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Review of Salmon Escapement Goals in the Kodiak Management Area, 2022

by

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

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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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ABSTRACT

An interdivisional team of staff from the Alaska Department of Fish and Game met beginning in October of 2022 to review existing Pacific salmon (*Oncorhynchus*) escapement goals in the Kodiak Management Area (KMA) and report findings to the directors of the Divisions of Commercial Fisheries and Sport Fish. The KMA salmon escapement goals had been reviewed most recently in 2019. The current review team found 20 goals that will remain unchanged, 1 goal will be revised, and 1 goal will be discontinued. The Pasagshak River sockeye salmon (*O. nerka*) aerial survey based lower bound sustainable escapement (SEG) goal will be replaced with a weir-based SEG of 2,000 to 8,000 fish, and the Malina Creek sockeye salmon SEG of 1,000 to 10,000 fish will be discontinued. When combined with existing escapement goals, these staff findings to the directors of the Divisions of Commercial Fisheries and Sport Fish result in 21 escapement goals for the KMA: 12 for sockeye salmon, 2 for Chinook salmon (*O. tshawytscha*), 4 for coho salmon (*O. kisutch*), 3 for pink salmon (*O. gorbuscha*), and 1 for chum salmon (*O. keta*).

Keywords: Pacific salmon, *Oncorhynchus* spp., escapement goal, Kodiak, stock status, KMA

INTRODUCTION

Fisheries for Pacific salmon (*Oncorhynchus* spp.) in Alaska are managed by the Alaska Department of Fish and Game (ADF&G) to reach desired spawning escapement levels. The surplus is thus available for harvest in subsistence, commercial, and sport fisheries. The desired escapement levels are referred to as escapement goals and are scientifically determined with the goal of creating management targets that meet constitutional, statutory, and regulatory obligations.

This report documents the 2022 review of salmon escapement goals in the Kodiak Management Area (KMA) based on the Alaska Board of Fisheries (BOF) *Policy for the management of sustainable salmon fisheries* (SSFP; 5 AAC 39.222) and the *Policy for statewide salmon escapement goals* (5 AAC 39.223). Findings from this review are reported to ADF&G directors of Divisions of Commercial Fisheries and Sport Fish, and will take effect for salmon stocks returning in 2024. Salmon escapement goals in the KMA were last reviewed in 2019 (McKinley et al. 2019). For the 2022 review, an additional 3 years of data (2019–2021) were available. An important facet of the *Policy for statewide salmon escapement goals* is that the establishment of escapement goals is a collaborative job of the BOF and ADF&G, but the BOF recognizes ADF&G's responsibility to establish biological escapement goals, sustainable escapement goals, sustained escapement thresholds, and aggregate goals.

The different types of goals are defined as follows in the SSFP:

- biological escapement goal (BEG): the escapement that provides the greatest potential for maximum sustained yield (MSY);
    - MSY: provides greatest annual yield over the long term;
- sustainable escapement goal (SEG): a level of escapement, indicated by an index or an escapement estimate, that is known to provide for sustained yield over a 5- to 10-year period, used in situations where a BEG cannot be estimated or managed for;
- sustained escapement thresholds (SET): means a threshold level of escapement, below which the ability of the salmon stock to sustain itself is jeopardized;
- aggregate goals: escapement goals for aggregates of individual spawning populations with similar productivity and vulnerability to fisheries and for salmon stocks managed as units.

A report documenting the established escapement goals for stocks of 5 common Pacific salmon species (Chinook *Oncorhynchus tshawytscha*, sockeye *O. nerka*, coho *O. kisutch*, pink *O. gorbuscha*, and chum *O. keta*) spawning in the Kodiak, Chignik, Alaska Peninsula, and Aleutian Islands management areas of Alaska was prepared in 2001 (Nelson and Lloyd 2001).

Most of the escapement goals documented in the 2001 report were based on average escapement estimates and spawning habitat availability and had been implemented in the early 1970s and 1980s.

Since 2001, escapement goals for the KMA have gone through BOF review in 2005, 2007, 2010, 2013, 2016, and 2019 (Nelson et al. 2005; Honnold et al. 2007; Nemeth et al. 2010; Sagalkin et al. 2013; Schaberg et al. 2016; McKinley et al. 2019).

STUDY AREA

The KMA encompasses the waters of the western Gulf of Alaska surrounding the Kodiak Archipelago and along that portion of the Alaska Peninsula that drains into the Shelikof Strait between Cape Douglas and Kilokak Rocks (Figure 1). The Kodiak Island archipelago extends approximately 240 km (150 miles) from Shuyak Island south to Tugidak Island. The Mainland portion of the KMA is about 256 km (160 miles) long and is separated from the archipelago by Shelikof Strait, which averages 48 km (30 miles) in width (Figure 2). Chirikof Island, located approximately 64 km (40 miles) south–southwest of Tugidak Island, is also included in the KMA.

The KMA is divided into 7 commercial fishing districts: Afognak, Northwest Kodiak, Southwest Kodiak, Alitak, Eastside Kodiak, Northeast Kodiak, and Mainland Districts (Figure 1; Anderson et al. 2023). These are further subdivided into sections, each of which is composed of smaller statistical areas, including terminal or special harvest areas. For commercial salmon fisheries, legal gear in districts or sections can consist of purse seines, hand purse seines, beach seines, or set gillnets. Subsistence fishery management occurs in general conformity with the commercial fishery management boundaries.

To regulate Kodiak commercial salmon fisheries, ADF&G staff are guided by 10 KMA salmon management plans that describe biological and allocative constraints and were adopted into regulation by the BOF (5 AAC 18.360–369). Subsistence fishing is largely advised through the subsistence regulations. These plans and regulations reflect traditional fishing opportunities and the subsequent harvest allocations that have resulted between and within gear types participating in specific fisheries. The primary objectives of the management plans are to achieve salmon spawning escapement goals while allowing for orderly harvest of salmon surplus to escapement requirements.

Commercial fisheries in the KMA primarily target sockeye salmon from June through early July; some early chum salmon stocks may influence management in localized areas (Anderson et al. 2023). Pink salmon stocks are targeted from early July through mid-August, with some areas managed specifically for local sockeye or chum salmon stocks. Late-run sockeye, coho, and late returning chum salmon are targeted from mid-August through early September; coho salmon are the targeted species in late September and October.

Sport fisheries are managed according to the sport fish regulations for Southwest Alaska, although there are sport saltwater management plans pertaining to Chinook salmon and black rockfish harvest. Sport fishing in the KMA is divided into 2 areas: the Kodiak Road Zone (KRZ) and the Remote Zone. The majority of the sport fishing effort occurring in the KRZ is in proximity to the City of Kodiak. Anglers primarily target coho, sockeye, and Chinook salmon in several fisheries, although all species of salmon are harvested by anglers. Chinook salmon have historically been the most sought after species by anglers in the KMA. Over the last 20 years, effort has shifted from freshwater fisheries at the Karluk and Ayakulik Rivers and stocked runs in the KRZ to primarily

saltwater areas near the City of Kodiak coinciding with the declines in Chinook salmon runs in the KMA. Today, however, coho salmon are the most popular species targeted throughout the island by sport fish anglers. Anglers target them in nearshore salt waters surrounding Afognak and Shuyak Islands during August and in nearly all freshwater areas through early October.

OVERVIEW OF GENERAL ESCAPEMENT GOAL METHODS

The current escapement goal review primarily examines recent (2019–2021) data and updates previous analyses. In October of 2022, an interdivisional team including staff from the Divisions of Commercial Fisheries and Sport Fish (hereafter referred to as "the team") reviewed the existing KMA salmon escapement goals and recent escapements for stocks with escapement goals. The team spent several months performing the escapement goal review analyses and then met again to make a formal decision on actions to present to the BOF at the fall 2023 work session. This process required several iterative meetings before final escapement goal findings are provided to the BOF. The current general escapement goal review framework is as follows:

1. Compile all available escapement, harvest, and age information since the 2019 review.
2. Review the methods used to establish the existing goals, consider alternatives, and determine the most appropriate methods to evaluate salmon stocks with existing goals.
3. Determine the most appropriate goal type (BEG or SEG) based on quality and quantity of available data.
4. Conduct analysis or reanalysis of existing goals.
5. Consider additional stocks that may have sufficient data to develop a goal.
6. Eliminate or discontinue goals for stocks in which the goal is no longer appropriate.
7. Come to a consensus on goal changes or updates, if needed.
8. Present goal change findings to the directors of the Divisions of Commercial Fisheries and Sport Fish for approval.

Escapement, harvest, and age data associated with each stock or combination of stocks to be examined were compiled from research reports, management reports, and unpublished historical databases. Limnological and spawning habitat data were compiled for each system when available. The team evaluated the type, quality, and amount of data for each stock according to criteria described in Clark et al. (2014). This evaluation assisted in determining the appropriate type of escapement goal to apply to each stock as defined in the SSFP and the *Policy for statewide salmon escapement goals*.

Salmon escapement estimates were calculated through a variety of methods in the KMA: (1) weir counts, (2) aerial surveys, and (3) foot surveys. Salmon harvest estimates were primarily estimated through the commercial fishery fish ticket receipts but also incorporate personal use and subsistence fishery estimates in addition to sport fishery estimates from the annual Statewide Harvest Survey.

ESCAPEMENT GOAL DETERMINATION

Escapement goals for each stock were evaluated differently depending on the type of goal and type of data available. Typically, those systems with estimates of escapement, age composition, and stock-specific harvest were analyzed using spawner–recruit models and result in BEGs. Those systems with available escapement estimates but lacking both estimates of harvest and age composition were suited for SEGs and primarily accommodate the percentile approach (Clark et

al. 2014). A detailed review of general methods used for the different types of goals is presented in the *Spawner–Recruit Analysis*, *Percentile Approach*, and *Other Methodologies* sections.

This document discusses in detail only systems that have not been reviewed with the updated methodology, that did not have escapement that fell within the escapement goal range over the previous 3 years (and not already a stock of concern), systems that have changed escapement monitoring methodology (e.g., weir vs. aerial survey), or systems that have had other significant changes in habitat quality or availability. Additional considerations for modifying an escapement goal for a system include analysis indicating that an increase in yield could result from changing the goal, the current goal has become unmanageable, or there is no directed fishery on the stock. As a result, only Malina Creek sockeye salmon and Pasagshak River sockeye salmon are discussed fully in the main text. All other systems went through an escapement goal review and have not undergone any significant changes since the last review, which used the current escapement goal analyses methodology. Historical goal changes and supporting background information are referenced for all systems in system specific appendices and are demarcated in Table 1.

SPAWNER–RECRUIT ANALYSIS

In Alaska, most salmon BEGs are developed using Ricker (1954) spawner–recruit models (Munro and Volk 2016). Calculations for spawner–recruit models were done within the framework of a Bayesian spawner–recruit web-based application written by Toshihide Hamachan Hamazaki.[1] As defined in the SSFP (5 AAC 39.222), BEGs are estimates of the number of spawners that provide the greatest potential for maximum sustained yield (S_{MSY}). For this review, most ranges surrounding S_{MSY} were calculated as the escapement estimates that produced yields of at least 90% of MSY (Hilborn and Walters 1992; CTC 1999). The carrying capacity, defined as S_{EQ}, was estimated by the Ricker model as the escapement level (abundance of spawners) that provides an equivalent level of return or replacement when the stock has not been exploited (Quinn and Deriso 1999). Estimates of S_{MSY} and S_{EQ} were not used if the model fit the data poorly or if critical model assumptions were violated. Hilborn and Walters (1992), Quinn and Deriso (1999), and the Chinook Technical Committee (CTC 1999) provide good descriptions of the Ricker model and diagnostics to assess model fit. All Ricker models assumed a multiplicative error structure and were tested for residual autocorrelation, which was not corrected for if present based on the recommendations of Korman et al. (1995) for Alaskan sockeye salmon stocks. When auxiliary data were available (e.g., limnology or smolt abundance, age, and size), they were summarized, and biological trends were compared to estimates of adult production.

PERCENTILE APPROACH

Sustainable escapement goals (SEGs) were developed using several methods, depending on the system, species, and type of data available. For this review, most SEGs were determined using the Percentile Approach (Clark et al. 2014), risk analysis (Bernard et al. 2009), or the spawner–recruit model (Ricker 1954). Other methods used were yield analysis (Hilborn and Walters 1992), the euphotic volume model (Koenings and Kyle 1997), and the zooplankton forage model (Koenings and Kyle 1997). These latter 2 habitat-based models were used only for sockeye salmon to assess the likely number of juvenile fish that a system can support given available habitat or food. Results from these models were not generally used to determine escapement goals, but instead were used as a secondary, alternative analysis of production that was less dependent on adult fish count data.

[1] Hamazaki, T. 2023. Pacific salmon escapement goal analyses. (source: https://hamachan.shinyapps.io/Spawner_Recruit_Bayes/).

When used, results from the euphotic volume and zooplankton forage models were reported as generally corroborating or not corroborating the primary analysis.

Recently, all goals have been reviewed and established based on the Percentile Approach by Clark et. al. (2014). The Percentile Approach is based on the principle that a range of observed or indexed escapements that have been sustained over a period of time represents an SEG for a stock that has been fished and has probably sustained some unknown level of yields over the same time period. Thus, maintaining escapements of a stock within some range of percentiles observed over the time series of escapements represents a proxy for maintaining escapements within a range that encompasses S_{MSY} (Clark et al. 2014). This method takes into account the measurement error of the data collection method (i.e., weirs and towers have lower measurement error than aerial or foot surveys), the contrast of the escapement data (i.e., the ratio of highest observed escapement to the lowest observed escapement), and the exploitation rate of the stock. Based on these criteria, a tier system designates what percentiles should define the SEG range.

Tier	Escapement contrast	Measurement error	Harvest rate	SEG range
1	>8	High (aerial and foot surveys)	Low to moderate (< 0.40)	20th to 60th percentile
2	>8	Low (weirs and towers)	Low to moderate (< 0.40)	15th to 65th percentile
3	≤8	–	Low to moderate (< 0.40)	5th to 65th percentile

OTHER METHODOLOGIES

Some historical methods used to determine salmon escapement goals in previous KMA cycles are listed below. Although they were not used specifically in this review, some are referenced in the individual stock appendices.

The risk analysis (Bernard et al. 2009) has been used a time series of observed escapement estimates using probability distributions to establish a lower bound SEG, representing a precautionary reference point. This method is based on estimating the risk of management error and is particularly appropriate in situations where a stock (or stock aggregate) is not "targeted" and observed escapement estimates are the only reliable data available. In essence, this analysis estimates the probability of detecting escapement falling below the SEG in a predetermined number of consecutive years (k). For example, if we believe there is cause for concern when escapement falls below the SEG for 3 consecutive years, k would be equal to 3. Simultaneously, a second probability is estimated, which is the probability of taking action (e.g., closing a fishery to protect the stock) for 3 consecutive years when no action was needed. This analysis assumes that escapement observations follow a lognormal distribution and have a stationary mean (i.e., no temporal trend). Normality and temporal trends (autocorrelation) of log-transformed escapement data can be examined and steps taken to correct violation of these assumptions.

The yield analysis, like that used by Hilborn and Walters (1992), applied a tabular approach to examine escapement versus yield relationships. Escapements were arranged into size intervals. Multiple ranges for the size intervals were used to provide varying aggregations of escapements. For each escapement interval, several measures of yield from the observed escapements in that interval were calculated; specifically, the average and median return per spawner, average and median surplus yield (estimated as the return minus parental spawning escapement), and average

and median observed harvest. The average and median were both calculated because averages are highly influenced by large or small values.

The euphotic volume model, following the methods of Koenings and Kyle (1997), estimated adult escapement in part by determining the volume of lake water capable of primary production that could sustain a rearing population of juvenile sockeye salmon. The euphotic volume indicated a level of phytoplankton forage (primary production) available to zooplankton, and thus a level of zooplankton forage available for rearing juvenile fish. The model assumed that shallower light penetration would result in lower adult production compared to lakes with deeper light penetration because lakes with less photosynthetic capacity would not have the primary production necessary to sustain a larger rearing population. The euphotic volume model assumes there is no primary productivity below depths at which light has been attenuated by 99%.

The zooplankton model, as described in Witteveen et al. (2005), estimated smolt production based on an available zooplankton biomass fed upon by smolt of a targeted threshold size, in a lake of known size (Koenings and Kyle 1997). The zooplankton model, like the euphotic volume model, uses the premise that the availability of forage could affect survival of juvenile fish and subsequent adult production. Adult production was calculated using species fecundity and marine survival rates. The zooplankton model assumes zooplankton is the only available forage.

STOCK STATUS, METHODS, AND FINDINGS

The team added escapement data from 2019 through 2021 to the existing data sets for all 22 salmon stocks in the KMA with existing goals (Table 1). The team conducted analyses on each stock and determined that current escapement goals for all but 2 stocks (Malina Creek sockeye salmon and Pasagshak River sockeye salmon) were still appropriate.

MALINA CREEK SOCKEYE SALMON

Escapement Goal Background and Previous Review

Malina Creek is located on the southwest side of Afognak Island in the Kodiak Archipelago. The creek drains 2 lakes (Upper and Lower Malina Lakes), then flows westerly into Malina Bay, in the Southwest Afognak Section of the Afognak District (Figures 1 and 3). The system supports a small run of sockeye salmon. The first published escapement goal (SEG) for Malina Creek was developed in 1988 and was set at 5,000 to 10,000 sockeye salmon; it was based on historical aerial survey indexed escapements and, to a lesser extent, cursory spawning habitat evaluations (Nelson and Lloyd 2001). The escapement goal was revised to 10,000 to 20,000 in 1992, based on further limnological studies and rehabilitation investigations (Kyle and Honnold 1991).

To increase the natural production of sockeye salmon into the system, Upper Malina Lake was fertilized from 1991 through 2001, and Lower Malina Lake was fertilized from 1996 through 2001. The lakes were back stocked with juvenile sockeye salmon fry from 1992 to 1999 (Schrof and Honnold 2003). Malina Lake has been used as a backup brood source by Kodiak Regional Aquaculture Association (KRAA) for early-run sockeye salmon stocking projects; broodstock was obtained from Malina Lake in 2004 and 2005. A review in 2004 recommended reducing the SEG to 1,000 to 10,000 fish; this recommendation was based on the results using the percentile approach and the zooplankton biomass model. With 3 years of additional data, the 2007 escapement goal review team determined that the additional stock assessment data would not substantially affect the results of previous escapement goal analyses. Thus, the Malina Creek sockeye salmon SEG was left unchanged in 2007 (Honnold et al. 2007). A review in 2010 and 2013 with updated

limnology and aerial survey data corroborated the SEG, and the team found that no change was warranted (Nemeth et al. 2010; Sagalkin et al. 2013).

In 2016, limnological data from 1990 to 2015 were analyzed using zooplankton biomass and euphotic volume models to assess optimal escapement levels and the Percentile Approach was employed using available peak aerial survey and weir data from 1990 to 2015. During the 2019 escapement goal review, the escapement information from 2016 to 2018 was examined and the team agreed that no change in the escapement goal was needed.

Stock Status

In 2019, the escapement fell below the current SEG escapement goal of 1,000 to 10,000 sockeye salmon. The system was not surveyed in 2020, and in 2021, the escapement was within the SEG goal range at 1,450 sockeye salmon (Table 2). The system is difficult to assess with aerial methods for sockeye salmon and is currently surveyed for pink salmon with sockeye salmon counts being incidental to those efforts. The team found that this goal should be discontinued.

Escapement Goal Finding

Malina Creek is currently monitored via aerial survey and is primarily surveyed for the abundance of pink salmon. Additionally, although sockeye salmon are harvested in Southwest Afognak District, there is no directed commercial, subsistence, or sport harvest of Malina Creek sockeye salmon. The team found that discontinuing this SEG was appropriate.

PASAGSHAK RIVER SOCKEYE SALMON

Escapement Goal Background and Previous Review

The Pasagshak River drains from Lake Rose Teed into Ugak Bay of the Eastside Kodiak District. The system is located on the Kodiak Island road system and supports one of the largest sockeye salmon subsistence fisheries for Kodiak Island residents (Figure 3). Historically, escapement was estimated using aerial and foot surveys of the spawning grounds. A weir has been in place since the 2011 season.

The first Pasagshak River sockeye salmon escapement goal (SEG) was 1,000 to 5,000 fish and was established in 1988 (Nelson and Lloyd 2001) based on historical aerial survey index counts and, to a lesser extent, cursory spawning habitat evaluations. Nelson and Lloyd (2001) noted that this goal may be too low. In 2004, the SEG was revised to 3,000 to 12,000 fish, based on the percentile approach and a risk analysis (Nelson et al. 2005). This goal was assessed again in 2010 and a lower bound SEG of 3,000 fish was implemented in 2011 (Nemeth et al. 2010). The goal was reviewed again in 2013 and 2016, and the teams recommended no change (Sagalkin et al. 2013; Schaberg et al. 2016). In 2019, the recent escapement data were examined to determine whether a change in the escapement goal was justified, and the team agreed that no further analysis was necessary. Pasagshak River currently has an aerial survey-based lower bound SEG (LB SEG) of ≥3,000 fish for sockeye salmon.

Stock Status

Escapements in 2014, 2015, and 2018 were below the goal (Appendix I3). No aerial survey of Pasagshak was conducted in 2019 for sockeye salmon. In 2020 and 2021, aerial surveys estimated escapement levels below the goal. (Table 2).

Escapement Goal Finding

A weir has been operated to count sockeye salmon at the outlet of Lake Rose Teed, which drains into the Pasagshak River, since 2011. The dataset now constitutes 11 years, and we evaluated the weir-based counts using the percentile approach. The team found that a weir-based SEG of 2,000–8,000 fish would be appropriate for this system.

SUMMARY OF STAFF FINDINGS TO DIRECTORS

In summary, this comprehensive review of the 22 existing escapement goals in the KMA resulted in 20 goals remaining unchanged, the revision of 1 goal (Pasagshak River sockeye salmon weir-based SEG 2,000–8,000), and the removal of 1 goal (aerial survey based SEG for Malina Creek). Neither of these changes are anticipated to have management or allocative implications to the subsistence, commercial, or sport fisheries.

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TABLES AND FIGURES

Table 1.–Kodiak Management Area salmon escapement goals by species, system, year current goal adopted, stock of concern status, change criteria, and supporting information cross referenced to appendix.

Species	System	Year adopted	Stock of concern (year)	Change	Change criteria[b]	Appendix
Chinook	Ayakulik	2017	Yes (2020)[a]	None	–	A
Chinook	Karluk	2011	Yes (2011)[a]	None	–	B
Sockeye	Afognak	2019	No	None	–	C
Sockeye	Ayakulik (Early)	2011	No	None	–	D
Sockeye	Ayakulik (Late)	2011	No	None	–	D
Sockeye	Buskin	2011	No	None	–	E
Sockeye	Frazer	2008	No	None	–	F
Sockeye	Karluk (Early)	2017	No	None	–	G
Sockeye	Karluk (Late)	2017	No	None	–	G
Sockeye	Malina	2005	No	Discontinue	3	H
Sockeye	Pasagshak	2011	No	Change to weir SEG	4	I
Sockeye	Saltery	2011	No	None	–	J
Sockeye	Upper Station (Early)	2011	No	None	–	K
Sockeye	Upper Station (Late)	2019	No	None	–	K
Coho	American	2011	No	None	–	L
Coho	Buskin	2019	No	None	–	M
Coho	Olds	2019	No	None	–	N
Coho	Pasagshak	2011	No	None	–	O
Pink	Kodiak Arch. (Odd)	2011	No	None	–	P
Pink	Kodiak Arch. (Even)	2011	No	None	–	P
Pink	Mainland District	2011	No	None	–	Q
Chum	Kodiak Archipelago	2017	No	None	–	R

Note: En dashes mean not applicable.

[a] Stock of concern stock status is reported in a separate action plan memo or the Record Copy (RC) at the BOF meeting.

[b] Change criteria codes:

1. Analysis indicates an increase in yield may be achieved by adjusting the goal.
2. Current goal is not manageable and new goal is needed.
3. No directed fishery or inseason monitoring of system.
4. Changes in enumeration methods (e.g., peak aerial survey to weir).
5. Significant revisions to datasets used to assess goals (e.g., restructuring of run reconstruction methods).
6. Long term or consistent changes in habitat quality/availability (e.g., lagoon filling in or outlet of system blocked off due to natural erosion or hydraulic action.

Table 2.–Kodiak Management Area salmon escapements, 2013–2021.

System	2020 Goal range Lower	Upper	Type	Initial year	Year 2013	2014	2015	2016	2017	2018	2019	2020	2021
KING SALMON													
Ayakulik River[a]	4,800	8,400	BEG	2017	2,349	897	2,392	4,574	3,712	2,149	1,948	2,402	2,961
Karluk River	3,000	6,000	BEG	2011	1,824	1,182	2,777	3,434	2,600	3,155	3,898	3,344	2,796
SOCKEYE SALMON													
Afognak (Litnik) River[b]	20,000	50,000	SEG	2020	42,153	36,345	38,151	33,167	22,151	17,601	26,817	25,383	31,997
Ayakulik River early run	140,000	280,000	SEG	2011	214,969	210,040	218,178	182,589	204,497	189,008	162,430	220,935	265,756
Ayakulik River late run	60,000	120,000	SEG	2011	67,195	87,671	108,257	72,378	120,361	77,325	117,209	81,660	118,418
Buskin Lake	5,000	8,000	BEG	2011	16,189	13,976	8,719	11,584	7,222	4,284	12,297	7,741	2,330
Frazer Lake	75,000	170,000	BEG	2008	136,059	200,296	219,093	122,585	129,227	201,161	169,627	137,570	186,632
Karluk River early run	150,000	250,000	BEG	2017	234,880	252,097	260,758	173,874	242,599	205,054	190,168	158,846	131,775
Karluk River late run	200,000	450,000	BEG	2017	336,479	543,469	368,896	314,935	385,896	428,225	317,381	293,147	376,209
Malina Creek	1,000	10,000	SEG	2005	3,800	4,900	1,000	2,000	1,000	500	100	NC	1,450
Pasagshak River	3,000		LB SEG	2011	9,750	350	600	3,200	4,800	1,100	NC	1,000	700
Saltery Lake[c]	15,000	35,000	BEG	2011	35,939	29,047	39,920	54,377	35,218	19,299	20,783	22,637	61,824
Upper Station River early run[d]	43,000	93,000	BEG	2011	27,712	36,823	54,473	48,047	83,614	61,732	49,517	56,190	108,225
Upper Station River late run	120,000	265,000	SEG	2020	125,573	181,411	132,864	145,013	209,298	235,669	165,146	195,147	355,507
COHO SALMON													
American River	400		LB SEG	2011	841	1,595	530	500	410	78	NC	279	297
Buskin River[e]	4,700	9,600	SEG	2020	4,974	7,335	NC[f]	2,134	5,092	4,164	5,350	NC	7,427
Olds River	500		LB SEG	2020	2,145	1,320	1,357	1,634	1,054	878	NC	794	923
Pasagshak River	1,200		LB SEG	2011	1,648	4,934	1,790	737	701	3,186	488	2,031	4,721
PINK SALMON													
Kodiak Archipelago (odd year)	2,000,000	5,000,000	SEG	2011	4,450,711		5,614,531		5,079,016		4,688,688		4,562,998
Kodiak Archipelago (even year)	3,000,000	7,000,000	SEG	2011		2,733,282		1,699,281		4,874,342		9,429,396	
Mainland District	250,000	1,000,000	SEG	2011	628,680	254,650	754,600	65,305	1,010,100	280,400	904,400	1,484,000	478,250
CHUM SALMON													
Kodiak Archipelago[g]	101,000		LB SEG	2017	NA	84,700	171,800	89,700	184,500	115,100	99,400	64,200	113,300

-continued-

Table 2.–Page 2 of 2.

Notes: Cells demarcated in grey indicated the escapement did not meet the lower end objective. NC: No count estimated.

[a] Final escapements include estimated weir counts due to flooding at weir during Chinook (king) salmon run. Chinook salmon escapement estimated for Ayakulik River includes an estimated 20 Chinook salmon harvested above the weir when a fishery has occurred as harvest estimates are typically not available for Ayakulik River sport harvest. Chinook salmon sport harvest since 2011 is assumed to be zero as the fishery was closed to retention. All years include fish counts from post-weir aerial surveys. From 2011–2016 the BEG was 4,000–7,000 fish.

[b] Afognak (Litnik) River sockeye salmon escapement does not incorporate egg take removals.

[c] Saltery Lake sockeye salmon escapements are weir counts minus fish removed for egg-takes.

[d] Optimal escapement goal (OEG) for Upper Station River early run sockeye salmon was 25,000 from 1999–2013, the OEG was increased to 30,000 from 2014–2016 and managed for only if the department determined that the upper end of the Frazer escapement goal would be exceeded. The OEG was eliminated in 2017.

[e] Buskin River coho salmon escapements include estimated weir counts due to flooding.

[f] Buskin River coho salmon escapement in 2015 was incomplete because the weir was washed out for much of the season.

[g] The Kodiak Archipelago aggregate chum salmon goal was revised in 2016, which included a different index approach than previously used. The values in this row are using the new index method, so values prior to 2017 should not be read relative to the previous goal.

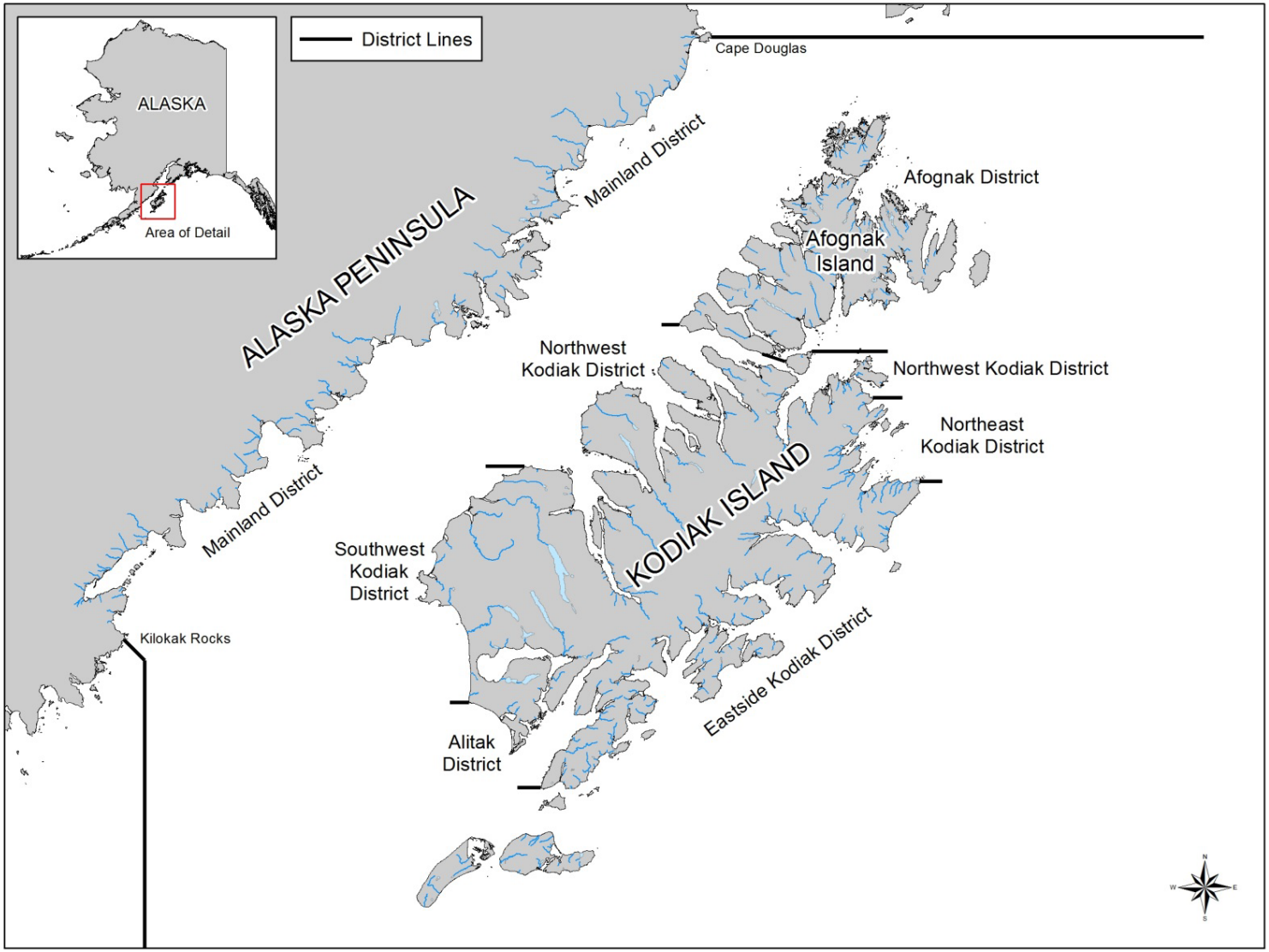


Figure 1.–The Kodiak Management Area, showing the commercial salmon fishing districts.

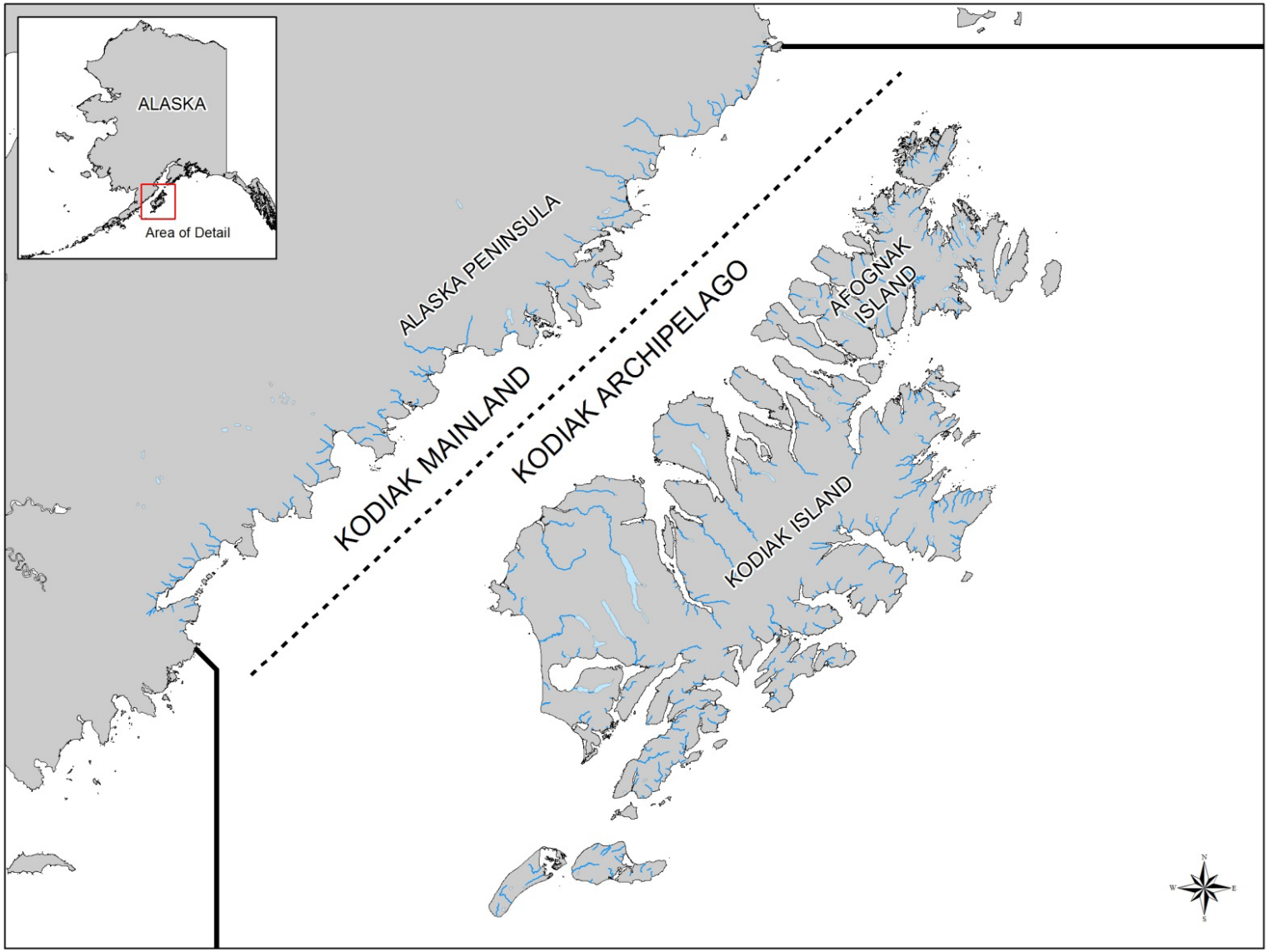


Figure 2.–Geographic boundaries of the Kodiak Management Area.

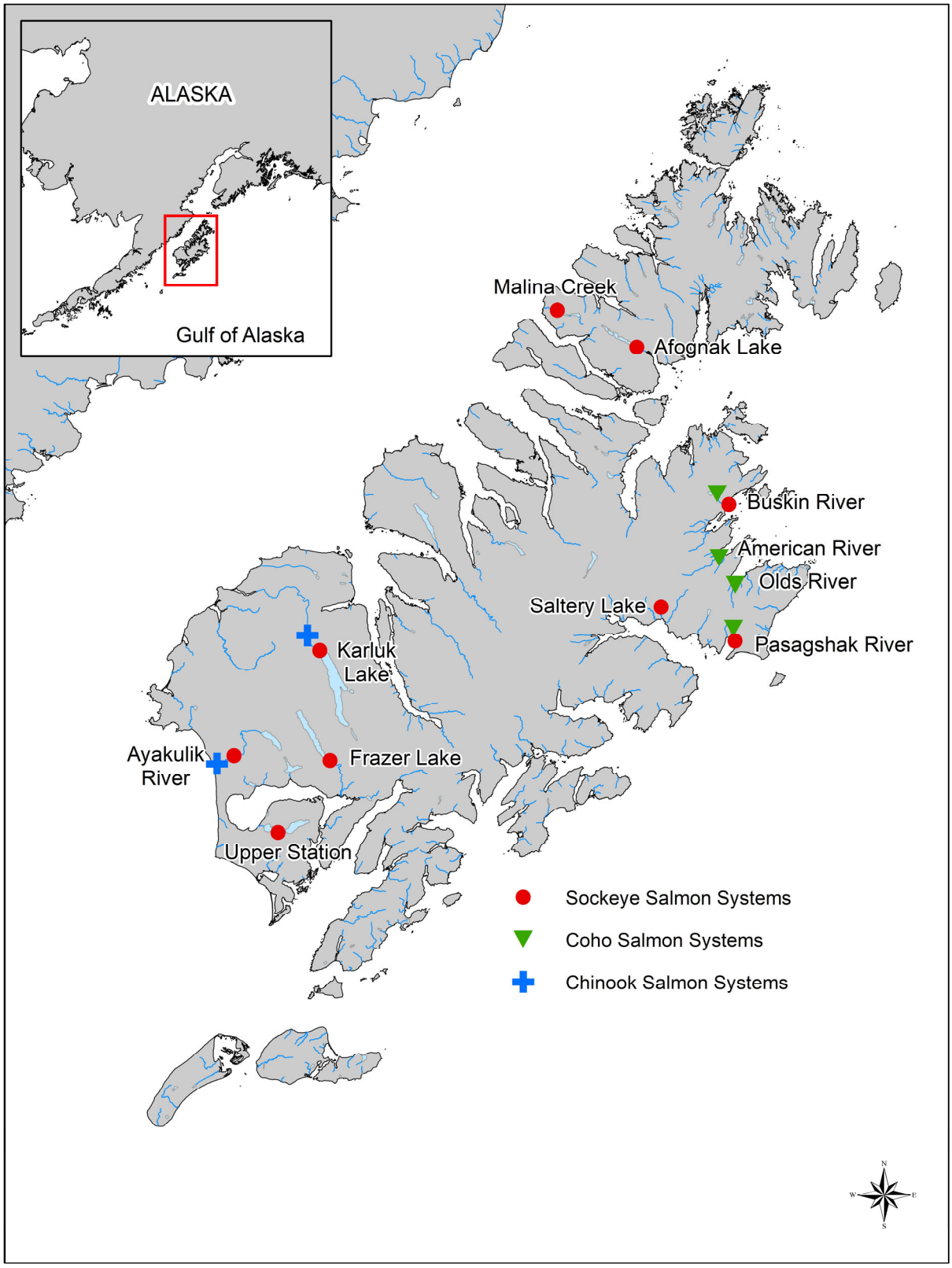


Figure 3.–Locations of Chinook, sockeye, and coho salmon systems with escapement goals in the Kodiak Management Area in 2021.

APPENDIX A: SUPPORTING INFORMATION FOR ESCAPEMENT GOALS FOR AYAKULIK RIVER CHINOOK SALMON

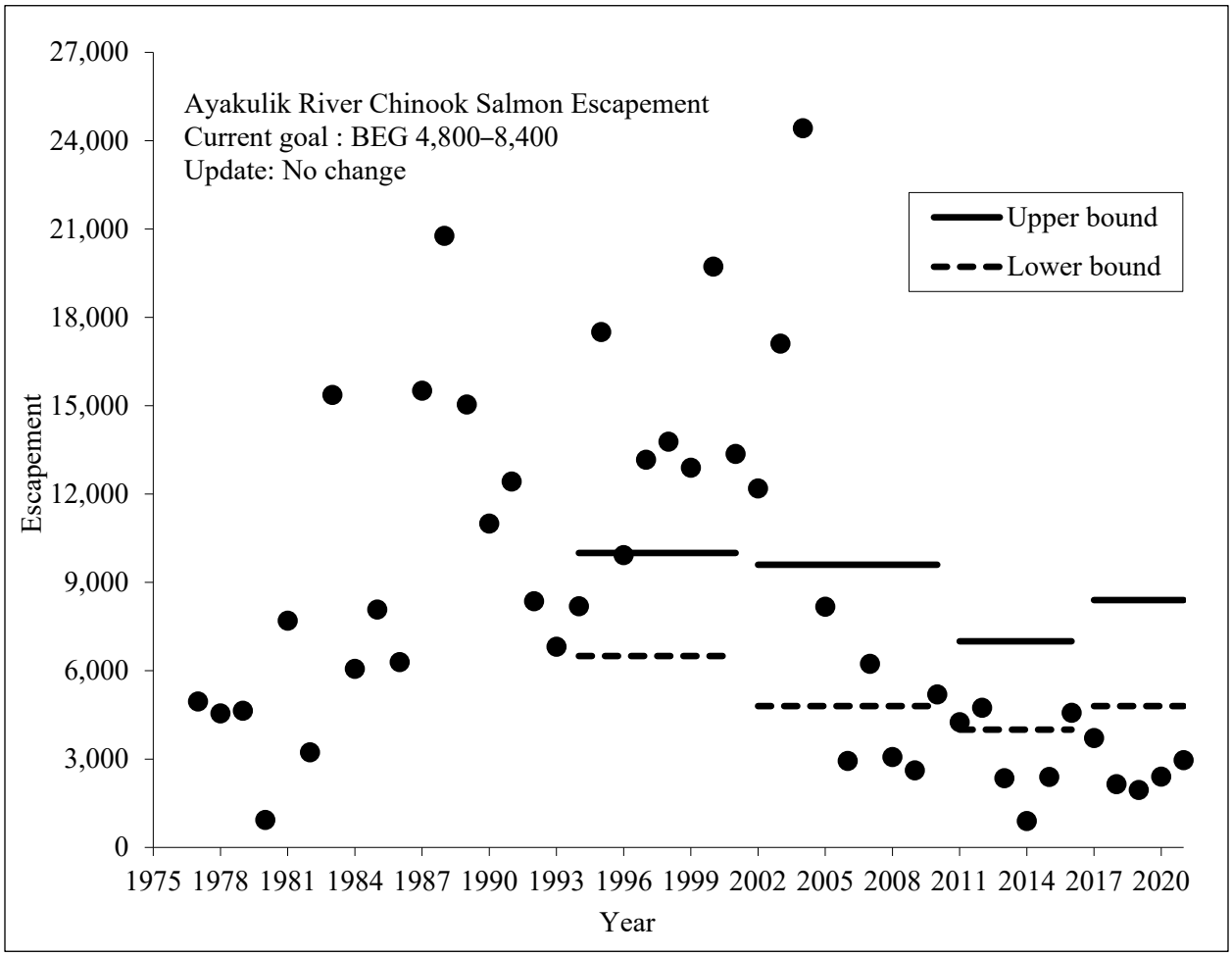
Appendix A1.–Description of stock and escapement goals for Ayakulik River Chinook salmon.

Stream location:	Kodiak Management Area; stream 256-201
Fishery:	Commercial, Subsistence, and Sport
Current escapement goal:	BEG: 4,800–8,400 (2017)
Updated escapement goal:	No change
Optimal escapement goal:	None
Inriver goal:	None
SOC status (type and year):	Stock of Management Concern (2020)
Escapement enumeration type	Weir
Data available:	
Counts:	Weir counts 1977–2021
Age composition:	Escapement 1993–2015
Stock specific harvest:	Annual subsistence harvests were estimated from returns of completed permits. Commercial harvests include all Chinook salmon harvested in the Inner (256-10, 256-15) and Outer (256-20) Ayakulik sections from June 1 through July 15. Sport harvests were historically estimated by the ADF&G Statewide Harvest Survey; however, due to low participation rates in recent years when a sport fishery occurs, harvests were assumed to be 20 fish above the weir.
Smolt information:	None
Limnology:	1990–1996 and 2009–2021
Data contrast:	Weir data 1977–2021: 27.1
Methodology:	Bayesian age-structured spawner–recruit analysis
Criteria for updated goal (Table 1)	None
Goal history:	Escapement goal originally based on historical escapements (6,500–10,000) and modified in 2002 (4,800–9,600), 2011 (4,000–7,000), and 2017.
Comments:	None

Appendix A2.–Annual harvest, weir count, total return, and escapement estimates for Ayakulik River Chinook salmon, 1977–2021.

Return Year	Commercial harvest	Subsistence harvest	Weir count	Total run	Sport harvest	Escapement
1977	361	0	5,163	5,524	205	4,958
1978	615	0	4,739	5,354	188	4,551
1979	70	0	4,833	4,903	192	4,641
1980	0	0	974	974	39	935
1981	473	0	8,018	8,491	319	7,699
1982	83	0	3,230	3,313	0	3,230
1983	662	0	15,511	16,173	145	15,366
1984	1,409	0	6,502	7,911	437	6,065
1985	3,043	0	8,151	11,194	76	8,075
1986	1,785	0	6,371	8,156	76	6,295
1987	729	0	15,636	16,365	126	15,510
1988	2,257	0	21,370	23,627	600	20,770
1989	0	0	15,432	15,432	390	15,042
1990	5,332	0	11,251	16,583	252	10,999
1991	4,685	0	12,988	17,673	563	12,425
1992	4,909	0	9,135	14,044	776	8,359
1993	2,708	0	7,819	10,527	1,004	6,815
1994	0	3	9,138	9,141	948	8,190
1995	2,412	4	17,701	20,117	200	17,501
1996	3,723	0	10,344	14,067	419	9,925
1997	812	0	14,357	15,169	1,190	13,167
1998	3,795	0	14,038	17,833	259	13,779
1999	3,564	26	13,503	17,093	609	12,894
2000	3,416	38	20,527	23,981	803	19,724
2001	6,727	16	13,929	20,672	568	13,361
2002	71	37	12,552	12,660	362	12,190
2003	0	14	17,557	17,571	451	17,106
2004	158	16	24,830	25,004	405	24,425
2005	0	8	8,340	8,348	165	8,175
2006	0	37	3,106	3,143	169	2,937
2007	0	0	6,535	6,535	303	6,232
2008	0	0	3,071	3,071	0	3,071
2009	0	0	2,615	2,615	0	2,615
2010	65	0	5,301	5,366	104	5,197
2011	62	0	4,316	4,378	65	4,251
2012	115	0	4,760	4,875	16	4,744
2013	633	0	2,369	3,002	15	2,349
2014	70	0	917	987	0	897
2015	356	0	2,392	2,748	0	2,392
2016	93	0	4,594	4,687	1	4,574
2017	138	0	3,712	3,850	0	3,712
2018	207	0	2,149	2,356	0	2,149
2019	8	0	1,948	1,956	0	1,948
2020	155	0	2,402	2,557	0	2,402
2021	305	0	2,961	3,266	0	2,961

Appendix A3.–Ayakulik River Chinook salmon escapement and escapement goal ranges, 1977–2021.

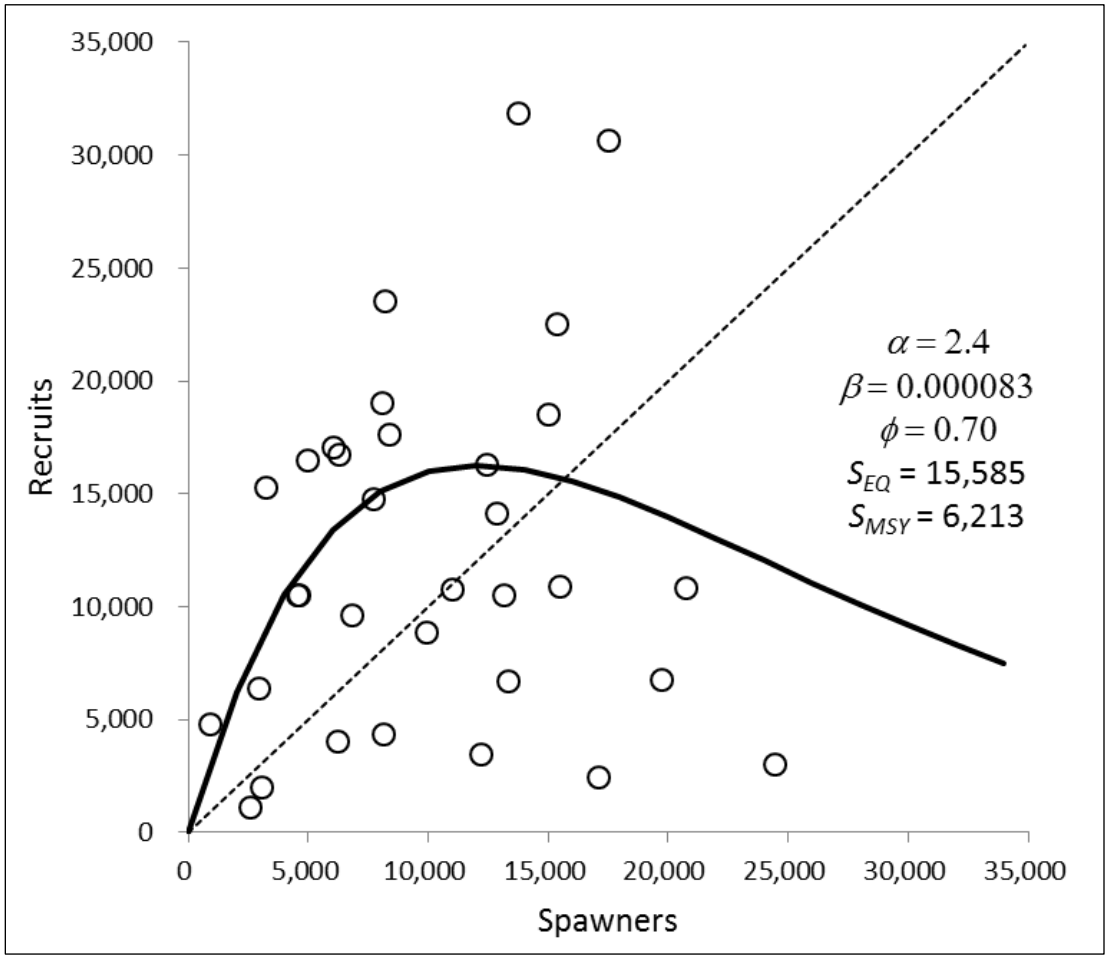


Appendix A4.–Brood table for Ayakulik River Chinook salmon.

Brood year	Escapement	Return by age					Return	Return/ spawner
		Age 3	Age 4	Age 5	Age 6	Age 7		
1977	4,958	407	5,063	1,698	8,647	655	16,470	3.3
1978	4,551	1,173	833	4,314	3,480	726	10,525	2.3
1979	4,641	282	2,539	2,434	4,752	492	10,499	2.3
1980	935	367	745	1,562	1,799	294	4,767	5.1
1981	7,699	644	3,137	3,258	6,547	1,183	14,770	1.9
1982	3,230	999	1,810	4,327	7,462	676	15,274	4.7
1983	15,366	848	4,084	9,142	7,189	1,240	22,503	1.5
1984	6,065	1,096	4,009	4,165	6,676	1,086	17,032	2.8
1985	8,075	1,595	2,694	5,288	8,351	1,083	19,010	2.4
1986	6,295	801	2,705	5,175	6,430	1,627	16,738	2.7
1987	15,510	712	2,285	3,577	4,115	210	10,899	0.7
1988	20,770	752	2,008	1,893	4,697	1,471	10,822	0.5
1989	15,042	977	2,823	2,346	11,744	594	18,485	1.2
1990	10,999	97	1,016	2,813	5,964	836	10,725	1.0
1991	12,425	987	2,804	3,465	8,500	558	16,314	1.3
1992	8,359	996	3,465	3,104	9,788	267	17,620	2.1
1993	6,815	573	1,578	2,551	4,754	179	9,636	1.4
1994	8,190	1,150	2,771	8,324	10,716	589	23,550	2.9
1995	17,501	1,603	3,289	12,010	12,981	743	30,627	1.8
1996	9,925	464	888	3,711	3,626	127	8,816	0.9
1997	13,167	178	1,664	4,188	3,766	710	10,505	0.8
1998	13,779	1,698	3,452	10,207	16,276	250	31,883	2.3
1999	12,894	714	3,417	6,568	3,239	187	14,125	1.1
2000	19,724	122	732	3,471	1,077	1,327	6,728	0.3
2001	13,361	356	1,046	1,457	3,314	526	6,699	0.5
2002	12,190	336	416	1,335	1,229	151	3,467	0.3
2003	17,106	98	380	829	804	350	2,461	0.1
2004	24,425	110	397	768	1,585	172	3,032	0.1
2005	8,175	113	691	1,525	1,900	85	4,314	0.5
2006	2,937	217	1,637	1,473	2,905	169	6,401	2.2
2007	6,232	134	730	1,172	1,880	81	3,998	0.6
2008	3,071	120	633	649	428	140	1,972	0.6
2009	2,615	48	178	228	617		1,070	0.4
2010	5,197	130	192	868	–	–	–	–
2011	4,251	72	710	–	–	–	–	–
2012	4,744	400	–	–	–	–	–	–
2013	2,354	–	–	–	–	–	–	–
2014	917	–	–	–	–	–	–	–
2015	2,392	–	–	–	–	–	–	–

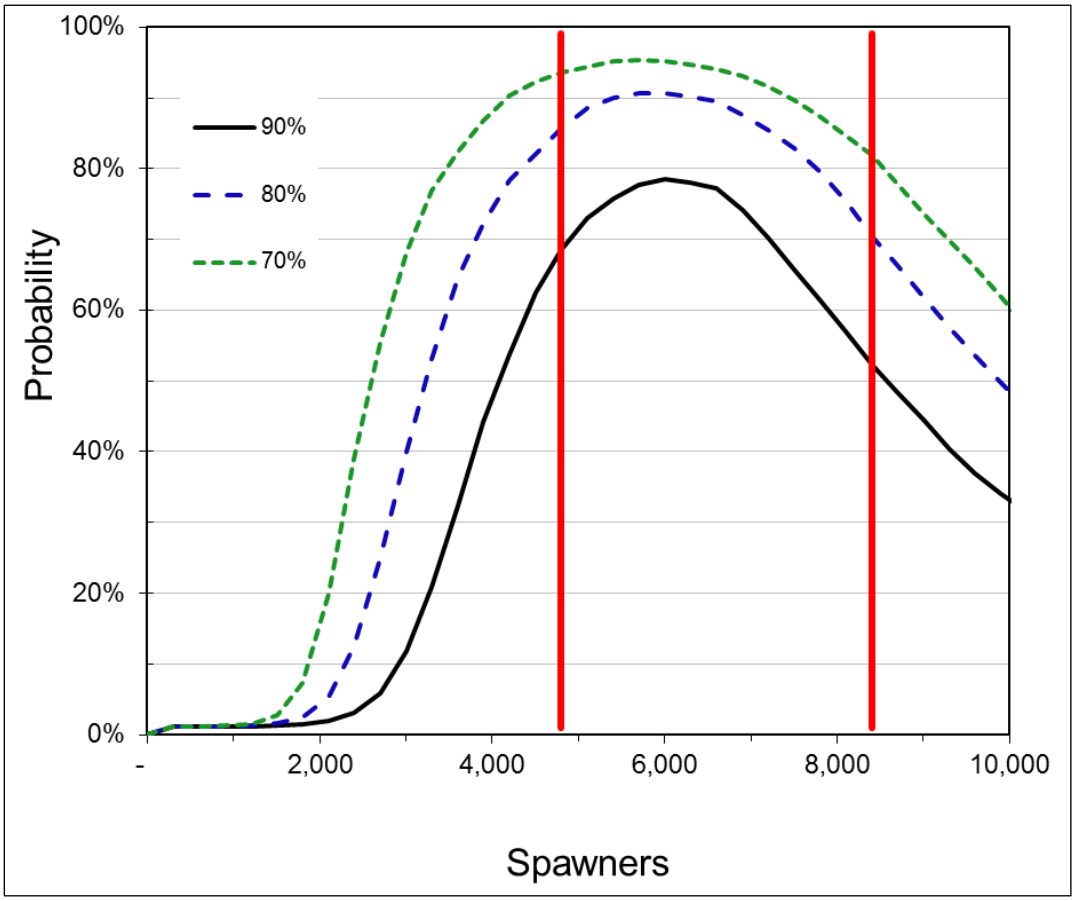
Note: No age composition collected since 2015. En dash = no data available.

Appendix A5.–Ricker spawner–recruit function fitted to Ayakulik River Chinook salmon data, 1977–2009 brood years. Parameter estimates are posterior medians.



Note: No age composition collected since 2015 and thus no brood year update since 2009.

Appendix A6.–Optimal yield profiles obtained by fitting an age-structured spawner–recruit model to Ayakulik River Chinook salmon data, brood years 1977–2009. Probability of achieving at least 70%, 80%, and 90% of maximum sustained yield is plotted for various levels of escapement. Vertical lines show current escapement goal.



Note: No age composition collected since 2015 and thus no brood year update since 2009.

APPENDIX B: SUPPORTING INFORMATION FOR ESCAPEMENT GOALS FOR KARLUK RIVER CHINOOK SALMON

Appendix B1.–Description of stock and escapement goal for Karluk River Chinook salmon.

Stream location:	Kodiak Management Area; stream 255-101
Fishery:	Commercial, Subsistence, and Sport
Current escapement goal:	BEG: 3,000–6,000 (2011)
Updated escapement goal:	No change
Optimal escapement goal:	None
Inriver goal:	None
SOC status (type and year):	Stock of Management Concern (2011)
Escapement enumeration type	Weir
Data available:	
Counts:	Weir counts 1976–2021
Age composition:	Escapement 1993–2015
Stock specific harvest:	Annual subsistence harvests were estimated from returns of completed permits. Commercial harvests include all Chinook salmon harvested in the Inner (255-10) and Outer (255-20) Karluk sections from June 1 through July 15. Sport harvests were estimated by the ADF&G Statewide Harvest Survey.
Smolt information:	None
Limnology:	1981–2021
Data contrast:	Weir data 1976–2021: 19.2
Methodology:	Bayesian age-structured spawner–recruit analysis.
Criteria for updated goal (Table 1)	None
Goal history:	Escapement goal originally based on historical escapements (3,000–6,000) and modified in 2002 (3,600–7,300) and 2011.
Comments:	Karluk lake enhanced with nutrient fertilizer from 1986 to 1990. Karluk River Chinook salmon used as broodstock for salmon stocking projects on the Kodiak Road System from 2000 to 2004.

Appendix B2.–Annual harvest, weir count, total run, and escapement estimates for Karluk River Chinook salmon, 1976–2021.

Return year	Commercial harvest[a]	Subsistence harvest[b]	Weir count[c]	Total return	Sport harvest[d]	Escapement[e]
1976	2	0	6,897	6,899	461	6,436
1977	0	0	8,434	8,434	461	7,973
1978	35	0	9,795	9,830	461	9,334
1979	0	0	9,555	9,555	461	9,094
1980	0	0	4,810	4,810	461	4,349
1981	0	0	7,575	7,575	461	7,114
1982	0	0	7,489	7,489	796	6,693
1983	0	0	11,746	11,746	304	11,442
1984	2	0	7,747	7,749	175	7,572
1985	5	0	5,362	5,367	472	4,890
1986	542	0	4,429	4,971	122	4,307
1987	313	0	7,930	8,243	199	7,731
1988	3	0	13,337	13,340	819	12,518
1989	0	0	10,484	10,484	559	9,925
1990	0	0	14,442	14,442	700	13,742
1991	0	0	14,022	14,022	1,599	12,423
1992	264	0	9,601	9,865	856	8,745
1993	3,082	5	13,944	17,031	1,634	12,310
1994	5,114	13	12,049	17,176	1,483	10,566
1995	1,794	31	12,657	14,482	1,284	11,373
1996	1,662	4	10,051	11,717	1,695	8,356
1997	1,445	17	13,443	14,905	1,574	11,869
1998	252	4	10,239	10,495	1,173	9,066
1999	1,067	7	13,063	14,137	1,766	11,297
2000	693	22	10,460	11,175	2,581	7,879
2001	2,588	24	4,453	7,065	1,304	3,149
2002	1,262	165	7,175	9,087	231[f]	6,944
2003	1,336	6	7,256	8,891	270[g]	6,986
2004	2,249	16	7,525	10,183	297[h]	7,228
2005	349	5	4,798	5,406	114[i]	4,684
2006	910	17	4,112	5,270	439[j]	3,673
2007	314	1	1,765	2,217	68[k]	1,697
2008	92	5	752	770	0	752
2009	0	0	1,306	1,306	0	1,306
2010	0	0	2,917	2,917	0	2,917
2011	0	2	3,420	3,422	0	3,420
2012	171	0	3,197	3,368	0	3,197
2013	1,550	0	1,824	3,374	0	1,824
2014	518	0	1,182	1,700	0	1,182
2015	228	0	2,777	3,005	0	2,777
2016	272	0	3,434	3,706	0	3,434
2017	340	0	2,600	2,940	0	2,600
2018	86	0	3,155	3,241	0	3,155
2019	142	10	3,898	4,050	0	3,898
2020	72	0	3,344	3,416	0	3,344
2021	97	0	2,796	2,893	0	2,796

-continued-

[a] *Source*: ADF&G, Commercial Fish Division Statewide Harvest Receipt (fish ticket) database. Commercial harvest is the harvest of chinook salmon from Inner and Outer Karluk statistical areas (255-10 and 255-20) through July 15.

[b] Based on subsistence harvest records maintained by the Westward Region of ADF&G's Commercial Fish Division; includes all reported harvest in Karluk Section.

[c] Source ADF&G, Commercial Fish Division Kodiak escapement (weir count) database. Inriver return is the weir count of chinook salmon.

[d] Recreational harvest is from the Statewide Harvest Survey.

[e] Escapement is weir count minus recreational harvest.

[f] Recreational harvest does not include harvest below weir of 485 Chinook.

[g] Recreational harvest does not include harvest below weir of 293 Chinook.

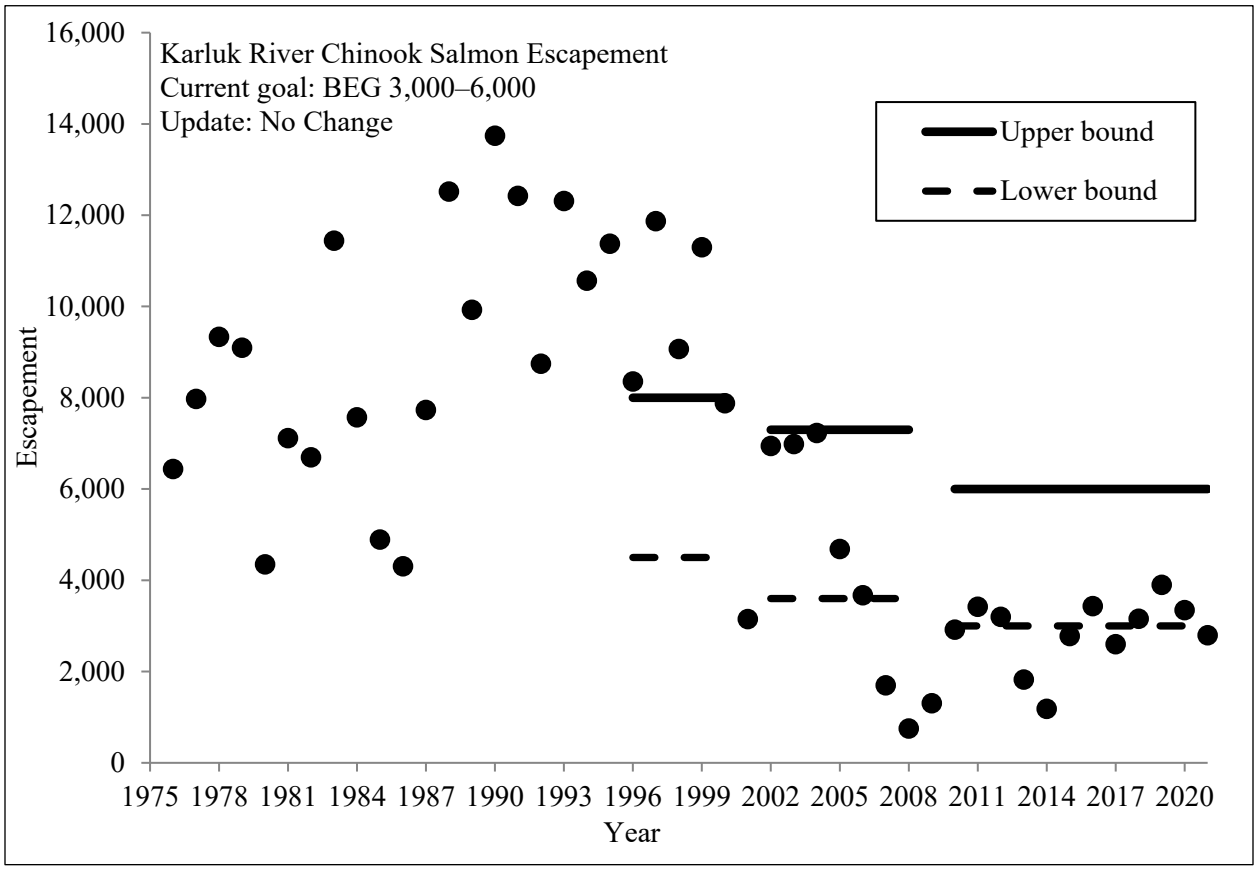
[h] Recreational harvest does not include harvest below weir of 393 Chinook.

[i] Recreational harvest does not include harvest below weir of 254 Chinook.

[j] Recreational harvest does not include harvest below weir of 231 Chinook.

[k] Recreational harvest does not include harvest below weir of 137 Chinook.

Appendix B3.–Karluk River Chinook salmon escapement and escapement goal ranges, 1976–2021.

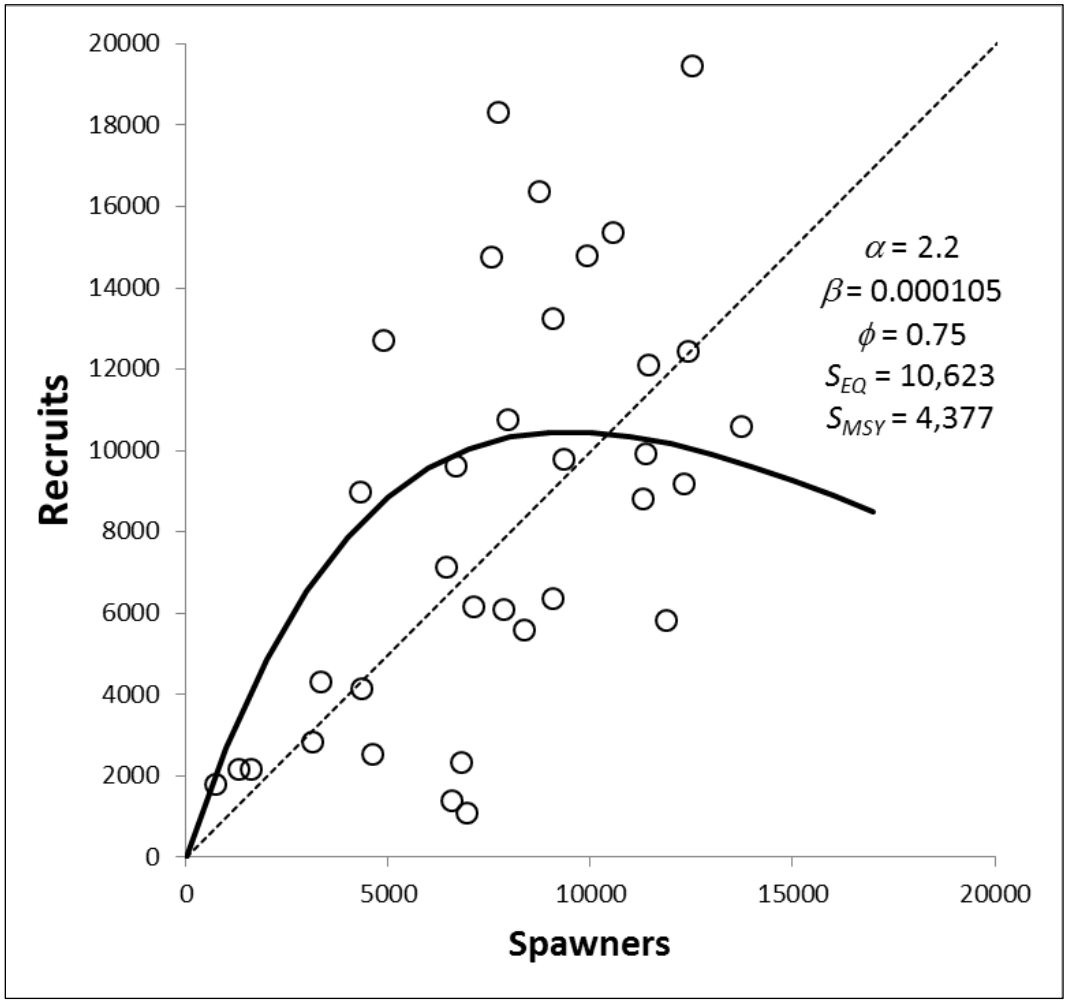


Appendix B4.–Brood table for Karluk River Chinook salmon.

Brood year	Escapement	Return by age					Recruits	Recruits/ spawner
		Age 3	Age 4	Age 5	Age 6	Age 7		
1976	6,436	418	625	2,297	3,082	721	7,143	1.1
1977	7,973	275	1,169	2,639	5,946	740	10,768	1.4
1978	9,334	409	1,018	3,685	4,115	551	9,779	1.0
1979	9,094	286	1,011	2,040	2,610	409	6,357	0.7
1980	4,349	237	563	1,236	1,746	345	4,128	0.9
1981	7,114	306	668	1,615	2,999	558	6,146	0.9
1982	6,693	335	837	2,782	5,037	621	9,612	1.4
1983	11,442	384	1,471	4,578	4,662	1,023	12,118	1.1
1984	7,572	646	2,270	3,590	7,025	1,225	14,756	1.9
1985	4,890	732	1,278	4,046	5,966	700	12,721	2.6
1986	4,307	415	1,353	3,419	3,673	124	8,984	2.1
1987	7,731	945	2,364	3,622	10,288	1,087	18,305	2.4
1988	12,518	977	1,519	5,205	10,254	1,488	19,443	1.6
1989	9,925	481	1,376	3,487	8,521	934	14,800	1.5
1990	13,742	97	1,643	2,147	5,811	879	10,577	0.8
1991	12,423	661	1,847	2,899	6,865	161	12,432	1.0
1992	8,745	454	1,915	5,248	7,907	850	16,374	1.9
1993	12,310	176	1,259	1,686	5,898	150	9,169	0.7
1994	10,566	589	1,437	5,846	6,777	703	15,352	1.5
1995	11,373	203	1,270	3,531	4,554	376	9,933	0.9
1996	8,356	166	472	1,543	3,248	155	5,584	0.7
1997	11,869	245	173	2,848	2,012	549	5,828	0.5
1998	9,066	151	2,242	5,013	5,603	240	13,249	1.5
1999	11,297	289	1,583	3,422	2,377	1,135	8,806	0.8
2000	7,879	121	459	2,111	2,905	499	6,095	0.8
2001	3,149	133	521	912	1,179	105	2,851	0.9
2002	6,574	162	225	368	533	108	1,396	0.2
2003	6,965	88	107	160	410	334	1,099	0.2
2004	6,805	70	52	497	1,332	376	2,327	0.3
2005	4,611	20	256	862	1,249	155	2,543	0.6
2006	3,351	53	325	1,449	1,865	618	4,310	1.3
2007	1,609	34	260	1,072	655	132	2,152	1.3
2008	752	65	209	792	599	115	1,780	2.4
2009	1,306	50	496	548	1,076		2,170	1.7
2010	2,916	793	318	1,181	–	–	–	–
2011	3,420	119	469	–	–	–	–	–
2012	3,197	178	–	–	–	–	–	–
2013	1,824	–	–	–	–	–	–	–
2014	1,182	–	–	–	–	–	–	–
2015	2,777	–	–	–	–	–	–	–

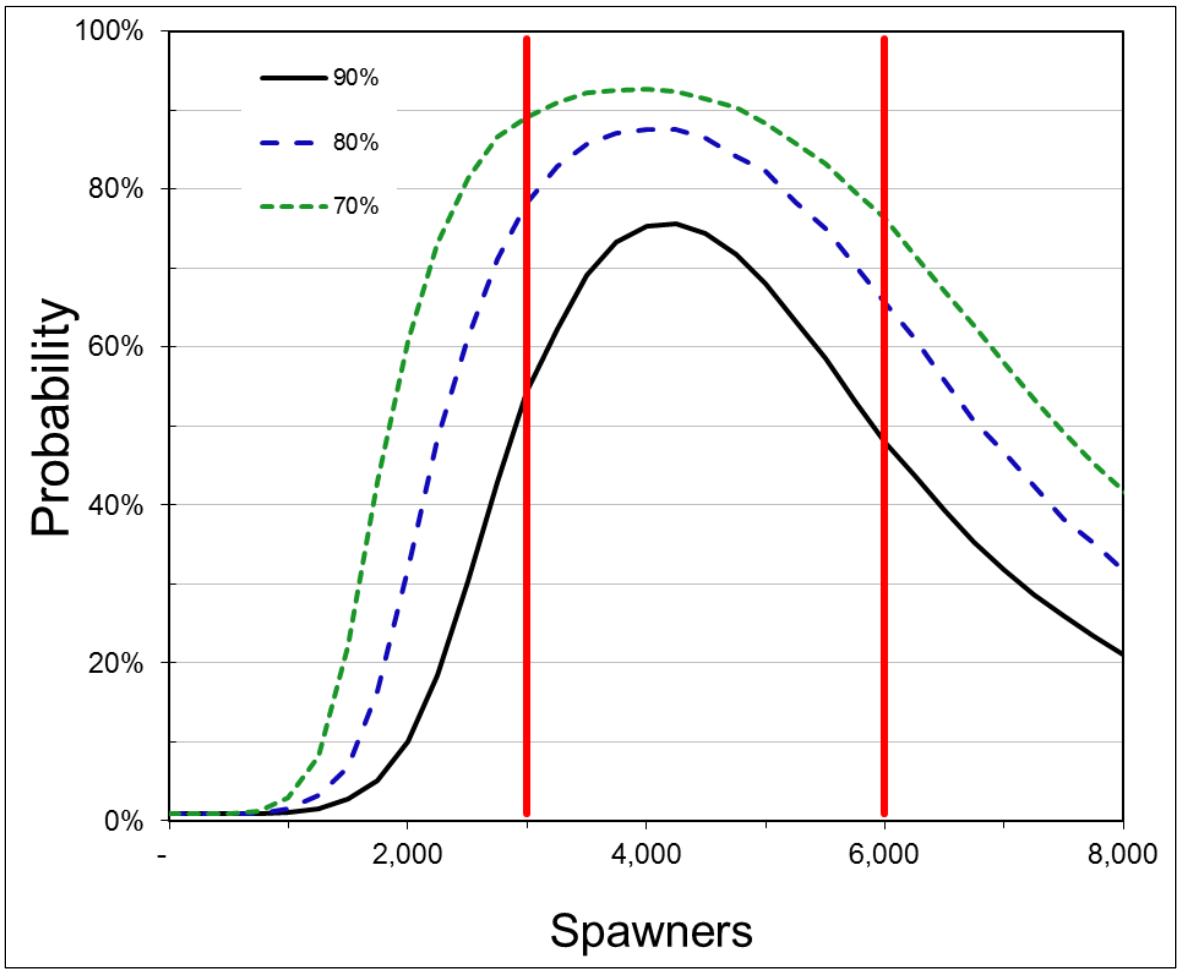
Note: No age composition collected since 2015. En dash = no data available.

Appendix B5.–Ricker spawner–recruit function fitted to Karluk River Chinook salmon data, 1976–2009 brood years. Parameter estimates are posterior medians.



Note: No age composition collected since 2015 and thus no brood year update since 2009.

Appendix B6.–Optimal yield profiles obtained by fitting an age-structured spawner–recruit model to Karluk River Chinook salmon data, 1976–2015. Probability of achieving at least 70%, 80%, and 90% of maximum sustained yield is plotted. Vertical lines show escapement goal.



Note: No age composition collected since 2015 and thus no brood year update since 2009.

APPENDIX C: SUPPORTING INFORMATION FOR ESCAPEMENT GOALS FOR AFOGNAK LAKE SOCKEYE SALMON

Appendix C1.–Description of stock and escapement goal for Afognak Lake sockeye salmon.

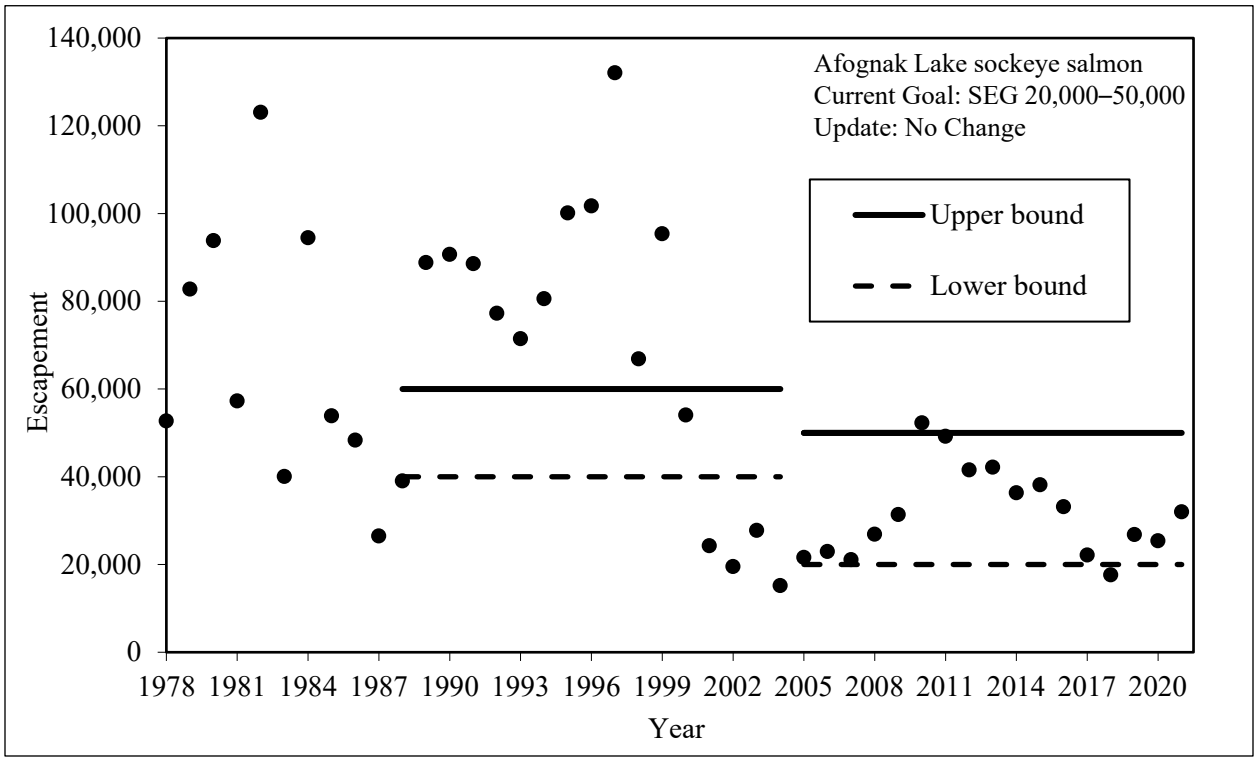
Stream location:	Kodiak Management Area; stream 252-342
Fishery:	Commercial, Subsistence, and Sport
Current escapement goal:	SEG: 20,000–50,000 (2020)
Updated escapement goal:	No change
Optimal escapement goal:	None
Inriver goal:	None
SOC status (type and year):	None
Escapement enumeration type	Weir
Data available:	
Counts:	Weir counts, 1921–1933 and 1978–2021; Aerial Survey 1966–1977
Age composition:	Escapement 1985–2021
Stock specific harvest:	1978–2021: Annual subsistence harvests were estimated from returns of completed permits. Commercial harvests include fish harvested in Afognak Bay (252–34). Sport harvests were estimated by the ADF&G Statewide Harvest Survey.
Smolt information:	1989–2017 (excluding 2002)
Limnology:	1987–2021
Data contrast:	Weir data 1982–2021: 8.7; Brood table 1982–2012: 8.6
Methodology:	Ricker spawner–recruit models, percentile approach, yield analysis, smolt biomass as a function of zooplankton biomass, and euphotic volume models.
Criteria for updated goal (Table 1)	None
Goal History:	Goal established in 1988 (40,000–60,000) and modified in 2005 (20,000–50,000 BEG) and 2020 (modified to SEG).
Comments:	Afognak lake enhanced with nutrient fertilizer from 1990 to 2000. Sockeye salmon back stocked in 1991, 1993, 1995, 1996, 1997. Weir moved in 1986 from lake outlet to 200 meters upstream from the mouth of the Afognak River.

Appendix C2.–Afognak Lake sockeye salmon escapement and egg take removals, 1921–2021.

Year	Weir counts	Peak aerial survey	Egg take removals	Year	Weir counts	Egg take removals
1921	37,653	–	–	1987	26,474	–
1922	–	–	–	1988	39,012	–
1923	8,025	–	–	1989	88,825	–
1924	10,317	–	–	1990	90,666	–
1925	11,000	–	–	1991	88,557	2,076
1926	22,250	–	–	1992	77,260	1,890
1927	7,491	–	–	1993	71,460	2,169
1928	20,812	–	–	1994	80,570	1,190
1929	25,400	–	–	1995	100,131	1,440
1930	2,467	–	–	1996	101,718	1,700
1931	30,515	–	–	1997	132,050	1,600
1932	25,202	–	–	1998	66,869	1,060
1933	36,154	–	–	1999	95,361	1,350
				2000	54,064	1,420
1966	–	950	–	2001	24,271	290
1967	–	550	–	2002	19,520	180
1968	–		–	2003	27,766	268
1969	–	2,600	–	2004	15,181	–
1970	–	7,500	–	2005	21,577	1,296
1971	–	22,000	–	2006	22,933	1,445
1972	–	100	–	2007	21,070	1,037
1973	–	100	–	2008	26,874	822
1974	–	4,300	–	2009	31,358	540
1975	–	10,000	–	2010	52,255	434
1976	–	29,000	–	2011	49,193	605
1977	–	51,300	–	2012	41,553	407
1978	52,699	–	–	2013	42,153	1,265
1979	82,740	–	–	2014	36,345	641
1980	93,806	–	–	2015	38,151	1,371
1981	57,267	–	–	2016	33,167	708
1982	123,055	–	–	2017	22,151	710
1983	40,049	–	–	2018	17,601	0
1984	94,463	–	–	2019	26,817	550
1985	53,872	–	–	2020	25,383	769
1986	48,333	–	–	2021	31,997	819

Note: En dash = no data available.

Appendix C3.–Afognak Lake sockeye salmon escapement and escapement goal ranges, 1978–2021.



Appendix C4.–Afognak Lake sockeye salmon brood table.

Brood year	Escapement	Age class returns																Total return	R/S[a]
		0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	3.1	1.4	2.3	3.2	4.1	2.4	3.3		
1982	123,055	2	0	17	112	5,504	112	0	13,845	762	0	0	371	0	0	0	0	20,726	0.17
1983	40,049	0	0	337	0	9,828	297	0	10,013	4,627	0	0	1,707	0	0	35	0	26,844	0.67
1984	94,463	0	0	1,588	54	24,634	1,307	0	47,110	22,360	0	339	24,078	0	0	0	0	121,471	1.29
1985	53,872	36	96	272	0	10,583	2,902	0	26,542	10,030	0	0	6,568	0	0	65	0	57,094	1.06
1986	48,333	0	0	8,022	35	54,737	717	0	108,494	4,958	0	428	10,370	0	0	0	0	187,760	3.88
1987	26,474	0	0	773	0	20,889	313	0	25,139	3,198	99	0	9,772	177	0	0	0	60,359	2.28
1988	39,012	0	0	472	0	18,628	8,360	0	23,626	9,607	57	77	9,686	80	0	0	0	70,593	1.81
1989	88,825	0	0	17,807	0	8,321	13,427	0	35,677	10,450	157	253	13,374	0	0	397	0	99,863	1.12
1990	90,666	0	0	12,902	0	30,978	4,194	0	96,927	18,526	0	397	56,869	175	0	0	199	221,167	2.44
1991	86,481	0	280	9,681	277	37,463	1,440	0	96,284	4,507	0	48	22,573	0	0	0	0	172,552	2
1992	75,370	0	0	3,925	175	20,223	4,698	0	70,857	3,087	0	365	5,377	0	0	0	0	108,706	1.44
1993	69,291	0	0	35,159	0	40,046	10,200	0	47,921	10,364	222	330	8,915	646	0	0	680	154,484	2.23
1994	79,380	0	0	7,863	0	7,842	6,959	74	12,841	57,821	74	0	52,384	2,531	0	0	205	148,593	1.87
1995	98,691	0	0	18,569	0	52,527	718	0	11,888	4,523	0	0	11,396	0	75	0	0	99,696	1.01
1996	100,018	0	0	1,463	0	1,888	264	0	6,789	925	4,213	0	996	6,818	0	0	3,992	27,348	0.27
1997	130,450	0	30	1,571	0	3,202	1,787	0	6,775	5,147	171	0	8,408	787	0	186	875	28,938	0.22
1998	65,809	0	0	399	0	207	666	0	238	7,296	0	3	4,225	0	0	0	0	13,033	0.2
1999	94,011	0	0	20	0	6,409	67	0	2,996	291	0	0	293	0	0	0	0	10,076	0.11
2000	54,644	0	0	1,173	0	6,971	26	0	18,560	495	0	36	2,199	0	0	0	0	29,460	0.54
2001	23,981	0	0	177	164	2,258	142	0	5,176	608	0	8	1,202	0	0	0	0	9,735	0.41
2002	19,340	0	0	716	20	14,769	0	0	11,665	435	0	1	196	0	0	0	0	27,803	1.44
2003	27,498	0	0	580	0	7,074	71	0	14,358	1,054	0	1	890	0	0	0	0	24,028	0.87
2004	15,181	0	0	1,105	0	11,631	90	0	15,538	710	0	64	140	0	0	0	0	29,278	1.93
2005	20,281	0	0	1,238	0	13,151	911	0	51,698	328	0	200	9,530	0	0	0	0	77,056	3.8
2006	21,488	0	0	1,492	0	10,108	127	0	18,494	5,727	0	54	4,876	0	0	0	0	40,878	1.9
2007	20,033	0	0	1,691	0	26,090	2,119	0	26,626	6,553	0	20	5,549	0	0	0	0	68,648	3.43
2008	26,052	0	0	2,753	0	7,379	367	0	31,931	2,570	0	0	4,873	0	0	0	0	49,873	1.91
2009	30,818	0	0	1,094	0	9,801	0	0	16,230	5,203	0	0	5,839	0	0	0	0	38,167	1.24
2010	51,821	0	0	92	0	8,365	245	0	17,474	1,764	0	26	5,892	0	0	0	0	33,858	0.65
2011	48,588	0	0	1,373	0	11,464	521	0	19,098	3,627	0	369	5,254	0	0	0	0	41,706	0.86
2012	41,046	0	0	1,089	72	3,835	0	0	10,886	448	0	377	5,279	0	0	0	0	21,896	0.54
2013	40,888	0	0	616	0	4,432	35	0	10,901	445	0	377	456	0	0	0	0	17,262	.042

-continued-

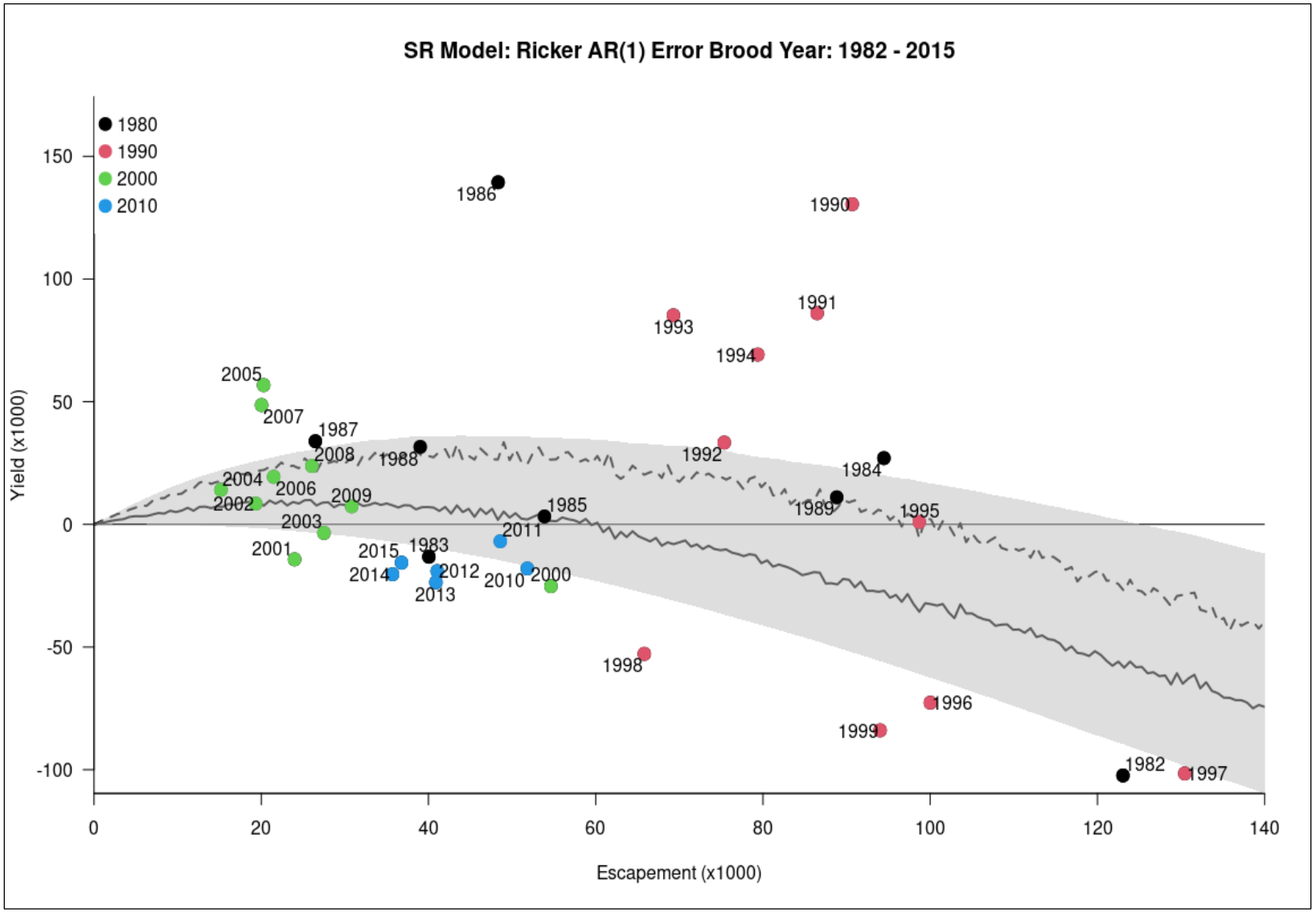
Appendix C4.–Page 2 of 2.

Brood year	Escapement	Age class returns																Total return	R/S[a]
		0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	3.1	1.4	2.3	3.2	4.1	2.4	3.3		
2014	35,704	0	0	726	0	4,411	36	0	9,692	111	0	0	396	0	0	0	0	15,372	0.43
2015	36,780	0	48	0	70	13,547	887	0	5,100	396	0	0	1,126	0	0	0		21,175	0.58
2016	32,459	0	0	2,746	0	7,725	545	0	13,904	1,213	0	–	–	–	–	–	–	–	–
2017	21,441	0	0	12,627	0	15,549	173	–	–	–	–	–	–	–	–	–	–	–	–
2018	17,601	0	0	953	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2019	26,267	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2020	24,624	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2021	31,178	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

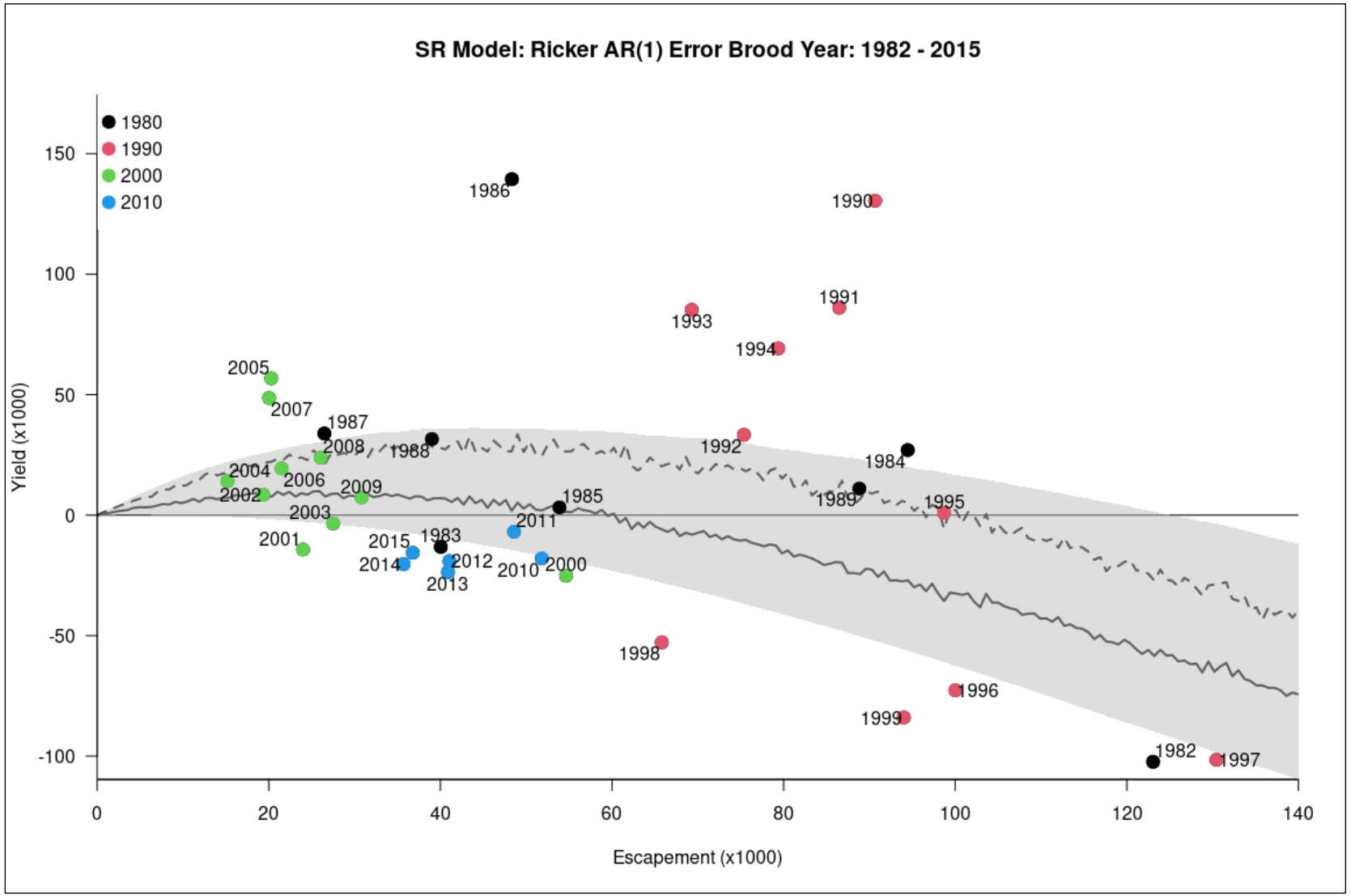
Note: En dash = no data available.

[a] R/S = return/spawner.

Appendix C5.–Ricker spawner–recruit function (solid line: mean; dash: median) fitted to Afognak River sockeye salmon data, 1982–2015 brood years. Gray shade indicates 90% Bayesian credible interval.



Appendix C6.–Ricker spawner–recruit yield curve (solid line: mean; dash: median) for Afognak River sockeye salmon 1982 to 2015 brood years. Gray shade indicates 90% Bayesian credible interval.



APPENDIX D: SUPPORTING INFORMATION FOR ESCAPEMENT GOALS FOR AYAKULIK RIVER SOCKEYE SALMON

Appendix D1.–Description of stock and escapement goal for Ayakulik River sockeye salmon.

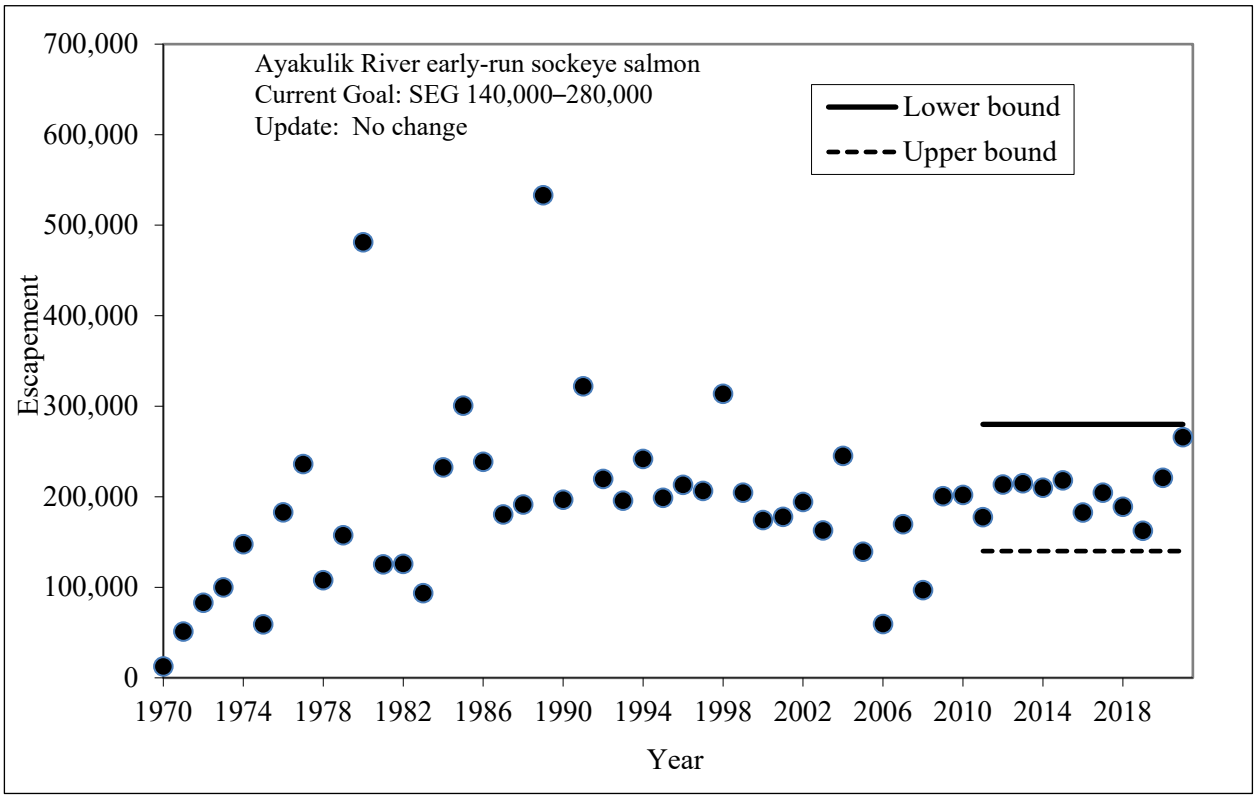
Stream location:	Kodiak Management Area; stream 256-201
Fishery:	Commercial, Subsistence, and Sport
Current escapement goal:	Early-run SEG: 140,000–280,000 (2011) Late-run SEG: 60,000–120,000 (2011)
Updated escapement goal:	No change
Optimal escapement goal:	None
Inriver goal:	None
SOC status (type and year):	None
Escapement enumeration type	Weir
Data available:	
Counts:	Weir counts, 1929–1932, 1934–1942, 1945–1946, 1948–1950, 1953–1960, and 1962–2021
Age composition:	Escapement 1962–2021 in years when weir was installed; Harvest 1970–2021
Stock specific harvest:	1970–2021
Smolt information:	1990–1996
Limnology:	1990–1996, 2009–2021
Data contrast:	Weir data 1970–2021: early (42.2), late (14.5).
Methodology:	Ricker spawner–recruit models, smolt biomass as a function of zooplankton biomass, and euphotic volume models.
Criteria for updated goal (Table 1)	None
Goal history:	Monthly minimum goals implemented from 1978–1987, with early and late run desired components implemented in 1983. In 1988 goal modified for early run (160,000–220,000) and late run (40,000–80,000). Modified to a single goal in 2001 (200,000–300,000) and again in 2005 (200,000–500,000). Goal separated back into early and late run goals in 2011.
Comments:	None.

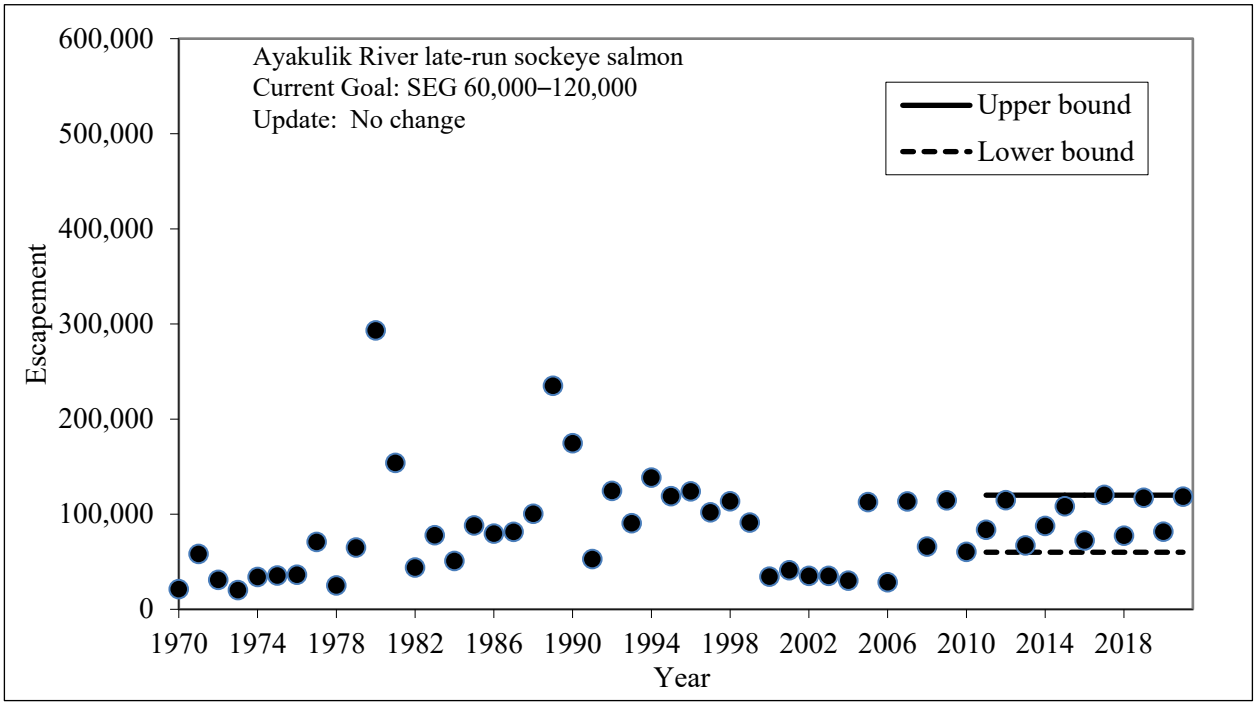
Appendix D2.–Ayakulik River sockeye salmon escapement and harvest estimates, 1929–2021.

Year	Weir counts		Commercial harvest	Year	Weir counts		Commercial harvest
	Early	Late			Early	Late	
1929	18,481	10,386	–	1979	157,408	64,862	31,901
1930	54,390	79,396	–	1980	481,165	293,163	208,281
1931	257,444	363,549	–	1981	125,272	153,928	177,795
1932	295,953	202,570	–	1982	125,852	43,826	102,075
1934	659,472	500,824	–	1983	93,540	77,875	25,003
1935	314,341	200,626	–	1984	232,466	50,749	392,218
1936	324,240	167,132	–	1985	300,568	88,191	517,250
1937	202,848	51,146	–	1986	238,557	79,578	415,848
1938	133,743	52,760	–	1987	180,515	81,398	119,459
1939	145,559	38,948	–	1988	191,386	100,388	312,132
1940	221,759	62,874	–	1989	533,066	235,035	0
1941	149,100	131,736	–	1990	196,695	174,587	1,467,737
1942	223,121	61,924	–	1991	321,985	52,874	926,419
1945	293,306	136,577	–	1992	219,723	124,461	404,246
1946	133,474	36,881	–	1993	195,701	90,469	338,727
1948	105,272	112,957	–	1994	241,811	138,370	41,331
1949	43,945	57,680	–	1995	198,864	118,968	565,040
1950	110,215	66,404	–	1996	213,229	123,926	906,897
1953	68,465	53,189	–	1997	206,346	101,868	135,595
1954	62,689	44,680	–	1998	313,739	113,469	1,018,898
1955	64,819	21,013	–	1999	204,552	91,165	693,912
1956	62,486	9,087	–	2000	174,297	34,354	236,190
1957	105,193	49,702	–	2001	177,822	41,070	367,522
1958	57,631	37,224	–	2002	194,187	35,105	6,505
1959	65,946	9,154	–	2003	162,708	35,184	90
1960	16,398	18,216	–	2004	245,123	30,115	170,749
1962	229,603	49,351	–	2005	139,246	112,660	53,835
1963	27,085	36,478	–	2006	59,315	28,465	32,325
1964	8,363	27,979	–	2007	169,596	113,446	99,937
1965	35,681	39,675	–	2008	96,912	65,976	81,540
1966	11,591	59,568	–	2009	200,648	114,536	70,588
1967	102,890	121,310	–	2010	201,933	60,394	255,942
1968	166,309	54,541	–	2011	177,480	83,661	170,490
1970	12,620	21,248	28,306	2012	213,501	114,753	229,906
1971	51,011	58,188	0	2013	214,969	67,195	147,877
1972	82,804	30,929	46,733	2014	210,040	87,671	329,711
1973	99,783	20,210	36,455	2015	218,178	108,257	491,289
1974	147,590	34,041	43,251	2016	182,589	72,378	108,191
1975	59,021	35,496	0	2017	204,497	120,361	122,551
1976	182,784	36,263	132,805	2018	189,008	77,325	179,337
1977	236,127	70,855	165,424	2019	162,430	117,209	300,211
1978	107,847	25,017	178,080	2020	220,935	81,660	190,271
				2021	265,756	118,418	899,720

Note: En dash = no data available.

Appendix D3.–Ayakulik River sockeye salmon escapement and escapement goals, 1970–2021.





Appendix D4.–Ayakulik River sockeye salmon brood table.

Brood year	Escap.	Ages																Total return	R/S[a]
		0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	3.1	1.4	2.3	3.2	2.4	3.3	3.4		
1975	94,517	0	0	0	1,393	10,982	14,989	0	30,950	308,251	0	0	96,141	858	0	0	0	463,563	4.9
1976	219,047	0	0	5,835	3,855	405,330	8,408	0	164,495	187,009	0	0	61,395	0	0	0	0	836,328	3.8
1977	306,982	0	0	0	0	5,060	3,431	0	18,656	170,721	0	0	85,541	3,940	0	0	0	287,349	0.9
1978	132,864	0	0	0	0	1,556	15,799	0	14,937	45,081	0	0	42,151	2,747	0	0	0	122,273	0.9
1979	222,270	0	0	3,625	441	16,345	18,352	0	40,958	131,539	0	0	41,815	1,438	0	0	0	254,511	1.1
1980	774,328	0	0	11,780	13,347	402,761	24,781	0	232,583	305,083	0	0	159,440	2,762	0	0	0	1,152,537	1.5
1981	279,200	0	0	17,149	0	310,784	7,450	0	230,889	328,622	0	0	168,527	28,564	0	0	0	1,091,984	3.9
1982	169,678	0	0	6,857	7,500	1,626	2,596	0	16,351	123,667	0	0	77,129	4,751	0	0	0	240,476	1.4
1983	171,415	0	0	548	1,171	20,198	15,116	0	72,231	168,055	0	0	104,765	1,148	0	0	0	383,233	2.2
1984	283,215	0	0	7,779	3,311	138,185	78,899	0	72,319	197,026	0	0	103,450	3,347	0	0	0	604,316	2.1
1985	388,759	0	0	61,345	3,903	365,489	18,971	0	589,731	513,314	0	0	229,750	4,276	0	0	0	1,786,779	4.6
1986	318,135	0	0	4,480	38,326	571,371	6,489	0	506,463	365,644	0	0	231,471	5,967	0	0	0	1,730,211	5.4
1987	261,913	0	0	12,991	15,380	173,341	13,602	0	103,512	317,142	0	0	341,728	32,807	0	5,063	0	1,015,566	3.9
1988	291,774	0	0	2,822	3,351	81,584	2,832	0	62,159	126,124	0	0	27,783	10,655	0	8,225	0	325,535	1.1
1989	768,101	0	0	2,571	5,565	26,297	29,189	0	18,318	310,379	0	0	254,557	59,553	0	46,238	0	752,667	1.0
1990	371,282	0	0	1,028	8,047	3,618	14,638	0	59,035	295,167	0	0	202,600	16,202	0	102	38	600,475	1.6
1991	384,859	0	640	22,371	17,118	145,925	36,123	0	393,249	482,187	0	19	158,923	5,779	64	2,796	0	1,265,194	3.3
1992	344,184	0	4,591	2,578	9,900	65,889	24,694	205	10,135	200,817	2,188	2,685	230,460	19,788	1,983	6,010	112	582,035	1.7
1993	286,170	0	0	3,093	3,678	2,504	16,283	400	176,539	409,718	516	8,075	138,504	7,591	344	5,426	0	772,671	2.7
1994	380,181	0	465	42,711	7,275	555,246	35,908	17,036	338,728	344,937	546	79	102,628	7,224	401	1,737	0	1,454,921	3.8
1995	317,832	0	0	4,711	4,707	101,292	18,181	516	53,759	227,822	3,186	0	240,294	22,068	1,125	6,135	0	683,795	2.2
1996	337,155	0	269	1,770	17,050	16,902	8,589	332	93,851	198,161	364	0	143,934	802	291	244	0	482,559	1.4
1997	308,214	0	5	1,250	4,810	14,447	5,395	597	11,767	34,814	330	0	16,169	727	0	1,490	0	91,802	0.3
1998	427,208	62	0	4,554	597	29,683	2,929	0	12,657	97,574	1,470	602	46,305	10,818	234	4,760	40	212,288	0.5
1999	295,717	0	0	2,953	4,818	53,015	8,754	353	124,906	192,030	0	240	80,066	4,301	658	1,930	0	474,025	1.6
2000	208,651	130	0	2,261	7,074	56,453	5,858	0	40,660	148,872	148	0	26,019	893	539	2,481	0	291,390	1.4
2001	218,892	0	0	97	0	21,217	4,756	0	12,812	57,133	0	315	95,615	2,218	299	142	0	194,605	0.9
2002	229,292	0	0	499	121	13,352	4,881	141	61,713	162,634	214	1,386	67,474	189	477	311	0	313,392	1.4
2003	197,892	0	40	2,224	1,086	47,900	5,678	0	47,986	88,088	0	152	36,068	2,986	296	1,015	0	233,520	1.2
2004	275,238	0	0	2,445	3,358	24,944	5,073	152	59,544	163,974	0	625	34,630	3,192	195	0	0	298,131	1.1
2005	251,906	0	67	5,423	694	99,530	13,239	0	73,594	260,808	1,059	307	33,847	2,480	0	682	0	491,729	2.0
2006	87,780	0	0	8,645	839	110,179	16,074	0	77,324	161,777	163	317	40,897	4,379	0	0	0	420,593	4.8
2007	283,042	0	0	15,958	1,454	101,723	35,354	0	103,711	318,854	224	336	58,052	1,205	0	0	0	636,871	2.3

-continued-

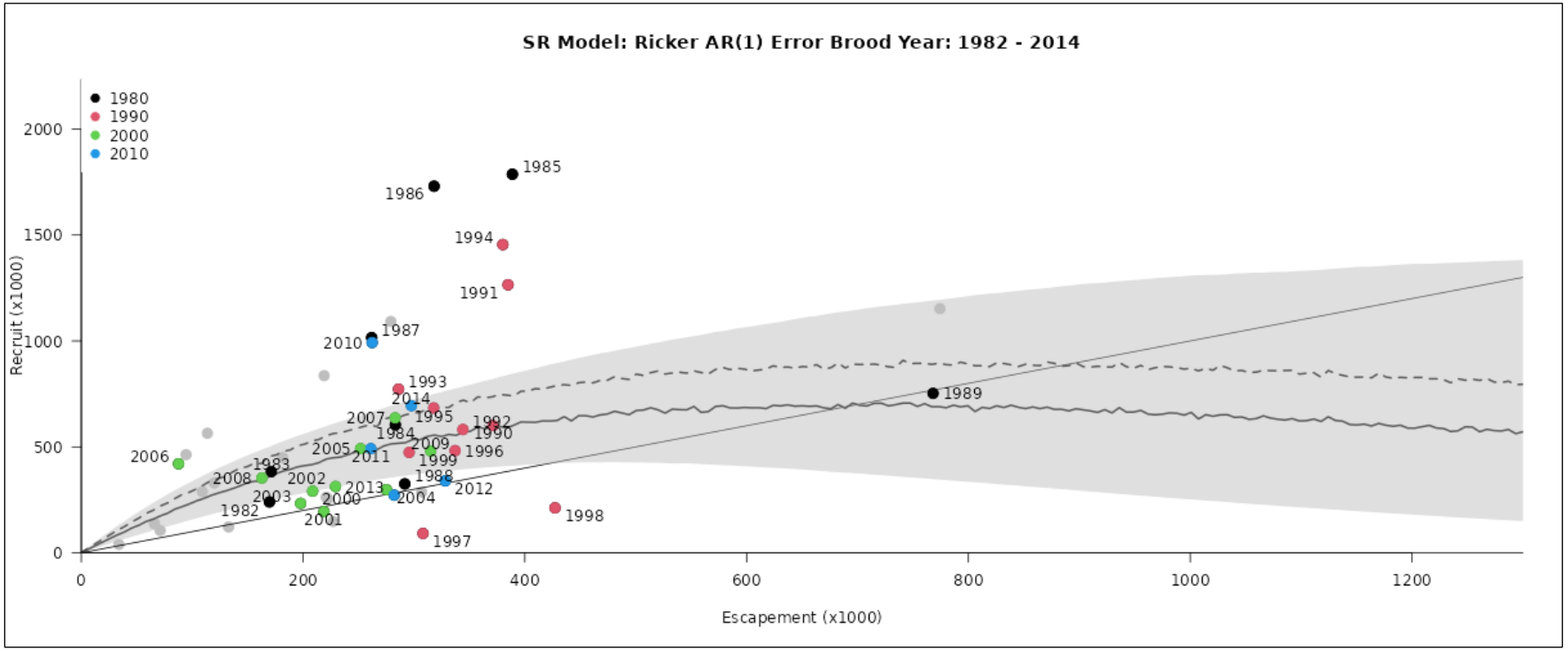
Appendix D4.–Page 2 of 2.

Brood year	Escap.	Ages																Total return	R/S[a]
		0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	3.1	1.4	2.3	3.2	2.4	3.3	3.4		
2008	162,888	0	0	16,912	866	66,934	11,628	0	67,656	149,978	0	666	37,279	1,460	9	38	0	353,426	2.2
2009	315,184	95	0	9,668	5,863	74,430	21,284	0	74,131	210,247	0	327	83,088	1,432	0	47	0	480,613	1.5
2010	262,327	0	318	50,918	1,376	277,596	20,472	0	394,285	218,636	516	164	26,807	1,449	0	0	0	992,538	3.8
2011	261,141	0	292	3,904	12,313	87,310	13,490	0	45,712	201,976	58	354	125,607	658	0	0	0	491,675	1.9
2012	328,254	0	1,421	4,859	5,419	69,546	8,623	355	96,102	136,435	0	131	17,016	0	0	0	0	339,906	1.0
2013	282,164	0	462	2,893	13,147	46,023	9,726	0	15,716	122,167	0	0	62,047	0	202	184	0	272,566	1.0
2014	297,711	0	0	18,572	0	264,673	5,747	0	254,873	123,601	0	246	26,985	0	0	0	–	694,698	2.3
2015	326,435	431	4,377	14,483	23,664	105,645	1,606	0	98,394	59,856	107	236	17,713	0	–	–	–	326,511	1.0
2016	254,967	0	0	8,415	2,108	184,190	12,363	0	83,148	111,689	0	–	–	–	–	–	–	401,911	1.6
2017	324,858	0	139	108,094	3,932	1,024,866	13,162	–	–	–	–	–	–	–	–	–	–	–	–
2018	266,333	0	428	28,696	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2019	279,639	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2020	302,595	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2021	384,174	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

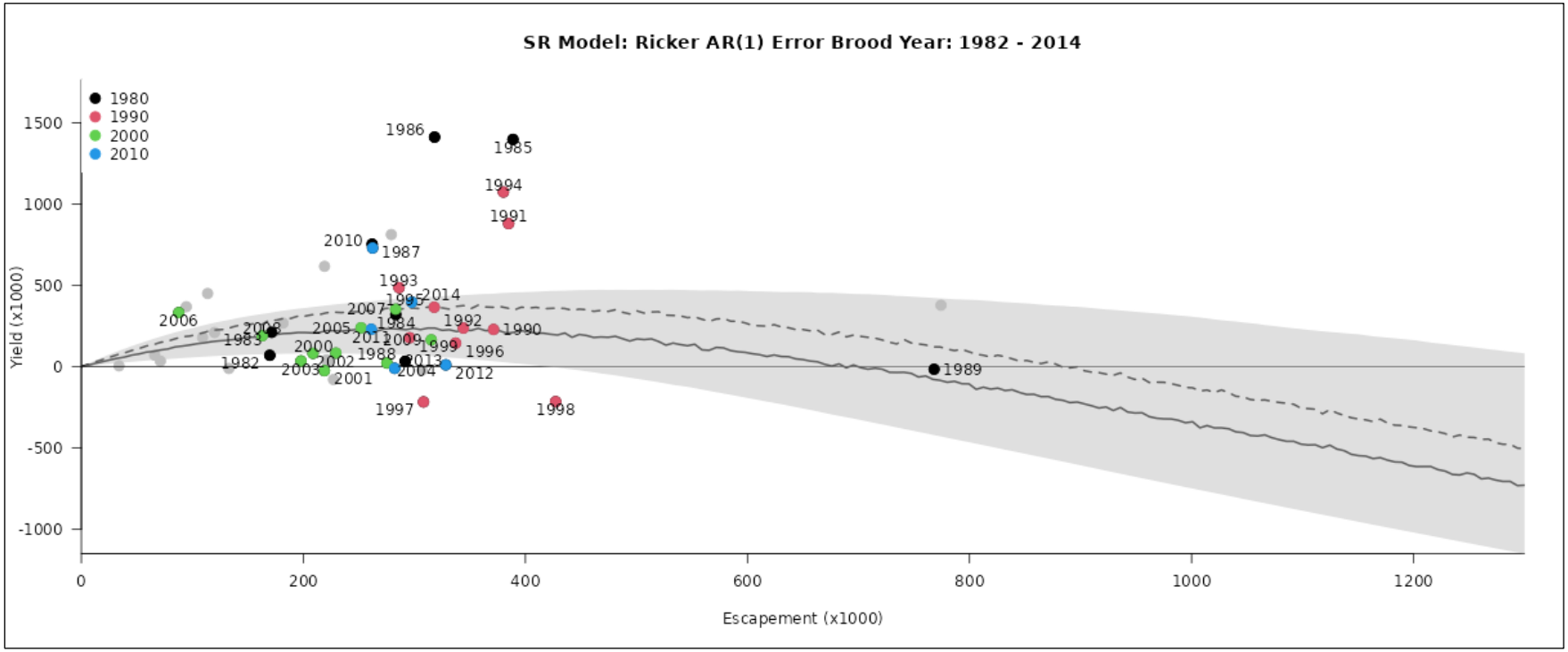
Note: For brood years 1968–1974, refer to Nemeth et al. (2010). En dash = no data available.

[a] R/S = return/spawner.

Appendix D5–Ricker spawner–recruit function (solid line: mean; dash: median) fitted to Ayakulik River sockeye salmon data, 1982–2014 brood years. Gray shade indicates 90% Bayesian credible interval.



Appendix D6–Ricker spawner–recruit yield curve (solid line: mean; dash: median) for Ayakulik River sockeye salmon 1982 –2014 brood years. Gray shade indicates 90% Bayesian credible interval.



APPENDIX E: SUPPORTING INFORMATION FOR ESCAPEMENT GOALS FOR BUSKIN RIVER SOCKEYE SALMON

Appendix E1.–Description of stock and escapement goal for Buskin River sockeye salmon.

Stream location:	Kodiak Management Area; stream 259-211
Fishery:	Subsistence and Sport
Current escapement goal:	BEG: 5,000–8,000 (2011)
Updated escapement goal:	No change
Optimal escapement goal:	None
Inriver goal:	None
SOC status (type and year):	None
Escapement enumeration type	Weir
Data available:	
Counts:	weir counts 1985–2021
Age composition:	Escapement 1986–1995; 1996–2021
Stock specific harvest:	1990–2021: Annual subsistence harvests were estimated from returns of completed permits. Commercial harvests include catches for the Woman's Bay (259-22) and Buskin River sections (259-26). Sport harvests of Buskin River sockeye salmon are estimated by the Statewide Harvest Survey.
Smolt information:	None
Limnology:	1990, 2013–2023
Data contrast:	Weir data 1990–2021: 10.2
Methodology:	Bayesian spawner–recruit analysis yielding 90% credibility interval for S_{MSY} of 4,950–8,700 and probability of sustained yield being greater than 90% of S_{MSY} occurring for a BEG of 5,000–8,000.
Criteria for updated goal (Table 1)	None
Goal history:	Goal established in 1990 (10,000–15,000) and modified in 1996 (8,000–13,000) and 2011.
Comments:	The weir was located approximately 2.5 km upstream of the river mouth from 1985–1990. In 1990, the weir was relocated to the outlet of Buskin Lake due to numerous washouts caused by high water conditions and to better account for sockeye entering Buskin Lake. In most years, the weir was operated at this site from late May through late July or early August for sockeye salmon, then moved downstream to count coho salmon through September; however, more recently, it has remained in place near the lake outlet and a second weir has been installed downstream during the coho salmon run.

Appendix E2.–Buskin River sockeye salmon estimated escapement and total run, 1990–2021.

Year	Commercial harvest[a]	Subsistence harvest	Inriver run[b]	Sport harvest[c]	Total run	Escapement[d]
1990	17	3,576	10,528	998	15,119	10,528
1991	16	4,525	9,789	1,575	15,905	9,789
1992	0	4,441	9,782	1,981	16,204	9,782
1993	4	4,779	9,526	1,544	15,853	9,526
1994	3	4,915	13,146	2,573	20,637	13,146
1995	80	5,563	15,520	1,087	22,250	15,520
1996	0	5,403	10,277	1,881	17,561	10,277
1997	0	5,892	9,840	1,843	17,575	9,840
1998	2	6,011	14,767	1,983	22,763	14,767
1999	1	7,985	10,812	1,467	20,265	10,812
2000	0	7,315	11,233	2,041	20,589	11,233
2001	0	10,260	20,556	827	31,643	20,556
2002	0	13,366	17,174	2,204	32,744	17,174
2003	6	10,651	23,870	3,017	37,544	23,870
2004	1,098	9,421	22,023	1,379	33,921	22,023
2005	0	8,239	15,468	1,540	25,247	15,468
2006	6	7,577	17,734	1,577	26,894	17,734
2007	30	11,151	16,502	1,509	29,192	16,502
2008	0	2,664	5,900	1,160	9,724	5,900
2009	45	1,883	7,757	687	10,372	7,757
2010	0	1,514	9,800	332	11,646	9,800
2011	38	4,639	11,982	1,277	17,936	11,982
2012	1	2,631	8,565	1,484	12,681	8,565
2013	17	6,160	16,189	1,310	23,676	16,189
2014	0	5,616	13,976	4,237	23,829	13,976
2015	12	3,935	8,718	NA	12,665	8,719
2016	0	4,827	11,584	2,503	18,914	11,584
2017	0	4,989	7,222	3,161	15,372	7,222
2018	0	474	4,284	335	5,093	4,284
2019	0	859	12,297	1,063	14,219	12,297
2020	0	1,642	7,741	1,715	11,098	7,741
2021	0	232	2,330	100	2,662	2,330

Note: NA means not available.

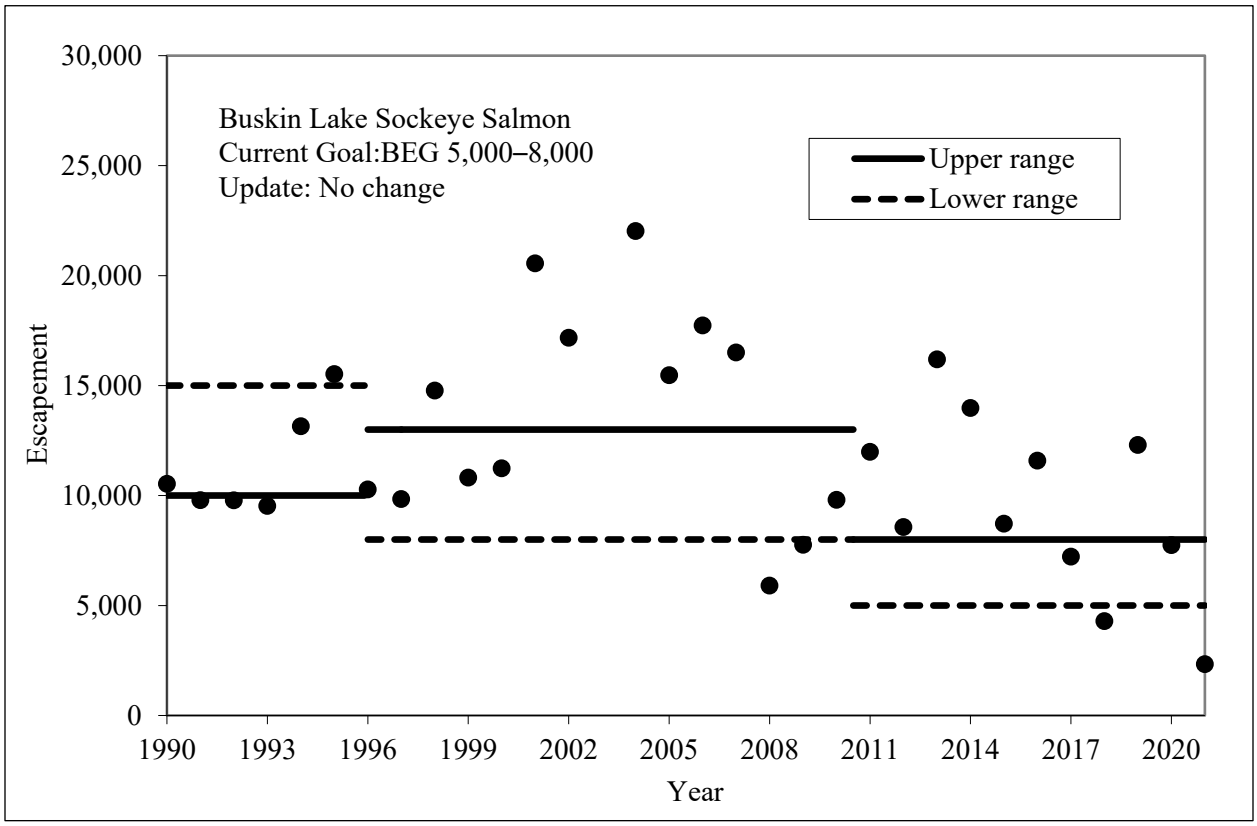
[a] Commercial harvest is the harvest of sockeye salmon from the Buskin River and Woman's Bay statistical areas (259-22 and 259-26).

[b] Inriver run is the estimated run to the weir at Buskin Lake.

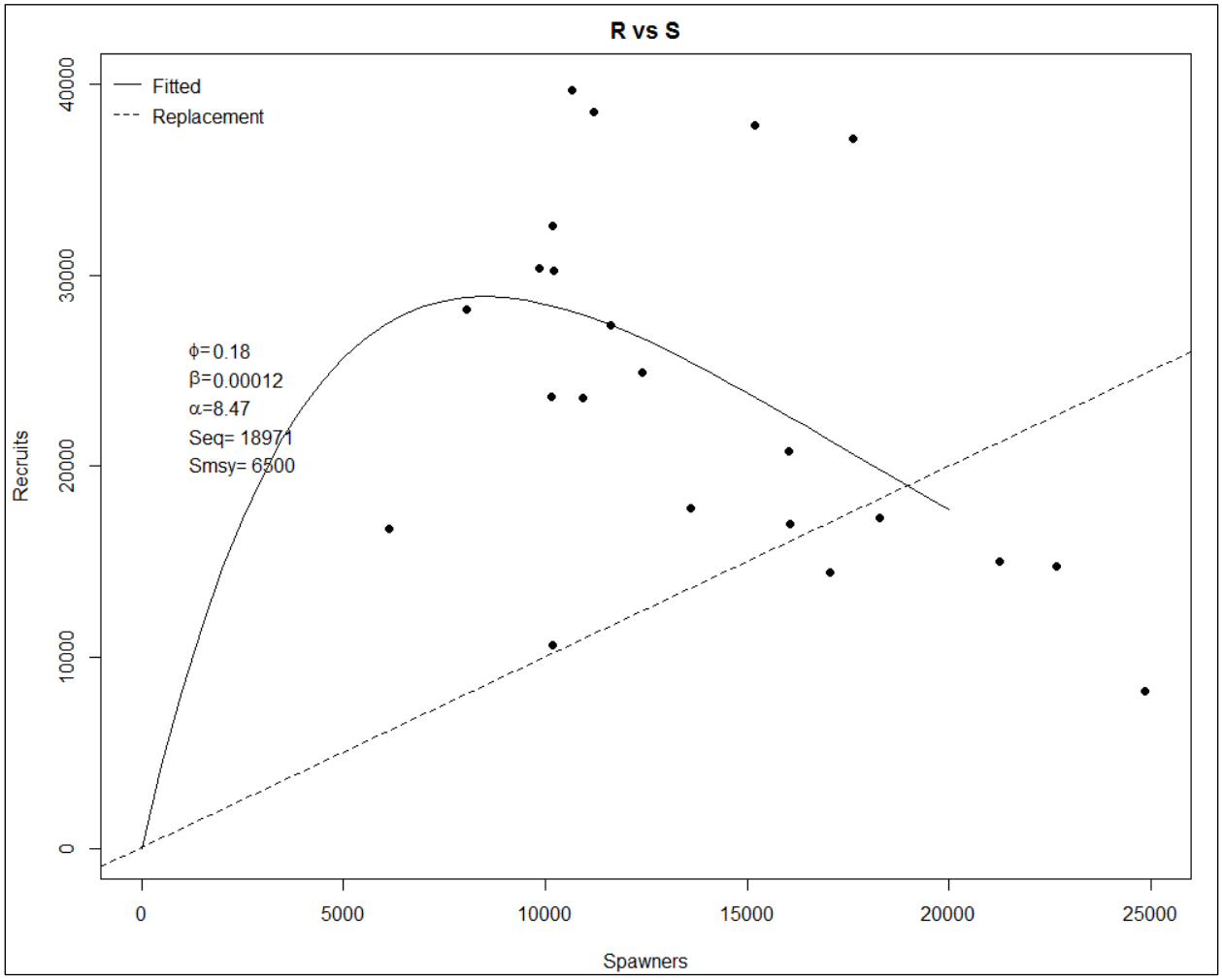
[c] Sport harvest from Statewide Harvest Survey.

[d] Escapement = inriver run.

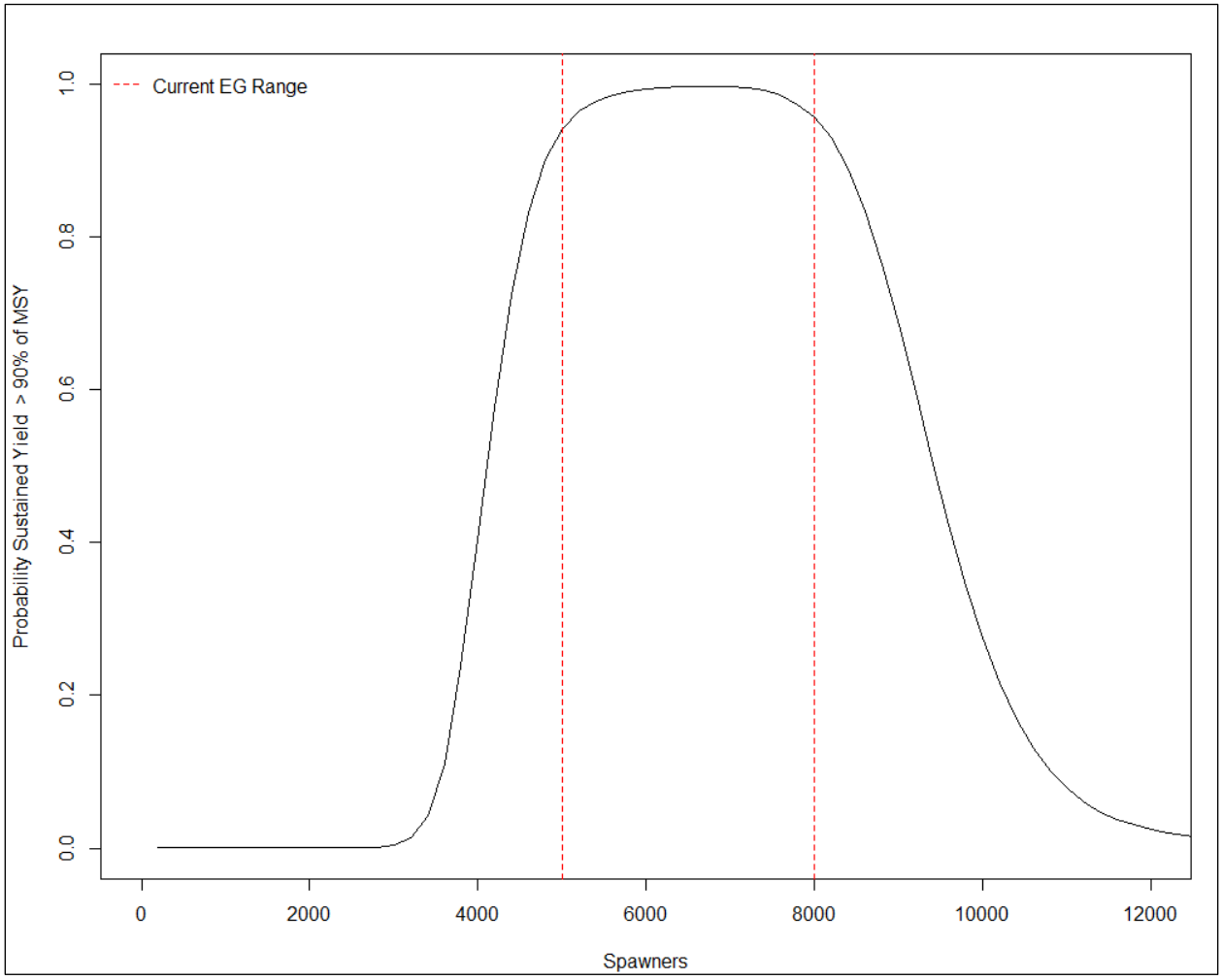
Appendix E3.–Buskin River sockeye salmon escapement and escapement goals, 1990–2021.



Appendix E4.–Ricker spawner–recruit function fitted to Buskin River sockeye salmon data, 1990–2011 brood years. Parameter estimates are posterior medians.



Appendix E5.–Optimal yield profile obtained by fitting an age-structured spawner–recruit model to Buskin River sockeye salmon data, 1990–2015 (reanalysis during the last review). Probability of achieving at least 90% of maximum sustained yield is plotted. Vertical lines show recommended escapement goal.



APPENDIX F: SUPPORTING INFORMATION FOR ESCAPEMENT GOALS FOR FRAZER LAKE SOCKEYE SALMON

Appendix F1.–Description of stock and escapement goal for Frazer Lake sockeye salmon.

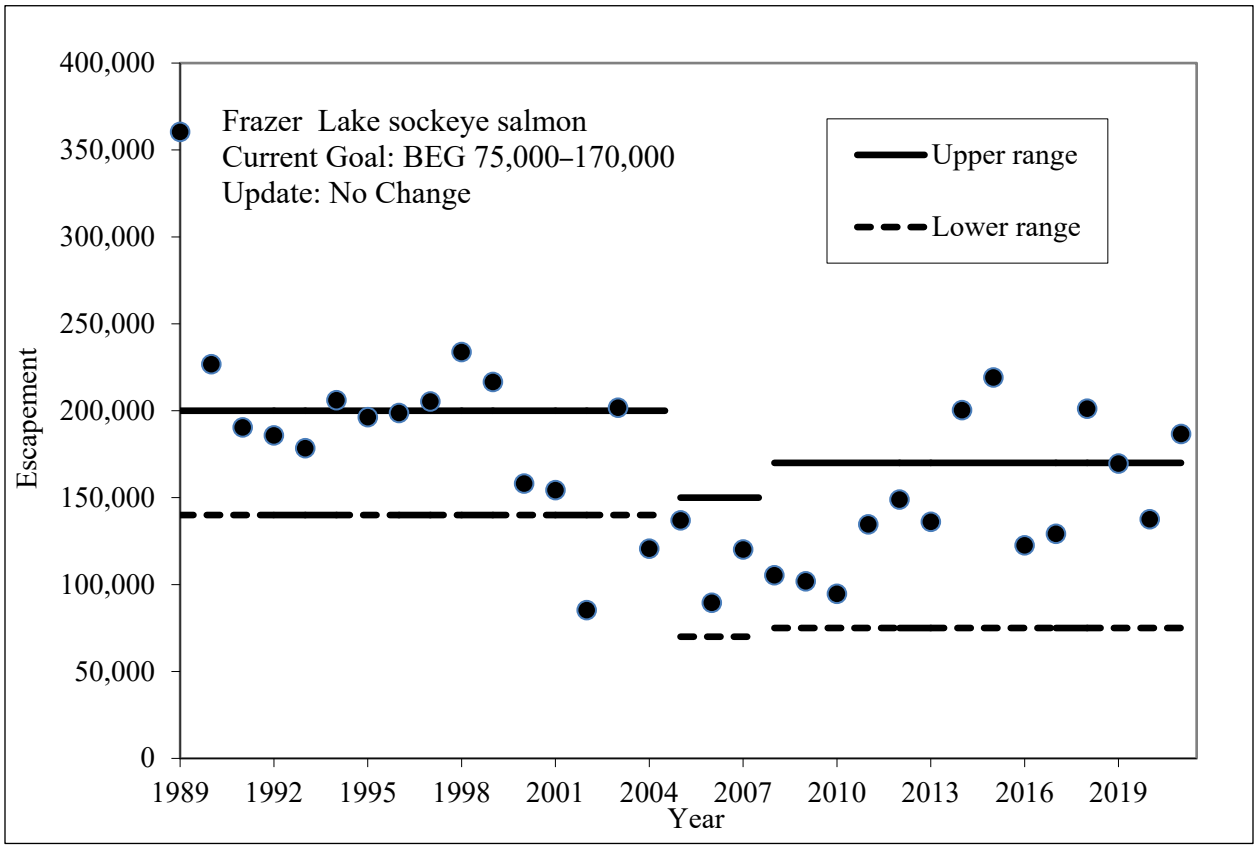
Stream location:	Kodiak Management Area; stream 257-403
Fishery:	Commercial, Subsistence, and Sport
Current escapement goal:	BEG: 75,000–170,000 (2008)
Updated escapement goal:	No change
Optimal escapement goal:	None
Inriver goal:	None
SOC status (type and year):	None
Escapement enumeration type	Weir
Data available:	
Counts:	Weir counts, 1956–2021
Age composition:	Escapement 1960s–2021; Harvest 1980s–2021
Stock specific harvest:	1974–2021.
Smolt information:	1989–2017
Limnology:	Limnology information 1985–1997 and 2001–2015. Frazer Lake was fertilized from 1988 to 1992 because of concerns about low escapement and poor smolt production.
Data contrast:	Weir data from 1989 through 2021: 4.2
Methodology:	Ricker spawner–recruit models (1966–2008; excluding 1985–1991), smolt biomass as a function of zooplankton biomass, and euphotic volume models.
Criteria for updated goal (Table 1)	None
Goal history:	1950s through the 1970s (175,000). 1981 (350,000–400,000) based upon rearing capacity and spawning habitat calculations. Lowered in 1986 (200,000–275,000). Lowered in 1988 (140,000–200,0000). 2004 decreased (70,000–150,000). The 2007 changed BEG (75,000–170,000). Reviewed in 2010, 2013, and 2016 with no change.
Comments:	The Frazer Lake sockeye run was established via transplant beginning in 1951. Construction of a fish pass to ascend the barrier falls was completed in 1962 and this run is now self-sustaining.

Appendix F2.–Frazer Lake sockeye salmon escapement and harvest estimates, 1956–2021.

Year	Weir counts	Run size	Year	Weir counts	Run size
1956	6	–	1989	360,373	1,070,871
1957	165	–	1990	226,707	979,833
1958	71	–	1991	190,358	1,268,145
1959	62	–	1992	185,825	418,773
1960	440	–	1993	178,391	751,405
1961	873	–	1994	206,071	650,045
1962	3,090	–	1995	196,323	952,377
1963	11,857	–	1996	198,695	700,913
1964	9,966	–	1997	205,264	416,419
1965	9,074	–	1998	233,755	606,343
1966	16,456	–	1999	216,565	357,079
1967	21,834	–	2000	158,044	394,705
1968	16,738	–	2001	154,349	403,372
1969	14,041	–	2002	85,317	110,225
1970	24,039	–	2003	201,679	313,914
1971	55,366	–	2004	120,664	712,251
1972	66,419	–	2005	136,948	625,937
1973	56,255	–	2006	89,516	117,900
1974	82,609	85,374	2007	120,186	168,571
1975	64,199	67,499	2008	105,363	520,603
1976	119,321	128,091	2009	101,845	474,976
1977	139,548	140,914	2010	94,680	165,112
1978	141,981	172,317	2011	134,642	372,422
1979	126,742	153,547	2012	148,884	372,047
1980	405,535	460,708	2013	136,059	271,230
1981	377,716	487,926	2014	200,296	426,265
1982	430,423	506,655	2015	219,093	437,169
1983	158,340	196,323	2016	122,585	244,327
1984	53,524	67,377	2017	129,227	216,401
1985	485,835	637,871	2018	201,161	321,832
1986	126,529	178,205	2019	169,627	416,606
1987	40,544	57,582	2020	137,570	258,155
1988	246,704	458,461	2021	186,632	429,669

Note: En dash = no data available.

Appendix F3.–Frazer Lake sockeye salmon escapement and escapement goals, 1989–2021.



Appendix F4.–Frazer Lake sockeye salmon brood table.

Brood year	Escap.	Age 0.2	1.1	0.3	1.2	2.1	1.3	2.2	3.1	1.4	2.3	3.2	4.1	2.4	4.2	3.3	8	Total return	R/S[a]
1976	119,321	0	2,150	0	223,444	8,753	73,677	257,625	0	0	143,383	0	0	0	0	393	0	709,424	5.9
1977	139,548	0	2,764	0	73,189	2,928	92,211	107,917	0	0	146,064	393	0	0	0	0	0	425,466	3.0
1978	141,981	0	7,807	0	162,130	507	24,148	22,970	0	0	16,844	0	0	0	0	638	0	235,043	1.7
1979	126,742	0	507	0	1,374	982	2,965	24,323	0	0	26,791	0	0	0	0	2,165	0	59,106	0.5
1980	405,535	0	0	0	6,064	16,305	7,654	589,393	0	0	141,065	684	0	46	0	52	0	761,264	1.9
1981	377,716	0	876	0	12,120	0	2,455	7,748	0	172	5,239	0	0	0	0	862	0	29,471	0.1
1982	430,423	0	1,276	0	23,647	431	28,624	3,735	24	754	10,870	10,812	0	0	0	0	0	80,172	0.2
1983	158,340	0	10	26	8,935	9,729	13,438	380,531	1,604	0	586,833	0	0	0	0	36,986	0	1,038,092	6.6
1984	53,524	0	1,001	0	5,771	33,628	7,437	386,832	0	0	67,142	2,046	0	0	0	0	0	503,856	9.4
1985	485,835	0	192	0	16,502	4,399	49,290	53,978	151	0	22,578	9,032	0	1,595	0	2,694	0	160,412	0.3
1986	126,529	1,393	67,475	0	727,658	40,794	230,893	972,290	0	0	168,815	9,129	0	0	0	8,584	0	2,227,031	17.6
1987	40,544	0	1,787	1,851	3,019	26,596	3,902	187,581	0	0	159,822	104	0	156	0	882	0	385,701	9.5
1988	246,704	0	1,886	0	21,073	7,793	30,096	210,586	133	0	64,565	20,510	0	16	0	7,994	0	364,652	1.5
1989	360,373	0	16,191	208	327,929	12,847	153,078	373,277	5,752	0	300,182	145,325	0	0	0	40,754	0	1,375,543	3.8
1990	226,707	0	1,096	0	18,217	12,986	33,393	400,750	1,678	0	210,744	15,341	0	455	0	9,340	0	704,000	3.1
1991	190,358	0	621	0	2,031	57,463	1,728	330,834	302	0	105,361	630	0	0	0	0	0	498,970	2.6
1992	185,825	0	3,545	0	20,513	78,168	27,471	211,959	4,666	0	185,148	18,141	0	0	0	2,209	0	551,819	3.0
1993	178,391	0	2,529	45	12,677	41,759	56,178	291,218	4,831	0	64,155	17,867	0	256	0	5,830	0	497,344	2.8
1994	206,071	0	2,056	0	23,034	17,688	39,741	112,849	1,048	0	77,546	15,427	0	187	0	15,733	0	305,309	1.5
1995	196,323	0	10,106	0	59,574	39,574	77,223	152,287	1,251	0	251,356	11,284	0	878	0	5,794	0	609,328	3.1
1996	198,695	0	20,062	0	41,983	22,276	81,667	32,786	26	1,670	54,175	109	92	211	0	201	0	255,258	1.3
1997	205,264	0	626	0	8,327	1,639	10,462	15,598	176	833	19,673	2,251	0	0	0	0	77	59,662	0.3
1998	233,755	0	367	0	1,450	18,943	14,884	128,297	12,803	0	58,315	89,184	0	362	0	33,767	0	358,372	1.5
1999	216,565	0	879	0	3,754	104,150	79	484,554	0	0	239,961	1,297	0	649	0	2,576	97	837,997	3.9
2000	158,044	0	26,856	0	69,457	10,097	218,891	105,837	0	721	79,631	435	0	678	316	309	514	513,742	3.3
2001	154,349	0	565	0	21,563	2,508	7,110	5,096	8,508	145	14,177	38,040	223	774	706	80,473	1,502	181,390	1.2
2002	85,317	0	1,675	0	6,801	5,173	6,216	34,309	8,528	0	44,275	35,650	0	416	0	29,093	198	172,334	2.0

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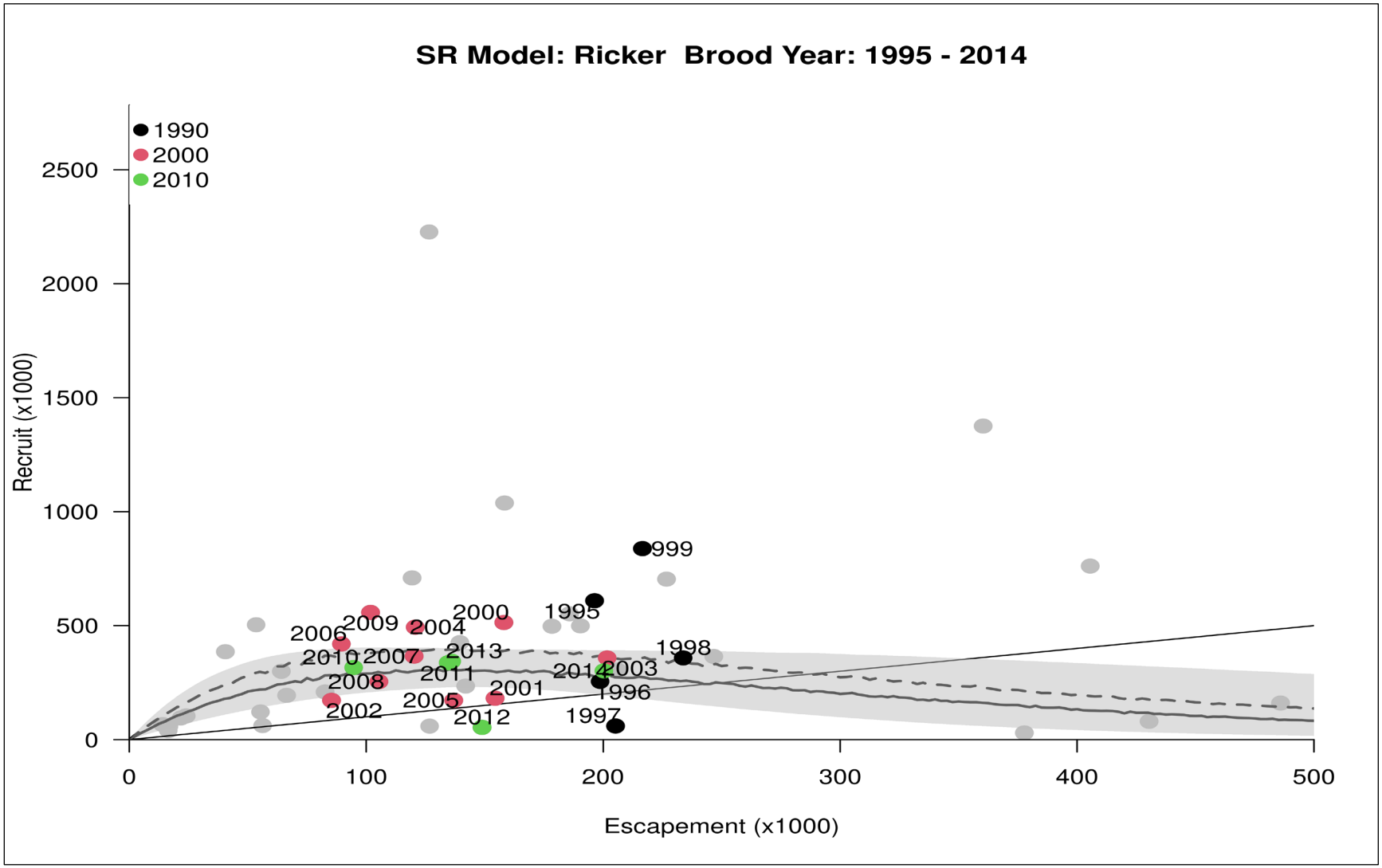
Appendix F4.–Page 2 of 2.

Brood year	Escap.	Age 0.2	1.1	0.3	1.2	2.1	1.3	2.2	3.1	1.4	2.3	3.2	4.1	2.4	4.2	3.3	8	Total return	R/S[a]
2003	201,679	0	1,201	0	9,899	44,359	16,348	169,365	3,430	0	81,123	31,296	0	184	0	1,236	0	358,440	1.8
2004	120,664	0	11,274	0	147,145	19,606	91,014	197,567	0	298	25,918	243	0	175	0	0	0	493,239	4.1
2005	136,948	0	2,318	0	34,034	8,824	43,136	36,815	5,935	435	36,735	3,222	89	339	0	500	0	172,382	1.3
2006	89,516	0	107	246	6,723	40,388	21,539	217,026	7,498	0	116,935	5,777	0	687	0	2,649	0	419,575	4.7
2007	120,186	0	3,793	661	13,301	67,117	21,050	171,111	0	0	87,987	576	0	454	0	0	0	366,050	3.0
2008	105,363	0	4,623	0	45,645	10,103	48,444	100,680	0	151	44,642	0	0	0	0	277	0	254,565	2.4
2009	101,845	495	93	0	10,784	17,550	16,452	322,752	860	0	174,311	12,255	0	108	0	2,143	0	557,803	5.5
2010	94,680	0	1,873	0	13,154	26,967	23,316	160,354	2,047	0	80,454	5,076	0	0	0	2,782	0	316,023	3.3
2011	134,642	0	832	0	8,207	55,889	6,723	142,675	161	0	121,157	843	0	648	0	0	0	337,135	2.5
2012	148,884	513	388	0	1,296	3,255	1,089	38,025	475	0	6,228	2,775	0	0	0	0	0	53,656	0.4
2013	136,059	0	2,435	0	19,533	28,978	7,887	193,903	2,901	0	82,015	5,280	0	42	0	749	0	343,724	2.5
2014	200,296	0	3,520	0	41,048	33,946	28,337	158,548	0	0	35,691	391	0	0	0	0	–	–	–
2015	219,093	0	32,496	0	66,627	13,720	59,984	19,083	0	0	17,166	0	0	–	–	–	–	–	–
2016	122,585	0	62,078	0	94,230	37,748	86,465	158,639	437	–	–	–	–	–	–	–	–	–	–
2017	129,227	0	10,238	795	66,293	92,706	–	–	–	–	–	–	–	–	–	–	–	–	–
2018	201,161	301	6,869	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2019	169,627	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2020	181,384	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2021	186,632	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

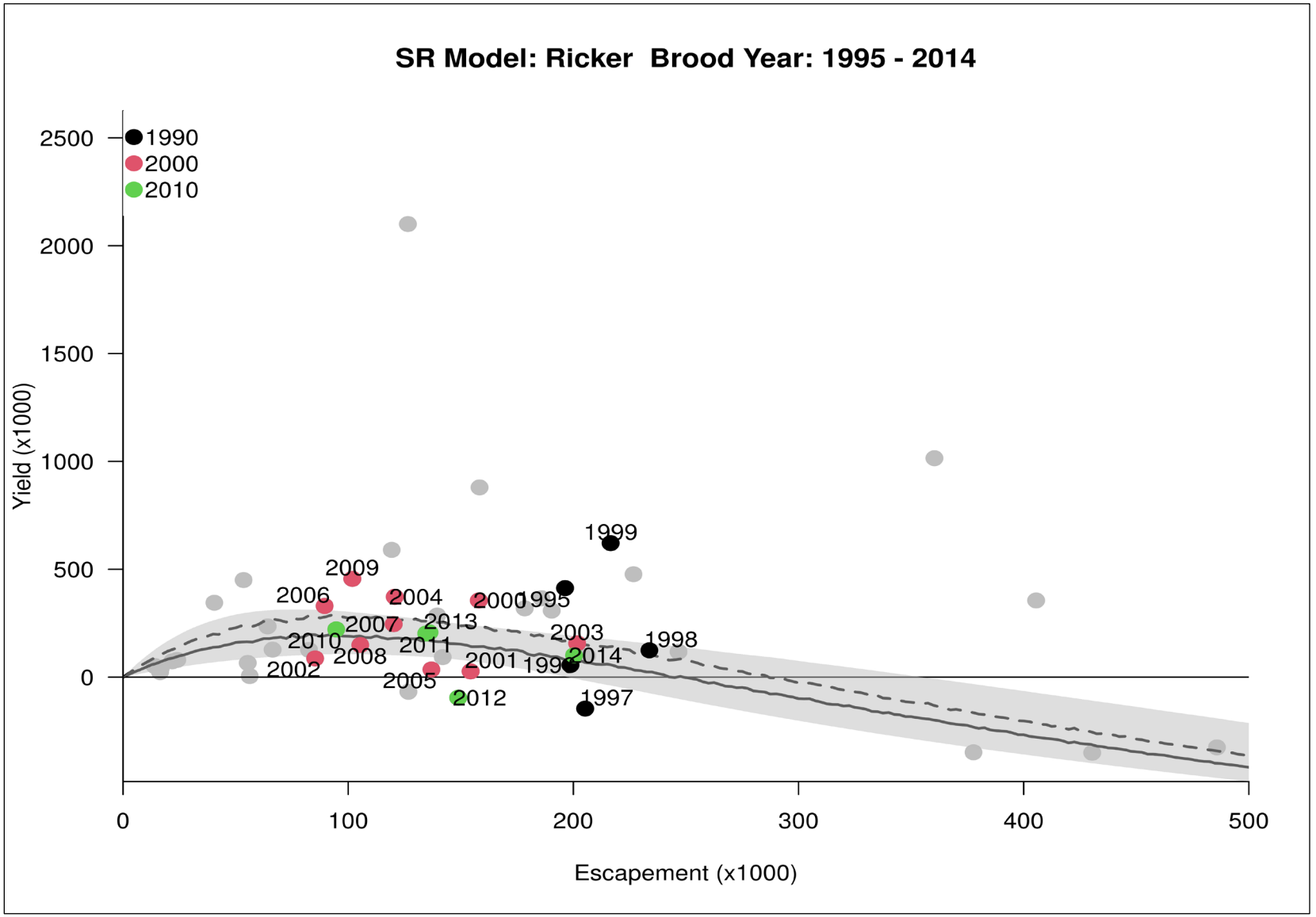
Note: Shaded years (1985–1995) were not included in spawner–recruit analysis due to influence from fertilization. En dash = no data available.

[a] R/S = return/spawner.

Appendix F5.–Ricker spawner–recruit function (solid line: mean; dash: median) fitted to Frazer Lake sockeye salmon data, 1995–2014 brood years. Gray shade indicates 90% Bayesian credible interval.



Appendix F6.–Ricker spawner–recruit yield curve (solid line: mean; dash: median) for Frazer Lake sockeye salmon 1995 –2014 brood years. Gray shade indicates 90% Bayesian credible interval.



APPENDIX G: SUPPORTING INFORMATION FOR ESCAPEMENT GOALS FOR KARLUK LAKE SOCKEYE SALMON

Appendix G1.–Description of stock and escapement goals for Karluk Lake sockeye salmon.

Stream location:	Kodiak Management Area; stream 255-101
Fishery:	Commercial, Subsistence, and Sport
Current escapement goal:	Early-run BEG: 150,000–250,000 (2017) Late-run BEG: 200,000–450,000 (2017)
Updated escapement goal:	No change
Optimal escapement goal:	None
Inriver goal:	None
SOC status (type and year):	None
Escapement enumeration type	Weir
Data available:	
Counts:	Weir counts 1981–2021
Age composition:	Escapement 1924–2021 sporadic; harvest 1985–2021
Stock specific harvest:	Standardized from 1985–2021
Smolt information:	1961–68, 1980–84, 1991–92, 1999–2006, and 2011–2014
Limnology:	1981–2015; 2021
Data contrast:	Weir data 1981–2015: early (8.6), late (19.9).
Methodology:	Ricker spawner–recruit (AR1)
Criteria for updated goal (Table 1)	None
Goal history:	Monthly goals for Karluk Lake in place from 1976–1987. Early run and late run goals established in 1988 (early:250,000–350,000; late: 310,000–550,000). In 1992, modified to BEGs of 150,000–250,000 (early) and 400,000–550,000 (late). In 2004, goals were lowered to 100,000–210,000 (early) and 170,000–380,000 (late). In 2008 the early goal was increased to 110,000–250,000. Last modification occurred in 2017.
Comments:	Karluk lake was enhanced with nutrient fertilizer from 1986 to 1990. Sockeye salmon fry back stocked in Upper Thumb River, 1979–1987.

Appendix G2.–Karluk Lake early-run sockeye salmon escapement, 1981–2021.

Year	Weir counts	Commercial harvest
1981	97,937	–
1982	122,705	–
1983	215,620	–
1984	288,422	–
1985	316,688	28,326
1986	358,756	116,191
1987	354,094	77,156
1988	296,510	35,236
1989	349,753	2
1990	196,197	32,021
1991	243,069	28,135
1992	217,152	245,012
1993	261,169	308,579
1994	260,771	188,452
1995	238,079	283,333
1996	250,357	509,874
1997	252,859	134,480
1998	252,298	116,473
1999	392,419	182,577
2000	291,351	266,485
2001	338,799	303,664
2002	456,842	167,038
2003	451,856	372,761
2004	393,468	396,088
2005	283,860	245,800
2006	202,366	272,537
2007	294,740	198,354
2008	82,191	70,751
2009	52,798	16,054
2010	71,453	9,908
2011	87,049	6,805
2012	188,085	47,801
2013	234,880	210,699
2014	252,097	176,323
2015	260,758	124,983
2016	173,874	41,884
2017	242,599	189,056
2018	205,054	42,474
2019	190,168	52,593
2020	158,846	22,200
2021	131,775	6,920

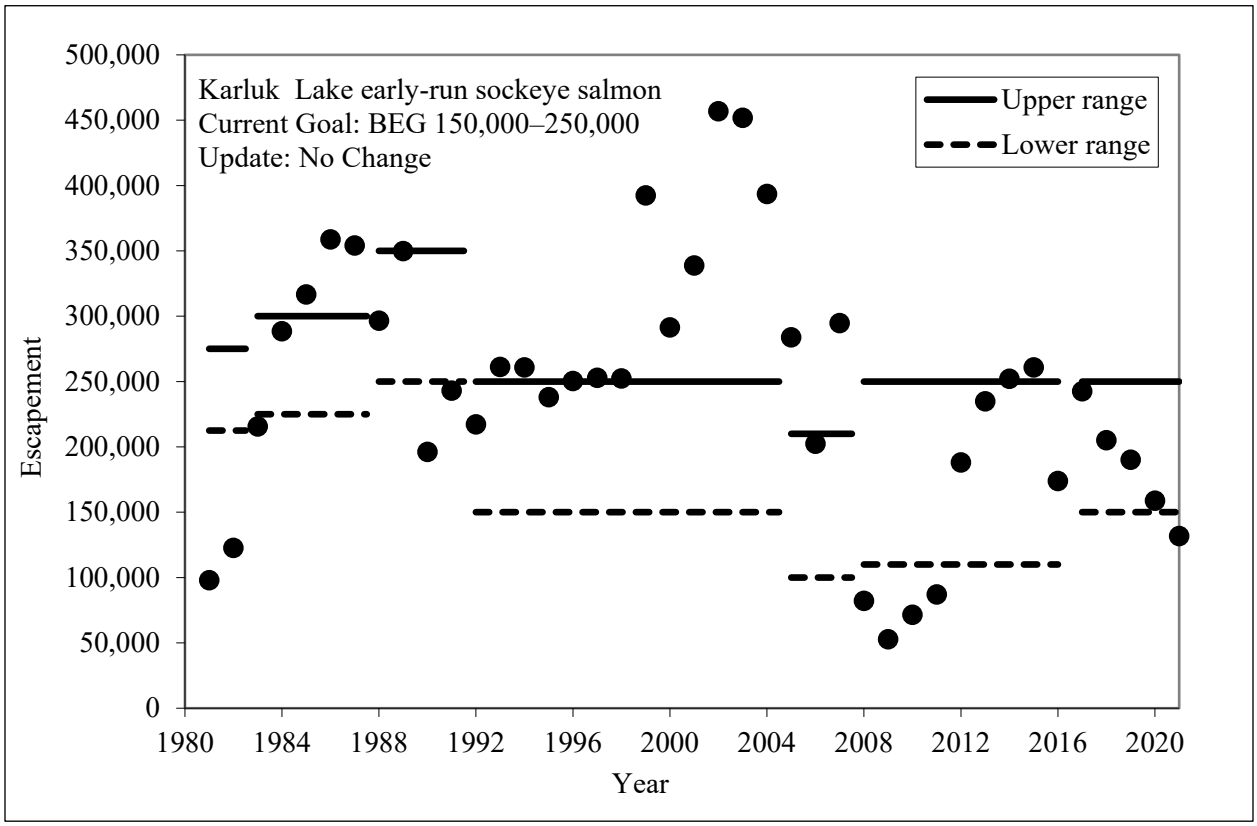
Note: En dash = no data available.

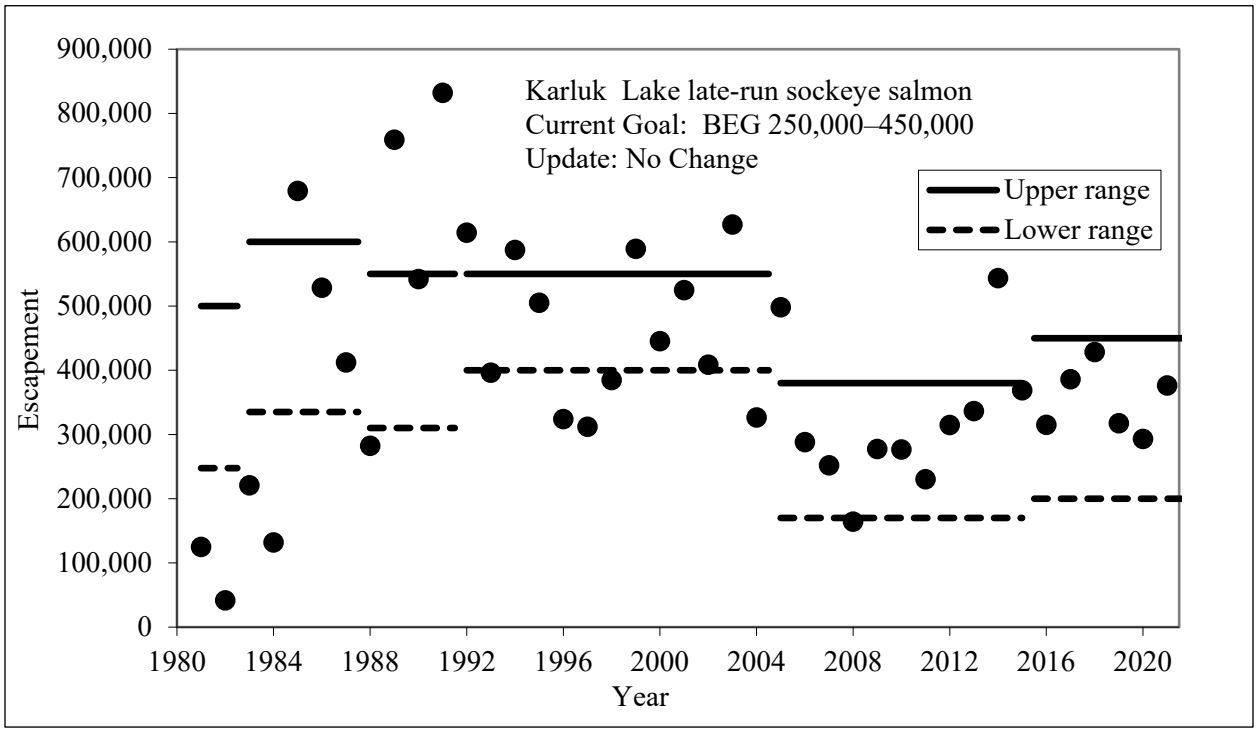
Appendix G3.–Karluk Lake late-run sockeye salmon escapement, 1981–2021.

Year	Weir counts	Commercial harvest
1981	124,769	–
1982	41,702	–
1983	220,795	–
1984	131,846	–
1985	679,260	168,328
1986	528,415	297,042
1987	412,157	170,019
1988	282,306	127,721
1989	758,893	3,476
1990	541,891	990,660
1991	831,970	1,097,830
1992	614,262	442,692
1993	396,288	235,361
1994	587,258	106,325
1995	504,977	361,535
1996	323,969	187,717
1997	311,902	127,114
1998	384,848	302,166
1999	589,119	414,885
2000	445,393	211,546
2001	524,739	347,790
2002	408,734	457,285
2003	626,854	965,484
2004	326,466	332,464
2005	498,102	423,573
2006	288,007	282,441
2007	251,835	469,775
2008	164,299	130,587
2009	277,280	52,503
2010	276,649	39,348
2011	230,273	34,995
2012	314,605	275,192
2013	336,479	416,935
2014	543,469	744,893
2015	368,896	472,761
2016	314,935	461,650
2017	385,896	643,431
2018	428,225	658,372
2019	317,381	419,775
2020	293,147	422,424
2021	376,209	394,380

Note: En dash = no data available.

Appendix G4.–Karluk Lake sockeye salmon escapement and escapement goal ranges, 1981–2021.





Appendix G5.–Karluk Lake early-run sockeye salmon brood table.

Brood year	Escap.	Ages 0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	3.1	1.4	2.3	3.2	4.1	2.4	3.3	4.2	2.5	3.4	4.3	4.4	Total return	R/S[a]
1976	204,037	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	–	–
1977	185,312	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	0	0	0	–	–
1978	248,741	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	10,989	0	0	0	0	0	10,989	–
1979	212,872	–	–	–	–	–	–	–	–	–	–	0	50,484	45,654	0	641	14,673	0	0	0	0	0	111,453	–
1980	132,396	–	–	–	–	–	–	0	11,635	193,760	4,085	0	103,899	60,395	0	0	37,689	0	0	0	0	0	411,464	–
1981	97,937	–	–	–	0	8,558	18,604	0	3,735	278,831	1,672	0	117,158	38,129	0	272	22,433	0	0	0	0	0	489,391	5.0
1982	122,705	0	0	1,244	841	4,650	5,466	0	21,058	197,293	4,169	0	93,560	37,079	0	0	20,728	0	0	0	0	320	386,408	3.1
1983	215,620	0	0	143	564	8,159	7,032	0	14,244	149,947	1,728	0	183,829	33,945	0	337	14,082	0	0	0	0	0	414,009	1.9
1984	288,422	0	0	0	0	4,090	8,393	0	5,830	97,537	738	0	94,258	30,589	0	908	19,634	0	0	0	0	0	261,977	0.9
1985	316,688	0	0	0	24	4,258	2,842	0	3,969	72,857	3,010	0	88,599	57,934	0	1,955	40,331	0	0	38	30	0	275,847	0.9
1986	358,756	0	24	0	337	6,152	2,201	346	6,443	87,691	4,031	94	129,381	131,218	0	479	61,223	1,508	0	235	113	0	431,475	1.2
1987	354,094	0	427	0	1,456	958	2,884	0	8,503	114,504	19,876	416	44,051	337,905	0	285	60,244	2,309	0	690	1,969	0	596,477	1.7
1988	296,510	0	0	0	0	8,383	6,297	0	9,708	84,322	13,770	0	37,096	202,729	0	320	70,357	231	0	39	2,906	0	436,159	1.5
1989	349,753	0	0	1,621	0	8,492	7,624	0	13,979	104,564	5,517	0	167,751	101,296	0	1	69,709	5,362	0	0	1,713	0	487,630	1.4
1990	196,197	0	0	181	0	18,149	2,780	0	50,649	79,156	6,586	652	146,751	97,063	0	269	70,863	760	0	0	0	0	473,858	2.4
1991	243,069	0	0	1,224	1,062	26,661	12,015	0	83,430	326,422	7,087	0	127,809	81,364	809	107	12,113	2,476	0	0	247	0	682,826	2.8
1992	217,152	0	0	2,669	4	9,627	9,642	0	13,159	52,730	14,935	0	42,891	58,375	0	769	36,603	0	0	79	0	0	241,483	1.1
1993	261,169	0	2	1,534	350	3,309	18,252	0	7,718	226,377	2,275	0	128,158	35,029	0	1,752	42,563	437	0	288	0	0	468,044	1.8
1994	260,771	0	0	1,017	0	8,956	7,266	0	41,179	294,780	1,857	427	182,133	54,148	0	587	33,887	1,781	0	1,042	0	0	629,059	2.4
1995	238,079	0	0	218	0	23,268	13,106	0	33,004	231,809	3,463	0	245,934	83,559	0	1,405	52,470	835	0	492	0	0	689,562	2.9
1996	250,357	0	0	0	0	2,063	5,959	0	2,217	253,847	2,326	0	215,129	84,029	0	61	42,035	0	0	1,461	114	0	609,241	2.4
1997	252,859	0	0	0	1,838	3,930	11,696	0	6,691	233,964	3,274	0	131,879	63,748	0	0	24,066	0	0	0	0	0	481,086	1.9
1998	252,298	0	0	574	0	4,258	19,885	0	5,410	531,206	4,517	532	168,024	104,530	715	0	14,578	0	0	0	0	0	854,229	3.4
1999	392,419	0	0	898	0	15,382	28,948	0	33,620	432,204	10,393	76	192,314	80,270	0	0	48,461	0	0	116	0	0	842,682	2.1
2000	291,351	0	0	939	0	9,611	4,286	0	3,393	223,141	6,013	129	109,252	78,082	0	483	74,506	523	0	1,561	0	0	511,919	1.8
2001	338,799	0	0	0	0	3,223	6,573	0	1,102	216,151	5,644	0	274,770	51,394	0	3,144	42,585	425	59	771	65	0	605,906	1.8
2002	456,842	0	0	78	0	4,894	11,188	0	7,592	69,773	1,251	99	59,363	12,086	0	698	4,882	0	0	0	0	0	171,904	0.4
2003	451,856	0	0	0	286	2,237	9,403	0	1,150	30,926	638	49	15,852	15,878	621	1	1,494	686	0	0	128	0	79,349	0.2

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Appendix G5.–Page 2 of 2.

Brood year	Escap.	Ages																					Total return	R/S[a]
		0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	3.1	1.4	2.3	3.2	4.1	2.4	3.3	4.2	2.5	3.4	4.3	4.4		
2004	393,468	0	760	0	99	196	390	0	946	17,044	4,700	0	5,120	32,065	0	0	10,449	101	0	21	0	0	71,891	0.2
2005	283,860	0	0	279	0	6,029	1,257	0	2,506	14,088	4,245	0	7,754	16,806	176	0	871	0	0	0	0	0	54,010	0.2
2006	202,366	0	0	0	23	15,167	5,207	0	4,056	27,614	6,532	0	13,395	8,786	0	0	1,027	0	0	0	0	0	81,807	0.4
2007	294,740	0	0	759	20	3,832	16,049	0	10,030	175,426	1,589	21	158,348	9,584	0	700	5,643	0	0	0	0	0	382,002	1.3
2008	82,191	0	0	338	0	15,219	10,309	102	44,996	184,375	2,182	137	145,950	9,675	0	63	1,599	0	0	0	0	0	414,946	5.0
2009	52,798	0	0	240	8	20,084	22,414	0	7,071	186,660	978	0	27,530	2,048	0	0	1	0	0	0	0	0	267,035	5.1
2010	71,453	0	0	2,288	0	28,315	41,549	0	23,538	276,983	1,242	0	18,647	3,700	0	33	447	0	0	0	0	0	396,743	5.6
2011	87,049	148	184	1,556	0	23,576	28,230	0	9,274	129,421	1,155	494	46,345	805	0	49	251	0	0	0	0	0	241,489	2.8
2012	188,085	0	0	932	0	28,938	23,415	280	58,091	266,861	2,089	49	29,594	1,714	0	0	410	0	0	0	0	0	412,374	2.2
2013	234,880	0	0	1,208	2,883	30,722	21,558	0	6,425	187,432	1,984	0	96,900	8,260	0	0	406	0	0	0	0	–	357,366	1.5
2014	252,097	0	362	605	49	8,380	8,919	0	3,382	87,325	492	0	13,910	1,482	0	0	66	0	–	–	–	–	124,973	0.5
2015	260,758	80	1,165	1,516	3,042	20,573	22,131	0	6,718	137,085	1,819	0	36,245	3,714	0	–	–	–	–	–	–	–	–	–
2016	173,874	0	136	110	0	6,742	11,439	0	3,588	63,431	834	–	–	–	–	–	–	–	–	–	–	–	–	–
2017	242,599	0	0	1,031	0	8,307	22,470	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2018	205,054	0	0	42	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2019	190,168	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2020	158,846	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2021	131,775	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Note: En dash = no data available.

[a] R/S = return/spawner.

Appendix G6.–Karluk Lake late-run sockeye salmon brood table.

Brood year	Escap.	Ages 0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	3.1	1.4	2.3	3.2	4.1	2.4	3.3	4.2	2.5	3.4	4.3	4.4	Total return	R/S[a]
1976	319,459	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	–	–
1977	366,936	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	0	0	0	0	–
1978	112,194	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	6,728	0	0	0	0	0	6,728	–
1979	248,908	–	–	–	–	–	–	–	–	–	–	0	54,171	167,426	0	0	85,143	0	0	0	0	0	306,739	–
1980	14,227	–	–	–	–	–	–	0	446	596,053	4,476	0	156,074	177,587	0	1,190	25,537	0	0	0	0	0	961,363	–
1981	124,769	–	–	–	0	5,158	13,129	0	0	402,872	2,521	0	187,293	49,557	0	0	14,077	0	0	0	0	0	674,607	–
1982	41,702	–	0	0	0	0	1,261	0	5,239	290,631	606	0	110,997	34,711	0	0	19,631	0	0	0	0	0	463,075	–
1983	220,795	0	0	0	4,079	4,160	12,830	0	480	241,803	1,268	31	213,452	42,156	0	2,070	47,370	0	0	0	0	0	569,699	2.6
1984	131,846	0	885	0	0	445	6,246	0	30,516	424,123	0	937	303,542	271,018	0	471	71,764	651	0	0	0	0	1,110,598	8.4
1985	679,260	169	0	0	1,084	30,165	212	189	60,235	784,914	494	595	493,743	421,972	0	462	43,998	0	0	42	0	0	1,838,274	2.7
1986	528,415	0	893	0	15,519	39,109	978	105	57,974	835,214	1,162	0	114,862	655,219	0	563	60,240	325	0	147	1,623	0	1,783,933	3.4
1987	412,157	106	5,976	201	17,067	24,703	1,737	0	550	226,552	2,373	0	23,389	320,723	0	79	54,451	1,600	0	0	0	0	679,507	1.6
1988	282,306	0	2,531	111	2,424	4,649	1,512	0	3,127	189,196	7,249	0	71,078	212,649	0	0	16,740	0	0	0	9	0	511,274	1.8
1989	758,893	0	3,555	799	3,717	5,909	12,607	0	3,302	308,439	6,233	0	151,212	214,110	0	0	12,030	950	0	0	0	0	722,863	1.0
1990	541,891	0	3,591	971	6,292	16,995	3,241	0	10,310	447,371	1,085	18	52,479	80,226	0	591	62,392	1,095	0	0	64	0	686,721	1.3
1991	831,970	0	7,113	340	2,879	16,292	3,023	0	8,568	340,535	4,731	52	191,311	85,334	0	952	13,107	659	0	111	0	0	675,007	0.8
1992	614,262	0	1,567	1,923	0	3,880	6,759	0	12,234	57,188	5,043	0	76,196	138,987	0	513	28,379	0	0	0	0	0	332,669	0.5
1993	396,288	0	0	1,501	2,860	3,550	17,168	0	11,541	412,758	1,362	36	202,913	75,591	0	0	23,523	0	0	0	0	0	752,802	1.9
1994	587,258	0	0	198	1,192	24,718	4,323	0	17,261	616,350	1,008	0	159,094	109,890	0	551	41,274	821	0	128	0	0	976,808	1.7
1995	504,977	0	1,156	0	3,219	48,766	8,685	0	1,839	353,857	5,252	0	390,880	129,216	0	424	28,253	405	0	284	1,384	0	973,619	1.9
1996	323,969	0	540	633	0	2,970	108	0	469	283,071	2,817	0	149,445	139,820	0	0	83,431	0	0	0	934	0	664,238	2.1
1997	311,902	0	0	407	0	1,473	21,821	0	291	494,043	18,682	0	268,631	235,707	0	0	12,330	0	0	421	0	0	1,053,807	3.4
1998	384,848	0	0	136	0	586	33,787	1,399	2,716	923,141	8,407	0	78,063	143,454	0	0	12,558	0	0	0	284	0	1,204,530	3.1
1999	589,119	0	0	0	0	25,117	41,401	0	7,645	403,399	3,410	85	154,603	210,642	0	0	65,446	0	0	208	94	0	912,050	1.5
2000	445,393	155	669	51	3,376	6,049	270	0	1,126	531,303	2,955	0	292,380	55,025	0	2,875	100,967	1,046	0	4,014	0	10	1,002,271	2.3
2001	524,739	0	0	0	0	2,543	5,375	0	2,611	132,216	3,786	0	305,575	113,907	0	13,374	38,224	0	21	231	10	0	617,873	1.2
2002	408,734	0	0	62	2,790	3,319	12,383	0	6,844	183,353	672	361	161,086	25,895	0	9	14,881	99	0	0	528	0	412,282	1.0
2003	626,854	0	0	208	1,750	2,494	1,544	0	1,887	41,395	2,247	0	15,635	269,401	348	0	5,707	10,460	0	0	1,746	0	354,822	0.6
2004	326,466	0	277	5	301	1,998	510	0	543	15,162	10,973	0	7,084	223,546	0	0	8,868	2,084	0	0	0	0	271,352	0.8
2005	498,102	0	3,532	63	0	423	2,022	0	544	63,514	768	0	20,543	72,929	0	0	3,929	0	0	0	0	0	168,266	0.3

-continued-

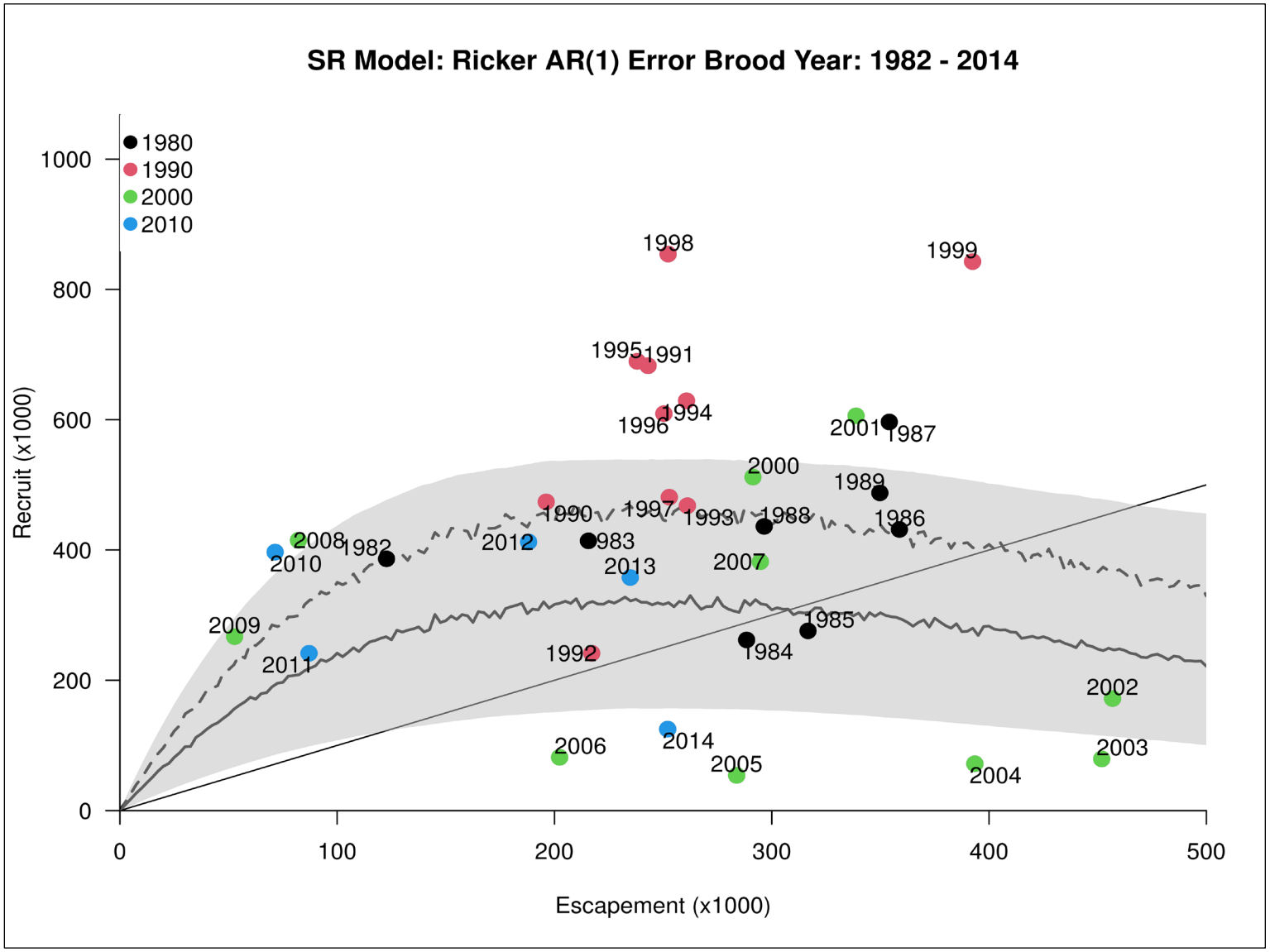
Appendix G6.–Page 2 of 2.

Brood year	Escap.	Ages 0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	3.1	1.4	2.3	3.2	4.1	2.4	3.3	4.2	2.5	3.4	4.3	4.4	Total return	R/S[a]
2006	288,007	0	0	15	0	1,734	2,029	0	1,553	123,394	11,965	34	38,311	73,030	0	59	7,613	0	0	0	0	0	259,736	0.9
2007	251,835	0	0	81	2,235	3,207	18,490	0	6,173	452,112	217	0	183,111	64,437	0	901	9,435	0	0	0	0	0	740,399	2.9
2008	164,299	0	0	0	34	8,620	6,489	0	5,738	464,655	508	159	215,642	60,733	0	154	5,958	0	0	0	0.0	0	768,690	4.7
2009	277,280	0	501	349	7	14,742	11,322	0	7,407	921,554	6,778	0	51,167	74,985	0	0	1,009	0	0	0	0	0	1,089,820	3.9
2010	276,649	0	203	1,020	0	34,359	28,966	0	44,158	578,076	2,578	0	29,006	22,456	0	0	8,443	0	0	0	0	0	749,264	2.7
2011	230,273	0	0	2,428	0	35,700	48,035	0	17,984	645,806	1,551	1,276	259,900	19,783	0	223	687	0	0	0	0		1,033,374	4.5
2012	314,605	0	0	846	77	35,769	21,225	0	67,635	555,033	2,524	619	48,225	55,909	0	0	6,469	0	–	–	–	–	794,321	2.5
2013	336,479	0	129	1,571	7,261	53,487	47,821	0	13,851	889,228	3,421	0	152,903	58,385	0	0	6,886	0	–	–	–	–	1,227,712	3.7
2014	543,469	0	3,217	2,948	47	59,007	9,674	0	13,088	411,714	0	0	148,917	23,625	0	0	4,152	0	–	–	–	–	–	–
2015	368,896	0	3,889	1,818	19,776	53,276	18,952	0	27,127	440,615	4,150	0	192,243	39,281	0	–	–		–	–	–	–	–	–
2016	314,935	0	850	1,743	0	18,294	9,593	0	16,496	413,210	178	–	–	–	–	–	–		–	–	–	–	–	–
2017	385,896	0	1,990	143	26,948	47,063	25,933	–	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–
2018	428,225	0	2,831	2,138	–	–	–	–	–	–	–	–	–	–	–	–	–		–	–	–	–	–	–
2019	317,381	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2020	293,147	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2021	376,209	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

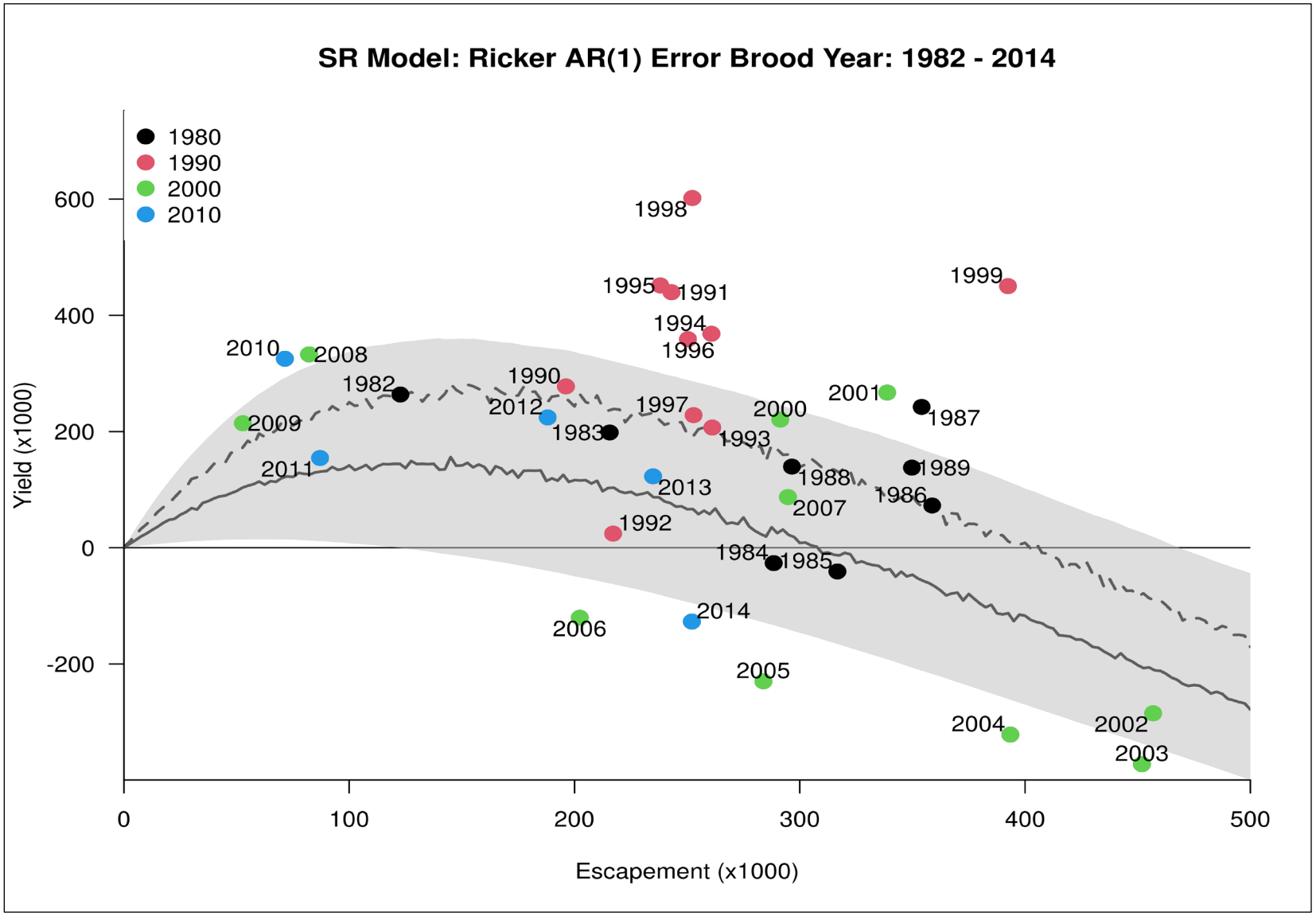
Note: En dash = no data available.

[a] R/S = return/spawner.

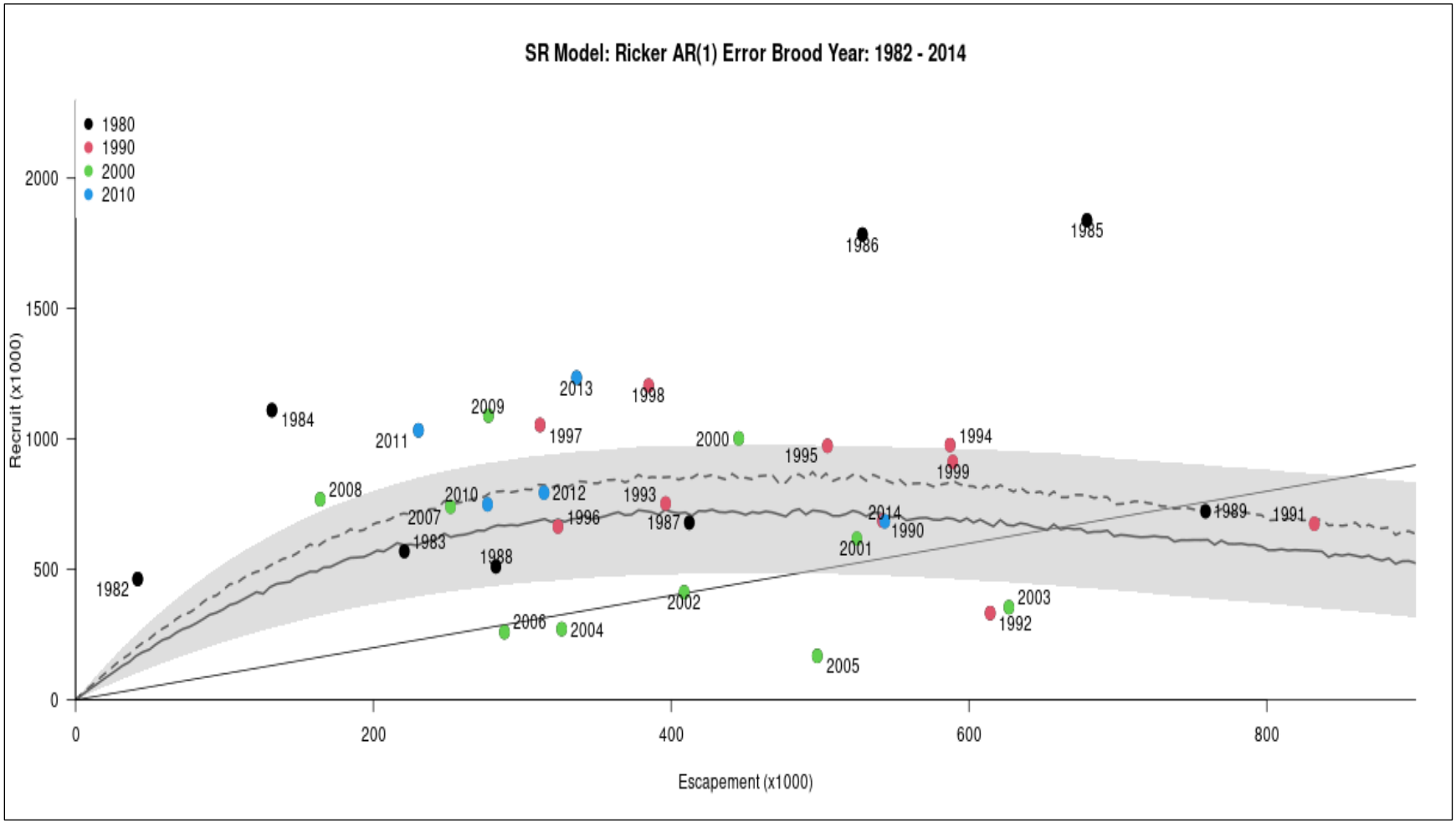
Appendix G7.–Ricker spawner–recruit function (solid line: mean; dash: median) fitted to Karluk Lake early-run sockeye salmon data, 1982–2014 brood years. Gray shade indicates 90% Bayesian credible interval.



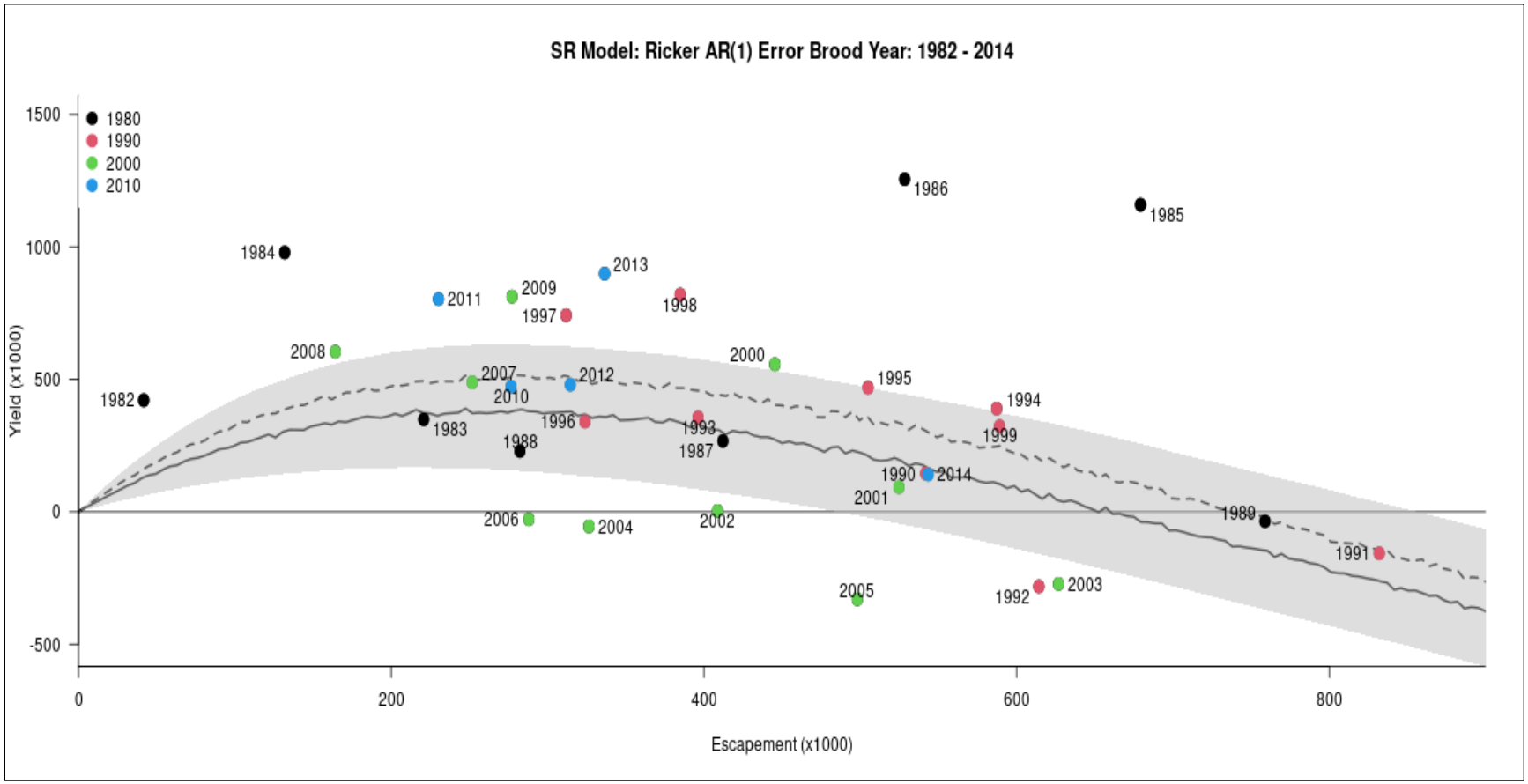
Appendix G8.–Ricker spawner–recruit yield curve (solid line: mean; dash: median) for Karluk Lake early-run sockeye salmon 1982–2014 brood years. Gray shade indicates 90% Bayesian credible interval.



Appendix G9.–Ricker spawner–recruit function (solid line: mean; dash: median) fitted to Karluk Lake late-run sockeye salmon data, 1982–2014 brood years. Gray shade indicates 90% Bayesian credible interval.



Appendix G10.–Ricker spawner–recruit yield curve (solid line: mean; dash: median) for Karluk Lake late-run sockeye salmon 1982–2014 brood years. Gray shade indicates 90% Bayesian credible interval.



APPENDIX H: SUPPORTING INFORMATION FOR ESCAPEMENT GOALS FOR MALINA CREEK SOCKEYE SALMON

Appendix H1.–Description of stock and escapement goal for Malina Creek sockeye salmon.

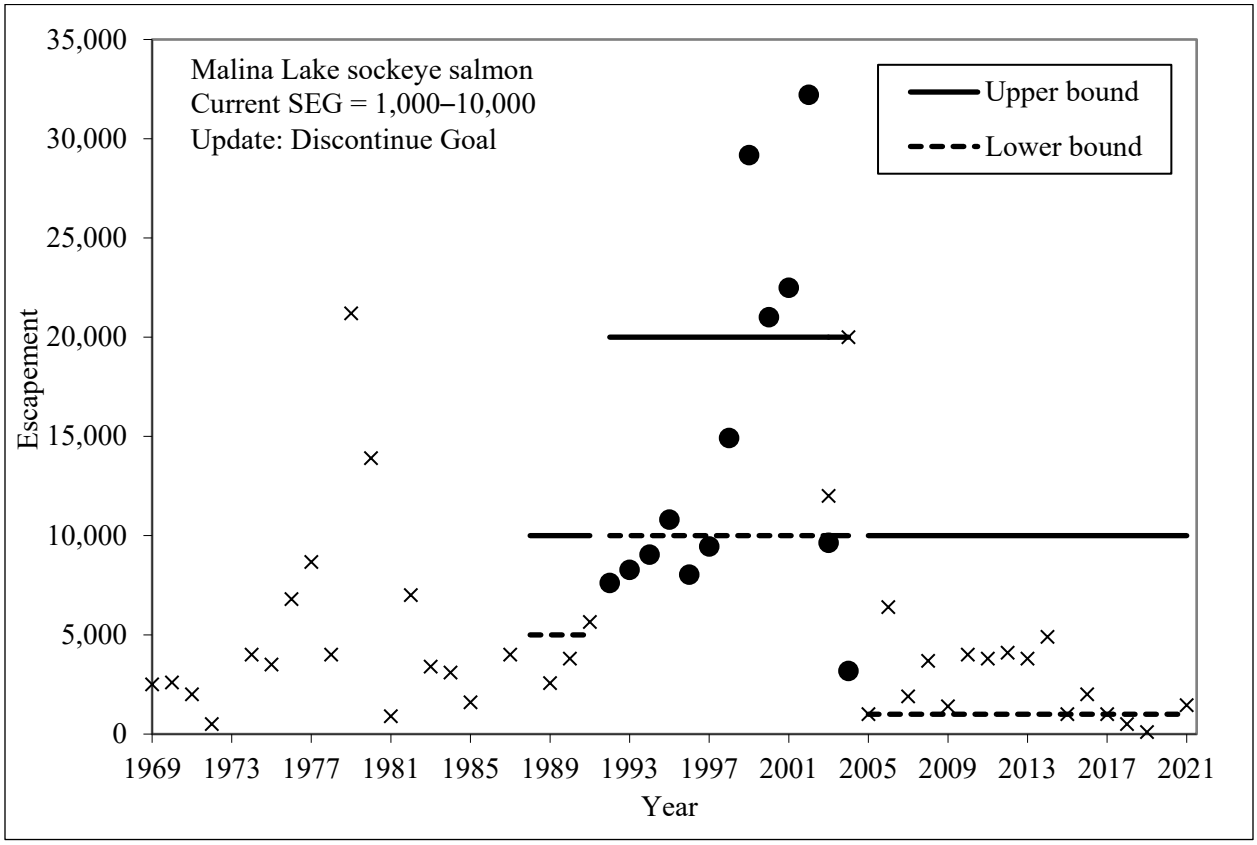
Stream location:	Kodiak Management Area; stream 251-105
Fishery:	Subsistence and Sport
Current escapement goal:	SEG: 1,000 to 10,000 (2005)
Updated escapement goal:	Discontinue goal
Optimal escapement goal:	None
Inriver goal:	None
SOC status (type and year):	None
Escapement enumeration type	Aerial Survey, Weir
Data available:	
Counts:	Peak aerial surveys: 1968–1991, 2003–2021; Weir: 1992–2005
Age composition:	Escapement 1990–2005
Stock specific harvest:	None
Smolt information:	1991–2005
Limnology:	Limnology data from 1989 to 2023
Data contrast:	Peak aerial surveys: 212.0 Weir data: 10.1
Methodology:	Percentile (15th–75th), euphotic volume analysis, spawning habitat, smolt biomass as a function of zooplankton biomass.
Criteria for updated goal (See Table 1)	3 - No directed fishery.
Goal history:	First SEG 1988 (5,000–10,000). Revised 1992 (10,000–20,000) in 1992. Reduced 2004 (1,000–10,000). Reviewed with no change in 2007, 2010, 2013, and 2016.
Comments:	Lake was stocked with indigenous juvenile sockeye salmon from 1992 to 1999 and fertilized from 1991 to 2001. Historical terminal harvest fishery is no longer fished.

Appendix H2.–Malina Creek sockeye salmon escapement, 1968–2021.

Year	Peak aerial survey	Weir counts	Year	Peak aerial survey	Weir counts
1968	0	–	1995	–	10,803
1969	2,500	–	1996	–	8,030
1970	2,600	–	1997	–	9,455
1971	2,000	–	1998	–	14,917
1972	500	–	1999	–	29,171
1973	0	–	2000	–	21,006
1974	4,000	–	2001	–	22,490
1975	3,500	–	2002	–	32,214
1976	6,800	–	2003	12,000	9,636
1977	8,667	–	2004	20,000	3,180
1978	4,000	–	2005	1,000	–
1979	21,200	–	2006	6,400	–
1980	13,900	–	2007	1,900	–
1981	900	–	2008	3,690	–
1982	7,000	–	2009	1,400	–
1983	3,400	–	2010	4,000	–
1984	3,100	–	2011	3,800	–
1985	1,600	–	2012	4,100	–
1986	0	–	2013	3,800	–
1987	4,000	–	2014	4,900	–
1988	0	–	2015	1,000	–
1989	2,570	–	2016	2,000	–
1990	3,800	–	2017	1,000	–
1991	5,650	–	2018	500	–
1992	–	7,610	2019	100	–
1993	–	8,273	2020	–	–
1994	–	9,042	2021	1,450	–

Note: En dash = no data available.

Observed escapement by year (Xs for aerial surveys, solid circles for weir counts) and SEG.



APPENDIX I: SUPPORTING INFORMATION FOR ESCAPEMENT GOALS FOR PASAGSHAK RIVER SOCKEYE SALMON

Appendix I1.–Description of stock and escapement goal for Pasagshak River sockeye salmon.

Stream location:	Kodiak Management Area; stream 259-411
Fishery:	Subsistence and Sport
Current escapement goal:	Lower bound SEG: 3,000 (2011)
Updated escapement goal:	Weir-based SEG (2,000–8,000)
Optimal escapement goal:	None
Inriver goal:	None
SOC status (type and year):	None
Escapement enumeration type	Aerial Survey, Weir
Data available:	
Counts:	Fixed-wing peak aerial survey (PAS) escapement index counts for 1968–2015; weir installed in 2011–2015. Weir counts, 2011–2021
Age composition:	Escapement (2011–2021)
Stock specific harvest:	Subsistence harvest estimated annually since 1993 from permit returns. Inriver sport harvests estimated annually since 1977 through the Statewide Harvest Survey. No stock-specific harvest information for commercial fisheries, though total annual catch data are available from Pasagshak Bay (statistical area 259-43)
Smolt information:	None
Limnology:	Lake Rose Teed: 1994, 2000, 2001
Data contrast:	Aerial survey data 1968 to 2015: 232 Weir data from 2011–2021; 8.5
Methodology:	Percentile
Criteria for updated goal (Table 1)	Code 4. Changes in enumeration methods (PAS to weir).
Goal history:	1988 SEG (1,000 to 5,000). Revised in 2004 (3,000 to 12,000). 2010 changed to LB SEG (3,000). Reviewed in 2013, 2016, and 2019 with no change
Comments:	None

Appendix I2.–Pasagshak River sockeye salmon aerial survey and harvest estimates, 1968–2021.

Year	Peak survey	Weir	Harvest		
			Sport[a]	Subsistence[b]	Commercial[c]
1968	3,000	–	–	–	–
1969	4,500	–	–	–	–
1970	–	–	–	–	–
1971	700	–	–	–	–
1972	2,000	–	–	–	–
1973	200	–	–	–	–
1974	4,000	–	–	–	–
1975	1,000	–	–	–	–
1976	4,500	–	–	–	–
1977	–	–	176	–	–
1978	5,470	–	85	–	–
1979	12,000	–	236	–	–
1980	3,484	–	284	–	–
1981	2,759	–	205	–	–
1982	5,400	–	199	–	–
1983	3,458	–	192	–	–
1984	3,700	–	374	–	–
1985	1,500	–	182	–	–
1986	3,200	–	428	64	–
1987	14,000	–	417	82	–
1988	20,000	–	819	84	–
1989	14,300	–	1,244	166	–
1990	4,680	–	1,018	598	–
1991	25,000	–	815	1,664	–
1992	3,590	–	427	1,752	–
1993	16,000	–	543	2,253	–
1994	2,400	–	861	1,554	–
1995	12,500	–	571	2,099	–
1996	21,500	–	723	2,846	–
1997	13,200	–	1,009	2,746	–
1998	1,850	–	614	1,011	–
1999	9,800	–	1,241	2,589	–
2000	6,000	–	2,721	4,088	–
2001	3,800	–	701	6,471	–
2002	4,750	–	1,062	4,492	–
2003	8,000	–	492	5,910	–
2004	46,400	–	3,192	9,820	8,612
2005	22,000	–	3,751	7,396	1,861
2006	6,300	–	2,074	7,616	612
2007	14,300	–	1,721	7,525	0
2008	14,900	–	4,527	8,760	0
2009	1,400	–	1,021	7,121	0
2010	4,800	–	1,027	4,494	0
2011	8,100	13,402	1,592	6,021	11
2012	2,600	4,585	2,080	4,981	0
2013	9,750	11,421	1,685	6,796	15
2014	350	522	2,077	828	0
2015	600	2,077	31	155	0
2016	3,200	7,053	572	593	0
2017	4,800	11,021	2,084	5,724	0
2018	1,100	2,019	262	375	0
2019	NA	4,537	227	414	0
2020	1,000	3,922	169	580	0
2021	700	8,551	106	1,217	0

-continued-

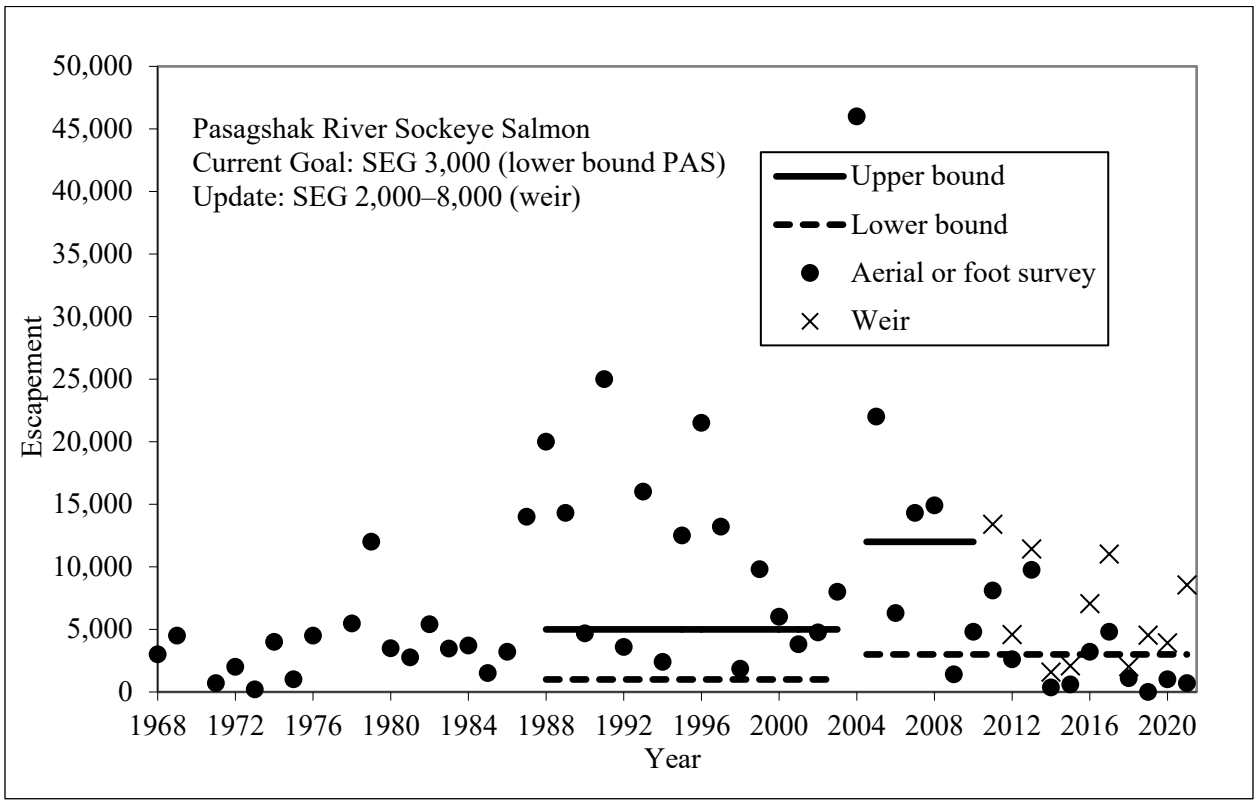
Note: En dash = no data available.

[a] Sport harvests from the Statewide Harvest Survey.

[b] Subsistence harvests from the ADF&G Division of Commercial Fisheries database, Westward Region.

[c] Commercial harvests from the ADF&G Division of Commercial Fisheries database statistical area 259-43. Prior to 2004, statistical areas were not split out, and it is impossible to separate harvest among systems.

Observed escapement by year (solid circles for aerial surveys, Xs for weir counts) and SEG.



APPENDIX J: SUPPORTING INFORMATION FOR ESCAPEMENT GOALS FOR SALTERY LAKE SOCKEYE SALMON

Appendix J1.–Description of stock and escapement goal for Saltery Lake sockeye salmon.

Stream location:	Kodiak Management Area; stream 259-415
Fishery:	Commercial, Subsistence, and Sport
Current escapement goal:	BEG: 15,000–35,000 (2011)
Updated escapement goal:	No change
Optimal escapement goal:	None
Inriver goal:	None
SOC status (type and year):	None
Escapement enumeration type	Weir
Data available:	
Counts:	Aerial surveys from 1976–1986, 1992, 2004–2007; weir counts from 1986–1991, 1993–2003, and 2008–2021.
Age composition:	Escapement 1985–1989, 1993–2003, 2008–2021
Stock specific harvest:	Subsistence harvest estimated annually since 1993 from permit returns. Inriver sport harvests estimated annually since 1977 through the Statewide Harvest Survey. No stock-specific harvest information for commercial fisheries, though total annual catch data are available from Inner Ugak (statistical area 259-41, 42)
Smolt information:	Limited samples 1997–2002
Limnology:	1994–2021
Data contrast:	Weir data 1986–2021: 3.5; Survey data 1976–2007: 7.0
Methodology:	Ricker spawner–recruit, zooplankton model
Criteria for updated goal (Table 1)	None
Goal history:	Goal established in 1988 (20,000 to 40,000). In 2001 the goal was modified to BEG of 15,000 to 30,000. In 2007 the goal was changed to SEG of 20,000 to 50,000 (survey) but reverted back to BEG (15,000 to 30,00) with weir operation. Goal was slightly modified in 2011.
Comments:	Saltery Lake is the primary brood source for fry stocked into Spiridon Lake by Kodiak Regional Aquaculture Association. Egg takes have been prosecuted annually since 1994.

Appendix J2.–Saltery Lake sockeye salmon aerial survey and weir count estimates, 1976–2021.

Year	Peak survey	Weir count	Egg take	Adjusted escapement[a]	Harvest		
					Sport[b]	Subsistence[c]	Commercial[d]
1976	18,000	–	–	–	–	–	2,527
1977	30,800	–	–	–	–	–	877
1978	22,000	–	–	–	–	–	7,540
1979	43,000	–	–	–	–	–	15,546
1980	31,600	–	–	–	–	–	0
1981	43,000	–	–	–	–	–	20,948
1982	28,000	–	–	–	–	–	2,708
1983	46,400	–	–	–	–	–	5,236
1984	120,000	–	–	–	–	–	16,774
1985	26,000	–	–	–	–	–	2,888
1986	24,000	38,314	–	–	–	199	16,431
1987	–	22,705	–	–	–	92	3,338
1988	–	25,654	–	–	390	145	12,489
1989	–	30,237	–	–	417	327	0
1990	–	29,767	–	–	–	328	11,434
1991	–	52,592	–	–	–	406	7,842
1992	44,450	–	–	–	518	502	32,665
1993	–	77,186	–	–	563	328	48,672
1994	–	58,975	4,238	54,737	1,237	392	11,037
1995	–	43,859	122	43,737	652	432	22,381
1996	–	35,488	103	35,385	1,128	264	2,891
1997	–	31,016	2,700	28,316	703	348	4,662
1998	–	26,263	2,560	23,703	1,453	200	1,024
1999	–	62,821	4,318	58,503	1,847	563	41,050
2000	–	45,604	2,582	43,022	5,151	311	37,425
2001	–	45,608	845	44,763	2,454	566	11,423
2002	–	36,336	2,000	34,336	3,629	468	32,028
2003	–	57,993	4,175	53,818	4,463	668	43,751
2004	54,000	–	4,079	49,921	590	627	5,468
2005	28,500	–	5,422	23,078	796	423	23,722
2006	28,000	–	3,537	24,463	453	289	5,037
2007	17,200	–	1,818	15,382	564	382	18,130
2008	–	49,266	1,799	47,467	5,693	894	52,144
2009	–	46,591	3,123	43,468	4,916	750	26,123
2010	–	26,809	2,707	24,102	4,303	619	4,862
2011	–	30,768	2,965	27,803	3,905	390	25,886
2012	–	28,188	3,033	25,155	3,339	386	14,357
2013	–	39,697	3,758	35,939	9,940	503	24,108
2014	–	31,772	2,725	29,047	10,649	1,028	11796
2015	–	42,468	2,548	39,920	7,035	657	3620
2016	–	57,867	3,490	54,377	7,072	1,386	33,820
2017	–	39,315	4,097	35,218	2,460	1,009	11,142
2018	–	22,845	3,546	19,299	2,793	544	11
2019	–	22,183	1,400	20,783	6,927	184	1,942
2020	–	24,987	2,350	22,637	2,560	1,074	431
2021	–	64,602	2,778	61,824	4973	1109	2,155

-continued-

Note: En dash = no data available.

[a] Adjusted escapement subtracts the KRAA egg-take estimates from the escapement estimate.

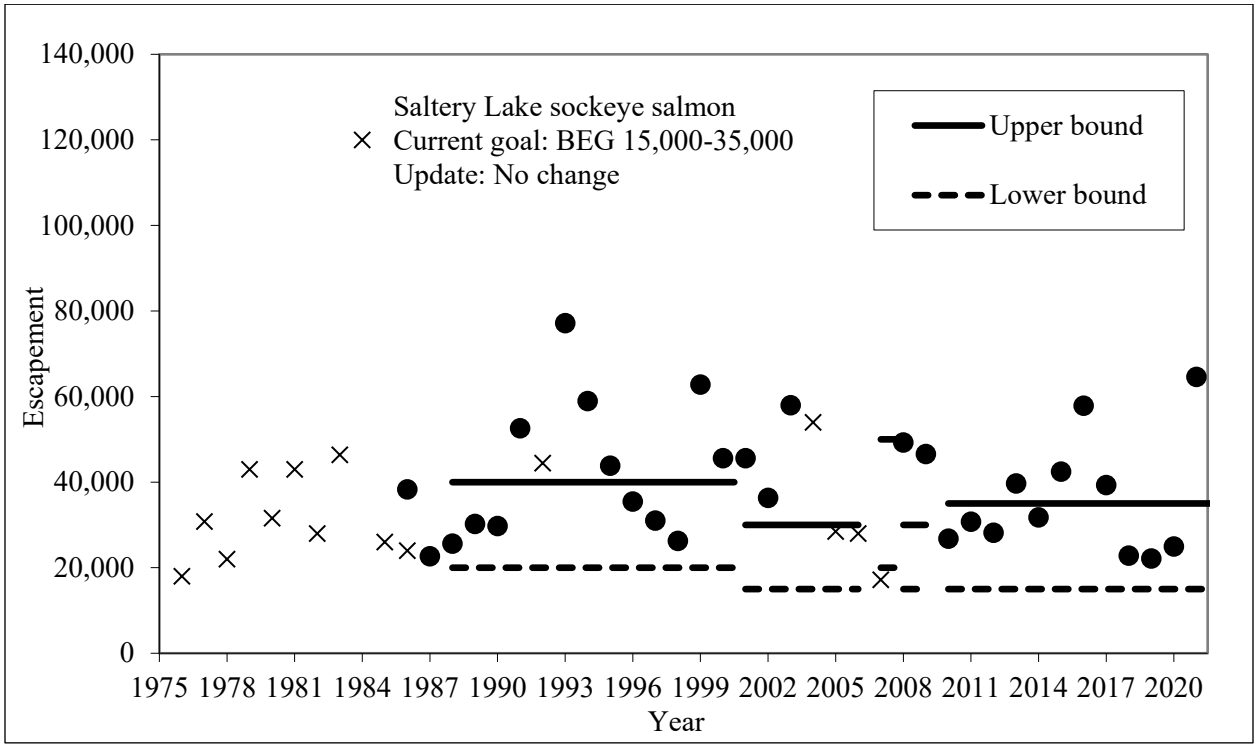
[b] Sport harvests from the Statewide Harvest Survey.

[c] Subsistence harvests from the ADF&G Division of Commercial Fisheries database, Westward Region.

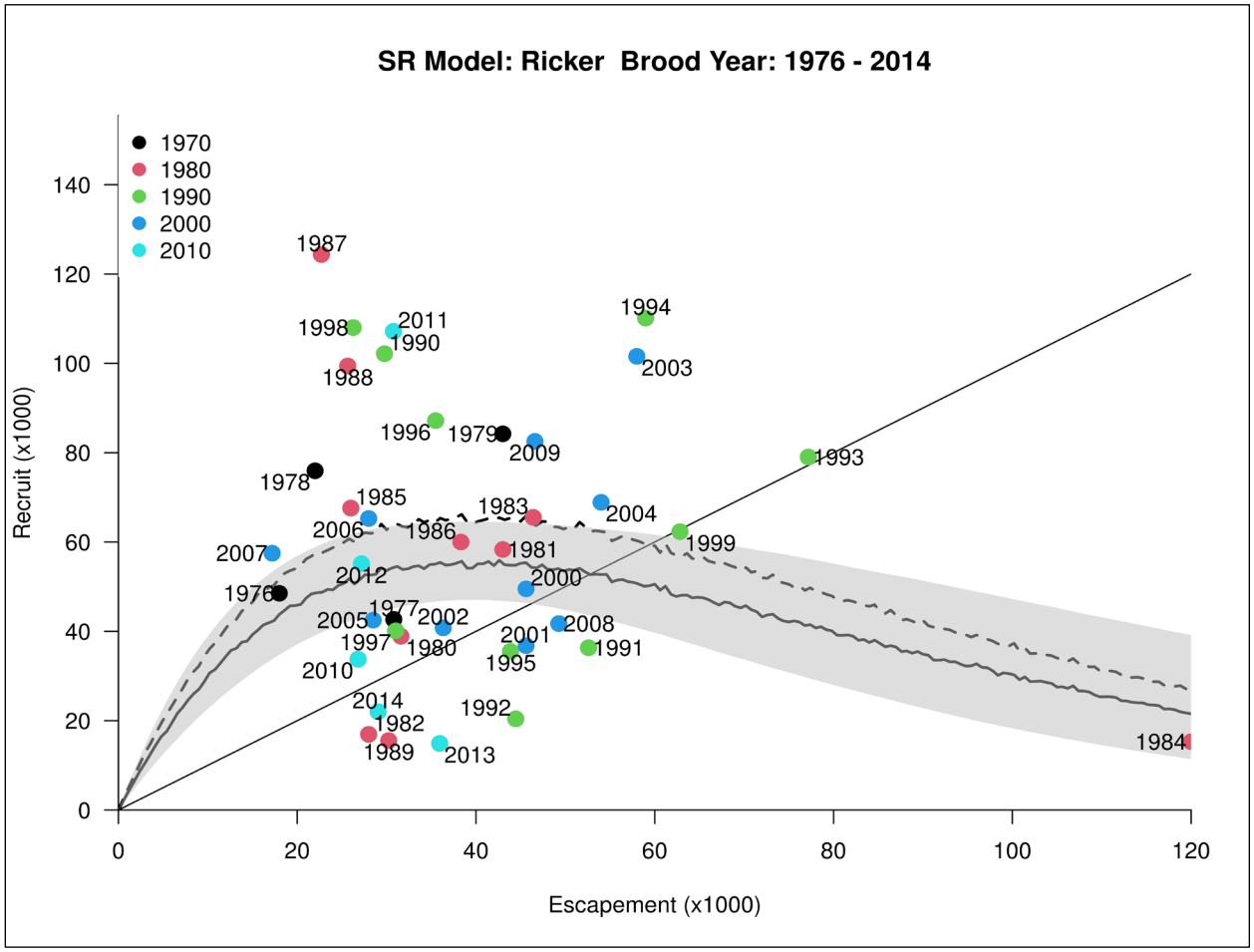
[d] Commercial harvests from the ADF&G Division of Commercial Fisheries database statistical areas 259-41 and 259-42.

Appendix J3.–Saltery Lake sockeye salmon escapement and escapement goals, 1976–2021.

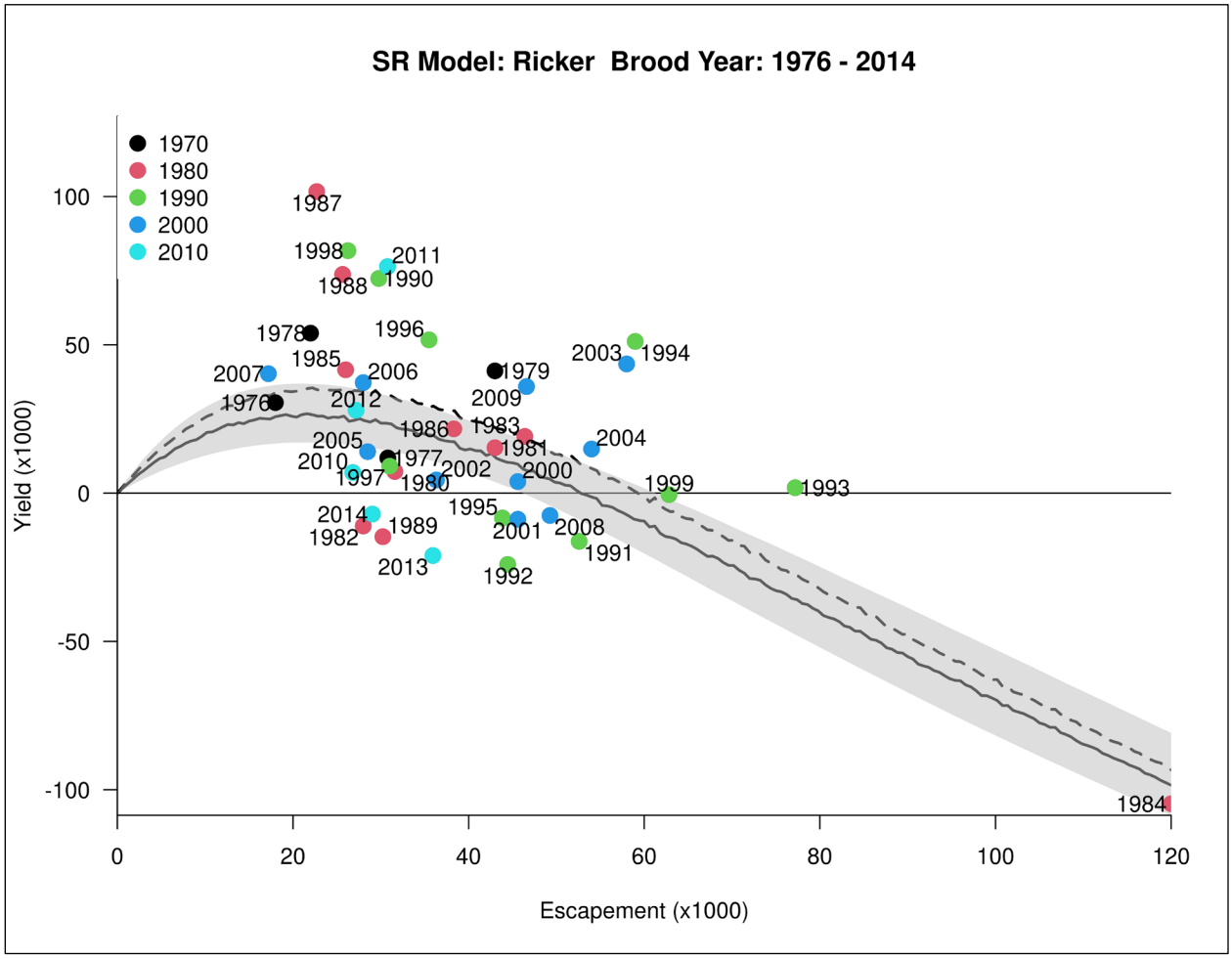
Observed escapement by year (circles are weir counts, Xs are aerial surveys)



Appendix J4.–Ricker spawner–recruit function (solid line: mean; dash: median) fitted to Saltery Lake sockeye salmon data, 1976–2014 brood years. Gray shade indicates 90% Bayesian credible interval.



Appendix J5.–Ricker spawner–recruit yield curve (solid line: mean; dash: median) for Saltery Lake sockeye salmon 1976–2014 brood years. Gray shade indicates 90% Bayesian credible interval.



APPENDIX K: SUPPORTING INFORMATION FOR ESCAPEMENT GOALS FOR UPPER STATION RIVER SOCKEYE SALMON

Appendix K1.–Description of stock and escapement goal for Upper Station River sockeye salmon.

Stream location:	Kodiak Management Area; stream 257-304
Fishery:	Commercial, Subsistence, Sport
Current escapement goal:	Early-run BEG: 43,000–93,000 (2011) Late-run SEG: 120,000–265,000 (2020)
Updated escapement goal:	No change
Optimal escapement goal:	None (see comments)
Inriver goal:	None
SOC status (type and year):	None
Escapement enumeration type	Weir
Data available:	
Counts:	Weir counts 1969–2021.
Age composition:	Escapement 1969–2021, Harvest 1970s–2021,
Stock specific harvest:	standardized from 1979–2021
Smolt information:	1988–1993, 2003, and 2013–2021
Limnology:	1967, 1986, 1990–1993, 1995, 1999–2001, 2009–2021,
Data contrast:	Weir data, all years: early (16.5), late (25.9)
Methodology:	Ricker spawner–recruit AR1 (early run). Percentile (late run).
Criteria for updated goal (Table 1)	None
Goal history:	Monthly goals for Upper Station published in 1978–1987. Early run goal established in 1988 as an SEG (50,000–75,000) and modified in 2005 (30,000–65,000). The early-run goal was changed to BEG in 2011. Late run goal established in 1988 as an SEG (150,000–200,000). In 2005 the late-run goal was changed to BEG (120,000–265,000). The late-run goal reverted to an SEG in 2020 due uncertainty in S-R model.
Comments:	An early-run OEG of 25,000 fish was adopted in 2000 by the BOF but then eliminated in 2017. Upper Station late run used as broodstock for Spiridon Lake and egg takes were conducted from 1988 to 1996 averaging 3,500 fish annually.

Appendix K2.–Upper Station River early-run sockeye salmon escapement and harvest estimates, 1969–2021.

Year	Weir counts	Commercial harvest
1969	22,509	–
1970	16,168	–
1971	32,529	–
1972	39,613	–
1973	26,892	–
1974	35,319	–
1975	10,325	–
1976	28,567	–
1977	26,380	–
1978	66,157	–
1979	53,115	–
1980	37,866	–
1981	77,042	–
1982	170,610	30,217
1983	115,890	27,800
1984	96,798	19,994
1985	27,408	6,364
1986	100,812	113,562
1987	74,747	70,072
1988	56,724	67,896
1989	64,582	59,389
1990	56,159	106,647
1991	50,026	119,764
1992	19,076	22,622
1993	34,852	51,996
1994	37,645	57,727
1995	41,492	170,502
1996	58,686	154,617
1997	47,655	18,735
1998	30,713	82,582
1999	36,521	51,457
2000	55,761	87,265
2001	66,795	91,895
2002	36,802	0
2003	76,175	24,215
2004	78,487	190,627
2005	60,349	95,717
2006	24,997	7,432
2007	31,895	5,877
2008	38,800	60,392
2009	34,585	46,623
2010	42,060	13,105
2011	28,759	22,874
2012	25,487	34,700
2013	27,712	29,502
2014	36,823	10,517
2015	54,473	11,631
2016	48,047	14,466
2017	83,614	17,922
2018	61,732	9,021
2019	49,517	15,082
2020	56,190	9,799
2021	108,225	85,098

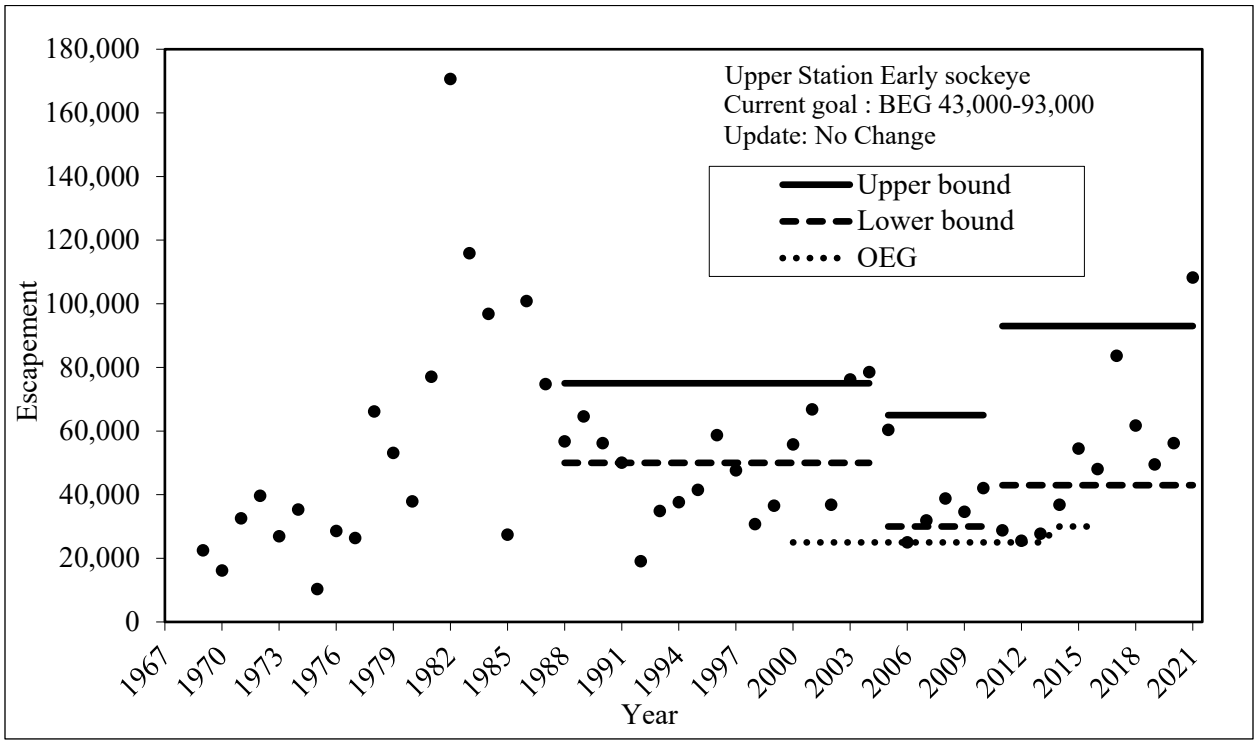
Note: En dash = no data available.

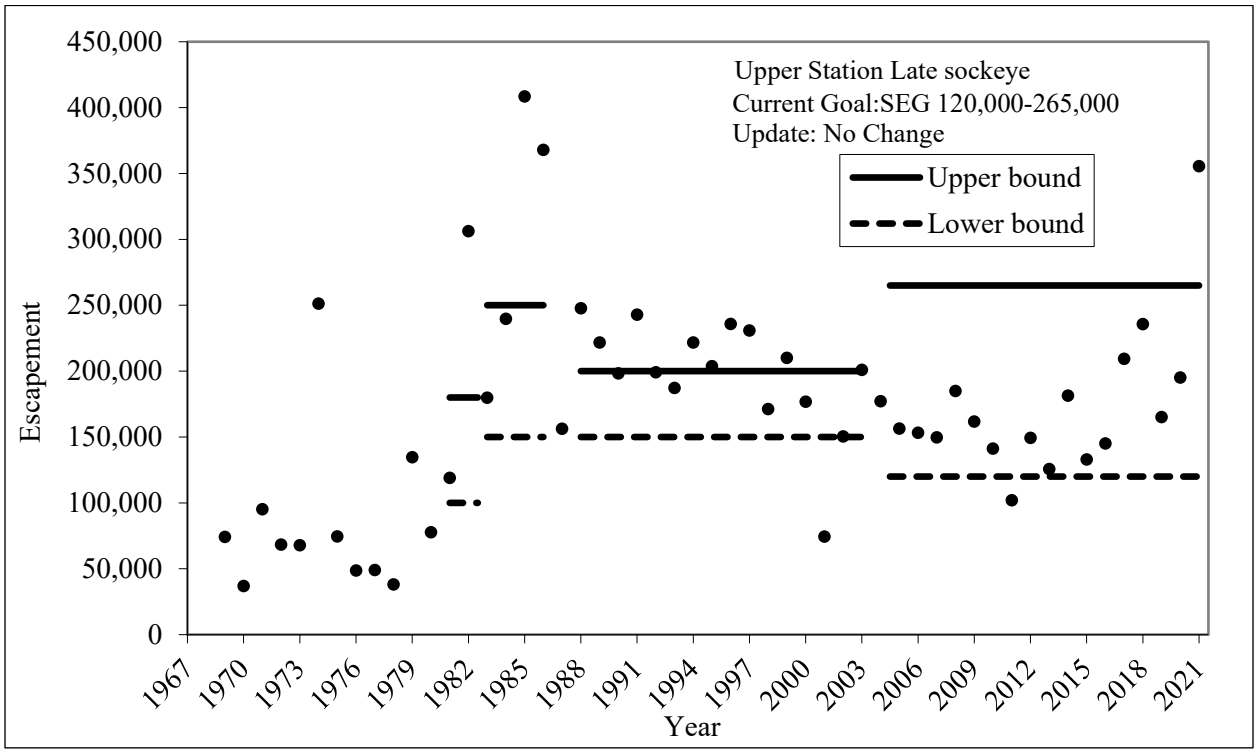
Appendix K3.–Upper Station River late-run sockeye salmon escapement and harvest estimates, 1969–2021.

Year	Weir counts	Commercial harvest
1969	74,150	–
1970	36,833	–
1971	95,150	–
1972	68,351	–
1973	67,826	–
1974	251,234	–
1975	74,456	–
1976	48,650	–
1977	49,001	–
1978	38,126	–
1979	134,579	–
1980	77,718	–
1981	118,900	–
1982	306,161	345,943
1983	179,741	361,991
1984	239,608	328,309
1985	408,409	522,561
1986	367,922	1,025,016
1987	156,274	384,337
1988	247,647	754,836
1989	221,706	485,347
1990	198,287	512,468
1991	242,860	514,467
1992	199,067	219,371
1993	187,229	258,283
1994	221,675	235,186
1995	203,659	383,973
1996	235,727	666,349
1997	230,793	288,226
1998	171,214	185,086
1999	210,016	358,673
2000	176,783	136,471
2001	74,408	60,620
2002	150,349	9,367
2003	200,894	211,844
2004	177,108	336,745
2005	156,401	124,324
2006	153,153	62,296
2007	149,709	44,032
2008	184,856	237,865
2009	161,736	187,403
2010	141,139	63,319
2011	101,893	68,875
2012	149,325	64,332
2013	125,573	33,656
2014	181,411	12,893
2015	132,864	53,803
2016	145,013	45,036
2017	209,298	97,120
2018	235,669	148,355
2019	165,146	23,375
2020	195,147	136,928
2021	355,507	274,071

Note: En dash = no data available.

Appendix K4.–Upper Station River early- and late-run sockeye salmon escapement and escapement goals, 1969–2021.





Appendix K5.–Upper Station River early-run sockeye salmon brood table.

Brood year	Escap.	Age 0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	3.1	1.4	2.3	3.2	3.3	2.4	Total return	return/ spawner
1975	10,325	0	0	0	0	1,458	208	0	6,393	14,783	0	0	8,738	485	0	0	32,065	3.1
1976	28,567	0	0	0	133	9,722	0	0	10,438	47,090	0	0	27,139	0	0	0	94,522	3.3
1977	26,380	0	0	0	0	32,041	243	0	48,850	94,081	0	0	35,526	634	0	0	211,375	8.0
1978	66,157	0	243	243	1,809	28,948	0	0	32,354	70,735	0	0	19,660	0	37	0	154,029	2.3
1979	53,115	0	0	0	0	4,124	0	0	17,554	65,300	0	46	14,870	38	142	0	102,074	1.9
1980	37,866	0	317	0	2,341	11,937	0	0	4,000	7,165	38	0	7,259	0	25	0	33,082	0.9
1981	77,042	0	0	0	542	2,832	1,498	0	4,370	85,872	0	43	23,861	0	0	0	119,082	1.5
1982	170,610	0	2,472	234	1,006	113,439	781	0	75,684	37,220	0	360	18,131	70	0	0	249,398	1.5
1983	115,890	0	285	1,220	1,181	5,491	1,205	0	11,396	87,555	0	0	41,723	217	0	0	150,273	1.3
1984	96,798	0	109	0	3,443	2,118	66	0	1,792	46,879	0	0	14,103	113	60	0	68,683	0.7
1985	27,408	0	1,476	4	2,865	2,314	22,466	0	6,714	86,949	0	0	42,895	633	64	0	166,380	6.1
1986	100,812	0	35	5,680	449	51,361	936	0	36,048	83,179	60	18	8,248	340	408	0	186,783	1.9
1987	74,747	0	2,134	46	1,022	2,027	3,849	0	726	30,417	27	0	25,242	779	57	0	66,326	0.9
1988	56,724	0	17	0	71	82	852	0	1,607	35,640	210	206	7,282	1,072	0	0	47,038	0.8
1989	64,582	0	450	404	5,823	8,751	6,313	0	5,539	67,810	0	0	34,127	0	0	0	129,217	2.0
1990	56,159	0	1,497	578	0	6,275	3,414	0	19,145	82,269	0	0	6,839	361	6	0	120,384	2.1
1991	50,026	0	407	3,258	20,467	46,391	6,815	0	57,478	131,931	0	0	27,274	0	0	0	294,021	5.9
1992	19,076	52	2,338	223	5,878	5,959	3,583	0	3,435	24,099	0	0	7,268	0	0	0	52,835	2.8
1993	34,852	219	669	605	2,423	5,189	2,741	0	11,812	31,749	0	0	5,168	1,229	0	62	61,866	1.8
1994	37,645	0	229	994	4,887	53,607	1,320	0	7,176	33,104	0	0	17,361	570	0	0	119,248	3.2
1995	41,492	0	185	2,467	5,857	33,691	1,497	360	44,415	44,608	0	492	20,938	689	92	0	155,291	3.7
1996	58,686	0	79	177	2,723	30,487	1,973	0	81,164	51,987	4	25	15,238	281	0	0	184,138	3.1
1997	47,655	0	422	45	0	972	2,438	0	558	11,566	34	0	7,233	795	2,006	0	26,069	0.5
1998	30,713	0	0	6	0	145	6,264	0	418	45,950	0	0	16,490	8	0	0	69,281	2.3
1999	36,521	0	0	2,598	328	27,894	6,080	0	34,497	81,382	0	360	38,405	626	28	0	192,198	5.3
2000	55,761	0	780	10,912	7,338	122,434	2,623	69	59,315	40,862	69	121	9,843	139	235	28	254,768	4.6
2001	66,795	0	1,131	1,123	3,856	6,472	5,116	0	4,335	15,475	0	24	13,764	0	0	0	51,298	0.8

-continued-

Appendix K5.–Page 2 of 2.

Brood year	Escap.	Age 0.1	0.2	1.1	0.3	1.2	2.1	0.4	1.3	2.2	3.1	1.4	2.3	3.2	3.3	2.4	Total return	return/ spawner
2002	36,802	82	532	382	574	1,295	42	36	4,890	2,815	0	0	8,604	0	0	36	19,289	0.5
2003	76,175	0	75	502	88	10,903	3,245	0	9,334	34,250	0	106	13,258	86	0	0	71,846	0.9
2004	78,487	0	191	1,553	6,398	36,836	3,258	0	25,750	32,372	0	0	4,211	0	0	0	110,570	1.4
2005	60,349	0	233	281	0	5,884	3,446	0	3,904	42,706	64	0	9,733	130	0	2	66,385	1.1
2006	24,997	0	0	269	0	1,815	2,367	0	4,513	24,439	5	28	14,943	620	0	4	49,002	2.0
2007	31,895	0	71	26	136	3,578	4,849	0	3,112	28,723	0	16	16,845	0	0	0	57,358	1.8
2008	38,800	0	0	978	52	10,317	2,056	0	10,744	21,686	5	0	2,534	0	0	0	48,373	1.2
2009	34,585	0	108	226	2,346	2,774	2,782	0	2,354	30,938	4	0	7,963	0	0	0	49,495	1.4
2010	42,060	0	0	228	0	1,784	6,735	0	2,353	45,458	89	0	5,892	76	0	0	62,615	1.5
2011	28,759	0	80	132	0	1,376	7,241	0	696	27,850	26	0	16,886	0	0	0	54,286	1.9
2012	25,487	0	0	1,625	438	15,567	4,505	0	14,248	31,792	0	0	2,681	0	0	0	70,856	2.8
2013	27,712	0	319	7,144	976	31,053	2,719	0	8,118	28,517	0	0	4,704	99	0	0	83,651	3.0
2014	36,823	0	79	3,240	0	26,729	1,373	0	8,904	16,940	0	36	1,325	123	0	0	58,749	1.6
2015	54,473	0	148	3,289	0	18,840	2,582	0	7,220	9,210	0	0	975	0	–	–	–	–
2016	48,047	0	39	12,490	0	28,723	2,978	0	20,419	14,562	0	–	–	–	–	–	–	–
2017	83,614	0	128	16,245	81	137,702	7,582	–	–	–	–	–	–	–	–	–	–	–
2018	61,732	0	0	12,002	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2019	49,517	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2020	56,190	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2021	108,225	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Note: En dash = no data available.

Appendix K6.–Upper Station River late-run sockeye salmon brood table.

Brood year	Escap.	Age 0.1	0.2	1.1	2.0	0.3	1.2	2.1	0.4	1.3	2.2	3.1	1.4	2.3	3.2	3.3	2.4	Total return	R/S[a]
1975	74,456	901	3,021	0	0	0	61,142	1,132	0	36,479	76,157	0	0	5,228	0	0	0	184,060	2.5
1976	48,650	0	10,190	0	0	36,479	38,399	2,560	0	11,501	141,154	0	0	10,336	940	0	0	251,559	5.2
1977	49,001	0	640	0	0	3,137	52,279	1,046	0	66,714	312,897	0	0	9,732	0	0	0	446,444	9.1
1978	38,126	0	82,601	1,046	0	90,205	134,367	4,698	0	55,146	217,342	0	0	26,755	2,638	0	0	614,798	16.1
1979	134,579	0	31,947	0	0	63,256	71,366	0	0	103,020	339,950	0	736	10,850	360	280	0	621,765	4.6
1980	77,718	0	124,890	0	0	56,178	35,951	2,131	0	21,758	55,472	399	0	16,555	965	223	0	314,522	4.0
1981	118,900	0	1,294	0	0	17,853	157,249	12,280	1,007	149,158	345,506	0	0	14,809	0	0	879	700,035	5.9
1982	306,161	0	644,017	5,129	0	324,600	364,312	5,029	117	92,824	231,963	0	0	5,168	2,042	0	0	1,675,201	5.5
1983	179,741	4,867	182,514	0	0	135,177	23,242	1,682	0	53,195	92,799	0	0	30,036	0	1,488	0	525,000	2.9
1984	239,608	3,012	37,733	528	0	89,721	187,451	5,064	0	21,543	224,033	0	0	23,712	4,642	0	0	597,438	2.5
1985	408,409	2,313	562,757	1,958	0	309,775	34,924	12,374	0	40,759	179,839	0	578	45,289	6,140	0	0	1,196,706	2.9
1986	367,922	1,449	72,415	1,953	0	94,380	291,815	5,610	678	116,039	451,917	0	0	17,721	1,579	1,289	6	1,056,851	2.9
1987	156,274	0	68,016	495	0	113,821	12,899	127	0	17,053	104,995	0	225	27,470	15,072	39	0	360,212	2.3
1988	247,647	0	9,222	216	0	27,793	76,583	1,000	0	71,330	80,102	177	133	4,037	1,244	0	0	271,836	1.1
1989	221,706	401	169,158	1,125	0	85,530	83,807	12,864	142	53,928	184,067	308	0	21,693	0	0	0	613,023	2.8
1990	198,287	1,432	56,992	3,904	0	115,907	27,747	7,728	444	17,591	237,284	0	0	4,315	0	67	0	473,411	2.4
1991	242,860	6,744	51,810	4,858	0	163,283	73,541	6,484	160	44,507	712,676	31	0	20,546	0	0	0	1,084,640	4.5
1992	199,067	4,913	61,018	1,108	0	15,733	58,923	12,611	79	6,302	279,349	0	0	7,189	156	192	26	447,599	2.2
1993	187,229	5,186	46,015	5,688	0	114,817	35,842	45,256	444	10,769	199,820	191	278	27,883	5,350	0	0	497,539	2.7
1994	221,675	1,417	10,206	6,322	0	23,167	90,488	17,439	44	25,603	293,322	80	0	6,069	968	0	0	475,125	2.1
1995	203,659	233	3,020	3,340	0	3,349	179,562	24,492	0	13,017	251,855	0	254	14,264	307	247	20	493,960	2.4
1996	235,727	277	1,972	6,536	0	1,335	35,606	4,057	0	15,478	88,856	121	1	4,856	2,282	0	1,500	162,877	0.7
1997	230,793	0	347	0	0	916	2,842	11,901	0	1,932	129,206	1,984	130	8,502	17,554	1,942	0	177,256	0.8
1998	171,214	0	0	89	0	0	2,511	13,979	0	3,281	219,890	25,325	0	13,190	890	0	0	279,155	1.6
1999	210,016	0	279	2,323	0	672	80,315	15,939	0	20,091	313,886	19	346	40,906	5,360	465	9	480,610	2.3
2000	176,783	96	34,433	5,197	0	36,394	122,248	4,045	98	30,388	181,491	0	31	16,677	986	187	165	432,436	2.4
2001	74,408	0	522	215	0	1,701	5,696	8,310	0	7,078	77,172	0	78	9,900	300	0	0	110,971	1.5

-continued-

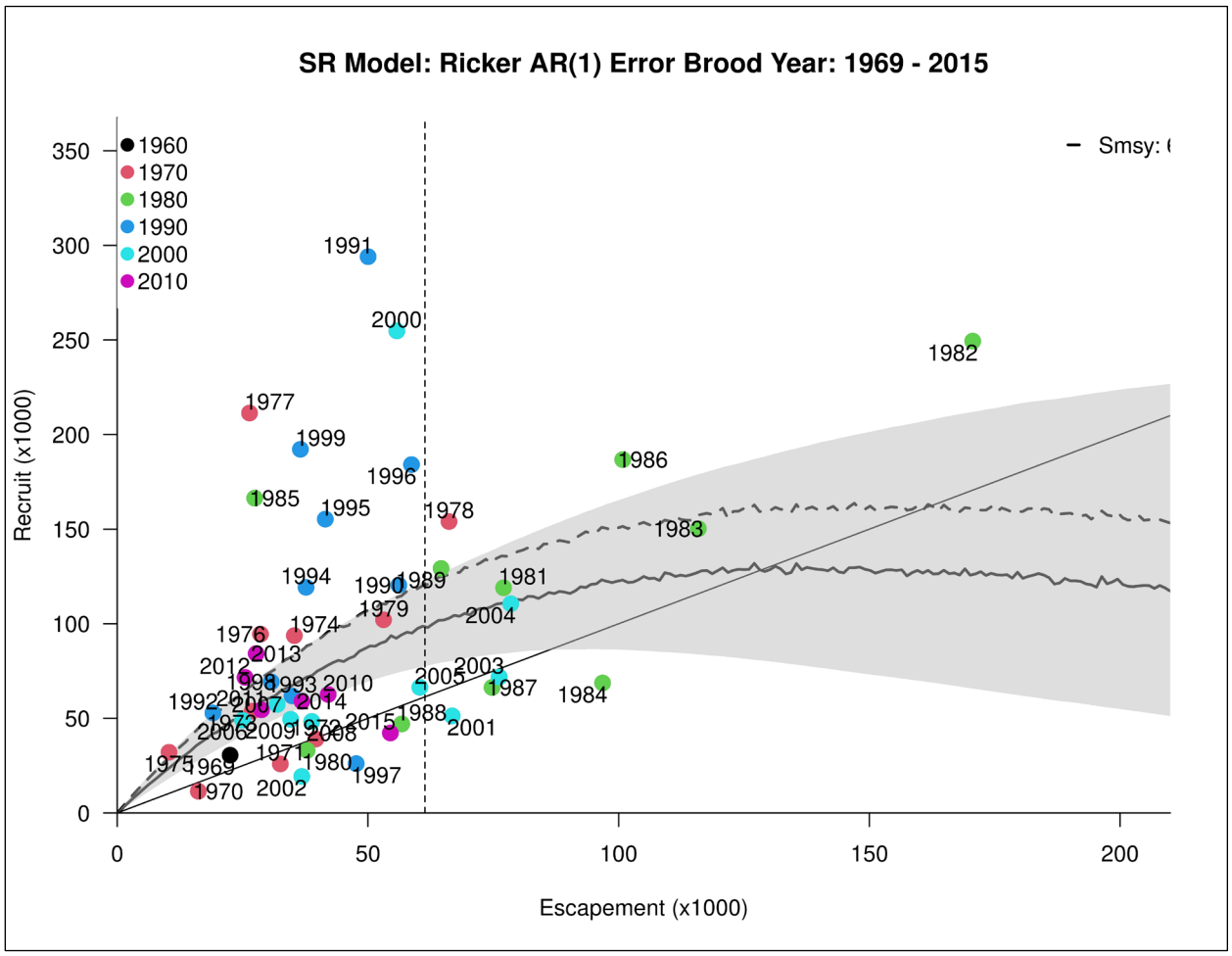
Appendix K6.–Page 2 of 2.

Brood year	Escap.	Age 0.1	0.2	1.1	2.0	0.3	1.2	2.1	0.4	1.3	2.2	3.1	1.4	2.3	3.2	3.3	2.4	Total return	R/S[a]
2002	150,349	411	2,421	3,965	0	7,179	94,543	8,085	0	21,609	95,473	0	0	13,730	0	0	235	247,650	1.6
2003	200,894	43	888	1,667	0	337	51,307	7,446	0	16,131	256,511	0	357	15,308	548	0	0	350,545	1.7
2004	177,108	669	5,264	1,535	0	24,845	99,160	7,094	0	29,761	255,957	181	0	5,577	1,457	185	0	431,685	2.4
2005	156,401	139	2,828	2,423	0	3,067	20,933	20,082	0	6,256	171,458	153	0	8,694	3,150	0	4	239,187	1.5
2006	153,153	0	931	1,561	0	177	10,327	8,207	0	5,267	126,317	182	74	3,988	6,115	531	0	163,678	1.1
2007	149,709	218	59	787	0	287	12,235	11,858	0	10,286	140,872	46	277	8,838	241	0	0	186,005	1.2
2008	184,856	0	0	2,217	0	349	40,340	7,761	0	10,196	105,047	943	0	5,639	0	0	0	172,492	0.9
2009	161,736	376	2,236	1,527	0	5,796	8,546	16,773	0	3,942	171,268	0	0	23,034	250	0	0	233,747	1.4
2010	141,139	58	149	2,066	0	38	9,380	3,245	0	4,197	115,614	24	0	1,408	1,764	0	0	137,943	1.0
2011	101,893	0	7	533	0	5,790	26,119	7,436	0	7,460	101,503	8	0	7,343	704	0	0	156,902	1.5
2012	149,325	0	1,699	1,927	0	3,637	56,890	5,748	0	45,927	141,560	0	0	9,326	373	0	0	267,087	1.8
2013	125,573	579	7,762	3,278	0	13,373	66,103	14,350	0	9,025	178,257	0	0	3,425	0	0	0	296,152	2.4
2014	181,411	593	10,842	2,993	0	4,676	147,013	2,289	0	9,829	113,308	0	0	11,476	0	0	0	303,019	1.7
2015	132,864	3,765	29,948	3,107	0	11,163	32,156	6,652	0	20,192	89,334	0	0	3,834	0	–	–	–	–
2016	145,013	0	3,090	8,891	252	1,043	167,293	11,223	0	47,475	213,590	0	–	–	–	–	–	–	–
2017	209,298	1,809	21,834	9,241	0	29,444	274,334	28,778	–	–	–	–	–	–	–	–	–	–	–
2018	235,669	440	26,360	5,763	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2019	165,146	0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2020	195,147	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2021	355,507	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

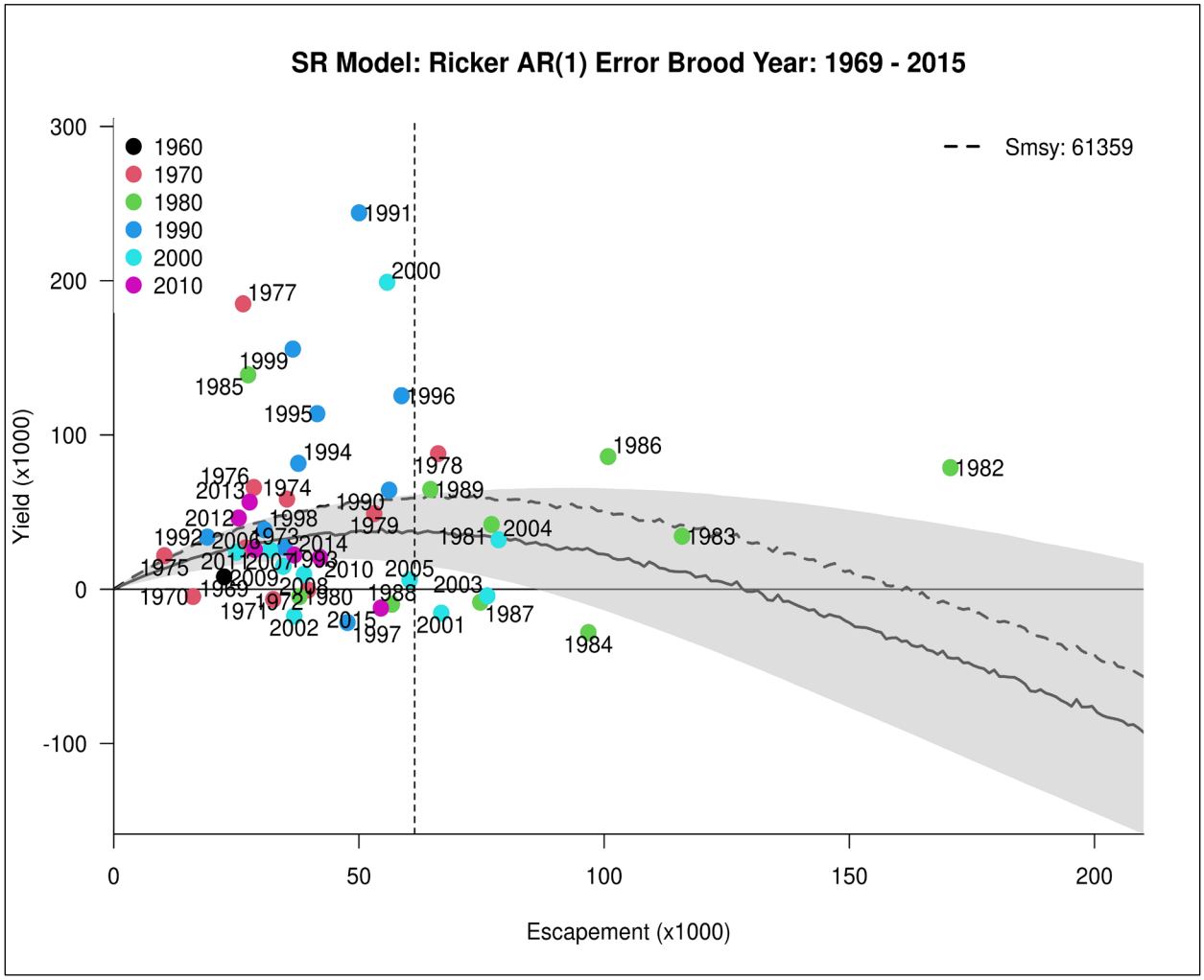
Note: En dash = no data available.

[a] R/S = return/spawner.

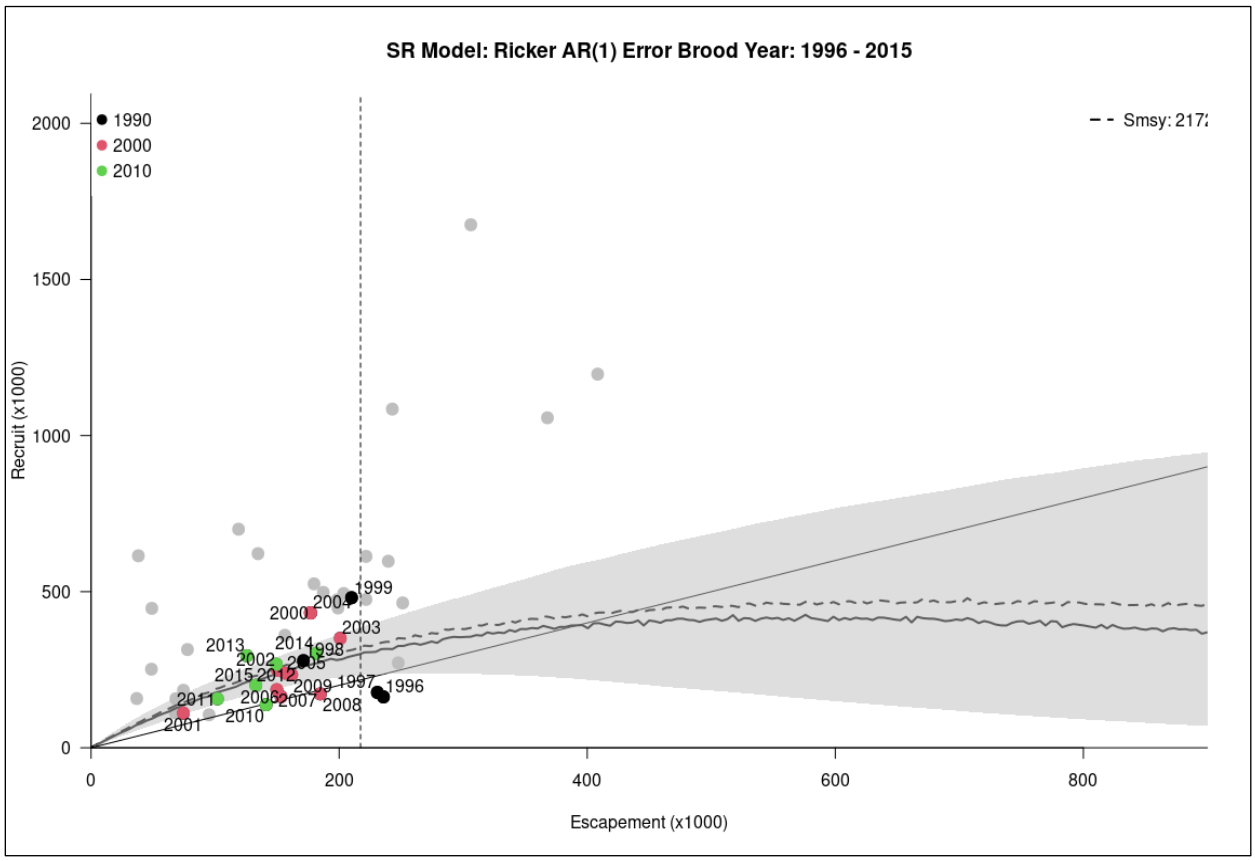
Appendix K7.–Ricker spawner–recruit function (solid line: mean; dash: median) fitted to Upper Station early-run sockeye salmon data, 1969–2015 brood years. Gray shade indicates 90% Bayesian credible interval.



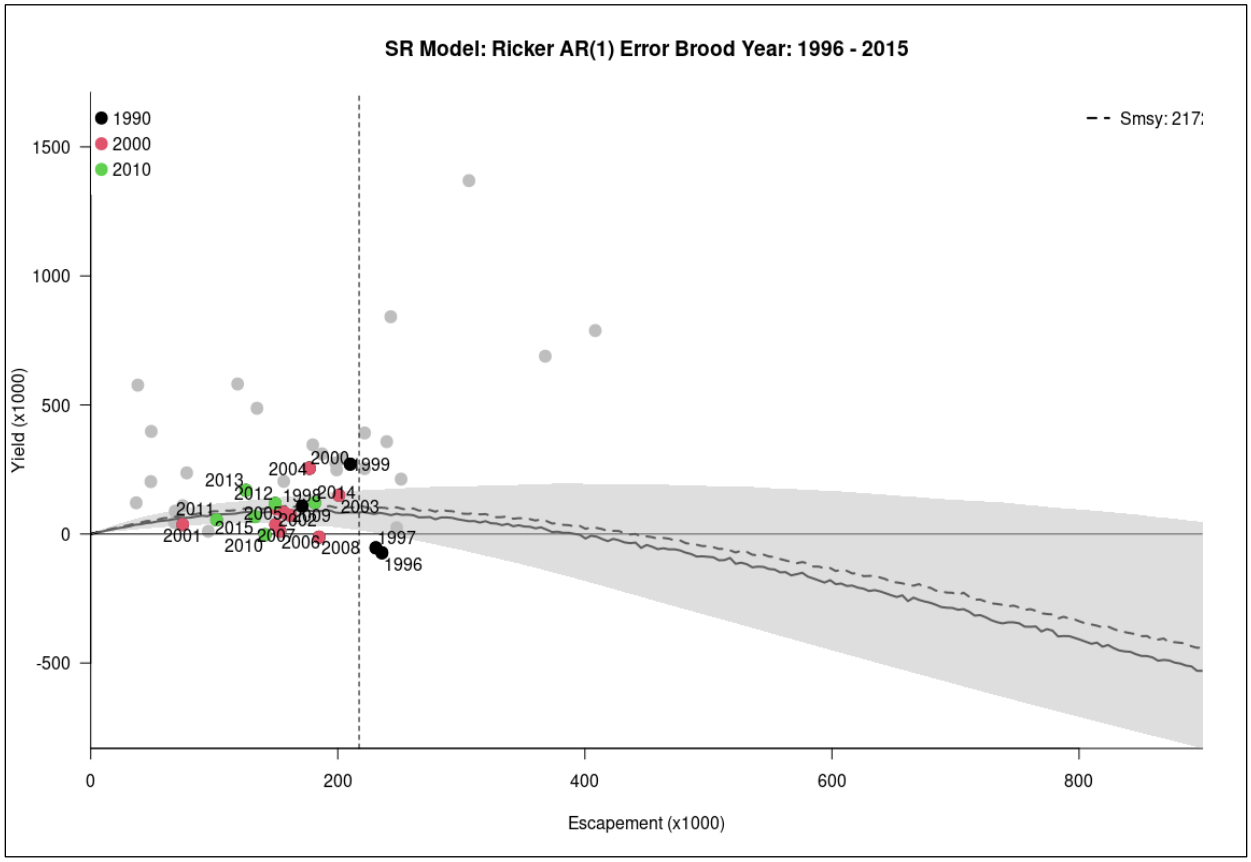
Appendix K8.–Ricker spawner–recruit yield curve (solid line: mean; dash: median) for Upper Station early-run sockeye salmon 1969–2015 brood years. Gray shade indicates 90% Bayesian credible interval.



Appendix K9.–Ricker spawner–recruit function (solid line: mean; dash: median) fitted to Upper Station late-run sockeye salmon data, 1996–2015 brood years. Gray shade indicates 90% Bayesian credible interval.



Appendix K10.–Ricker spawner–recruit yield curve (solid line: mean; dash: median) for Upper Station late-run sockeye salmon 1996–2015 brood years. Gray shade indicates 90% Bayesian credible interval.



APPENDIX L: SUPPORTING INFORMATION FOR ESCAPEMENT GOALS FOR AMERICAN RIVER COHO SALMON

Appendix L1.–Description of stock and escapement goal for American River coho salmon.

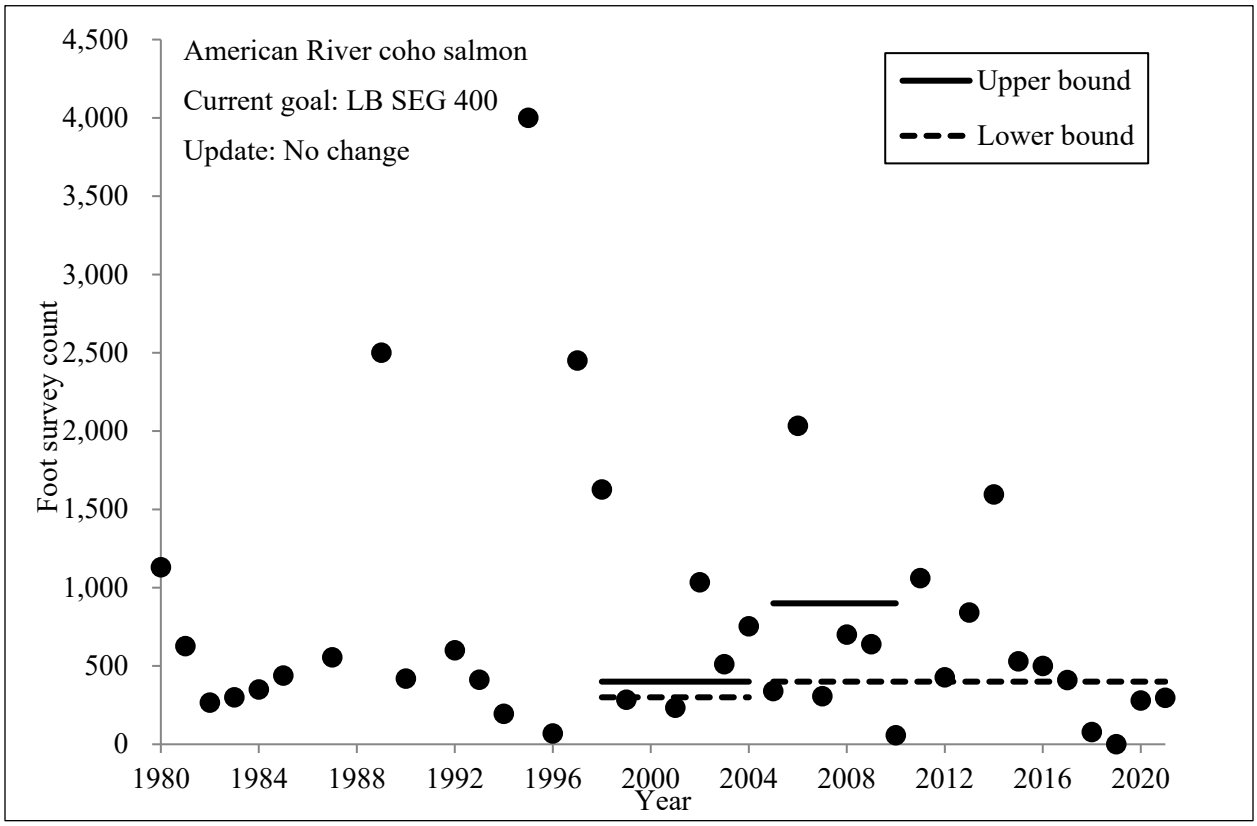
Stream location:	Kodiak Management Area; stream 259-231
Fishery:	Commercial, Commercial sport, Subsistence, Sport
Current escapement goal:	Lower bound (LB) SEG: 400 (2011)
Updated escapement goal:	No change
Optimal escapement goal:	None
Inriver goal:	None
SOC status (type and year):	None
Escapement enumeration type	Foot survey
Data available:	
Counts:	Foot survey 1980–2021 (excl. 1986, 1988, and 1991)
Age composition:	None
Stock specific harvest:	None: (Variable subsistence harvest data and inriver sport harvest are available from the Statewide Harvest Survey).
Smolt information:	None
Limnology:	None
Data contrast:	1980–2021: 68.9
Methodology:	Theoretical Ricker model
Criteria for updated goal (Table 1)	None
Goal history:	The first American River coho salmon SEG was 300–400 fish in the 1990s, then changed to 400–900 fish in 2005. It was modified to a LB SEG of 400 fish in 2011.
Comments:	Theoretical stock-recruit analysis with average foot surveys and average harvest (sport, commercial and subsistence) from 1980–2003 was used to specify the SEG that potentially maximizes yield give uncertainty in the productivity of this stock. Alpha-parameter values in the stock-recruit analysis ranged from 4 to 8.

Appendix L2.–Annual escapement index and harvest of American River coho salmon, 1980–2021.

Year	Foot survey
1980	1,130
1981	627
1982	266
1983	300
1984	350
1985	439
1986	–
1987	555
1988	–
1989	2,500
1990	419
1991	–
1992	600
1993	412
1994	194
1995	4,000
1996	69
1997	8,200
1998	1,627
1999	284
2000	–
2001	233
2002	1,034
2003	511
2004	753
2005	339
2006	2,033
2007	307
2008	700
2009	639
2010	58
2011	1,061
2012	427
2013	841
2014	1,595
2015	530
2016	500
2017	410
2018	78
2019	NA
2020	279
2021	297

Note: En dash = no data available.

Appendix L3.–American River coho salmon escapement and escapement goals, 1980–2021.



APPENDIX M: SUPPORTING INFORMATION FOR ESCAPEMENT GOALS FOR BUSKIN RIVER COHO SALMON

Appendix M1.–Description of stock and escapement goal for Buskin River coho salmon.

Stream location:	Kodiak Management Area; stream 259-211
Fishery:	Commercial, Subsistence, Sport
Current escapement goal:	SEG: 4,700–9,600 (2020)
Updated escapement goal:	No change
Optimal escapement goal:	None
Inriver goal:	None
SOC status (type and year):	None
Escapement enumeration type	Weir
Data available:	
Counts:	Weir counts 1985–2021
Age composition:	Escapement 1985–2021
Stock specific harvest:	Commercial and Subsistence 1985–2021, Recreational 1980–2021
Smolt information:	None
Limnology:	Buskin Lake: 1990, 2013–2021
Data contrast:	1985–2021: 7.6
Methodology:	Percentile
Criteria for updated goal (Table 1)	None
Goal history:	The first Buskin River coho salmon SEG was 6,000– 9,000 fish. In 2005, the SEG was changed to a BEG of 3,200–7,200 fish and modified again in 2014 (4,700–9,600). In 2020, the BEG was changed back to an SEG.
Comments:	Inriver harvest of the sport fishery are estimated annually through the Statewide Harvest Survey. Annual catch data are available for statistical area 259-26. The recently updated creel survey of the Buskin River shows that 17% of the current sport harvests occur above the weir, and escapement estimates from 2017 to present reflect this change (Polum et al. 2019)

Appendix M2.–Annual escapement and harvest of Buskin River coho salmon, 1980–2021.

Year	Escapement	Weir count	Harvest			Total run
			Sport[a]	Subsistence[b]	Commercial[c]	
1980	–	–	2,643	–	–	–
1981	–	–	2,269	–	–	–
1982	–	–	2,431	–	–	–
1983	–	–	2,307	–	–	–
1984	–	–	1,871	–	–	–
1985	9,213	9,474	2,178	2,554	666	14,611
1986	9,477	9,939	4,098	2,541	1,065	17,151
1987	10,727	11,103	3,133	1,742	2,334	17,936
1988	6,365	6,782	3,474	1,586	254	11,679
1989	9,356	9,930	4,782	1,302	–	15,440
1990	6,039	6,222	1,521	1,774	1	9,335
1991	8,434	8,929	4,121	1,481	15	14,051
1992	6,358	6,535	1,474	1,907	–	9,739
1993	6,318	6,813	4,125	1,720	7	12,170
1994	7,855	8,146	2,429	2,167	15	12,466
1995	8,438	8,694	2,132	1,285	224	12,079
1996	8,141	8,439	2,481	1,263	–	11,885
1997	10,582	10,926	2,864	1,383	–	14,829
1998	8,742	9,062	2,669	1,394	9	12,814
1999	9,383	9,794	3,422	1,320	3	14,128
2000	7,737	8,048	2,589	1,717	–	12,043
2001	13,214	13,494	2,332	1,421	–	16,967
2002	10,349	10,649	2,497	1,517	–	14,363
2003	12,754	13,150	3,302	1,242	6	17,304
2004	9,016	9,599	4,860	1,481	95	15,452
2005	16,235	16,596	3,010	2,414	–	21,659
2006	12,560	13,348	6,567	1,567	763	21,457
2007	8,375	9,001	5,215	1,193	757	15,540
2008	8,176	9,028	4,259	1,165	–	13,600
2009	9,583	10,624	5,207	874	138	15,802
2010	6,239	6,808	2,847	679	–	9,765
2011	5,298	6,026	3,640	287	197	9,422
2012	4,906	5,291	1,926	984	10	7,826
2013	4,974	5,959	4,926	611	40	10,551
2014	7,335	8,413	5,388	1,537	1	14,261
2015[d]	NC	NC	4,889	824	13	NA
2016	2,134	2,513	1,895	496	–	4,525
2017	5,092	5,559	2,337	300	–	7,729
2018	4,164	4,523	1,793	1,171	–	7,128
2019	5,350	5,537	934	340	67	6,691
2020[d]	NC	NC	1,205	780	–	NA
2021	7,427	7,919	2,462	516	13	10,418

Note: En dash = no data available. NA = not applicable.

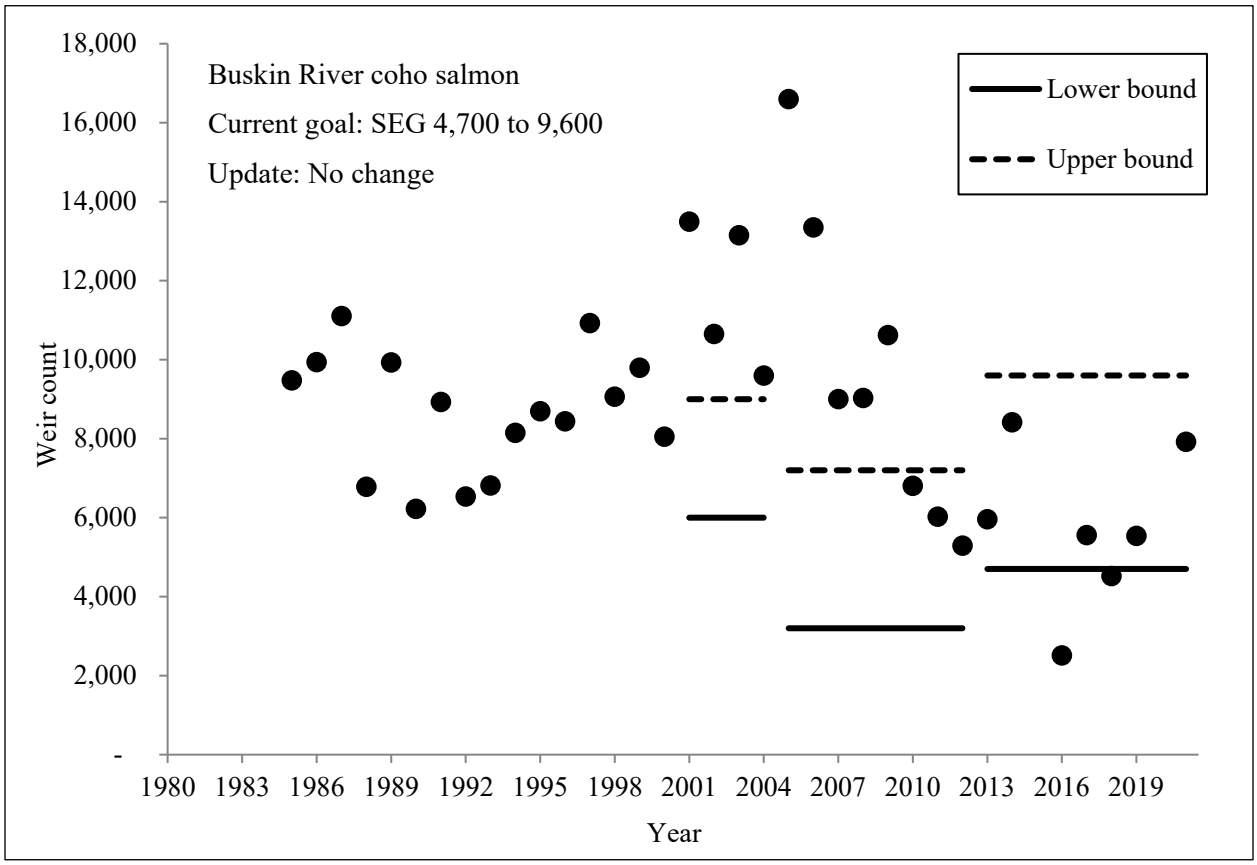
[a] Sport harvests from the Statewide Harvest Survey.

[b] Subsistence harvests from the ADF&G Division of Commercial Fisheries database, Westward Region.

[c] Commercial harvests from the ADF&G Division of Commercial Fisheries database.

[d] Weir counts incomplete resulting no counts (NC) for 2015 and 2020.

Appendix M3.–Buskin River coho salmon escapement and escapement goals, 1985–2021.



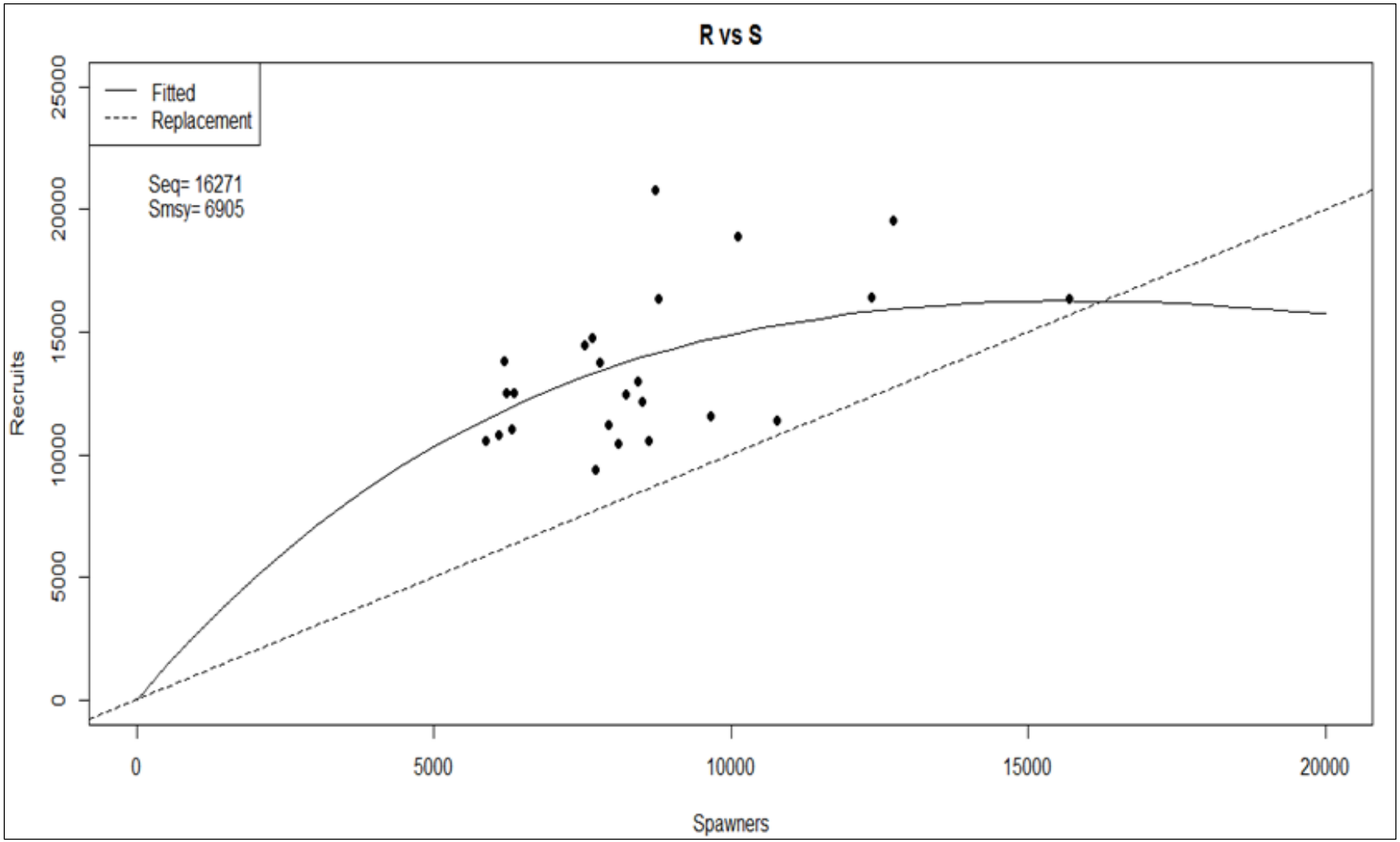
Appendix M4.–Buskin River coho salmon brood table.

System: Buskin River
Species: Coho salmon

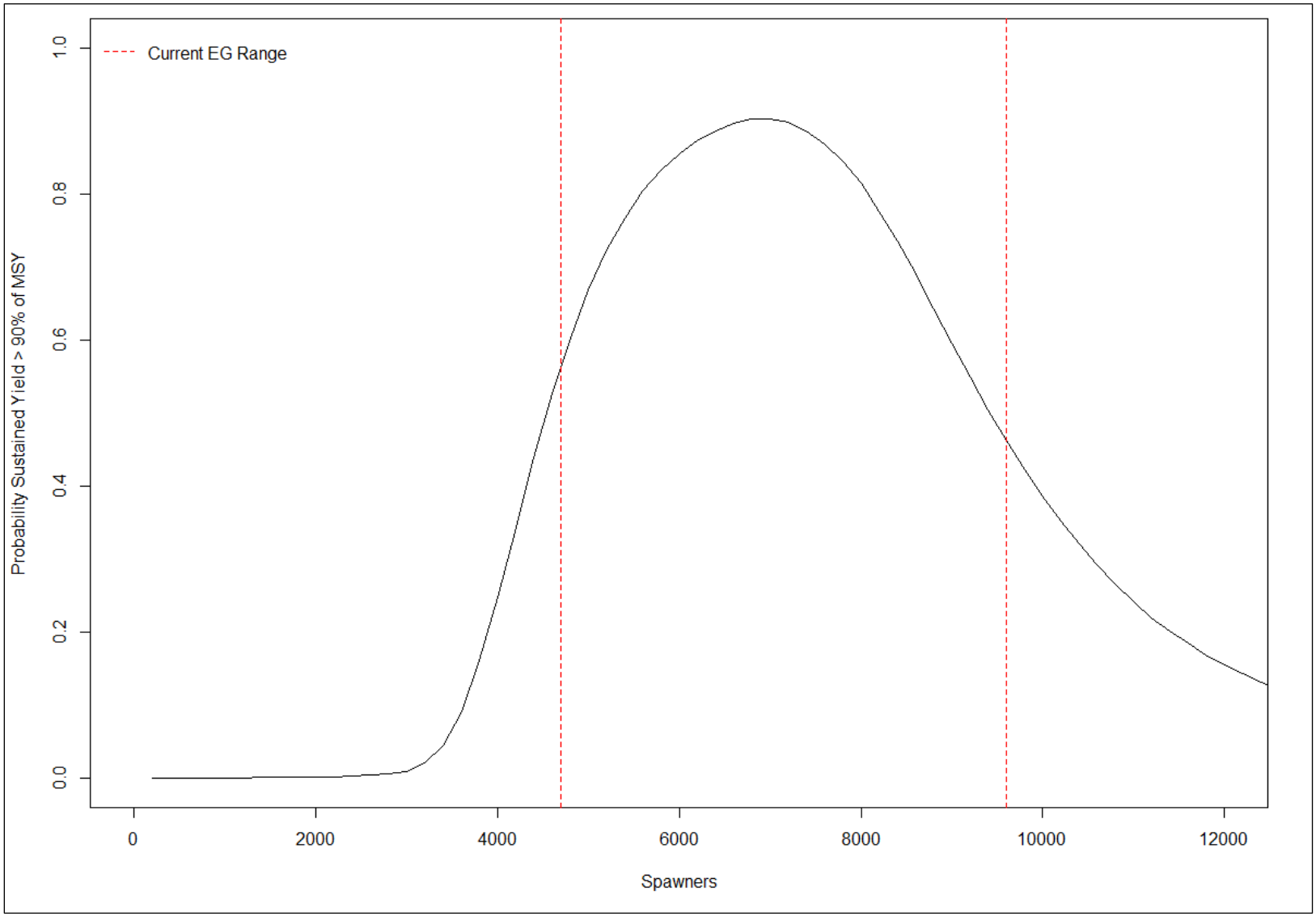
Brood year	Escapement	Age class 1.0	1.1	1.2	2.0	2.1	2.2	3.0	3.1	3.2	4.1	Return	Return/ spawner
1989	9,356	0	2,275	0	213	8,774	0	0	648	0	0	11,910	1.3
1990	6,039	0	2,143	38	40	8,082	37	38	262	0	0	10,640	1.8
1991	8,434	0	3,431	0	229	8,938	44	0	1,049	0	69	13,759	1.6
1992	6,358	0	2,767	0	37	8,215	0	0	1,517	0	0	12,537	2.0
1993	6,318	37	2,578	0	0	10,139	55	69	1,265	44	44	14,232	2.3
1994	7,855	0	2,897	0	138	9,074	177	110	2,392	0	0	14,788	1.9
1995	8,438	0	2,310	0	0	9,079	160	44	917	0	0	12,510	1.5
1996	8,141	0	2,303	0	44	8,733	42	40	42	0	0	11,205	1.4
1997	10,582	0	2,153	0	40	8,526	0	42	422	0	0	11,183	1.1
1998	8,742	0	8,106	0	210	11,641	0	47	1,375	0	0	21,379	2.4
1999	9,383	0	2,159	0	94	11,846	0	89	2,137	0	0	16,325	1.7
2000	7,737	0	3,683	0	311	9,653	0	0	1,325	0	0	14,970	1.9
2001	13,214	0	3,624	0	0	14,969	0	0	1,135	0	0	19,729	1.5
2002	10,349	38	5,233	0	66	15,200	0	28	141	0	0	20,705	2.0
2003	12,754	66	5,039	0	55	11,954	0	0	258	0	0	17,372	1.4
2004	9,016	0	2,883	0	492	9,153	0	64	705	0	0	13,297	1.5
2005	16,235	70	4,061	0	64	12,782	0	0	185	0	0	17,163	1.1
2006	12,560	0	2,013	0	302	7,602	0	124	1,047	0	0	11,087	0.9
2007	8,375	0	1,483	0	371	6,805	95	0	95	0	91	8,941	1.1
2008	8,176	0	1,570	0	0	7,158	0	95	273	0	0	9,097	1.1
2009	9,583	0	191	0	191	8,931	0	0	223	0	0	9,536	1.0
2010	6,239	0	1,185	0	365	11,810	0	0	960	0	0	14,320	2.3
2011	5,298	0	1,671	–	0	–	–	–	–	–	–	–	–
2012	4,906	0	–	–	–	–	–	–	–	–	–	–	–
2013	4,974	–	–	–	–	–	–	–	–	–	–	–	–
2014	7,335	–	–	–	–	–	–	–	–	–	–	–	–
2015	–	–	–	–	–	–	–	–	–	–	–	–	–

Note: Brood table has not been updated since 2014; en dashes mean no data.

Appendix M5.–Ricker spawner–recruit function fitted to Buskin River coho salmon data, 1989 to 2010 brood years. Parameter estimates are posterior medians.



Appendix M6.–Optimal yield profile obtained by fitting an age-structured spawner–recruit model to Buskin River coho salmon data, 1989–2010. The probability of achieving at least 90% of maximum sustained yield is plotted. Vertical lines show recommended escapement goal.



APPENDIX N: SUPPORTING INFORMATION FOR ESCAPEMENT GOALS FOR OLDS RIVER COHO SALMON

Appendix N1.–Description of stock and escapement goal for Olds River coho salmon.

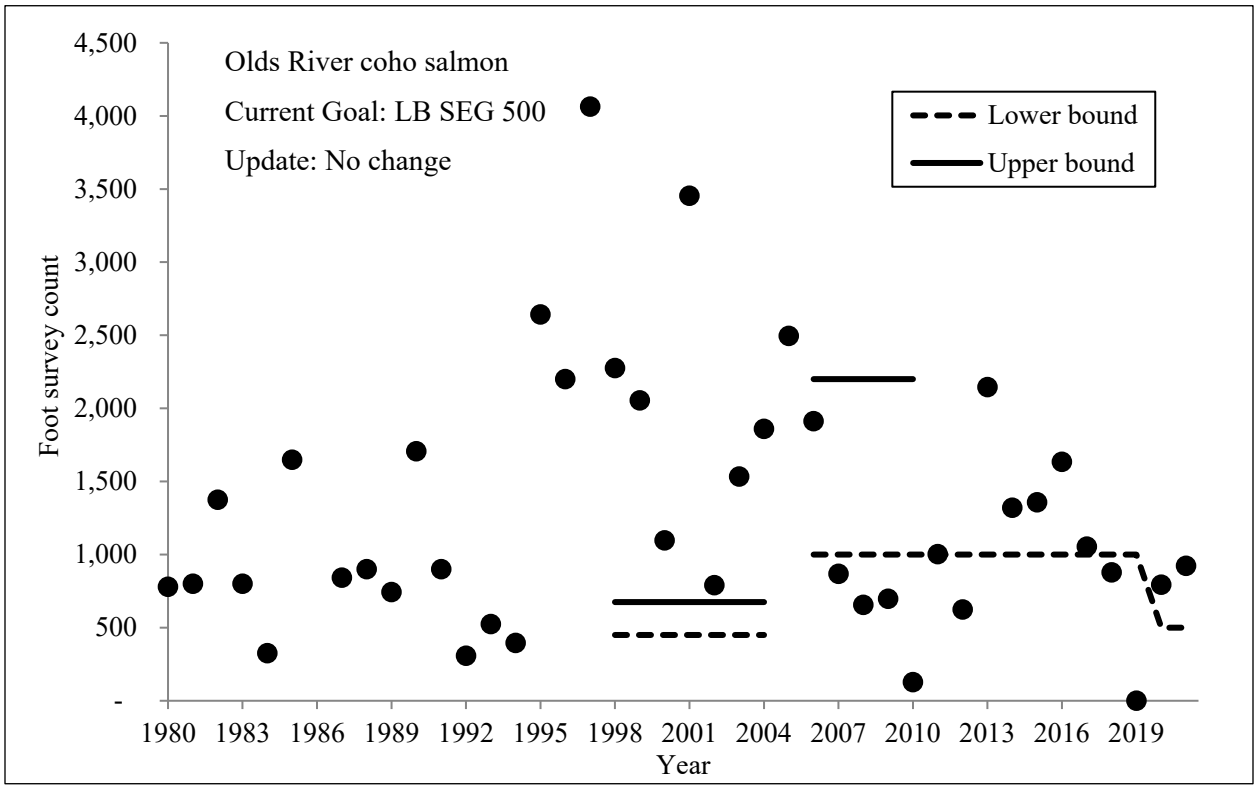
Stream location:	Kodiak Management Area; stream 259-242
Fishery:	Commercial, Commercial sport, Subsistence, Sport
Current escapement goal:	Lower bound SEG of 500 fish (2020)
Updated escapement goal:	No change
Optimal escapement goal:	None
Inriver goal:	None
SOC status (type and year):	None
Escapement enumeration type	Foot survey
Data available:	
Counts:	Foot survey 1980–2021 (excluding 1981, 1983, 1988, and 1991)
Age composition:	None
Stock specific harvest:	None: (Variable subsistence harvest data and inriver sport harvest are available from the Statewide Harvest Survey).
Smolt information:	None
Limnology:	None
Data contrast:	1980–2021: 32
Methodology:	Percentile
Criteria for updated goal (Table 1)	None
Goal history:	The first Olds River SEG was 450 to 675 fish, then changed to 1,000 to 2,200 fish in 2005. Modified to LB SEG of 500 fish in 2020.
Comments:	Mark–recapture work conducted in 1997 and 1998 (Begich et al. 2000) indicated foot surveys in the Olds River represent 69% to 104% of point estimates of abundance and were within the 95% confidence interval of estimated abundance in 1998. Inriver harvest of the recreational fishery are estimated annually through the Statewide Harvest Survey. Annual catch data are available for statistical area 259-24.

Appendix N2.–Annual escapement index of Olds River coho salmon, 1980–2021.

Year	Foot survey
1980	780
1981	800
1982	1,375
1983	800
1984	325
1985	1,648
1986	–
1987	842
1988	900
1989	743
1990	1,706
1991	900
1992	308
1993	525
1994	395
1995	2,642
1996	2,200
1997	4,064
1998	2,276
1999	2,054
2000	1,097
2001	3,454
2002	790
2003	1,534
2004	1,860
2005	2,495
2006	1,912
2007	868
2008	656
2009	697
2010	127
2011	1,003
2012	624
2013	2,145
2014	1,320
2015	1,357
2016	1,634
2017	1,054
2018	878
2019	NA
2020	794
2021	923

Note: En dash = no data available.

Appendix N3.–Olds River coho salmon escapement and escapement goals, 1980–2021.



APPENDIX O: SUPPORTING INFORMATION FOR ESCAPEMENT GOALS FOR PASAGSHAK RIVER COHO SALMON

Appendix O1.–Description of stock and escapement goal for Pasagshak River coho salmon.

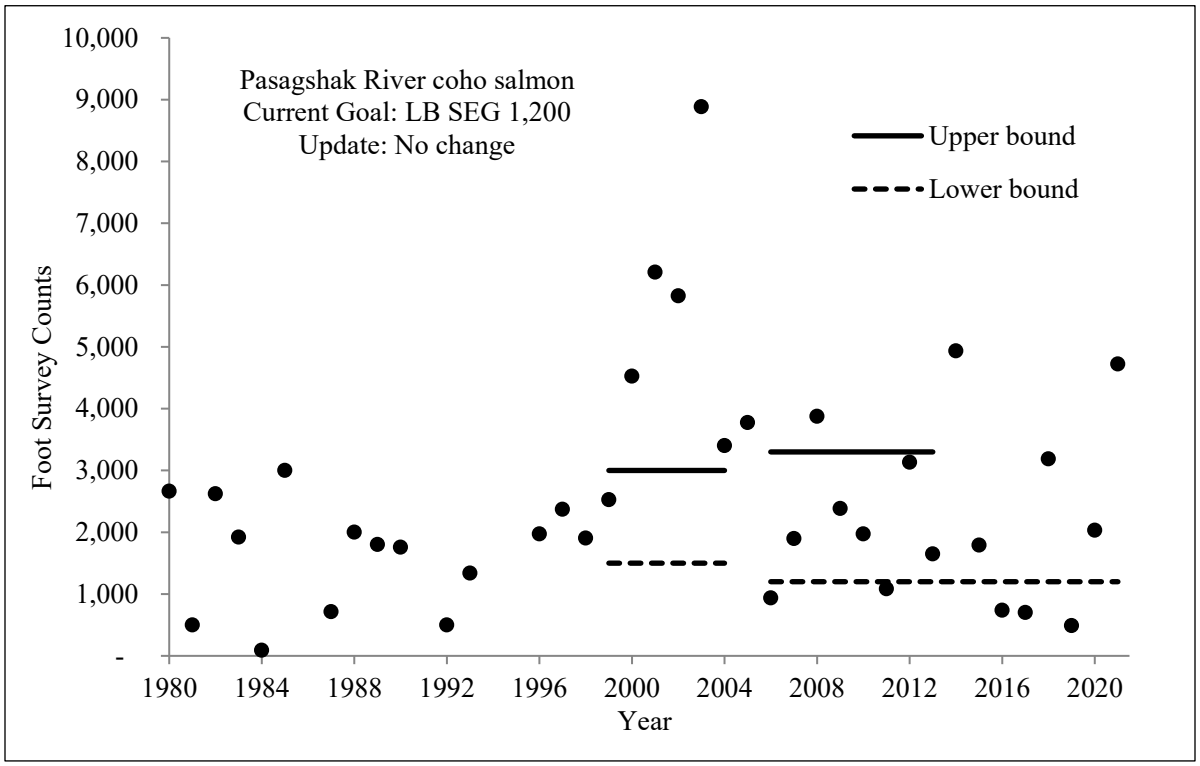
Stream location:	Kodiak Management Area; stream 259-411
Fishery:	Commercial, Commercial sport, Subsistence, Sport
Current escapement goal:	Lower bound (LB) SEG: 1,200 fish (2011)
Updated escapement goal:	No change
Optimal escapement goal:	None
Inriver goal:	None
SOC status (type and year):	None
Escapement enumeration type	Foot survey
Data available:	
Counts:	Foot survey 1980–2021 (excluding 1985, 1988, 1989, 1991, 1992, 1994, and 1995)
Age composition:	None
Stock specific harvest:	None: (Variable subsistence harvest data and inriver sport harvest are available from the Statewide Harvest Survey).
Smolt information:	None
Limnology:	Lake Rose Teed: 1994, 2000, 2001
Data contrast:	1980–2021 (excluding 1992; considered incomplete): 98.7
Methodology:	Theoretical Ricker model
Criteria for updated goal (Table 1)	None
Goal history:	The first Pasagshak River coho salmon SEG was 1,500 to 3,000 fish, then changed to 1,200–3,300 fish in 2005. Modified to LB SEG in 2011.
Comments:	Fishery managers have indicated that foot surveys in the Pasagshak River since 1996 likely represent most of the actual escapement to the system. Foot surveys are conducted annually and inriver harvest of the recreational fishery are estimated annually through the Statewide Harvest Survey. Annual catch data are available for statistical area 259-41.

Appendix O2.–Annual escapement index of Pasagshak River coho salmon, 1980–2021.

Year	Foot survey
1980	2,664
1981	500
1982	2,621
1983	1,920
1984	90
1985	3,000
1986	–
1987	714
1988	2,000
1989	1,800
1990	1,757
1991	–
1992	500
1993	1,337
1994	–
1995	–
1996	1,973
1997	2,371
1998	1,906
1999	2,525
2000	4,526
2001	6,209
2002	5,825
2003	8,886
2004	3,402
2005	3,773
2006	937
2007	1,896
2008	3,875
2009	2,385
2010	1,971
2011	1,083
2012	3,132
2013	1,648
2014	4,934
2015	1,790
2016	737
2017	701
2018	3,186
2019	488
2020	2,031
2021	4,721

Note: En dash = no data available.

Appendix O3.–Pasagshak River coho salmon escapement and escapement goals, 1980–2021.



APPENDIX P: SUPPORTING INFORMATION FOR ESCAPEMENT GOALS FOR KODIAK ARCHIPELAGO PINK SALMON

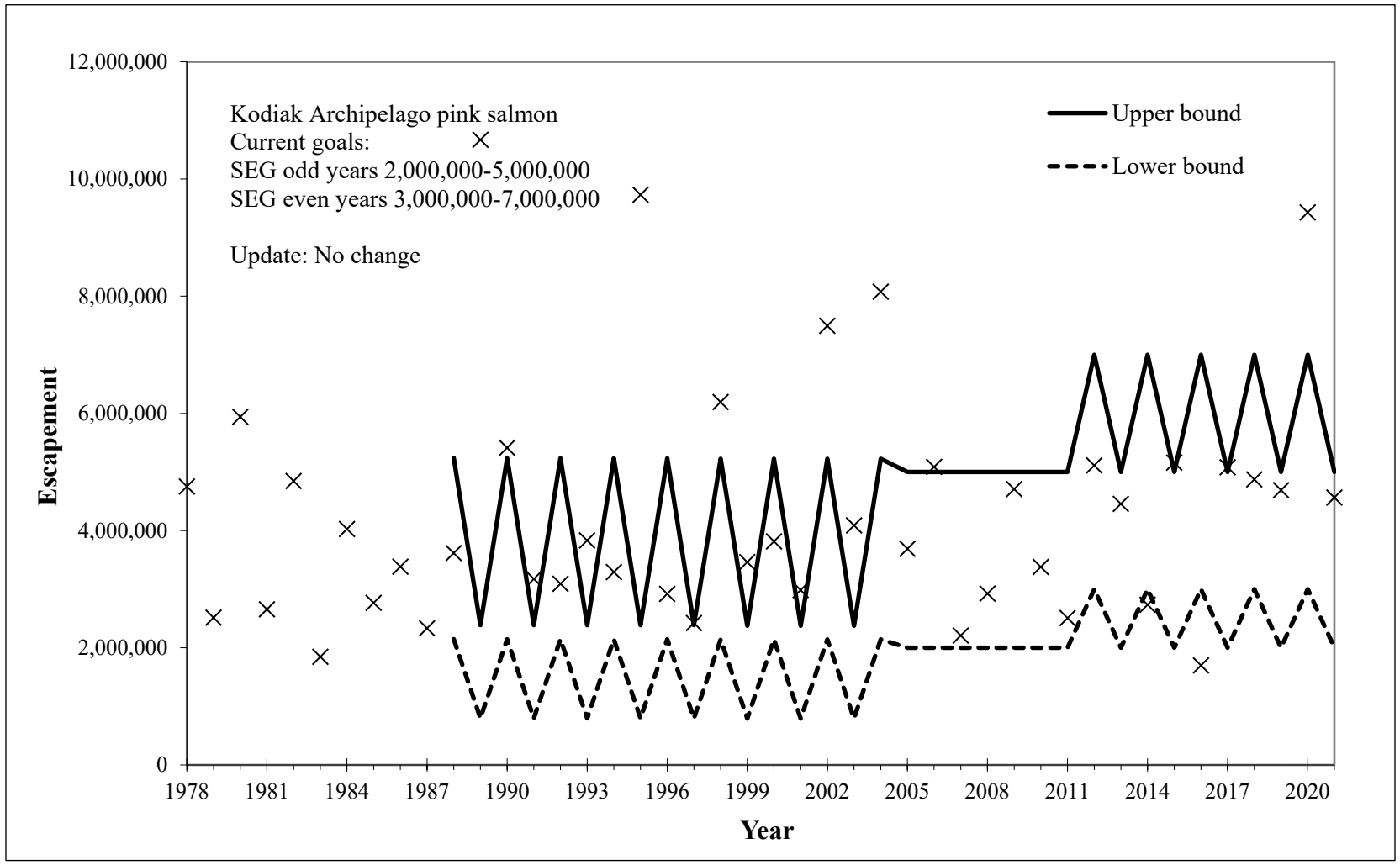
Appendix P1.–Description of stock and escapement goal for Kodiak Archipelago pink salmon.

Stream location:	Kodiak Management Area; Districts 251 to 259
Fishery:	Commercial
Current escapement goal:	SEG Odd Years: 2,000,000–5,000,000 (2011) SEG Even Years: 3,000,000–7,000,000 (2011)
Updated escapement goal:	No change
Optimal escapement goal:	None
Inriver goal:	None
SOC status (type and year):	None
Escapement enumeration type	Aggregate peak aerial survey; weir
Data available:	
Counts:	Aerial survey 1968–2021; weir counts 1976–2021
Age composition:	None
Stock specific harvest:	1978–2021, estimated by combined districts harvest in Archipelago.
Smolt information:	None
Limnology:	None
Data contrast:	1976–2021: 7.0
Methodology:	Ricker spawner–recruit model
Criteria for updated goal (Table 1)	None
Goal history:	KMA district goals were published in 1978. Upper and lower bounds and separate even- and odd-goals established in 1988. Modified to a single aggregate Archipelago goal in 2005. In 2011, Ricker model used to update SEG.
Comments:	An expansion factor of two (2) was used on pink salmon escapement aerial survey data and combined with Karluk and Ayakulik escapement data. The resultant Ricker model was significant ($P = 3.9 \times 10^{-5}$). The resultant S_{MSY} estimate was corrected for Karluk and Ayakulik weir counts and weighted peak aerial survey data.

Appendix P2.–Kodiak Archipelago pink salmon peak escapement and harvest estimates, 1978–2021.

Year	Peak survey	Harvest
1978	4,752,564	14,767,000
1979	2,513,297	10,445,000
1980	5,939,637	16,726,000
1981	2,655,869	9,362,000
1982	4,845,754	7,318,000
1983	1,846,583	4,289,000
1984	4,025,164	10,228,000
1985	2,766,941	3,607,000
1986	3,383,518	10,356,000
1987	2,331,221	3,898,000
1988	3,614,253	12,207,000
1989	10,668,567	182,000
1990	5,412,594	4,569,000
1991	3,175,610	14,136,000
1992	3,093,014	2,415,000
1993	3,832,171	20,577,000
1994	3,290,790	5,917,000
1995	9,730,506	37,636,000
1996	2,920,544	2,458,000
1997	2,420,679	9,096,000
1998	6,193,925	15,225,000
1999	3,460,986	7,459,000
2000	3,813,914	6,139,000
2001	2,984,844	6,042,000
2002	7,494,477	11,308,000
2003	4,088,412	8,360,000
2004	8,074,963	17,171,100
2005	3,688,158	16,061,700
2006	5,086,372	26,636,025
2007	2,208,678	16,307,004
2008	2,924,708	6,024,389
2009	4,707,894	18,077,949
2010	3,378,483	5,473,019
2011	2,506,714	14,225,522
2012	5,111,049	13,807,954
2013	4,450,711	16,204,463
2014	2,733,282	4,743,500
2015	5,614,531	27,270,021
2016	1,699,281	2,010,218
2017	5,079,016	23,666,910
2018	4,874,342	2,735,448
2019	4,688,688	25,450,323
2020	9,429,396	16,034,402
2021	4,562,998	15,555,666

Appendix P3.–Kodiak Archipelago pink salmon indexed escapement and escapement goal ranges, 1978–2021.



APPENDIX Q: SUPPORTING INFORMATION FOR ESCAPEMENT GOALS FOR KODIAK MAINLAND PINK SALMON

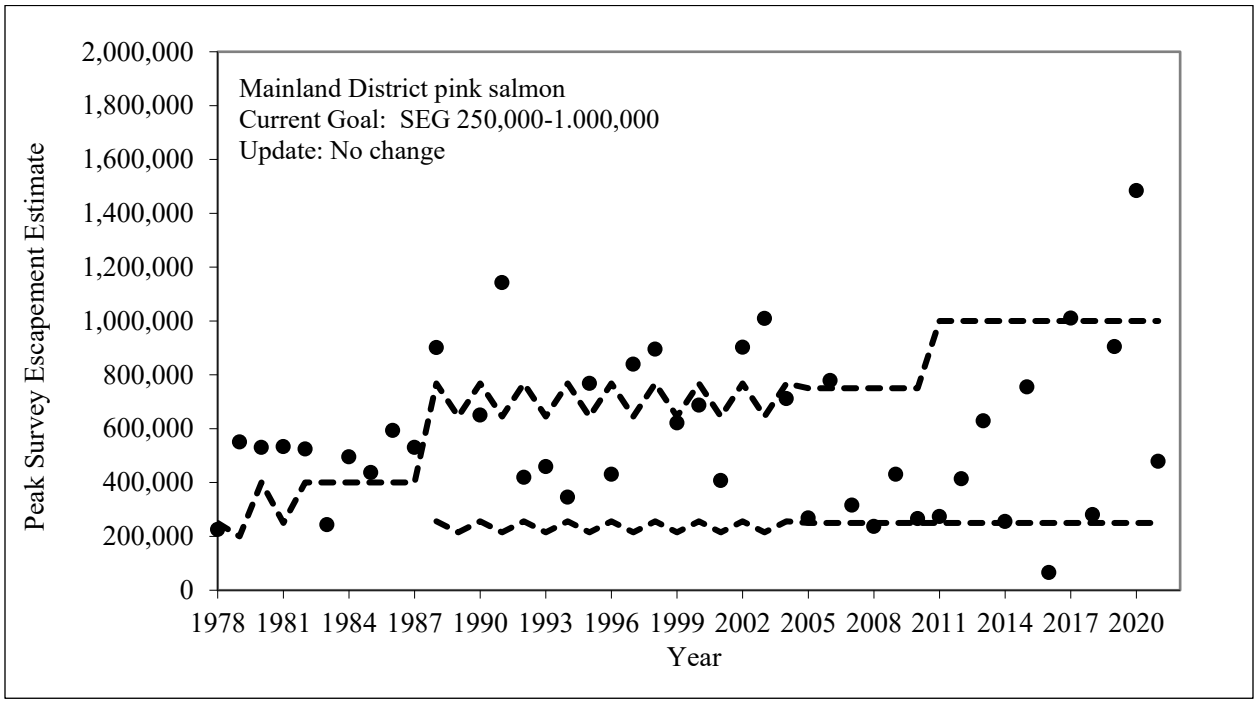
Appendix Q1.–Description of stock and escapement goal for Kodiak Mainland pink salmon.

Stream location:	Kodiak Management Area; District 262
Fishery:	Commercial
Current escapement goal:	SEG: 250,000–1,000,000 (2011)
Updated escapement goal:	No change
Optimal escapement goal:	None
Inriver goal:	None
SOC status (type and year):	None
Escapement enumeration type	Peak aerial survey
Data available:	
Counts:	Aerial survey, 1968–2021
Age composition:	None
Stock specific harvest:	1978–2021, estimated by Mainland District annual harvest
Smolt information:	None
Limnology:	None
Data contrast:	1978–2021: 60.9
Methodology:	Ricker model
Criteria for updated goal (Table 1)	None
Goal history:	Mainland district lower bound goal published in 1978. Upper and lower bounds and separate even- and odd-goals established in 1988. Modified to a single goal in 2005 of 250,000–750,000. In 2011, Ricker model used to update SEG an increased upper bound to 1,000,000.
Comments:	An expansion factor of two (2) was used on pink salmon escapement aerial survey data and coupled with harvest estimates. The resultant Ricker model was significant ($P = 6.3 \times 10^{-5}$). The resultant S_{MSY} estimate was corrected for expanded aerial survey information.

Appendix Q2.–Kodiak Mainland pink salmon aggregate escapement and harvest estimates, 1978–2021.

Year	Peak survey	Harvest
1978	225,000	237,000
1979	550,000	623,000
1980	530,000	287,000
1981	533,000	271,000
1982	524,000	582,000
1983	243,000	184,000
1984	495,000	345,000
1985	437,000	261,000
1986	593,000	806,000
1987	530,000	226,000
1988	901,000	1,748,000
1989	3,977,000	0
1990	650,000	876,000
1991	1,142,000	1,166,000
1992	419,000	190,000
1993	459,000	1,366,000
1994	345,000	194,000
1995	768,000	696,000
1996	430,000	50,000
1997	839,000	728,000
1998	895,000	559,000
1999	621,000	384,000
2000	687,000	117,000
2001	407,000	398,000
2002	902,000	323,000
2003	1,009,000	173,000
2004	711,555	283,600
2005	268,050	473,812
2006	778,200	899,213
2007	315,300	617,342
2008	236,500	652,238
2009	430,100	631,800
2010	265,650	141,308
2011	273,500	249,245
2012	413,325	97,687
2013	620,680	204,611
2014	254,650	154,841
2015	754,600	787,280
2016	65,305	90,097
2017	1,010,100	1,434,099
2018	280,400	27,326
2019	904,400	2,624,547
2020	1,484,000	973,486
2021	478,250	143,943

Appendix Q3.–Kodiak Mainland pink salmon indexed escapement and escapement goals ranges, 1978–2021.



APPENDIX R: SUPPORTING INFORMATION FOR ESCAPEMENT GOALS FOR KODIAK ARCHIPELAGO CHUM SALMON

Appendix R1.–Description of stock and escapement goal for Kodiak chum salmon.

Stream location:	Kodiak Management Area; Districts 251 to 259
Fishery:	Commercial
Current escapement goal:	Lower bound SEG: 101,000 (2017)
Updated escapement goal:	No change
Optimal escapement goal:	None
Inriver goal:	None
SOC status (type and year):	None
Escapement enumeration type	Peak aerial survey
Data available:	
Counts:	Aerial survey 1967–2021. Standardized index streams complete from 1978 to 2021.
Age composition:	None
Stock specific harvest:	None
Smolt information:	None
Limnology:	None
Data contrast:	1978–2021: 7.2
Methodology:	Percentile
Criteria for updated goal (Table 1)	None
Goal history:	Individual district goals were established in 1988. District goals revised to lower bound SEGs in 2005. Mainland District goal was eliminated and Archipelago aggregate created in 2008. Archipelago aggregate modified to index stream lower bound SEG (101,000) in 2017.
Comments:	Seventeen (17) area-wide systems were chosen to represent an indexed escapement goal: Uganik River 253-122, Terror River 253-331, Uyak River 254-202, Zachar River 254-301, Spiridon River 254-401, Sturgeon River 256-401, Deadman River 257-502, Sulua Creek 257-603, N. Kiliuda Creek 258-206, W. Kiliuda Creek 258-207, Midway Creek 258-521, Barling Creek 258-522, American River 259-231, Olds River 259-242, Kizhuyak River 259-365, Saltery River 259-415, and Eagle Harbor 259-424.

Appendix R2.–Kodiak Archipelago chum salmon aggregate escapement indices, 1978–2021.

Year	Kodiak Archipelago Index
1978	134,000
1979	–
1980	–
1981	247,500
1982	305,300
1983	344,420
1984	233,400
1985	–
1986	–
1987	–
1988	–
1989	424,100
1990	164,895
1991	388,653
1992	–
1993	–
1994	106,300
1995	181,303
1996	115,635
1997	97,600
1998	–
1999	–
2000	223,531
2001	149,800
2002	143,100
2003	–
2004	–
2005	–
2006	–
2007	85,050
2008	59,080
2009	105,750
2010	119,000
2011	143,550
2012	94,900
2013	–
2014	84,700
2015	171,800
2016	89,700
2017	184,500
2018	115,100
2019	99,400
2020	64,200
2021	113,300

Note: En dash = no data available.

Appendix R3.–Kodiak Archipelago chum salmon peak aerial survey counts, in selected indicator streams, 1978–2021.

Year	253-122 Uganik River	253-331 Terror River	254-202 Uyak River	254-301 Zachar River	254-401 Spiridon River	256-401 Sturgeon River	257-502 Deadman River	257-603 Sulua Chum Creek	258-206 N. Kiliuda Creek	258-207 W. Kiliuda Creek	258-521 Midway Creek	258-522 Barling Creek	259-231 American River	259-242 Sid Olds	259-365 Kizhuyak River	259-415 Saltery River	259-424 Eagle Harbor	Total Index
1978	4,000	3,000	8,000	6,000	8,000	57,300	10,000	6,000	3,500	3,000	2,700	1,500	4,000	6,000	4,000	5,000	2,000	134,000
1979	2,000	5,000	[redacted]	2,500	21,000	97,000	2,000	2,900	300	11,000	1,000	3,000	5,000	6,000	31,000	3,200	6,900	–
1980	[redacted]			10,000	11,000	44,000	75	24,000	3,500	20,000	20,000	2,000	4,000	8,500	21,000	1,200	[redacted]	–
1981	8,000	5,000	1,500	18,000	7,000	72,000	15,000	9,000	4,400	32,000	20,000	3,000	2,500	500	35,000	7,000	7,600	247,500
1982	30,000	12,900	3,000	40,000	38,000	55,000	8,000	8,000	7,200	8,200	10,000	12,000	3,000	42,000	12,000	8,000	8,000	305,300
1983	25,000	10,050	40,000	20,000	40,000	74,000	40,000	31,000	3,000	2,200	12,000	9,000	10,000	11,000	3,170	5,000	9,000	344,420
1984	10,000	10,000	10,000	12,000	21,000	80,000	10,000	12,000	4,000	9,000	5,000	5,000	8,400	15,000	9,000	10,000	3,000	233,400
1985	5,000	3,000	10,000	24,600	[redacted]	1,500	10,000	20,000	13,000	11,300	16,000	3,000	10,400	8,000	7,000	6,000	7,000	–
1986	250	10,000	[redacted]	15,600	67,000	92,000	1,100	600	1,800	1,400	12,000	5,000	4,000	8,000	55,000	189	4,500	–
1987	15,000	15,000	10,000	5,000	[redacted]	12,200	16,000	8,700	2,400	3,160	1,100	5,800	800	4,500	8,500	250	12,000	–
1988	20,000	15,000	25,000	75,000	15,000	53,200	10,000	50	5,000	20,000	[redacted]	500	8,000	15,000	27,500	[redacted]	500	–
1989	53,000	23,000	57,600	80,000	32,000	5,000	22,000	5,500	1,800	34,000	2,300	10,000	11,000	1,400	55,500	15,000	15,000	424,100
1990	8,000	5,000	6,000	12,800	5,000	90,000	1,500	1,800	25	4,400	7,350	6,350	8,000	4,000	2,300	270	2,100	164,895
1991	11,823	2,200	60,000	11,400	22,100	47,500	52,500	20,250	200	19,500	63,900	21,800	12,000	10,000	1,480	17,000	15,000	388,653
1992	30,000	15,000	15,000	30,000	16,900	41,000	8,000	3,800	[redacted]	1,500	1,000	5,000	4,500	3,000	6,400	250	4,100	–
1993	10,000	6,100	2,500	20,000	5,000	1,300	[redacted]	4,500	5,000	3,500	3,000	2,800	2,000	7,000	500	3,000	11,000	–
1994	10,000	5,000	8,000	12,800	10,300	10,000	7,500	9,000	3,500	2,000	1,750	5,500	3,250	5,000	4,200	500	8,000	106,300
1995	14,000	16,000	13,000	23,000	22,000	32,000	17,000	20,000	200	1,500	3,500	500	8,000	1,500	8,000	103	1,000	181,303
1996	35,000	15,000	3,100	15,000	8,000	6,820	5,100	2,500	10	900	5,600	7,500	2,500	100	3,900	5	4,600	115,635
1997	20,000	15,000	3,500	20,000	3,400	3,200	3,000	800	500	500	3,500	2,500	6,000	1,500	5,000	6,000	3,200	97,600

-continued-

Year	253-122 Uganik River	253-331 Terror River	254-202 Uyak River	254-301 Zachar River	254-401 Spiridon River	256-401 Sturgeon River	257-502 Deadman River	257-603 Sulua Chum Creek	258-206 N. Kiliuda Creek	258-207 W. Kiliuda Creek	258-521 Midway Creek	258-522 Barling Creek	259-231 American River	259-242 Sid Olds	259-365 Kizhuyak River	259-415 Saltery River	259-424 Eagle Harbor	Total Index
1998		5,000	5,000	10,000	3,650	24,093	1,000	4,000		100	3,000	5,200	800	1,000	1,800	1,500	1,600	–
1999	7,000	15,000	2,000	20,000	8,500	71,610		7,500	6,500	5,200	7,700	12,600		2,000	300	2,500	7,100	–
2000	40,000	10,000	15,000	28,000	16,500	14,331	33,800	4,800	3,800	11,000	3,000	9,000	1,500	1,500	10,800	2,500	18,000	223,531
2001	18,000	15,000	17,650	20,700	3,000	500	10,500	5,000	50	400	4,500	5,000	8,000	5,500	23,900	1,000	11,100	149,800
2002	8,000	2,000	10,000	11,500	6,500	55,700	2,000	700	6,000	9,000	5,600	6,000	5,000	2,000	1,400	6,900	4,800	143,100
2003	6,000	13,600	3,000	9,200	4,500	12,900	8,300	24,000	3,000	5,100	15,000	5,600	500	1,700	23,000		2,600	–
2004	4,000	15,600	5,000	2,100		10,100	5,000		20,000	5,000	8,000	10,000			4,000		250	–
2005	5,000	1,700	8,000	5,600	13,400	2,000	6,700	35,000		15,000		1,000		7,000	1,500	6,000	6,000	–
2006		6,600	2,600	17,000	5,000	14,500			60,000	35,000	12,000	27,000	3,300	5,500	10,100	14,000	12,000	–
2007	1,800	8,400	4,500	5,000	7,900	300	5,900	6,600	1,400	4,900	3,400	14,600	8,200	8,550	200	1,500	1,900	85,050
2008	9,000	4,500	6,000	2,500	11,200	4,000	2,500	1,400	500	200	2,800	6,900	700	980	1,000	700	4,200	59,080
2009	1,600	4,800	4,500	9,400	23,500	750	14,000	6,700	3,200	3,500	4,000	3,500	5,400	3,100	12,400	600	4,800	105,750
2010	9,200	3,600	2,000	2,200	10,700	8,400	4,200	5,000	2,200	4,200	7,500	29,000	4,300	6,200	8,700	2,400	9,200	119,000
2011	15,000	3,700	9,850	34,300	8,300	8,400	8,200	6,300	7,000	6,900	9,600	4,500	4,800	2,300	3,600	2,500	8,300	143,550
2012	5,100	7,000	8,800	3,600	5,100	9,100	9,600	700	3,400	9,700	6,000	8,000	3,500	3,200	7,200	1,900	3,000	94,900
2013	3,800	5,000	3,800	16,600	300		8,800	10,500	8,000	10,600	17,000	19,600	400	2,300	6,600	3,900	1,900	–
2014	1,600	7,000	8,500	8,500	6,600	1,200	12,100	3,000	2,500	6,000	7,500	8,500	400	1,900	3,800	1,600	4,000	84,700
2015	10,000	10,800	11,800	28,000	15,000	1,100	19,000	9,600	4,500	2,500	13,400	8,000	10,500	3,200	5,300	6,200	12,900	171,800
2016	8,300	5,100	4,400	9,000	5,800	5,900	8,000	2,300	4,300	5,200	15,400	5,800	600	1,300	4,600	2,800	900	89,700
2017	13,000	10,000	18,000	17,800	8,300	15,000	22,000	15,000	10,000	11,000	13,500	8,500	5,200	3,000	4,000	6,000	4,200	184,500
2018	8,500	10,000	7,000	15,000	6,300	10,000	15,000	6,000	3,400	8,000	3,600	10,000	1,000	1,600	100	2,200	7,400	115,100
2019	6,000	8,000	6,500	9,300	9,100	11,300	2,200	4,000	7,100	7,000	13,000	2,000	1,000	1,300	4,000	600	7,000	99,400
2020	4,800	5,200	3,500	4,900	1,600	19,900	4,700	1,200	1,200	2,500	4,100	2,200	700	800	1,700	1,800	3,400	64,200
2021	4,100	19,000	8,800	9,700	15,100	2,300	3,600	3,000	1,500	10,300	4,700	4,600	2,200	2,700	8,300	5,400	8,000	113,300

Note: Systems not successfully surveyed in a survey year are blacked out. If 1 or more system in a survey year was not successfully surveyed, the Total Index was not calculated and is noted with an en dash.

Appendix R4.–Kodiak Archipelago chum salmon escapement and escapement goals ranges, 1978–2021.