 Aug	14	23 Sep	16		
24 Aug	14	24 Sep	–		
25 Aug	14	25 Sep	15		
26 Aug	14	26 Sep	–		
27 Aug	13	27 Sep	14		
28 Aug	13	28 Sep	–		
29 Aug	13	29 Sep	10		
30 Aug	12	30 Sep	–		
31 Aug	12				

The number of coho salmon tagged each day will be determined by capture rates (Figure 1), the number of tags remaining to deploy within the temporal stratum (Table 2), and the number of tags already deployed in the stratum. All captured coho salmon that appear healthy will be tagged until the predetermined daily number of tag deployments is reached. If the target number of radio tags cannot be deployed on a given sample day, we will attempt to deploy remaining tags in the subsequent tagging event until all transmitters have been deployed for a given event.

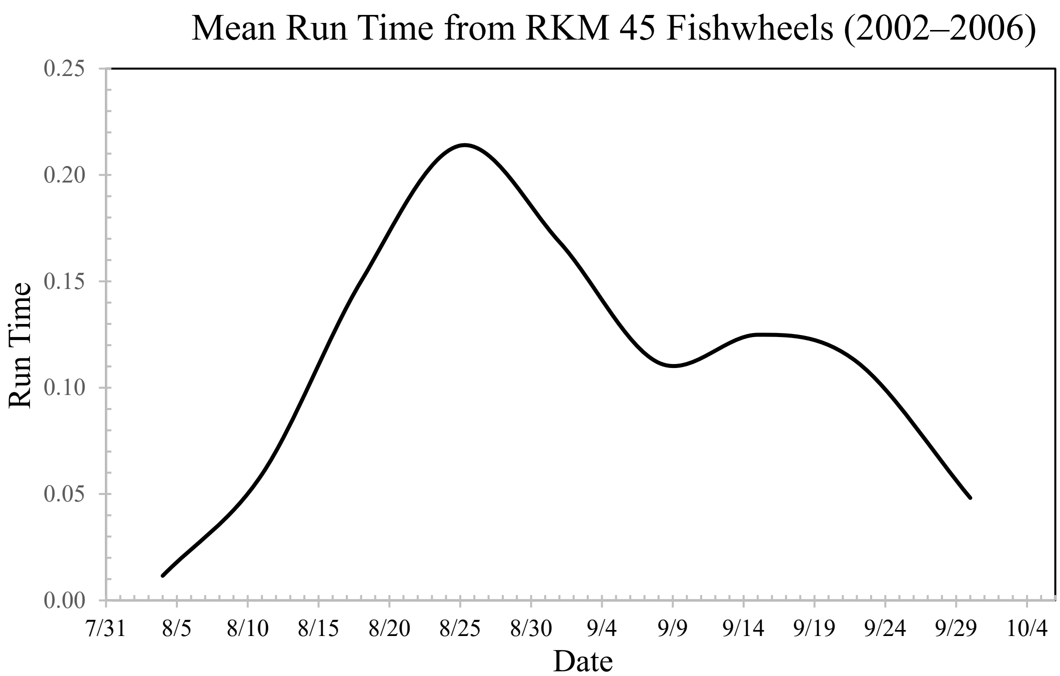

Figure 1.–Mean catch rates (run timing) of coho salmon at Kenai River RKM 45 fishwheels during 2002–2006.

Source: Adapted from data in Massengill (2007a, 2007b, 2008, 2013).

Table 2.–Temporal strata for radiotransmitter deployments in coho salmon in 2023 and 2024.

Stratum	Start date	End date	Expected number of tags
1	1 Aug	18 Aug	73
2	19 Aug	23 Aug	65
3	24 Aug	28 Aug	68
4	29 Aug	3 Sep	71
5	4 Sep	12 Sep	71
6	13 Sep	20 Sep	63
7	21 Sep	3 Oct	77

To determine the sample size of radiotransmitter deployments, we assumed that approximately 75–80% of the radiotagged fish will survive the tagging event based on results from previous similar studies (e.g., Massengill and Evans 2007). The harvest rate in the sport fishery upstream of the tagging location is expected to be approximately 10–20%. If 64 fish are tagged in a given temporal stratum, we expect approximately 38 tagged fish will migrate to approximately 18 to 22 spawning destinations, and we expect the 90% confidence intervals for the estimated proportions of fish migrating to major spawning destinations to have a half-width of 16 percentage points. However, it is likely that temporal strata may be pooled as deemed appropriate (see *Data Analysis*), increasing effective sample size and improving precision in estimation.

Radiotelemetry

Radiotelemetry will be used to uniquely identify and track individual coho salmon to their respective spawning destinations upstream of RKM 45. Movements of radiotagged coho salmon will be documented using a combination of fixed data-logging receiver stations and mobile tracking using boats and fixed-wing aircraft. Fixed receiver stations will be used to automatically identify and record fish movements throughout the Kenai River watershed (Table 3). Mobile boat tracking will be conducted biweekly after tag deployment during the fall between Kenai Lake outlet and tidewater. Aerial surveys will be conducted twice each month throughout the fall and more frequently as fish migrate to their respective spawning destinations. A portable global positioning system (GPS) will be used during all mobile tracking surveys to accurately identify the latitude and longitude of each located fish.

Table 3.–Locations of fixed receiver stations throughout the Kenai River watershed.

Physical location	River section	River km	Purpose
Sunken Island	Mainstem	18.5	Monitor fallout of radiotagged coho salmon
Moose Range Meadows	Mainstem	45	Monitor the movement of radiotagged coho salmon entering the study area
Funny River weir	Tributary	2	Monitor the proportion and run timing of radiotagged coho salmon entering the Funny River
Moose River confluence	Tributary	0.25	Monitor mainstem migration; monitor the proportion and run timing of radiotagged coho salmon entering Moose River; coincides with SWHS boundary
Lower Killey River	Tributary	0.25	Monitor mainstem migration; monitor the proportion and run timing of radiotagged coho salmon entering the lower Killey River
Middle Killey River	Tributary	0.25	Monitor mainstem migration; monitor the proportion and run timing of radiotagged coho salmon entering the middle Killey River
Skilak Lake outlet	Mainstem	80	Monitor mainstem migration and entry into Skilak Lake
Skilak River	Tributary	0.25	Monitor the proportion and run timing of radiotagged coho salmon entering Skilak River
Skilak Lake inlet	Mainstem	104	Monitor mainstem migration and run timing into the upper Kenai River; coincides with SWHS boundary
Kenai Lake outlet	Mainstem	130	Monitor mainstem migration and entry into Kenai Lake; coincides with SWHS boundary
Quartz Creek	Tributary	0.25	Monitor the proportion and run timing of radiotagged coho salmon entering Quartz Creek
Trail River	Tributary	0.25	Monitor the proportion and run timing of radiotagged coho salmon entering Trail River
Snow River	Tributary	0.25	Monitor the proportion and run timing of radiotagged coho salmon entering Snow River

DATA COLLECTION

All capture and tagging information will be recorded on data sheets (Appendix A1). Radiotracking data for fixed and mobile tracking will be collected on telemetric receivers and downloaded onto desktop computers daily. Technicians will fill out download forms and return them daily to project biologists (Appendices A2 and A3).

DATA REDUCTION AND ARCHIVING

Technicians will return their radiotagging data sheets daily and will be responsible for ensuring the recorded data are legible and accurate. Project biologists will ensure all data are returned, legible, and entered correctly and will ensure files are downloaded from the field computer to the office computer. Telemetry data from fixed stations, aerial surveys, and boat surveys will be given to project biologists for downloading into a network-protected database for error checking and quality control.

All data will be duplicated and archived at both ADF&G and USFWS. There will be complete (100%) data sharing between entities.

Data will be stored in nonproprietary formats to ensure reuse and long-term preservation. Project data may initially exist in proprietary or binary formats as primary-level data in a state that is easily utilized by the research team, although in many cases, the primary-level data is not in a form ready to be shared with the broader science community or integrated with other datasets. All provisional data will be given to the USFWS project biologist, manually quality assessed, controlled, and flagged for obvious inconsistencies during the postprocessing phases of the project. The final format for project data will be in an open standard suitable for long-term archiving, such as the following:

- Containers: TAR, GZIP, ZIP
- Databases: CSV, XML
- Tabular data: CSV
- Geospatial raster data: GeoTIFF/TIFF, NetCDF, HDF-EOS
- Moving images: MOV, MPEG, AVI, MXF
- Sounds: WAVE, AIFF, MP3, MXF
- Statistics: ASCII, DTA, POR, SAS, SAV
- Still images: TIFF, JPEG 2000, PDF, PNG, GIF, BMP
- Text: XML, PDF/A, HTML, ASCII, UTF-8
- Web archive: WARC.

DATA ANALYSIS

Radiotelemetry information collected with various tracking methods will be integrated into a database that archives the dates, locations, and fates of radiotagged coho salmon. Locations will be recorded as latitude and longitude coordinates and displayed on a geographic coverage of the Kenai River watershed using ArcMap software. The study period for each radiotagged coho salmon will be defined as the number of days between transmitter implantation and the date of final radio contact or last observed movement, as indicated by the motion sensors in the radio transmitters. Distances between consecutive locations will be used to describe the movements of each radiotagged coho salmon.

Each radiotagged fish will be assigned 1 of 8 possible fates based on information collected from mobile and fixed radio receivers (Table 4). The collection of tagged fish known to enter the study area (waters upstream of RKM 45) and that are considered tributary and mainstem spawners will constitute the sample for estimating spawning distribution from each temporal stratum. Fish with a "harvested" or "no motion" (dead or regurgitated tag) assigned fate will be censored from the sample. Fish that back out and drop out of the Kenai River watershed will also be censored. Fish whose spawning location cannot be determined with reasonable certainty will be placed into an unknown category. Fish that are categorized as "other tributary spawners" and "other mainstem spawners" will not be included to estimate spawning distribution for Objective 1 because their spawning locations are downstream of the study area and therefore most of those fish would likely never enter the study area.

Table 4.–Possible fates of coho salmon radiotagged in the Kenai River watershed.

Fate	Description	Study objective
Tributary spawner	A fish that spawns in a tributary above RKM 45 of the mainstem Kenai River	All
Mainstem spawner	A fish that spawns in the mainstem Kenai River above RKM 45	All
Other tributary spawner	A fish that spawns in a tributary below RKM 45	Primary 2, Secondary 3
Other mainstem spawner	A fish that spawns within the mainstem below RKM 45	Primary 2, Secondary 3
Dead/regurgitate	A fish that did not complete its migration because it has either died or regurgitated its transmitter (no motion on sensor)	Censor
Harvested	A fish that is harvested in either the subsistence or sport fisheries	Censor
Backout	A fish that has dropped out of the Kenai River watershed alive	Censor
Unknown	A fish that has lost contact with mobile or fixed receivers or cannot be assigned another fate with reasonable certainty	Secondary 3

Note: A "spawning" fish is one that remains in one location for an extended time without activating the mortality sensor.

Proportion Spawning by Location

For fish whose fates include tributary or mainstem spawner, spawning locations will be defined where a cluster of 2 or more fish occur within a minimum distance deemed biologically reasonable by posthoc observations of radio-tag locations. If n_i is the number of coho salmon tagged in temporal stratum *i* that are tracked to a spawning location and n_{ij} is the number of n_i spawning in location *j*, the proportion of all coho salmon from temporal stratum *i* spawning in location *j* (the proportion p_{ij}) will be estimated as follows (Cochran 1977):

$$\hat{p}_{ij} = \frac{n_{ij}}{n_j} \tag{1}$$

and its variance will be estimated as

$$\widehat{\text{Var}}\left(\hat{p}_{ij}\right) = \frac{\hat{p}_{ij}\left(1 - \hat{p}_{ij}\right)}{n_j - 1} \tag{2}$$

Because inriver abundance of coho salmon may vary temporally independent of tag deployment rates, it is unlikely that it will be appropriate to pool all temporal strata for the purpose of estimating proportions for each spawning location. However, differences in proportions among temporal strata may be tested using chi-squared tests of homogeneity with contingency table analysis, and temporal strata may be collapsed as appropriate. If no evidence of differences in proportions is found among sets of adjacent strata, these strata may be pooled to increase sample size and therefore improve precision in estimation.

If sufficient consistency among sampling-related variables (e.g., mesh sizes, etc.) can be attained such that catch per unit effort (CPUE) among temporal strata is comparable, it may be possible to estimate proportions over the full run using stratified estimators weighted by CPUE according to the following, in which p_j denotes the proportion of the full run to use spawning area j, and $CPUE_i$ denotes CPUE associated with temporal stratum i:

$$\hat{p}_j = \frac{\sum_i (CPUE_i \hat{p}_{ij})}{\sum_i CPUE_i} \quad (3)$$

with variance estimated as

$$\widehat{\mathrm{Var}}(\hat{p}_j) = \left(\frac{1}{\sum_i CPUE_i}\right)^2 \sum_i CPUE_i^{\,2}\ \widehat{\mathrm{Var}}(\hat{p}_{ij}) \quad (4)$$

However, it should be noted that the variances estimated here do not account for variance in CPUE, which is difficult to quantify, and therefore should be interpreted as a minimum estimate.

Spawning Distribution

A tagged fish that migrates to a particular location and remains in the area for an extended time without activating the mortality sensor will be considered at its spawning destination. A cluster of at least 2 such fish detected within a distance deemed biologically reasonable by posthoc observations will be considered a "confirmed" spawning location for purposes of this investigation. Potential spawning locations may occur in the mainstem Kenai River and its tributaries, including tributaries to Skilak and Kenai Lakes. Assuming a binomial distribution, 38 active tags in a given temporal stratum will allow a 90% probability of detecting 2 or more fish in a spawning location used by 10% of the spawning population associated with a given temporal stratum. If temporal strata can be pooled, this and other such probabilities will increase substantially. It is possible that spawning areas will be identified geographically that are not currently part of the Kenai River coho salmon genetic baseline database.

Travel Time

Travel time through the mainstem Kenai River will be determined in days from the time of tagging until radiotagged fish exit the mainstem into tributaries, are harvested, or reach their ultimate spawning destination within the mainstem Kenai River as denoted by a cessation of upstream migration and the start of milling behavior.

Spawn Time

Spawn timing for each radiotagged fish will be determined as the time when the first mortality signal is emitted after a period when upstream movement has ceased and before a series of following mortality signals.

SCHEDULE AND DELIVERABLES

Dates	Activity
August	Hiring (*Eskelin*)
August–mid-October	Fish capture and radiotagging *(ADF&G)*
August–mid-November	Radiotracking and download stations downstream of Skilak Lake outlet (*ADF&G and USFWS*).
August–November 30	Download fixed stations, flight surveys, boat tracking upstream of Skilak Lake outlet (*USFWS)*
As needed	Data analysis (*ADF&G and USFWS*)
End of project (2025)	Publication of final FDS report (*ADF&G and USFWS*)

RESPONSIBILITIES

COLLABORATION BY ADF&G AND USFWS

ADF&G technicians will be responsible for tagging coho salmon and radiotracking tagged fish via boat in the Kenai River mainstem downstream of Skilak Lake outlet. USFWS will be responsible for radiotracking tagged fish in the Kenai River drainage upstream of Skilak Lake outlet, including a combination of boat and aerial surveys. USFWS will be responsible for downloading and maintenance of fixed stations.

STAFF RESPONSIBILITIES

Principal investigator: *Tony Eskelin, ADF&G Project Leader, Fishery Biologist III*
Duties: Project biologist for ADF&G responsible hiring and training personnel, supervising staff. Assists USFWS with planning and data analysis. Primary author on any ADF&G reporting.

Co-principal investigator: *Ken Gates, USFWS Project leader, Fishery Biologist*
Duties: Project biologist for USFWS. Leads USFWS staff, directs ADF&G tagging efforts, flight surveys, and mobile radiotracking. Conducts data analysis. Serves as coauthor on ADF&G reporting.

Consulting Biometrician: *Matt Tyers, Biometrician III*
Duties: Provides guidance on sampling design and data analysis and edits reports.

ADF&G Sampling Crew:
Ivan Karic*, Fish and Wildlife Technician III, 1 August–16 November*
Kris Dent*, Fish and Wildlife Technician III, 1 August–16 November*
Warren Wyrick*, Fish and Wildlife Technician II, 1 August–16 November*
Stacie Mallette*, Fish and Wildlife Technician III, 21 August–16 October 16*
Sylas Troy*, Fish and Wildlife Technician II, 1 August–16 October 16*
Duties: Operate State of Alaska vehicles and boats, adhere to sampling schedule, capture and tag fish, radiotracking of tagged fish, complete miscellaneous duties as assigned.

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APPENDIX A: SAMPLING FORMS

Appendix A1.–Radiotagging data form.

Kenai River 2023 Coho Salmon Radio Tagging

Date: ______________ Crew: ____ Net Size: ____ x ____ Page: ____ of _____

Water Temp: _____ Total # Sets: ________ Strata #: ________

		Coho Only								
Tagged Fish		Channel	Code	Pluse Rate	Sex (M/F)	Length (MEF)	Vial #	Waypoint #	Set #	Comments
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										

Chinook	Coho	Sockeye	Pink	Dolly Varden	Rainbow	Other

Appendix A2.–Fixed telemetry download data form.

Fixed Radio Telemetry Data Sheets

Fixed Station: ________________________________

Date	Download (Y/N)	Logging (Y/N)	Voltage (0-15)	File Name	Check File (Y/N)	Initialize Receiver (Y/N)	Crew Initials	Notes

Appendix A3.–Mobile tracking data form.

Kenai Coho Telemetry Data Sheet

Date________________________ Mobile Receiver # ______________

Survey Type___________________

Crew________________________ Start Time __________

Location: e.g., XX/XX/2022_Bing_Lake

Waypoint	Channel	Code	Signal Strength	RM	Description