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**Review of Salmon Escapement Goals in the Alaska
Peninsula and Aleutian Islands Management Areas,
2015**

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)		General		Mathematics, statistics	
centimeter	cm	Alaska Administrative Code	AAC	<i>all standard mathematical signs, symbols and abbreviations</i>	
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	H_A
gram	g	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	e
hectare	ha	at	@	catch per unit effort	CPUE
kilogram	kg	compass directions:		coefficient of variation	CV
kilometer	km	east	E	common test statistics	(F, t, χ^2 , etc.)
liter	L	north	N	confidence interval	CI
meter	m	south	S	correlation coefficient (multiple)	R
milliliter	mL	west	W	correlation coefficient (simple)	r
millimeter	mm	copyright	©	covariance	cov
		corporate suffixes:		degree (angular)	$^\circ$
Weights and measures (English)		Company	Co.	degrees of freedom	df
cubic feet per second	ft ³ /s	Corporation	Corp.	expected value	E
foot	ft	Incorporated	Inc.	greater than	>
gallon	gal	Limited	Ltd.	greater than or equal to	\geq
inch	in	District of Columbia	D.C.	harvest per unit effort	HPUE
mile	mi	et alii (and others)	et al.	less than	<
nautical mile	nmi	et cetera (and so forth)	etc.	less than or equal to	\leq
ounce	oz	exempli gratia (for example)	e.g.	logarithm (natural)	ln
pound	lb	Federal Information Code	FIC	logarithm (base 10)	log
quart	qt	id est (that is)	i.e.	logarithm (specify base)	log ₂ , etc.
yard	yd	latitude or longitude	lat. or long.	minute (angular)	'
		monetary symbols (U.S.)	\$, ¢	not significant	NS
Time and temperature		months (tables and figures): first three letters	Jan,...,Dec	null hypothesis	H_0
day	d	registered trademark	®	percent	%
degrees Celsius	°C	trademark	™	probability	P
degrees Fahrenheit	°F	United States (adjective)	U.S.	probability of a type I error (rejection of the null hypothesis when true)	α
degrees kelvin	K	United States of America (noun)	USA	probability of a type II error (acceptance of the null hypothesis when false)	β
hour	h	U.S.C.	United States Code	second (angular)	"
minute	min	U.S. state	use two-letter abbreviations (e.g., AK, WA)	standard deviation	SD
second	s			standard error	SE
Physics and chemistry				variance	
all atomic symbols				population sample	Var var
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				

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ABSTRACT

In January 2015, an interdivisional team, including staff from the Division of Commercial Fisheries and the Division of Sport Fish, was formed to review Pacific salmon *Oncorhynchus* sp. escapement goals in the Alaska Peninsula and Aleutian Islands Management areas (Area M). This review was based on the Policy for the Management of Sustainable Salmon Fisheries (5 AAC 39.222) and the Policy for Statewide Salmon Escapement Goals (5 AAC 39.223). Of the 24 existing Area M salmon escapement goals evaluated, the team recommended revising 2 goals, consolidating an even/odd year goal, and leaving the other 20 goals unchanged.

After a comprehensive review of the available data, the team recommended that no changes in the current sustainable escapement goals (SEGs) were warranted for 11 sockeye salmon *O. nerka* systems that include runs to Orzinski, Bear (early and late run), McLees, and Thin Point lakes; Mortensens, Christianson, and Swanson lagoons; North Creek; and the Sandy, and Ilnik rivers. No change was recommended for the sockeye salmon biological escapement goal (BEG) at Nelson River. In addition, the team recommended no changes to the current SEGs for 5 chum salmon *O. keta* aggregates in the North and South Alaska Peninsula and 2 coho salmon *O. kisutch* goals at Nelson and Ilnik rivers. One Chinook salmon *O. tshawytscha* BEG (Nelson River) also did not warrant change. The team did indicate revision of 2 goals (Meshik River sockeye salmon SEG 48,000 to 86,000; Cinder River sockeye salmon SEG 36,000 to 94,000) and consolidation of the even/odd year South Peninsula pink salmon *O. gorbuscha* pair into an annual SEG (1,750,000 to 4,000,000).

Key words: Pacific salmon, *Oncorhynchus*, escapement goal, Area M, Alaska Peninsula, stock status.

INTRODUCTION

This report documents the 2015 review of salmon escapement goals in the Alaska Peninsula and Aleutian Islands Management areas (Area M) 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* (EGP; 5 AAC 39.223). Recommendations from this review are made to the directors of the divisions of Commercial and Sport Fisheries of the Alaska Department of Fish and Game (ADF&G) and are intended to take effect for salmon stocks returning in 2016. Salmon escapement goals in Area M were last reviewed in 2012 (Sagalkin and Erickson 2013).

Two important terms defined in the SSFP are as follows:

1. “*biological escapement goal* (BEG): the escapement that provides the greatest potential for maximum sustained yield (MSY); ...” and
2. “*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...”.

A report documenting the established escapement goals for stocks of 5 Pacific salmon species (Chinook *Oncorhynchus tshawytscha*, sockeye *O. nerka*, coho *O. kisutch*, pink *O. gorbuscha*, and chum *O. keta* salmon) 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 Area M have gone through review 4 times (2004, 2007, 2010, and 2013; Nelson et al. 2006; Honnold et al. 2007; Witteveen et al. 2009; Sagalkin and Erickson 2013).

In January 2015, the Salmon Escapement Goal Interdivisional Review Team (hereafter referred to as the team) was formed to review the existing Area M salmon escapement goals and recent escapements for stocks with escapement goals. The team included staff from the Division of

Commercial Fisheries (CF) and the Division of Sport Fish (SF): Kevin Schaberg (CF), Tim McKinley (SF), Nicholas Sagalkin (CF), Heather Finkle (CF), Birch Foster (CF), Michelle Wattum (CF), Mary Beth Loewen (CF), Jeff Wadle (CF), Dawn Wilburn (CF), Bob Murphy (CF), Matthew Keyes (CF), David Barnard (CF), Lisa Fox (CF), Eric Volk (CF), Andrew Munro (CF), Jim Hasbrouck (SF), Tom Vania (SF), and Tyler Polum (SF).

For this review the team 1) determined the appropriate goal type (BEG or SEG) for each Area M salmon stock with an existing goal, based on the quality and quantity of available data; 2) determined the most appropriate methods to evaluate the escapement goal ranges; 3) estimated the escapement goal for each stock and compared these estimates with the current goal; 4) determined if a goal could be developed for any stocks or stock-aggregates that currently have no goal; 5) developed recommendations for each goal evaluated to present to the directors of the divisions of Commercial Fisheries and Sport Fish for approval; and 6) reviewed recent escapements to all stocks with escapement goals.

STUDY AREA

Area M comprises 2 separate management areas: 1) the Alaska Peninsula Management Area and 2) the Aleutian Islands Management Area (Figure 1).

Alaska Peninsula Management Area includes all waters of Alaska from Cape Menshikof to Cape Sarichef and from a line extending from Scotch Cap through the easternmost tip of Ugamak Island to a line extending 135° southeast from Kupreanof Point (55°33.98' N lat., 159°35.88' W long; 5 AAC 09.100). The area is divided into 6 commercial fishing districts: the Southeastern (comprising the Southeastern District Mainland and the Shumagin Islands), South Central, Southwestern, Unimak, Northwestern, and Northern districts (5 AAC 09.200). Commonly, aggregates of these districts are referred to as the South Peninsula and North Peninsula (Figure 2). These districts are further subdivided into sections and smaller statistical areas.

The Aleutian Islands Management Area includes the waters of Alaska surrounding the Aleutian Islands west of Cape Sarichef and west of a line extending from Scotch Cap through the easternmost tip of Ugamak Island, including waters surrounding the Pribilof Islands (5 AAC 12.100), except the Atka-Amlia Islands Area described in 5 AAC 11.101 (Figure 1). The Aleutian Islands area is separated into 4 commercial fishing districts: the Akutan, Unalaska, Umnak, and Adak districts. There is little commercial salmon fishing in the area and very few of the 458 known salmon streams are consistently monitored for escapement (Holmes 1997).

BACKGROUND

Nelson River on the North Peninsula is the only Chinook salmon system in Area M with an escapement goal (Table 1; Figure 3). Chinook salmon escapement at this system is primarily monitored by weir counts. There are no spawning stocks of Chinook salmon documented along the South Peninsula or Aleutian Islands.

A total of 14 sockeye salmon stocks (13 systems) in Area M have escapement goals in place. Three of these stocks are located along the South Peninsula, 10 are located along the North Peninsula, and one is located on Unalaska Island (Table 1; Figures 2 through 4). All of these stocks directly affect the daily management of associated fisheries and 6 of these systems currently have weirs for direct enumeration of escapement. Escapements of the remaining stocks are monitored via aerial surveys.

Coho salmon are not monitored in some Area M streams due to the difficulty and expense of conducting surveys during late fall. However, there are escapement goals in place for 2 coho stocks on the North Peninsula (Table 1; Figure 3). There are no coho salmon escapement goals for the Aleutian Islands where, similar to Area M, conducting aerial surveys has proven to be difficult and expensive.

Pink salmon are generally a high-volume commercial species in Area M and are managed as aggregates of streams by district or section. There are odd- and even-year goals for the stock-aggregate pink salmon escapement goal for the South Peninsula, and there are currently no other established pink salmon goals in Area M (Table 1; Figure 3). These stock-aggregate goals comprise the respective sums of aerial survey escapement objectives for 165 individual index streams (Honnold et al. 2007; Nelson and Lloyd 2001).

A total of 5 stock-aggregate escapement goals are currently established for chum salmon in Area M (Table 1; Figures 2 and 3). These stock-aggregate goals comprise the respective sums of aerial survey escapement objectives for 136 individual index streams (Honnold et al. 2007; Nelson and Lloyd 2001). Sixty-seven of these index streams are located along the South Peninsula and 69 are found along the North Peninsula. There are no chum salmon escapement goals for the Aleutian Islands, where conducting aerial surveys to monitor escapement are problematic and costly.

METHODS

During the review process, all escapement goals were reviewed, and of these, 3 sockeye salmon stocks were reevaluated (Table 1). In addition, 2 pink salmon stock-aggregate goal ranges were reevaluated (Table 1). We conducted our review similarly to the 2012 review (Sagalkin and Erickson 2013), primarily examining recent (2012 to 2014) data and updating previous analyses. We did not review or analyze data for most stocks in which goals were recently eliminated (2009 and 2012). A formal meeting, via teleconference, to discuss and develop recommendations was held in January 2015. The team also communicated on a regular basis by telephone and email.

Available 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 (Table 2). This evaluation was used to assist in determining the appropriate type of escapement goal to apply to each stock, as defined in the SSFP and EGP.

BIOLOGICAL ESCAPEMENT GOAL DETERMINATION

In Alaska, most salmon BEGs are developed using Ricker (1954) spawner-recruit models (Munro and Volk 2010). BEG ranges, as defined in the SSFP (5AAC 39.222), are estimates of the number of spawners that provide the greatest potential for maximum sustained yield, abbreviated as S_{msy} . There were no Area M spawning stocks with BEGs that the team determined needed to be reevaluated.

SUSTAINABLE ESCAPEMENT GOAL DETERMINATION

Sustainable escapement goals (SEGs) for Area M salmon stocks were determined using the percentile approach (Clark et al. 2014). This is based on the simple principle that a range of

observed escapements, or an index of escapements that have been sustained over a period of time, represent an SEG for a stock that has been fished and likely 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).

The percentile method takes into account the measurement error of the data collection method (e.g., weirs and towers have lower measurement error than aerial or foot surveys), 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 (< .40)	20 th –60 th percentile
2	>8	Low (weirs and towers)	Low to moderate (< .40)	15 th –65 th percentile
3	4-8	-	Low to moderate (< .40)	5 th –65 th percentile

CHINOOK SALMON

Nelson River

Escapement Goal Background and Previous Reviews

Nelson River is located in the Nelson Lagoon Section of the Northern District of the Alaska Peninsula Management Area (Figures 2 and 3). Nelson River has the only Chinook salmon escapement goal currently established in Area M. Escapement has been counted almost every year since 1974 from either a tower (1974 to 1988) or a weir (1989 to present). Since 1985, salmon escapement was only assessed through the end of the sockeye salmon run. In nearly all years, an aerial survey was conducted to count Chinook salmon downstream of the tower or weir on the day that, or a few days after, the weir or tower was removed. Stock-specific catch data are available from the Nelson Lagoon Section gillnet fishery due to the terminal nature of that fishery. The first published escapement goal for Nelson River was developed in 1985, and a range was set at 4,500 to 9,000 Chinook salmon based on weir and counting tower data collected from 1978 to 1984 (Nelson and Lloyd 2001; Appendix A). The goal was changed in 1993 to a range of 3,200 to 6,400 Chinook salmon based on aerial survey data collected from 1985 to 1992 (Nelson and Lloyd 2001). The SEG was modified in 2003 (Nelson et al. 2006) to a BEG of 2,400 to 4,400 fish using a Ricker spawner-recruit curve (Ricker 1954) that was corroborated with a habitat model (Parken et al. 2006.). The BEG was corroborated in 2006 using a Ricker spawner-recruit curve, and there was consensus to not reevaluate the goal in 2009 and 2012, resulting in no change to the Nelson River Chinook salmon BEG (Witteveen et al. 2009; Sagalkin and Erickson 2013).

2015 Review

Nelson River Chinook salmon escapements since the last review were above the current BEG in 2013 and 2014 (Table 1). There was no compelling information to suggest that any changes were necessary to the current BEG and the team agreed that no further review was necessary in 2015.

SOCKEYE SALMON

Orzinski Lake

Escapement Goal Background and Previous Reviews

Orzinski Lake is located in the Northwest Stepovak Section of the Southeastern District (Figures 2 and 3). The first published escapement goal for Orzinski Lake was developed in 1980, and a range was set at 15,000 to 20,000 sockeye salmon (Nelson and Lloyd 2001; Appendix B). Aerial surveys were used to estimate escapement into Orzinski Lake from 1968 through 1989, and a weir was used from 1990 through the present. An escapement goal review of this system was conducted during 2003. All available stock assessment data were analyzed using the percentile, euphotic volume, smolt biomass as a function of zooplankton biomass, and lake surface area methods, and these analyses reasonably corroborated the existing SEG and no change was warranted (Nelson et al. 2006). During the 2006 escapement goal review (Honnold et al. 2007), staff examined escapement data using the percentile approach and determined there was no significant change in the estimate and that the goal would remain the same. With additional years of data, the 2009 and 2012 escapement goal review teams determined that the additional stock assessment data would not substantially affect the results of previous escapement goal analyses. Thus, there was consensus to not reevaluate the goal in 2009 and 2012, and there was no change to the Orzinski Lake sockeye salmon SEG (Witteveen et al. 2009; Sagalkin and Erickson 2013).

2015 Review

Stock-specific harvest estimates for Orzinski Lake sockeye salmon were not available. Recent escapement estimates and age compositions were examined to determine if a change in the escapement goal was justified. Escapements since the last review were similar to those in the recent past (Table 1), and the team agreed that no further analysis was necessary in 2015.

Thin Point Lake

Escapement Goal Background and Previous Reviews

Thin Point Lake is located in the Thin Point Section of the Southwestern District (Figures 2 and 3). The first published escapement goal for Thin Point Lake was developed in the late 1980s and a range was set at 14,000 to 28,000 sockeye salmon (Nelson and Lloyd 2001; Appendix C). Aerial surveys have been used to estimate escapement into Thin Point Lake from 1968 to the present and a weir was used from 1994 to 1998.

An escapement goal review of this system was conducted during 2003. All available stock assessment data were analyzed using the percentile, euphotic volume analysis, smolt biomass as a function of zooplankton biomass, and lake surface area methods (Nelson et al. 2006). The authors concluded that these analyses reasonably corroborated the existing SEG and no change was warranted (Table 1). With additional years of data, the 2009 and 2012 escapement goal review teams determined that the additional stock assessment data would not substantially affect the results of previous escapement goal analyses. Thus, there was consensus to not reevaluate the

goal in 2009 and 2012, and there was no change to the Thin Point Lake sockeye salmon SEG (Witteveen et al. 2009; Sagalkin and Erickson 2013).

2015 Review

Stock-specific harvest estimates for Thin Point Lake sockeye salmon were not available. Recent escapement data (Table 1) were examined to determine if a change in the escapement goal was justified, and the team agreed that no further analysis was necessary in 2015.

Mortensens Lagoon

Escapement Goal Background and Previous Reviews

Mortensens Lagoon is located in the Cold Bay Section of the Southwestern District (Figures 2 and 3). The first published escapement goal range for Mortensens Lagoon was developed in the late 1980s and set at 3,200 to 6,400 sockeye salmon (Nelson and Lloyd 2001; Appendix D). Aerial surveys have been used to estimate escapement into Mortensens Lagoon from 1968 to the present and a weir was operated from 2001 to 2006.

An escapement goal review conducted during 2003 using the percentile, euphotic volume analysis, smolt biomass as a function of zooplankton biomass, and lake surface area methods concluded that these analyses reasonably corroborated the existing SEG and no change was warranted (Nelson et al. 2006). During the subsequent 2006 escapement goal review, the team utilized the percentile approach and also corroborated the 3,200 to 6,400 sockeye salmon SEG (Honnold et al. 2007). With additional years of data, the 2009 and 2012 escapement goal review teams determined that the additional stock assessment data would not substantially affect the results of previous escapement goal analyses. Thus, there was consensus to not reevaluate the goal in 2009 and 2012, and there was no change to the Mortensens Lagoon sockeye salmon SEG (Witteveen et al. 2009; Sagalkin and Erickson 2013).

2015 Review

Stock-specific harvest estimates for Mortensens Lagoon sockeye salmon were not available. Recent escapement data (Table 1) were examined to determine if a change in the escapement goal was justified, and the team agreed that no further analysis was necessary in 2015.

Christianson Lagoon

Escapement Goal Background and Previous Reviews

Christianson Lagoon is located in the Uria Bay Section of the Northwestern District (Figures 2 and 3). The first published escapement goal range for Christianson Lagoon was developed in the 1980s and set at 25,000 to 50,000 sockeye salmon (Nelson and Lloyd 2001; Appendix E). Aerial surveys have been used to estimate escapement into Christianson Lagoon from 1960 to the present.

An escapement goal review of this system conducted during 2003 using the percentile method (Nelson et al. 2006) concluded that the analysis reasonably corroborated the existing SEG and no change was warranted (Nelson et al. 2006). The subsequent 2006 escapement goal review team also utilized the percentile approach and corroborated the 25,000 to 50,000 sockeye salmon SEG (Honnold et al. 2007). With additional years of data, the 2009 and 2012 escapement goal review teams determined that the additional stock assessment data would not substantially affect the results of previous escapement goal analyses. Thus, there was consensus to not reevaluate the

goal in 2009 and 2012, and there was no change to the Christianson Lagoon sockeye salmon SEG (Witteveen et al. 2009; Sagalkin and Erickson 2013).

2015 Review

Stock-specific harvest estimates for Christianson Lagoon sockeye salmon were not available. Recent escapement data (Table 1) were examined to determine if a change in the escapement goal was justified, and the team agreed that no further analysis was necessary in 2015.

Swanson Lagoon

Escapement Goal Background and Previous Reviews

Swanson Lagoon is located in the Swanson Lagoon Section of the Northwestern District (Figures 2 and 3). The first published escapement goal range for Swanson Lagoon was developed in 1990 and set at 8,000 to 16,000 sockeye salmon (Nelson and Lloyd 2001; Appendix F). Aerial surveys have been used to estimate escapement into Swanson Lagoon from 1960 to the present. The escapement goal review of this system conducted during 2003 using the percentile method concluded that because of data uncertainty and that the established SEG produced sufficient returns of escapement and harvest, no change in the SEG was warranted (Nelson et al. 2006). The subsequent 2006 escapement goal review also utilized the percentile approach and changed the goal to 6,000 to 16,000 sockeye salmon SEG (Honnold et al. 2007). During the 2009 escapement goal review, the percentile algorithm was recalculated using updated escapement estimates from 1990 to 2008. Based on the results of this analysis, the team recommended maintaining the existing 6,000 to 16,000 sockeye salmon SEG (Witteveen et al. 2009). The 2012 escapement goal review team determined that the additional stock assessment data would not substantially affect the results of previous escapement goal analyses, and no review was conducted (Sagalkin and Erickson 2013). The stock was, however, recommended for a stock of concern determination due to repeated low escapement.

2015 Review

Stock-specific harvest estimates for Swanson Lagoon sockeye salmon were not available. Analysis of recent escapement data (Table 1) revealed continued low escapements, and the stock was again recommended as a stock of concern in 2015. The team determined this stock required further review and the updated percentile method (Clark et al. 2014) was used to evaluate if the recent low escapements would significantly impact and warrant changing the escapement goal range.

North Creek

Escapement Goal Background and Previous Reviews

North Creek is located in the Black Hills Section of the Northern District (Figures 2 and 3). The first published escapement goal for North Creek was developed in the late 1980s, and a range was set at 4,400 to 8,800 sockeye salmon (Nelson and Lloyd 2001; Appendix G). Aerial surveys have been used to estimate escapement into North Creek from 1960 to the present. An escapement goal review of this system conducted during 2003 using the percentile method concluded that the analysis reasonably corroborated the existing SEG, and no change was warranted (Nelson et al. 2006). During the 2006 escapement goal review, the team used the percentile approach and corroborated the 4,400 to 8,800 sockeye salmon SEG (Honnold et al. 2007). During the 2009 escapement goal review, the percentile algorithm was recalculated using

updated escapement estimates from 1990 to 2008. Based on the results of this analysis the team recommended maintaining the existing 4,400 to 8,800 sockeye salmon SEG (Witteveen et al. 2009). The 2012 escapement goal review team determined that the additional stock assessment data would not substantially affect the results of previous escapement goal analyses, and no review was conducted (Sagalkin and Erickson 2013).

2015 Review

Stock-specific harvest estimates for North Creek sockeye salmon were not available. Recent escapement data (Table 1) were examined to determine if a change in the escapement goal was justified, and the team agreed that no further analysis was necessary in 2015.

Nelson River

Escapement Goal Background and Previous Reviews

Nelson River is located in the Nelson Lagoon Section of the Northern District (Figures 2 and 3). The first published escapement goal for Nelson River was developed in 1979 and set as an SEG, with a range of 100,000 to 150,000 sockeye salmon (Nelson and Lloyd 2001; Appendix H). Tower counts were used to estimate escapement into Nelson River from 1962 to 1988, and a weir has been used from 1989 to the present. An escapement goal review of this system conducted during 2003 using the Ricker spawner-recruit model, percentile method, euphotic volume analysis, smolt biomass as a function of zooplankton biomass, and lake surface area method recommended that the escapement goal should be reclassified as a BEG, with a range from 97,000 to 219,000 sockeye salmon (Nelson et al. 2006). The 2006 escapement goal review analysis using the Ricker spawner-recruit model corroborated the 97,000 to 219,000 sockeye salmon BEG (Honnold et al. 2007). With additional years of data, the 2009 and 2012 escapement goal review teams determined that the additional stock assessment data would not substantially affect the results of previous escapement goal analyses. Thus, there was consensus to not reevaluate the goal in 2009 and 2012, and there was no change to the Nelson River sockeye salmon BEG (Witteveen et al. 2009; Sagalkin and Erickson 2013).

2015 Review

Stock-specific harvest estimates for Nelson River sockeye salmon were available from 1970 to the present. Recent run data (Table 1) were examined to determine if a change in the escapement goal was justified. The run data from 2012 to 2014 were similar to the recent past, so the team agreed that no further analysis was necessary in 2015.

Bear Lake

Escapement Goal Background and Previous Reviews

Bear Lake is located in the Bear River Section of the Northern District (Figures 2 and 3). The first published escapement goals for Bear Lake were developed in late 1960s and set as SEGs, with ranges of 150,000 to 175,000 sockeye salmon for the early run; 50,000 to 75,000 sockeye salmon for the late run; and a total run SEG range of 200,000 to 250,000 sockeye salmon (Nelson and Lloyd 2001; Appendix I). Tower counts were used to estimate escapement into Bear River from 1964 to 1985, and a weir has been used from 1986 to the present.

An escapement goal review of this system conducted during 2003 using the Ricker spawner-recruit model, percentile method, euphotic volume analysis, smolt biomass as a function of zooplankton biomass, and lake surface area method indicated that the escapement goal range

should be increased to 293,000 to 488,000 sockeye salmon for the total Bear Lake run (176,000 to 293,000 for the early run; 117,000 to 195,000 for the late run; Nelson et al. 2006). The 2006 escapement goal review analysis also utilized the Ricker spawner-recruit model, percentile method, euphotic volume analysis, smolt biomass as a function of zooplankton biomass, and lake surface area methods to analyze data; these methods corroborated the SEGs established in 2003, and no changes were made to the Bear Lake escapement goals (Honnold et al. 2007). With additional years of data, the 2009 and 2012 escapement goal review teams determined that the additional stock assessment data would not substantially affect the results of previous escapement goal analyses. Thus, there was consensus to not reevaluate the goal in 2009 and 2012, and there was no change to the Bear Lake sockeye salmon SEG (Witteveen et al. 2009; Sagalkin and Erickson 2013).

2015 Review

Stock-specific harvest estimates were not available for early-run Bear Lake sockeye salmon. Recent escapement data (Table 1) were examined to determine if a change in the escapement goal was justified, and the team agreed that no further analysis was necessary for the Bear Lake runs in 2015.

Sandy River

Escapement Goal Background and Previous Reviews

Sandy River is located in the Bear River Section of the Northern District (Figures 2 and 3). Escapement has been monitored with annual aerial surveys since 1960, and a tower was used from 1962 to 1964. An aerial indexed total escapement goal range of 20,000 to 30,000 sockeye salmon was developed in the 1970s (Nelson and Lloyd 2001; Appendix J). In 1994, a weir was established for Sandy River and the goal range was doubled (40,000 to 60,000 fish) to account for more complete counts made at the weir (Nelson and Lloyd 2001). An escapement goal review of this system conducted during 2003 using the percentile method, euphotic volume analysis, smolt biomass as a function of zooplankton biomass, and lake surface area method concluded that because of data uncertainty and that the established SEG produced sufficient returns of escapement and harvest, no change in the SEG was warranted (Nelson et al. 2006). The 2006 escapement goal review using the percentile method with weir and aerial survey count data recommended changing the SEG range to 34,000 to 74,000 fish (Honnold et al. 2007). With additional years of data, the 2009 and 2012 escapement goal review teams determined that the additional stock assessment data would not substantially affect the results of previous escapement goal analyses. Thus, there was consensus to not reevaluate the goal in 2009 and 2012, and there was no change to the Sandy River sockeye salmon SEG (Witteveen et al. 2009; Sagalkin and Erickson 2013).

2015 Review

Stock-specific harvest estimates for Sandy River sockeye salmon were not available. Recent escapement data (Table 1) were examined to determine if a change in the escapement goal was justified, and the team agreed that no further analysis was necessary in 2015.

Ilnik River

Escapement Goal Background and Previous Reviews

The Ilnik River is located in the Ilnik Section of the Northern District and consists of 4 distinct spawning populations: Ilnik River, Willie Creek, Ocean River, and Wildman Lake (Figures 2 and 3). The current SEG for the Ilnik River system was developed in 1991 and set at 40,000 to 60,000 sockeye salmon (Nelson and Lloyd 2001; Appendix K). Aerial surveys were used to estimate escapement into the Ilnik River system from 1960 through 1990, and a weir was used from 1991 through the present. An escapement goal review of this system conducted during 2003 using the percentile method, euphotic volume analysis, smolt biomass as a function of zooplankton biomass, and lake surface area method concluded that the current escapement goals had produced sufficient returns and found that no change was warranted (Nelson et al. 2006). The 2006 escapement goal review using the percentile method with weir count data corroborated the existing SEG (Honnold et al. 2007). With additional years of data, the 2009 and 2012 escapement goal review teams determined that the additional stock assessment data would not substantially affect the results of previous escapement goal analyses. Thus, there was consensus to not reevaluate the goal in 2009 and 2012, and there was no change to the Ilnik River sockeye salmon SEG (Witteveen et al. 2009; Sagalkin and Erickson 2013).

2015 Review

Stock-specific harvest estimates for Ilnik River sockeye salmon were not available. Recent escapement estimates (Table 1) and age compositions were examined to determine if a change in the escapement goal was justified. The run and age data from 2012 to 2014 were similar to the recent past, so the team agreed that no further analysis was necessary in 2015.

Meshik River

Escapement Goal Background and Previous Reviews

Meshik River is located in the Inner Port Heiden Section of the Northern District (Figures 2 and 3). The SEG range of 10,000 to 20,000 was initially established in the late 1980s and was based on average peak escapements (Nelson and Lloyd 2001; Appendix L). Aerial surveys have been used to estimate escapement into Meshik River from 1960 through the present. An escapement goal review of this system conducted during 2003 using the percentile method concluded that the analysis reasonably corroborated the existing SEG and no change was warranted (Nelson et al. 2006). Following the 2006 escapement goal review using the percentile method, it was recommended to increase the Meshik River SEG to 20,000 to 60,000 fish; this change was implemented to reflect increased aerial survey effort and the subsequent increased sockeye salmon escapement estimates (Honnold et al. 2007).

In 2007, the BOF allowed fishing time in the Outer Port Heiden Section, which would affect escapement to the Meshik River. The Meshik River sockeye salmon escapement goal did not consider escapement to Red Bluff and Yellow Bluff creeks, which contribute a substantial number of fish to the total escapement transiting the Port Heiden area (generally on the order of 25%) and cannot be managed separately from Meshik River sockeye salmon escapement. With inclusion of the Red Bluff and Yellow Bluff creeks' escapements, the upper range of the 75th percentile of escapement increased substantially, suggesting the need for increasing the upper and lower bounds of the escapement goal. Because of increased aerial surveying effort and the need to account for the contribution of Red Bluff Creek and Yellow Bluff Creek sockeye salmon

escapements, the team recommended changing the Meshik River escapement goals from an SEG of 20,000 to 60,000 fish to an SEG of 25,000 to 100,000 fish (Witteveen et al. 2009). With 3 years of additional data, the 2012 escapement goal review team determined that the additional stock assessment would not substantially affect the results of previous escapement goal analyses. Thus, there was a consensus to not reevaluate the goal in 2012, and there was no change to the Meshik River sockeye salmon SEG (Sagalkin and Erickson 2013).

2015 Review

Stock-specific harvest estimates for Meshik River sockeye salmon were not available. Recent escapement estimates (Table 1) were examined to determine if a change in the escapement goal was justified. The team determined that this stock warranted further review and examined the stock using the updated percentile method (Clarke et al. 2014) to see if there was a significant change in the estimate that would warrant a change in the escapement goal.

Cinder River

Escapement Goal Background and Previous Reviews

Cinder River is located in the Cinder River Section of the Northern District (Figures 2 and 3). An SEG range of 6,000 to 12,000 sockeye salmon was initially established in the late 1980s and was based on average peak escapements (Nelson and Lloyd 2001; Appendix M). Aerial surveys have been used to estimate escapement into Cinder River from 1960 through the present. An escapement goal review of this system conducted during 2003 using the percentile method concluded that the analysis reasonably corroborated the existing SEG and no change was warranted (Nelson et al. 2006). The 2006 escapement goal review, also using the percentile method, recommended an increase to the Cinder River SEG to 12,000 to 48,000 fish; this change was implemented to reflect increased aerial survey effort and the subsequent increased sockeye salmon escapement estimates (Honnold et al. 2007). In 2009, the team reviewed escapement data from Mud Creek and Cinder River. Mud Creek and Cinder River share the same outlet; therefore, Mud Creek cannot be managed independently of the Cinder River if a fishery were opened in the Cinder River Section. However, the team found that escapement between the 2 streams was not correlated and surveys of Mud Creek are incomplete. Based on these results, the team recommended keeping the SEG the same (Witteveen et al. 2009). In 2012, escapement data were examined to determine if a change in the escapement goal was justified, and the team agreed that no further analysis was necessary in 2012 (Sagalkin and Erickson 2013).

2015 Review

Stock-specific harvest estimates for Cinder River sockeye salmon were not available. Recent escapement estimates for the Mud Creek and Cinder River aggregate (Table 1) were examined to determine if a change in the escapement goal was justified. The team examined whether annual escapement from the 2 systems were correlated and if the combined data from these 2 systems, applied to the updated percentile method (Clark et al. 2014), would better reflect current escapement trends in the event of a directed fishery.

McLees Lake

Escapement Goal Background and Previous Reviews

McLees Lake is located in the Unalaska District within the Aleutian Islands Management Area (Figure 4). The first published escapement goal for McLees Lake was developed in 1993 and a

range was set at 4,000 to 6,000 sockeye salmon based on spawning capacity (Nelson and Lloyd 2001; Appendix N). Aerial surveys have been used to estimate escapement into McLees on a limited basis from 1967 to 2003, and a weir has been operated by the U.S. Fish and Wildlife Service (USFWS) since 2001. No sockeye salmon were observed during aerial surveys of McLees Lake until 1974. An escapement goal review of this system conducted during 2003, using the percentile method from aerial survey numbers, concluded that with limited aerial survey estimates, few years of weir counts, and no history of management action ever exercised, the goal would be eliminated, but reevaluated in 3 years (Nelson et al. 2006). In 2006, the McLees Lake system was reevaluated with the percentile approach, and it was determined that no goal was justified; however, the McLees Lake sockeye salmon system would be reassessed pending collection of additional stock assessment data (Honnold et al. 2007). In 2009, an SEG for McLees Lake sockeye salmon was estimated according to the percentile algorithm resulting in an SEG of 12,000 to 59,000 fish. From the time the weir was first installed at McLees Lake in 2001 until 2004, the average sockeye salmon annual escapement was 71,000 fish. The magnitude of production from a lake the size of McLees was unexpected. The average annual escapement from 2005 to 2008 was 14,000 fish, prompting conservation concerns. Based on limited knowledge of McLees Lake sockeye salmon, a wide escapement goal range (10,000 to 60,000 fish) was recommended during years when a weir is operated, and no SEG in the absence of a weir (Witteveen et al. 2009). In 2012, escapement data were examined to determine if a change in the escapement goal was justified, and the team agreed that no further analysis was necessary in 2012 (Sagalkin and Erickson 2013).

2015 Review

Stock-specific harvest estimates for McLees Lake sockeye salmon were not available; there is little or no commercial activity on the stock and much of the limited harvest is taken by subsistence users from the Dutch Harbor/Unalaska area. Recent escapement data (Table 1) were examined to determine if a change in the escapement goal was justified and the team agreed that no further analysis was necessary in 2015.

COHO SALMON

Nelson River

Escapement Goal Background and Previous Reviews

Nelson River is located in the Nelson Lagoon Section of the Northern District (Figures 2 and 3). The first published escapement goal for Nelson River coho salmon was developed in the early 1980s, and a range was set at 18,000 to 25,000 fish (Nelson and Lloyd 2001; Appendix O). Aerial surveys were used to estimate coho salmon escapement into Nelson River from 1968 through 2014. An escapement goal review of this system conducted during 2003, using a risk analysis, concluded that the lower end (18,000) of the existing goal was appropriate as a threshold (Nelson et al. 2006). The 2006 escapement goal review of the Nelson River coho salmon escapement goal was limited by data too poor and insufficient to estimate an SEG; therefore, no change was warranted for the SEG threshold (Honnold et al. 2007). With additional years of data, the 2009 and 2012 escapement goal review teams determined that the additional stock assessment data would not substantially affect the results of previous escapement goal analyses. Thus, there was consensus to not reevaluate the goal in 2009 and 2012, and there was no change to the Nelson River coho salmon SEG (Witteveen et al. 2009; Sagalkin and Erickson 2013).

2015 Review

Stock-specific harvest estimates were not available for the Nelson River coho salmon fisheries. Recent escapement estimates (Table 1) were examined to determine if a change in the escapement goal was justified, but the team agreed that no further analysis was necessary in 2015.

Ilnik River

Escapement Goal Background and Previous Reviews

An Ilnik River coho salmon SEG of 10,000 to 19,000 was adopted in 1993 (Table 1; Appendix P). This goal was eliminated following the 2004 escapement goal review. Historical aerial survey escapement estimates were often sporadic, due to airplane unavailability, poor weather, or the frequent turbid conditions in the Ilnik River. Escapement estimates during that time were generally below the SEG, likely due to the poor aerial survey coverage. During the 2009 review, it was noted that sport fishing effort increased and there was some directed commercial fishing effort. In response to the increased effort, aerial surveys also increased. Ilnik River coho salmon escapement data from 1985 to 2008 were assessed with the percentile and risk analysis methods. With the increase of sport fishery harvest and the use of coho salmon catch-per-unit-effort (CPUE) data to make management decisions, the team recommended an SEG threshold of 9,000 fish based on the risk analysis for Ilnik River (Witteveen et al. 2009). With additional years of data, the 2012 escapement goal review team determined that the additional stock assessment data would not substantially affect the results of previous escapement goal analyses. Thus, there was consensus to not reevaluate the goal in 2012, and there was no change to the Ilnik River coho salmon SEG (Sagalkin and Erickson 2013).

2015 Review

Stock-specific harvest estimates were not available for the Ilnik River coho salmon fisheries. Recent escapement estimates (Table 1) were examined to determine if a change in the escapement goal was justified, but the team agreed that no further analysis was necessary in 2015.

PINK SALMON

Pink salmon escapement estimates in Area M are based on aerial surveys of fish returning to spawn. Each year since 1968, pink salmon have been counted during one or more flights along the Alaska Peninsula area (Figure 1). Total indexed escapement estimates were calculated by Area M management biologists, with estimation techniques outlined in Poetter and Nichols (2014).

South Peninsula

Escapement Goal Background and Previous Reviews

Even- and odd-year pink salmon escapement goals, by district, were first established in 1992 (Nelson and Lloyd 2001; Appendix Q). The sum of the district escapement goal ranges for the South Alaska Peninsula was 1,864,600 to 3,729,300 fish in even years and 1,637,800 to 3,275,700 fish in odd years. The difference between even- and odd-year escapement goals was due to higher even-year escapement goals in the Southwestern and Unimak districts.

Stock specific catch data are not available in this area. Because of this, during a 2003 review of escapement goals (Nelson et al. 2006), the district escapement estimates were aggregated into a single South Peninsula area wide escapement that was used, with the total pink salmon catch of the South Peninsula, to develop a single Ricker spawner-recruit model (Ricker 1954). Spawner-recruit models were developed from even-year, odd-year, and combined even- and odd-year escapement and catch data from 1975 to 2001. The contrast (3.2) in the even-year model was below the recommended minimum contrast of 4 (CTC 1999). The odd-year model was significant and resulted in an S_{MSY} estimate of 2.77 (90% S_{MSY} range of 1.75 to 4.0) million fish. The model developed using the combined even- and odd-year escapement and catch data was considered the best model (Nelson et al. 2006) and resulted in an S_{MSY} estimate of 2.33 (90% S_{MSY} range of 1.52 to 3.29) million fish. The results from this model corroborated the aggregate even-and odd-year goals (sum of the district escapement goal ranges), which were then designated BEGs (Nelson et al. 2006).

The 2006 escapement goal review of South Peninsula pink salmon followed the same methods as the 2003 review with the addition of 2004 and 2005 data. No change was recommended to the escapement goal range; however, the goal was reclassified as an SEG because it was based on aerial survey data (Honnold et al. 2007). In both the 2009 and 2012 reviews, the team determined that the additional stock assessment data would not substantially affect the results of the previous escapement goal analyses. Thus there was consensus to not reevaluate the goals in 2009 and 2012, and there was no change to the even- and odd-year South Peninsula pink salmon SEGs (Witteveen et al. 2009; Sagalkin and Erickson 2013).

2015 Review

With a failure to reach the South Peninsula pink salmon lower escapement goal for even years since 2010, the team decided it prudent to reassess the current goal. However, the inherent relationship between the even- and odd-year goals justified a reevaluation of both goals. The analysis in this manuscript is an update to the 2006 Ricker spawner-recruit model, adding aerial survey indexed escapement and catch data up to brood year 2012. Both even-, odd-, and combined-year datasets were analyzed with the Ricker spawner-recruit framework. However, one important adaptation was employed to more accurately model the population. This was to define the total harvest estimate for South Peninsula pinks as that occurring from July 15 onward for more precise accounting for local stocks (Matt Keyse, ADF&G Area Management Biologist-Area M, Sand Point Alaska, personal communication).

CHUM SALMON

Chum salmon escapement estimates in Area M are based on aerial surveys of fish returning to spawn. Total indexed escapement estimates were calculated by Area M management biologists, with estimation techniques outlined in Poetter and Nichols (2014).

South Peninsula

Escapement Goal Background and Previous Reviews

Chum salmon escapement goals, aggregated by district, were established in 1992 (Nelson and Lloyd 2001; Appendices R through T) and remained unchanged after the escapement goal review in 2003 (Nelson et al. 2006). The 2006 escapement goal review of South Peninsula chum salmon corroborated the original goals, with the exception of Unimak District, which was changed from an SEG to an SEG threshold after review of risk analysis results (Honnold et al.

2007). With 3 years of additional data, the 2009 escapement goal review team determined that the additional stock assessment data would not substantially affect the results of previous escapement goal analyses. Thus, there was consensus to not reevaluate the goal in 2009, and there was no change to the chum salmon aggregate SEGs (Witteveen et al. 2009). In 2012 the escapement goal review team reviewed the escapement information from the Unimak District and recommended removing the SEG from this district due to poor quality data. All other district goals were not reviewed, as escapement was adequate and did not indicate review was necessary (Sagalkin and Erickson 2013).

2015 Review

Stock-specific harvest estimates for South Peninsula chum salmon were not available. Recent escapement estimates (Table 1) were examined to determine if a change in the escapement goal was justified. The team agreed further review of the chum salmon aggregate escapement goals was unnecessary in 2015.

North Alaska Peninsula

Escapement Goal Background and Previous Reviews

Chum salmon escapement goals, aggregated by district, were set in 1992 at ranges of 223,600 to 447,200 for the Northwestern District and 119,600 to 239,200 for the Northern District (Nelson and Lloyd 2001; Appendices U and V). Based on separate Ricker spawner-recruit analyses during the 2003 escapement goal review, the Northwestern District escapement goal was changed to a BEG of 100,000 to 215,000 fish and no change was recommended for the Northern District BEG (Nelson et al. 2006). The 2006 escapement goal review of North Alaska Peninsula chum salmon also used Ricker spawner-recruit models to analyze the available data. No changes were made to the goal ranges; however, the escapement goals were reclassified from BEGs to SEGs as aerial survey data were used to provide indices of escapement rather than total escapement estimates. With additional years of data, the 2009 and 2012 escapement goal review teams determined that the additional stock assessment data would not substantially affect the results of previous escapement goal analyses. Thus, there was consensus to not reevaluate the goal in 2009 and 2012, and there was no change to the North Peninsula chum salmon Bay SEGs (Witteveen et al. 2009; Sagalkin and Erickson 2013).

2015 Review

Stock-specific harvest estimates for North Alaska Peninsula chum salmon were not available. Recent escapement estimates (Table 1) were examined to determine if a change in the escapement goal was justified, but the team agreed that no further analysis was necessary in 2015.

RESULTS

The comprehensive review of the 24 existing Area M salmon escapement goals resulted in recommendations to leave 20 goals unchanged, revise 2 goals, and consolidate an even/odd year pair into a single goal. Systems that did not warrant a change to their goals because either their escapement levels have consistently met their goals or have been comparable over the last 3 years include 1 Chinook salmon system (Nelson River); 11 sockeye salmon systems (Orzinski Lake, Thin Point Lake, Mortensens, Christianson, and Swanson lagoons, North Creek, Nelson

Lake, Bear [2 goals; early and late], Sandy, and Ilnik rivers, and McLees Lake); 2 coho salmon systems (Nelson and Ilnik rivers); and 5 chum salmon aggregates.

After a comprehensive review of the available data, the team recommended that no changes in the current escapement goals were warranted for Nelson River Chinook salmon BEG, 11 sockeye salmon SEGs that include runs to Orzinski, Bear (early and late run), McLees, and Thin Point lakes; Mortensens, Christianson, and Swanson lagoons; North Creek; Sandy and Ilnik rivers. No change was recommended for the sockeye salmon BEG at Nelson River. In addition, the team recommended no changes to the current SEGs for 5 chum salmon aggregates in the North and South Alaska Peninsula and 2 coho salmon SEGs at Nelson and Ilnik rivers. The team identified 4 goals for reevaluation in 2015. These include Meshik River sockeye salmon SEG, Cinder River sockeye salmon SEG, and South Peninsula pink even- and odd-year SEGs.

BIOLOGICAL ESCAPEMENT GOAL ESTIMATES

No systems with BEGs warranted further analysis.

SUSTAINABLE ESCAPEMENT GOAL ESTIMATES

Sockeye Salmon

Swanson Lagoon

Stock Status

An escapement goal review of this system conducted during 2003 using the percentile method concluded that the analysis reasonably corroborated the previous SEG (8,000 to 16,000 fish) and no change was warranted (Nelson et al. 2006). Following the 2006 escapement goal review using the percentile method, it was recommended to change the Swanson Lagoon SEG to 6,000 to 16,000 fish; this change was implemented to adjust for the difficulty in estimating escapement because of inclement weather conditions and poor visibility in the lagoon (Honnold et al. 2007). Estimated escapements were generally within the SEG range during 1991 to 2003, although escapements were often near the lower range. With the exceptions of 2004 and 2007, escapements from 2004 to 2014 were below the lower SEG range of 6,000 fish (Appendices F1 through F3). Notably in 2014, the mouth of the river feeding Swanson Lagoon was closed off to fish passage at low tide by a sand bar.

Evaluation of Recent Data

An SEG for Swanson Lagoon sockeye salmon was estimated according to the percentile method using aerial survey escapement estimates from 1995 to 2014 to address observed changes in escapement levels. The escapement estimates showed high contrast (65), and exploitation of this stock has been low in recent years. The estimated SEG range using this approach was from 1,660 to 7,840 fish for the 1995 to 2014 data (20th to 60th percentiles).

Escapement Goal Recommendation

According to area managers, it is difficult to estimate escapement in this system using aerial surveys because of inclement weather conditions and poor visibility. Swanson Lagoon survey effort usually coincides with that of Christianson Lagoon, which has at times precluded surveys during the peak of the Swanson Lagoon run. In light of the SOC status, the team recommended maintaining the current SEG of 6,000 to 16,000 fish to prevent harvest opportunities from depleting escapement and allow for the run to rebuild.

Meshik River

Stock Status

The current Meshik River sockeye salmon escapement goal is 25,000 to 100,000 fish (Table 1; Appendices L1 through L3). This goal was implemented in 2010 using the 15th to 75th percentiles of the escapement (Witteveen et al. 2009). In recent years, escapements have been in or above the current escapement goal range. The most recent 5-year average of escapement to the Meshik River system is approximately 82,000 fish.

Evaluation of Recent Data

An SEG for the combined escapements from Meshik River, Red Bluff Creek, and Yellow Bluff Creek was estimated according to the updated percentile method using aerial survey escapement estimates from 1990 to 2014. For the 25-year data set, high contrast in the escapement estimates (12.1) and low exploitation of this stock resulted in an SEG of 48,000 to 86,000 fish for the combined escapements (20th to 60th percentiles; Table 1; Appendices L1 through L3).

Escapement Goal Recommendation

While of commercial fishery importance, Meshik River sockeye salmon are particularly important to subsistence practices in the community of Port Heiden, the largest year-round community on the North Alaska Peninsula (Reedy-Maschner and Maschner 2012). This status results in the need for a robust escapement goal to not only ensure commercial viability but abundance and availability for subsistence harvest. Using the updated percentile method, the range of the escapement goal changed substantially, which resulted in increases to the lower bound and decreases to the upper bound. The team recommended changing the Meshik River escapement goal from an SEG of 25,000 to 100,000 fish to an SEG of 48,000 to 86,000 fish.

Cinder River

Stock Status

The current Cinder River sockeye salmon escapement goal is 12,000 to 48,000 fish and was established in 2007 using the 15th to 75th percentiles of the escapement (Table 1; Appendix M1). Since 1970, estimated escapements were extremely variable, ranging from below the SEG range to well in excess of the SEG range. The 2006 SEG was originally based solely on Cinder River sockeye salmon escapement. Because of more frequent aerial surveys of the Cinder River and Mud Creek, escapement estimates are available for Mud Creek from 2003 to 2014. Since 2003, Mud Creek has contributed approximately 8% to 38% of the total escapement to both systems. Since 2003, the Cinder River escapement has averaged 82,000 sockeye salmon and the Mud Creek escapement has averaged 21,600 sockeye salmon.

Evaluation of Recent Data

An SEG for Cinder River sockeye salmon was estimated and compared to an SEG for the combined escapements of the Cinder River, its tributaries, and Mud Creek according to the updated percentile method using aerial survey peak counts of escapement from 1991 to 2014 (24 years) and peak count aerial survey data from 2003 to 2014 (12 years). Tributary streams included in the analysis contributed to 5% or more of the historical average escapement and were consistently surveyed over the time stratum. For the 24-year data set, high contrast in the escapement estimates (11.2 for Cinder alone and 12.8 for combined river systems) and low exploitation of this stock resulted in an SEG of 36,000 to 75,000 fish for the Cinder River alone

and an SEG of 36,000 to 94,000 fish for the aggregate of escapements (20th to 60th percentiles; Table 1; Appendices M2 and M3). The 12-year dataset was low in contrast (<2.2) and, because of the high measurement error associated with aerial survey data, was not well-suited for SEG determination with the percentile method.

Escapement Goal Recommendation

With the inclusion of the Mud Creek escapement, the upper range of the 60th percentile of escapement increased substantially, suggesting the need for increasing the upper and lower bounds of the escapement goal. Because of the consistent increases to Cinder River escapement over the past decade and improved surveying effort of both drainages, the team recommended increasing the Cinder River SEG to 36,000 to 94,000 fish.

Pink Salmon

South Peninsula

Stock Status

The current South Peninsula pink salmon SEG ranges are approximately 1.86 to 3.73 million fish in even years and 1.64 to 3.28 million fish in odd years (Table 1; Appendix Q1). Before the goal was implemented in 2004, even-year and odd-year escapement estimates fell below the lower range in the early 1970s and then within the range until the mid-1990s (Appendices Q2 through Q4). Between the mid-1990s and mid-2000s, the escapements have generally been in or above the upper portion of the range. Since the mid-2000s the even-year escapement has generally been below the lower end of the range while the odd-year escapement has consistently reached the middle of the range. The current low production from the even-year South Peninsula pink salmon appears to have been the result of an anomalous climate event affecting survival of the 2008 brood year perpetuated by low return and subsequent escapement in 2010 and 2012. The 2016 outlook is improved with over 1.3 million pink salmon estimated as escapement in 2014 but still below the desired escapement goal range.

Evaluation of Recent Data

The even-year model fit to the brood year spawner-recruit data from 1976 to 2012 was significant ($P=0.015$) and had a contrast of 17.4. S_{MSY} was estimated at 2.88 million (90% S_{MSY} range of 1.84 to 4.11; Appendix Q5). The odd-year model fit to the brood year spawner-recruit data from 1975 to 2011 was significant ($P=0.0002$) and had a contrast of 11.6. S_{MSY} was estimated at 2.98 million (90% S_{MSY} range of 1.97 to 4.18; Appendix Q6). The combined even- and odd-year model fit to the brood year spawner-recruit data from 1975 to 2012 was significant ($P=1.6 \times 10^{-5}$) and had a contrast of 17.4. S_{MSY} was estimated at 2.97 million (90% S_{MSY} range of 1.90 to 4.25; Appendix Q7). Presence of autocorrelation (lag-1) was calculated and found not statistically significant in all models and none demonstrated issues of non-stationarity.

Although the even, odd, and combined models resulted in different estimates of S_{MSY} , the differences were not statistically different. The β (density dependence) parameter estimated for both the even- and odd-year models were nearly identical resulting in no statistical significant difference ($P=0.98$), while $\ln \alpha$ (productivity) parameter was slightly higher for the odd-year model yet still no statistical difference between the even-year model ($P=0.26$). These results suggest no significant difference between the even- and odd-year South Peninsula pink salmon run potential and the way in which escapement affects the survival to return.

Escapement Goal Recommendation

This analysis marks the first time that statistically significant models for South Peninsula pink salmon even, odd, and combined years have been constructed. Given the similarity in the estimates of S_{msy} (Appendices Q5 through Q7), and if the uncertainty associated with the even- and odd-year models is considered, there becomes no compelling evidence that the escapement goals for even- and odd-year South Peninsula pink salmon should be different. It is recommended that the even- and odd-year goals be aligned into an annual SEG of 1.75 to 4.0 million fish based on the examination of the combined-year spawner-recruit models and the existing goals.

DISCUSSION

Establishing prudent escapement goals is an evolving process, not only because each year provides more data, but also because methods to determine such goals are becoming more standardized and well documented. The SSFP and EGP are important steps in this evolution. Ideally, escapement goals should be based, in part, on ecological theory, principles of sustained yield, and empirical observations (Ricker 1954).

The methodologies used in this escapement goal evaluation were limited by the available data. Stock-specific catch data were not available for any stocks in Area M, with the exception of Nelson River Chinook and sockeye salmon and Bear Lake late-run sockeye salmon. While 5 systems in Area M (plus 1 additional system in the Aleutian Islands Management Area) currently have weirs for direct enumeration of escapement and are easily accessible for collection of representative age data, escapement estimates for the remaining systems are determined via aerial survey observations. Aerial survey escapement estimates can be inaccurate and imprecise due to weather conditions, differences between observers, and logistical limitations.

This comprehensive review of the 24 existing salmon escapement goals in Area M resulted in 20 goals remaining unchanged, revision of 2 goals (Meshik River sockeye salmon SEG 48,000 to 86,000; Cinder River and Mud Creek sockeye salmon SEG 36,000 to 94,000), and consolidating an even/odd year pair into a single goal (South Peninsula pink salmon annual SEG 1,750,000 to 4,000,000). While these changes represent more biologically sound and streamlined escapement goals, they should have a limited effect on the traditional management under the auspices of the current management plans.

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TABLES AND FIGURES

Table 1.—Current escapement goals, escapements observed from 2012 through 2014, and escapement goal recommendations in 2015 for Chinook, sockeye, coho, pink, and chum salmon stocks of the Alaska Peninsula and Aleutian Islands Management areas.

System	Escapement data type ^a	Current escapement goal		Escapement			2015 recommendation	
		Type	Range	2012	2013	2014		
Chinook Salmon								
Nelson River	WC/PAS	BEG	2,400	4,400	1,192	1,421	3,801	No Change
Sockeye Salmon								
Orzinski Lake	WC	SEG	15,000	20,000	17,243	17,386	13,600	No Change
Thin Point Lake	PAS	SEG	14,000	28,000	19,000	5,700	8,600	No Change
Mortensens Lagoon	PAS	SEG	3,200	6,400	5,000	4,000	500	No Change
Christianson	PAS	SEG	25,000	50,000	40,000	16,500	32,600	No Change
Swanson Lagoon	PAS	SEG	6,000	16,000	3,500	3,000	1,500	No Change
North Creek	PAS	SEG	4,400	8,800	18,000	8,500	7,500	No Change
Nelson River	WC	SEG	97,000	219,000	103,300	248,000	250,000	No Change
Bear Lake								
Early	WC	SEG	176,000	293,000	173,158	219,074	259,046	No Change
Late	WC	SEG	117,000	195,000	116,442	196,926	206,954	No Change
Sandy River	WC	SEG	34,000	74,000	27,100	42,000	59,000	No Change
Ilnik River	WC	SEG	40,000	60,000	61,000	51,000	59,000	No Change
Meshik River	PAS	SEG	25,000	100,000	50,900	85,400	114,700	Revise SEG 48,000–86,000
Cinder River	PAS	SEG	12,000	48,000	67,000	59,000	72,000	Revise SEG 36,000–94,000
McLees Lake	WC/PAS	SEG	10,000	60,000	15,111	15,687	12,424	No Change
Coho Salmon								
Nelson River	PAS	SEG	18,000		19,160	22,000	25,000	No Change
Ilnik River	PAS	SEG	9,000		14,800	13,000	33,000	No Change
Pink Salmon								
South Peninsula	PAS	SEG	1,864,600	3,729,300	478,910		1,340,380	Consolidate to annual SEG 1,750,000–4,000,000
South Peninsula	PAS	SEG	1,637,800	3,275,700		2,320,790		Consolidate to annual SEG 1,750,000–4,000,000
Chum Salmon								
Southeastern	PAS	SEG	106,400	212,800	31,072	184,350	82,300	No Change
South Central	PAS	SEG	89,800	179,600	86,190	155,050	95,000	No Change
Southwestern	PAS	SEG	133,400	266,800	87,230	163,200	130,745	No Change
Northwestern	PAS	SEG	100,000	215,000	140,000	92,800	54,525	No Change
Northern District	PAS	SEG	119,600	239,200	140,418	137,251	191,586	No Change

Table 2.—General criteria used to assess quality of data in estimating Area M salmon escapement goals.

Data quality	Criteria
Excellent	Escapement, harvest, and age all estimated with relatively good accuracy and precision (i.e., escapement estimated by a weir or hydroacoustics; harvest estimated by Statewide Harvest Survey or fish tickets); escapement and return estimates can be derived for a sufficient time series to construct a brood table and estimate S_{msy} .
Good	Escapement, harvest, and age estimated with reasonably good accuracy and/or precision (i.e., escapement estimated by capture-recapture experiment or multiple foot/aerial surveys); no age data or data of questionable accuracy and/or precision; data may allow construction of brood table; data time series relatively short to accurately estimate S_{msy} .
Fair	Escapement estimated or indexed and harvest estimated with reasonably good accuracy, but precision lacking for one, if not both; no age data; data insufficient to estimate total return and construct brood table.
Poor	Escapement indexed (i.e., single foot/aerial survey) such that the index provides a fairly reliable measure of escapement; no harvest and age data.

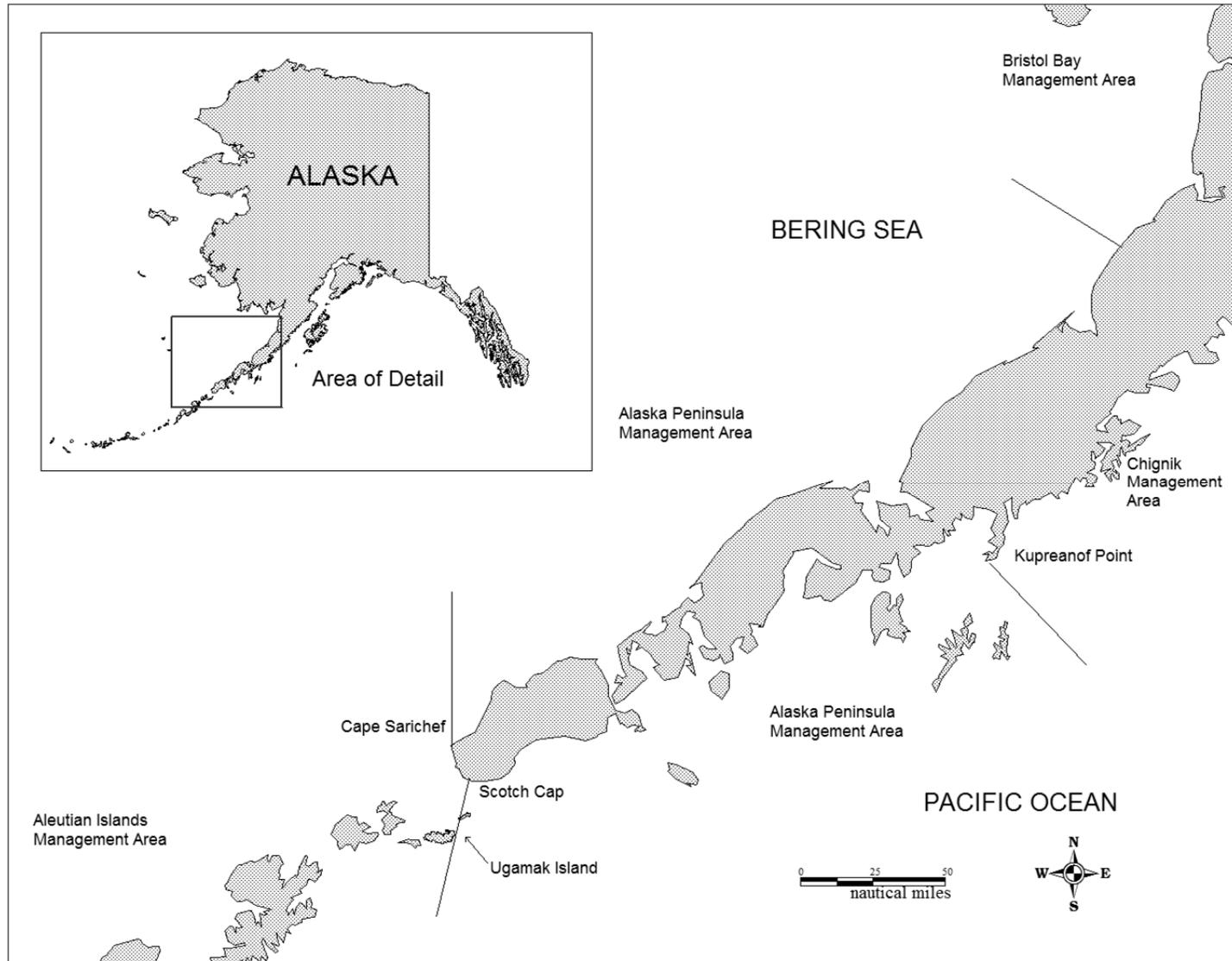


Figure 1.—Map of the Alaska Peninsula and Aleutian Islands Management areas.

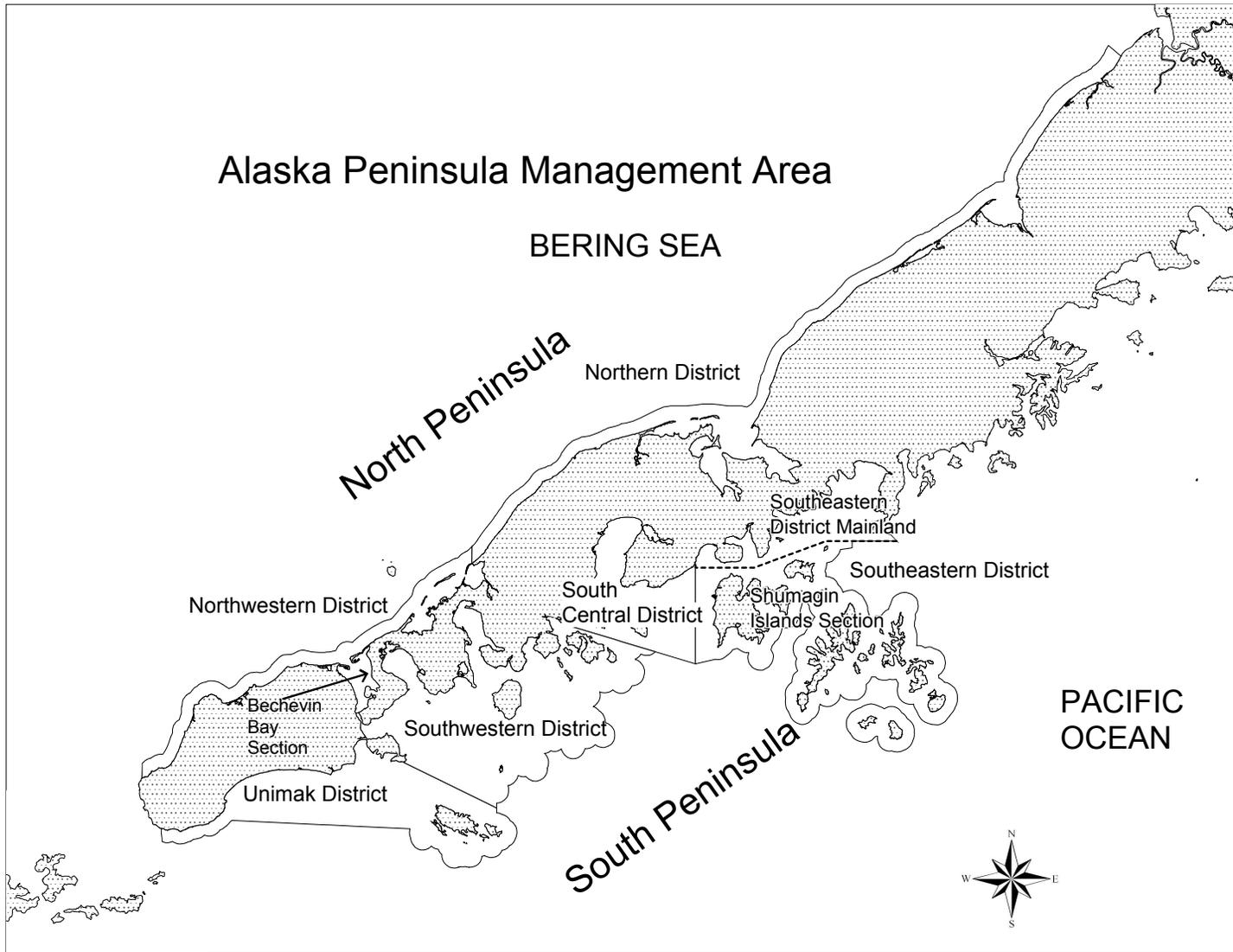


Figure 2.—Map of the Alaska Peninsula Management Area with commercial salmon fishing districts depicted.

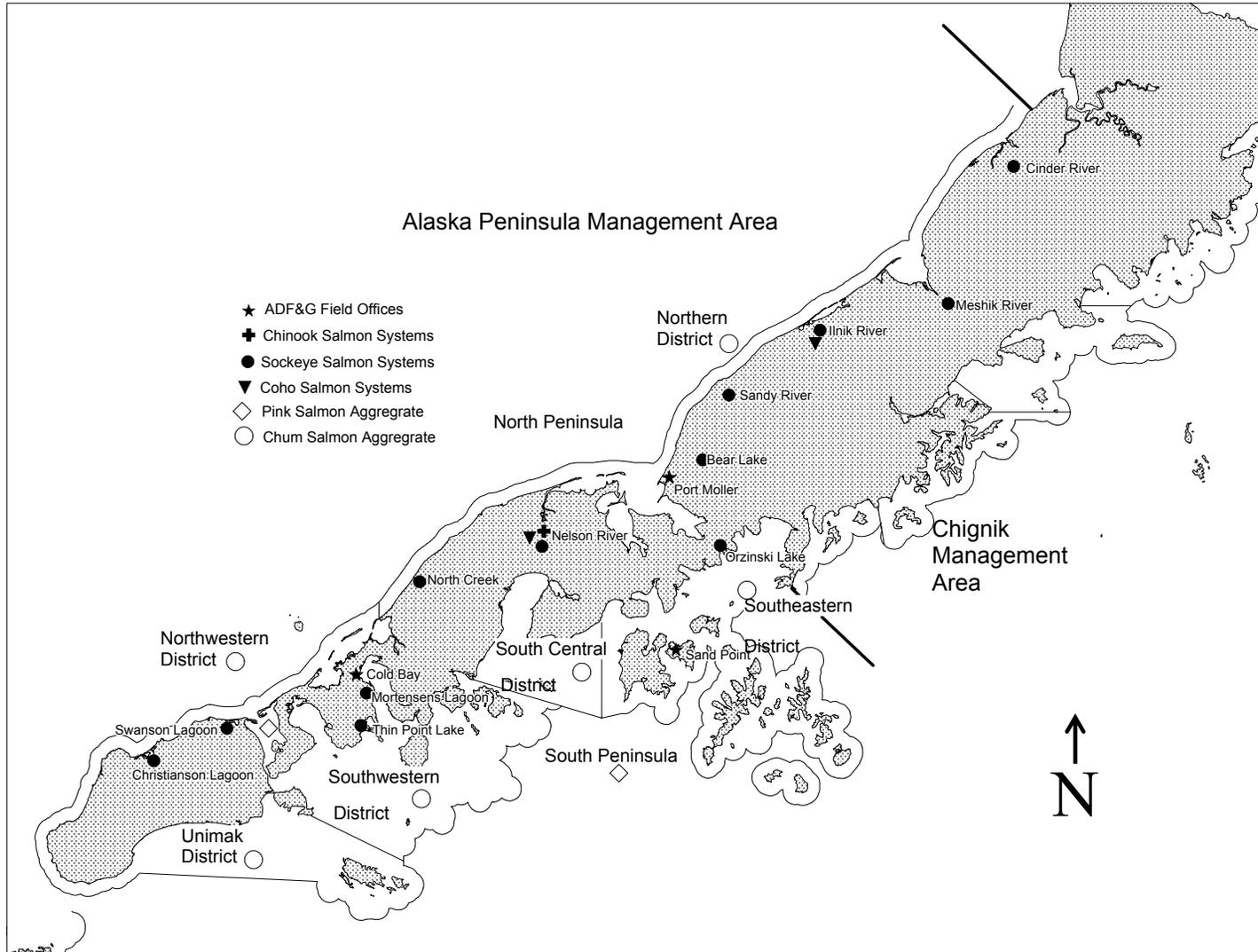


Figure 3.—Map of the Alaska Peninsula Management Area with salmon systems that currently have escapement goals depicted.

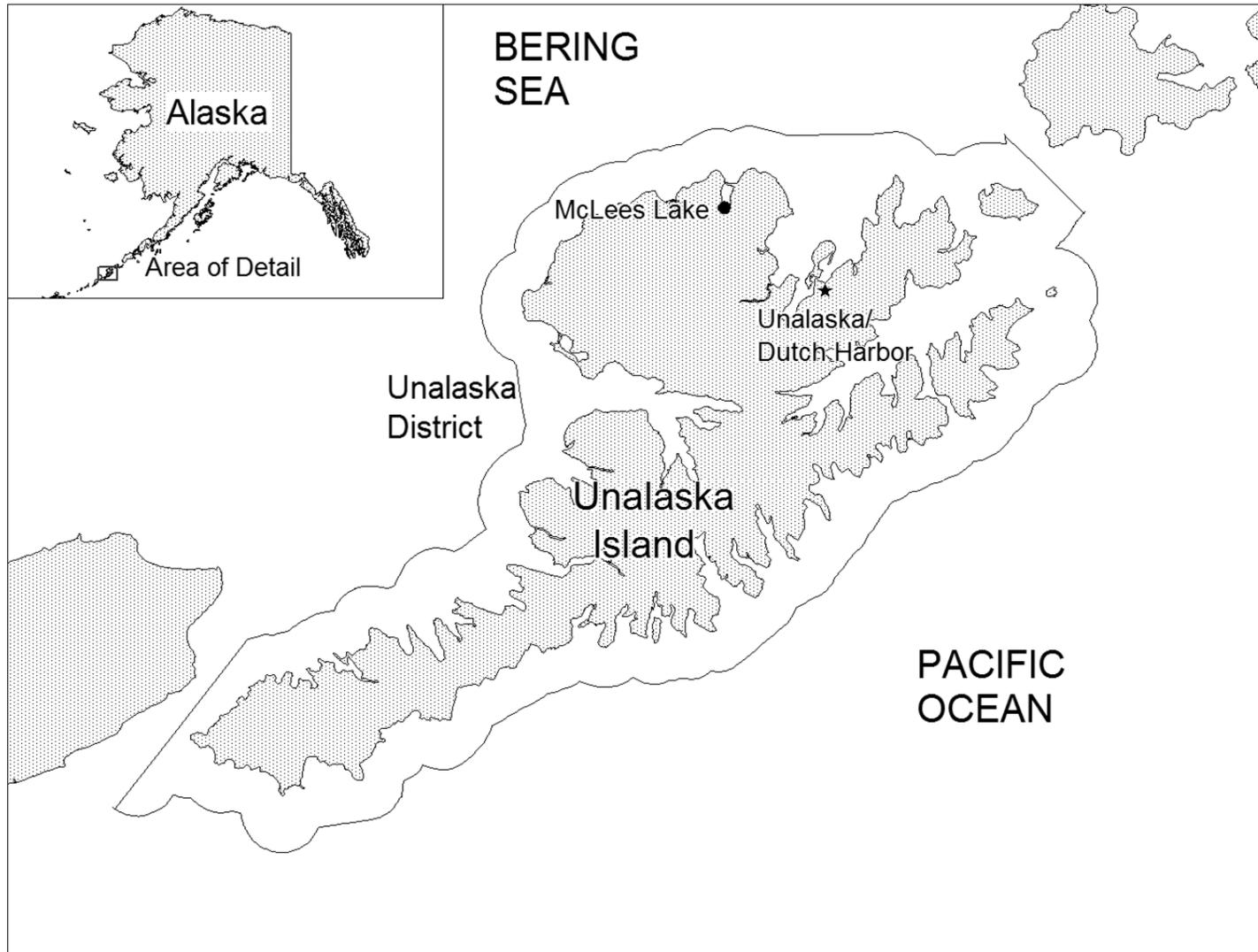


Figure 4.—Map of Unalaska Island within the Aleutian Islands Management Area with McLees Lake depicted.

**APPENDIX A. SUPPORTING INFORMATION FOR THE
NELSON RIVER CHINOOK SALMON ESCAPEMENT
GOAL**

Appendix A1.–Description of stock and escapement goal for Nelson River Chinook salmon.

System: Nelson River.

Species: Chinook salmon.

Description of stock and escapement goal.

Regulatory area:	Alaska Peninsula Management Area Westward Region.
Management division:	Commercial Fisheries.
Primary fishery:	Commercial set and drift gillnet.
Current escapement goal:	BEG: 2,400–4,400 (2003).
Recommended escapement goal:	No change.
Optimal escapement goal:	None.
Inriver goal:	None.
Action points:	None.
Escapement enumeration:	Tower 1974–1988; Weir 1989 to present.
Data summary:	
Data quality	
Data type	Tower or weir projects usually pulled from system prior to the end of the Chinook salmon run. Therefore, aerial surveys are conducted to count Chinook salmon downstream of the tower or weir on the day that, or a few days after, the weir or tower is removed either final tower or weir count. Stock-specific harvest information is available from 1970 to 2003. Harvest age data are available from 1985 to 2003.
Comments:	Current BEG was based on a Ricker analysis and verified with a habitat model.

Appendix A2.–Nelson River Chinook salmon escapement table.

System: Nelson River.

Species: Chinook salmon.

Data available for analysis of escapement goal.

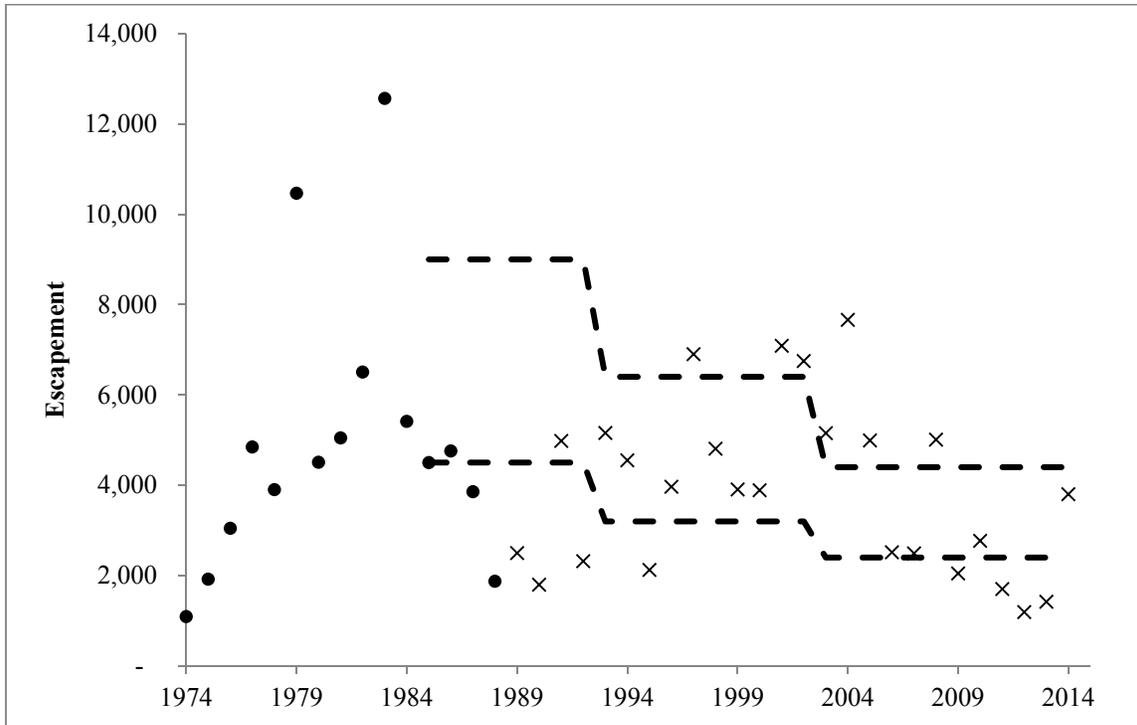
Year	Escapement index ^a
1974	1,092
1975	1,917
1976	3,045
1977	4,844
1978	3,901
1979	10,463
1980	4,506
1981	5,046
1982	6,503
1983	12,561
1984	5,412
1985	4,500
1986	4,757
1987	3,854
1988	1,873
1989	2,500
1990	1,800
1991	4,981
1992	2,320
1993	5,160
1994	4,552
1995	2,127
1996	3,967
1997	6,902
1998	4,809
1999	3,907
2000	3,891
2001	7,088
2002	6,750
2003	5,154
2004	7,664
2005	4,993
2006	2,516
2007	2,492
2008	5,012
2009	2,048
2010	2,767
2011	1,704
2012	1,192
2013	1,421
2014	3,801

^a The escapement index represents the peak survey, enumeration of carcasses, as well as ancillary and qualitative data.

System: Nelson River.

Species: Chinook salmon.

Solid circles represent tower counts, X-symbols represent weir counts, and dashed lines are the historic SEGs and current BEG.



**APPENDIX B. SUPPORTING INFORMATION FOR THE
ORZINSKI LAKE SOCKEYE SALMON ESCAPEMENT
GOAL**

System: Orzinski Lake.

Species: Sockeye salmon.

Description of stock and escapement goal.

Regulatory area:	Alaska Peninsula Management Area Westward Region.
Management division:	Commercial Fisheries.
Primary fishery:	Commercial set gillnet and purse seine.
Current escapement goal:	SEG: 15,000–20,000 (1980).
Recommended escapement goal:	No change.
Optimal escapement goal:	None.
Inriver goal:	None.
Action points:	None.
Escapement enumeration:	Aerial survey, 1970–1989; weir 1990 to present.
Data summary:	
Data quality	Fair for aerial surveys; good for weir enumeration.
Data type	Escapement age date 1990 to present. No stock-specific harvest information is available.
Comments	SEG estimate based on percentile method reasonably supports current goal.

Appendix B2.—Orzinski sockeye salmon escapement table.

System: Orzinski Lake.

Species: Sockeye salmon.

Data available for analysis of escapement goal.

Year	Escapement index ^a	Weir counts
1970	4,450	
1971	11,100	
1972	6,500	
1973	1,200	
1974	61,500	
1975	22,500	
1976	24,600	
1977	17,000	
1978	22,000	
1979	20,000	
1980	12,100	
1981	14,000	
1982	9,000	
1983	21,300	
1984	19,300	
1985	14,000	
1986	10,300	
1987	11,400	
1988	19,500	
1989	16,700	
1990		15,000
1991		40,000
1992		25,000
1993		24,700
1994		38,000
1995		30,000
1996		30,000
1997		35,000
1998		25,000
1999		15,000
2000		21,500
2001		31,200
2002		42,849
2003		70,690
2004		75,450
2005		44,797
2006		18,000
2007		10,643
2008		36,839
2009		21,457
2010		18,039
2011		16,764
2012		17,243
2013		17,386
2014		13,600

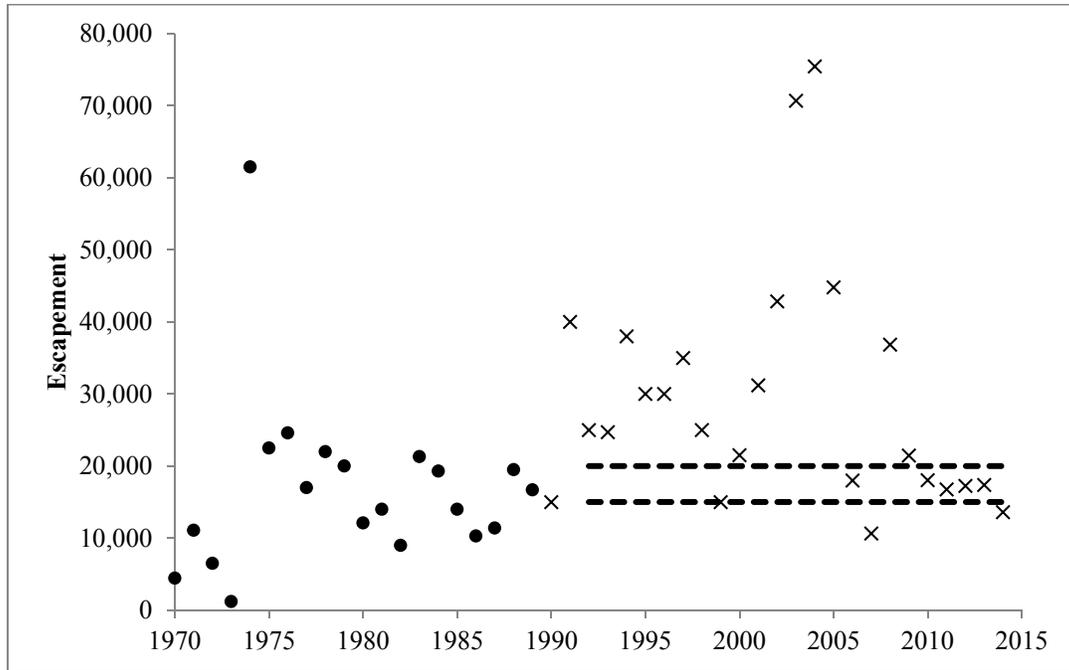
^a The escapement index represents the peak survey, enumeration of carcasses, as well as ancillary and qualitative data.

Appendix B3.—Orzinski sockeye salmon escapement graph.

System: Orzinski Lake.

Species: Sockeye salmon.

Solid circles represent aerial survey data, X-symbols represent weir counts, and dashed lines are the current SEG.



**APPENDIX C. SUPPORTING INFORMATION FOR THE
THIN POINT LAKE SOCKEYE SALMON ESCAPEMENT
GOAL**

System: Thin Point Lake.

Species: Sockeye salmon.

Description of stock and escapement goal.

Regulatory area:	Alaska Peninsula Management Area Westward Region.
Management division:	Commercial Fisheries.
Primary fishery:	Commercial purse seine and set and drift gillnet.
Current escapement goal:	SEG: 14,000–28,000 (late 1980s).
Recommended escapement goal:	No change.
Optimal escapement goal:	None.
Inriver goal:	None.
Action points:	None.
Escapement enumeration:	Aerial survey, 1968 to present; Weir counts, 1994–1998.
Data summary:	
Data quality	Fair for aerial surveys; poor for weir counts.
Data type	Due to prolonged milling behavior in Thin Point Lagoon below the weir site, most of the yearly escapement was not counted past the weir; therefore, aerial survey counts are considered more accurate. No stock-specific harvest information is available.
Comments	Percentile method supports current SEG.

Appendix C2.–Thin Point Lake sockeye salmon escapement table.

System: Thin Point Lake.

Species: Sockeye salmon.

Data available for analysis of escapement goal.

Year	Escapement index ^a
1970	1,100
1971	1,300
1972	1,300
1973	700
1974	16,000
1975	6,100
1976	20,500
1977	17,700
1978	7,400
1979	6,900
1980	12,000
1981	7,500
1982	8,800
1983	6,500
1984	5,000
1985	7,500
1986	12,400
1987	8,700
1988	23,500
1989	21,500
1990	15,000
1991	35,800
1992	32,600
1993	22,600
1994	25,000
1995	31,700
1996	9,000
1997	10,000
1998	21,000
1999	20,500
2000	12,000
2001	47,900
2002	51,000
2003	40,000
2004	34,500
2005	21,000
2006	11,510
2007	21,550
2008	18,900
2009	33,500
2010	12,400
2011	14,500
2012	19,000
2013	5,700
2014	8,600

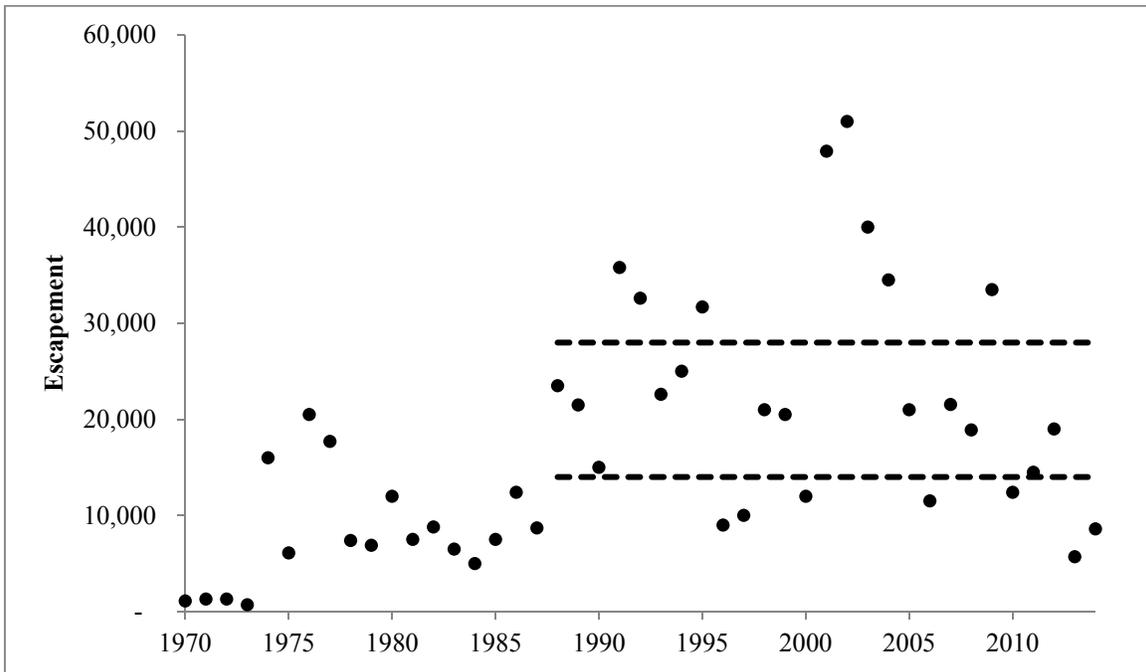
^a The escapement index represents the peak survey, enumeration of carcasses, as well as ancillary and qualitative data.

Appendix C3.–Thin Point Lake sockeye salmon escapement graph.

System: Thin Point Lake.

Species: Sockeye salmon.

Observed escapement by year (solid circles) and current SEG (dashed line).



**APPENDIX D. SUPPORTING INFORMATION FOR THE
MORTENSENS LAGOON SOCKEYE SALMON
ESCAPEMENT GOAL**

Appendix D1.–Description of stock and escapement goal for Mortensens Lagoon sockeye salmon.

System: Mortensens Lagoon.

Species: Sockeye salmon.

Description of stock and escapement goal.

Regulatory area:	Alaska Peninsula Management Area – Westward Region.
Management division:	Commercial Fisheries.
Primary fishery:	Commercial purse seine and set gillnet.
Current escapement goal:	SEG: 3,200–6,400 (late 1980s).
Recommended escapement goal:	No change.
Optimal escapement goal:	None.
Inriver goal:	None.
Action points:	None.
Escapement enumeration:	Aerial survey, 1970 to present; Weir counts, 2001–2006.
Data summary:	
Data quality	Poor for aerial surveys; good for weir counts.
Data type	Fixed aerial surveys from 1970 to present, and weir counts from 2001 to 2006, with escapement age data during weir counts. No stock-specific harvest information is available.
Comments	Percentile method supports current SEG.

Appendix D2.–Mortensens Lagoon sockeye salmon escapement table.

System: Mortensens Lagoon.

Species: Sockeye salmon.

Data available for analysis of escapement goal.

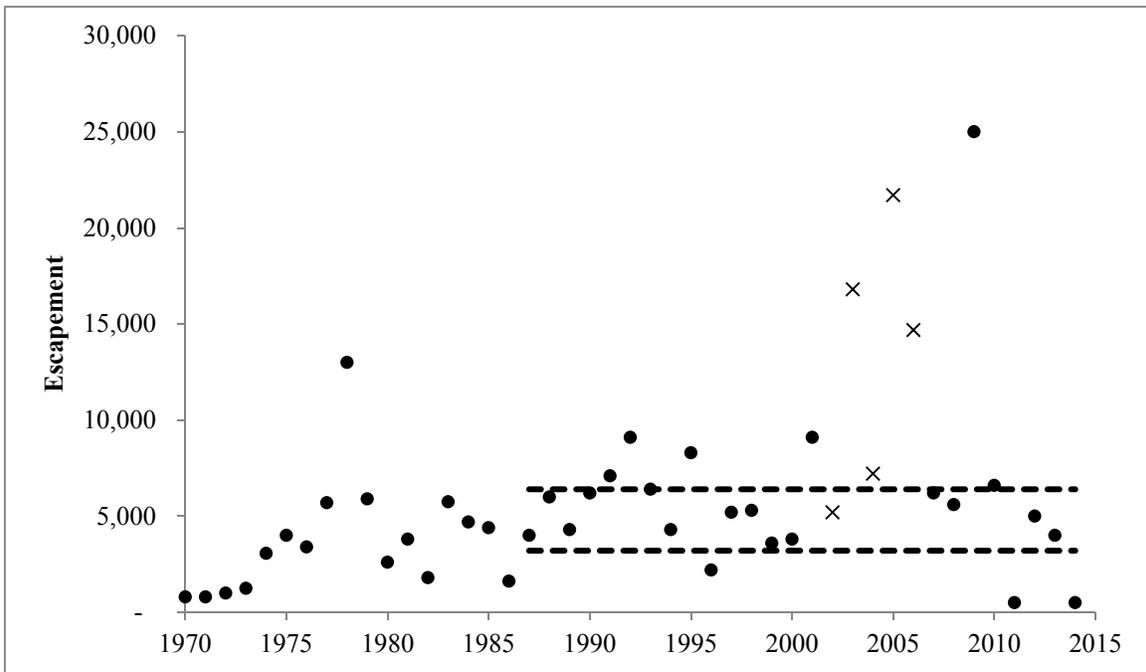
Year	Escapement index ^a	Weir count
1970	800	
1971	800	
1972	1,000	
1973	1,250	
1974	3,070	
1975	4,000	
1976	3,400	
1977	5,700	
1978	13,000	
1979	5,900	
1980	2,600	
1981	3,800	
1982	1,800	
1983	5,750	
1984	4,700	
1985	4,400	
1986	1,620	
1987	4,000	
1988	6,000	
1989	4,300	
1990	6,200	
1991	7,100	
1992	9,100	
1993	6,400	
1994	4,300	
1995	8,300	
1996	2,200	
1997	5,200	
1998	5,300	
1999	3,600	
2000	3,800	
2001	9,100	
2002		5,200
2003		16,804
2004		7,215
2005		21,703
2006		14,688
2007	6,200	
2008	5,600	
2009	25,000	
2010	6,600	
2011	500	
2012	5,000	
2013	4,000	
2014	500	

^a The escapement index represents the peak survey, enumeration of carcasses, and ancillary and qualitative data.

System: Mortensens Lagoon.

Species: Sockeye salmon.

Solid circles represent aerial survey data, X-symbols represent weir counts, and lines are the current SEG.



**APPENDIX E. SUPPORTING INFORMATION FOR THE
CHRISTIANSON LAGOON SOCKEYE SALMON
ESCAPEMENT GOAL**

System: **Christianson Lagoon.**

Species: **Sockeye salmon.**

Description of stock and escapement goal.

Regulatory area:	Alaska Peninsula Management Area Westward Region.
Management division:	Commercial Fisheries.
Primary fishery:	Commercial purse seine and set gillnet.
Current escapement goal:	SEG: 25,000–50,000 (late 1980s).
Recommended escapement goal:	No change.
Optimal escapement goal:	None.
Inriver goal:	None.
Action points:	None.
Escapement enumeration:	Aerial survey, 1971 to present.
Data summary:	
Data quality	Poor.
Data type	Fixed aerial surveys from 1971 to present; intermittent in 1960s. No stock-specific harvest information is available.
Comments	Percentile method supports current SEG.

Appendix E2.–Christianson Lagoon sockeye salmon escapement table.

System: Christianson Lagoon.

Species: Sockeye salmon.

Data available for analysis of escapement goal.

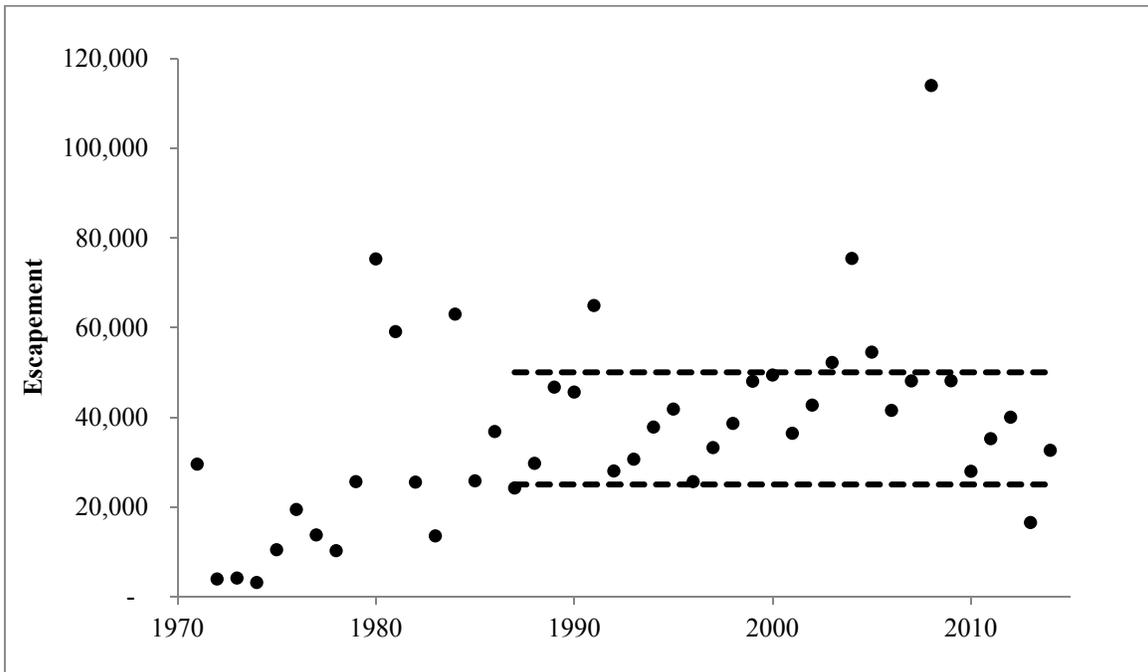
Year	Escapement index ^a
1971	29,500
1972	3,900
1973	4,100
1974	3,100
1975	10,400
1976	19,400
1977	13,700
1978	10,200
1979	25,600
1980	75,300
1981	59,100
1982	25,500
1983	13,500
1984	63,000
1985	25,800
1986	36,800
1987	24,200
1988	29,700
1989	46,700
1990	45,600
1991	64,900
1992	28,000
1993	30,600
1994	37,800
1995	41,800
1996	25,600
1997	33,200
1998	38,600
1999	48,000
2000	49,400
2001	36,400
2002	42,700
2003	52,200
2004	75,400
2005	54,500
2006	41,505
2007	48,075
2008	114,000
2009	48,100
2010	27,900
2011	35,200
2012	40,000
2013	16,500
2014	32,600

^a The escapement index represents the peak survey, enumeration of carcasses, as well as ancillary and qualitative data.

System: Christianson Lagoon.

Species: Sockeye salmon.

Solid circles represent aerial survey data and dashed lines are the current SEG.



**APPENDIX F. SUPPORTING INFORMATION FOR THE
SWANSON LAGOON SOCKEYE SALMON ESCAPEMENT
GOAL**

Appendix F1.–Description of stock and escapement goal for Swanson Lagoon sockeye salmon.

System: Swanson Lagoon.

Species: Sockeye salmon.

Description of stock and escapement goal.

Regulatory area:	Alaska Peninsula Management Area Westward Region.
Management division:	Commercial Fisheries.
Primary fishery:	Commercial purse seine and set and drift gillnet.
Current escapement goal:	SEG: 6,000–16,000 (2007).
Recommended escapement goal:	No change.
Optimal escapement goal:	None.
Inriver goal:	None.
Action points:	None.
Escapement enumeration:	Aerial survey, 1960 to present.
Data summary:	
Data quality	Poor.
Data type	Fixed aerial surveys from 1960 to present. No stock-specific harvest information is available.
Methodology	Percentile.
Criteria for SEG	High contrast, low exploitation.
Percentiles	20 th –60 th .
Comments	Data from 1995–2014 were used to reflect harvest rate reductions. SEG estimates based on percentile approach indicated lowering the current goal. However, because Swanson Lagoon sockeye salmon were considered a Stock of Concern in 2013, maintaining the current SEG reduces the chances of overfishing a depleted stock and provides for larger escapements to rebuild it.

Appendix F2.–Swanson Lagoon sockeye salmon escapement table.

System: Swanson Lagoon.

Species: Sockeye salmon.

Data available for analysis of escapement goal.

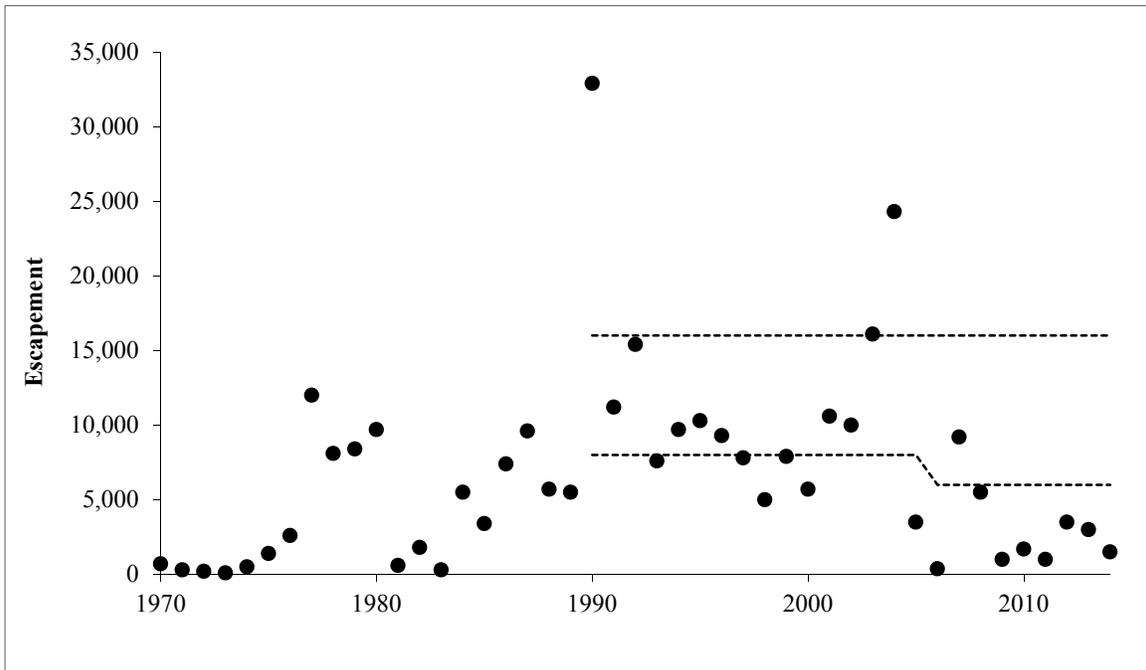
Year	Escapement index ^a
1970	700
1971	300
1972	200
1973	100
1974	50
1975	1,400
1976	2,600
1977	12,000
1978	8,100
1979	8,400
1980	9,700
1981	600
1982	1,800
1983	300
1984	5,500
1985	3,400
1986	7,400
1987	9,600
1988	5,700
1989	5,500
1990	32,900
1991	11,200
1992	15,400
1993	7,600
1994	9,700
1995	10,300
1996	9,300
1997	7,800
1998	5,000
1999	7,900
2000	5,700
2001	10,600
2002	10,000
2003	16,100
2004	24,300
2005	3,500
2006	376
2007	9,200
2008	5,500
2009	1,000
2010	1,700
2011	1,000
2012	3,500
2013	3,000
2014	1,500

^a The escapement index represents peak survey, enumeration of carcasses, and ancillary and qualitative data was used between 1970 and 2009. Peak aerial surveys were used from 2010 to present.

System: Swanson Lagoon.

Species: Sockeye salmon.

Solid circles represent aerial survey data and dashed lines are the current SEG.



**APPENDIX G. SUPPORTING INFORMATION FOR THE
NORTH CREEK SOCKEYE SALMON ESCAPEMENT
GOAL**

Appendix G1.–Description of stock and escapement goal for North Creek sockeye salmon.

System: North Creek.

Species: Sockeye salmon.

Description of stock and escapement goal.

Regulatory area:	Alaska Peninsula Management Area Westward Region.
Management division:	Commercial Fisheries.
Primary fishery:	Commercial set and drift gillnet.
Current escapement goal:	SEG: 4,400–8,800 (late 1980s).
Recommended escapement goal:	No change.
Optimal escapement goal:	None.
Inriver goal:	None.
Action points:	None.
Escapement enumeration:	Aerial survey, 1960 to present.
Data summary:	
Data quality	Poor.
Data type	Fixed aerial surveys from 1960 to present. No stock-specific harvest information is available.
Comments	Percentile method supports current SEG.

Appendix G2.–North Creek sockeye salmon escapement table.

System: North Creek.

Species: Sockeye salmon.

Data available for analysis of escapement goal.

Year	Escapement index ^a
1970	600
1971	
1972	
1973	
1974	1,800
1975	1,700
1976	7,100
1977	3,300
1978	500
1979	2,100
1980	3,400
1981	
1982	5,800
1983	2,000
1984	500
1985	3,600
1986	2,100
1987	8,300
1988	6,300
1989	7,000
1990	4,300
1991	9,000
1992	15,700
1993	9,700
1994	4,600
1995	3,400
1996	8,000
1997	5,700
1998	6,700
1999	10,900
2000	8,100
2001	8,000
2002	10,100
2003	10,200
2004	15,000
2005	45,000
2006	7,530
2007	16,800
2008	38,000
2009	8,000
2010	18,500
2011	10,200
2012	18,000
2013	8,500
2014	7,500

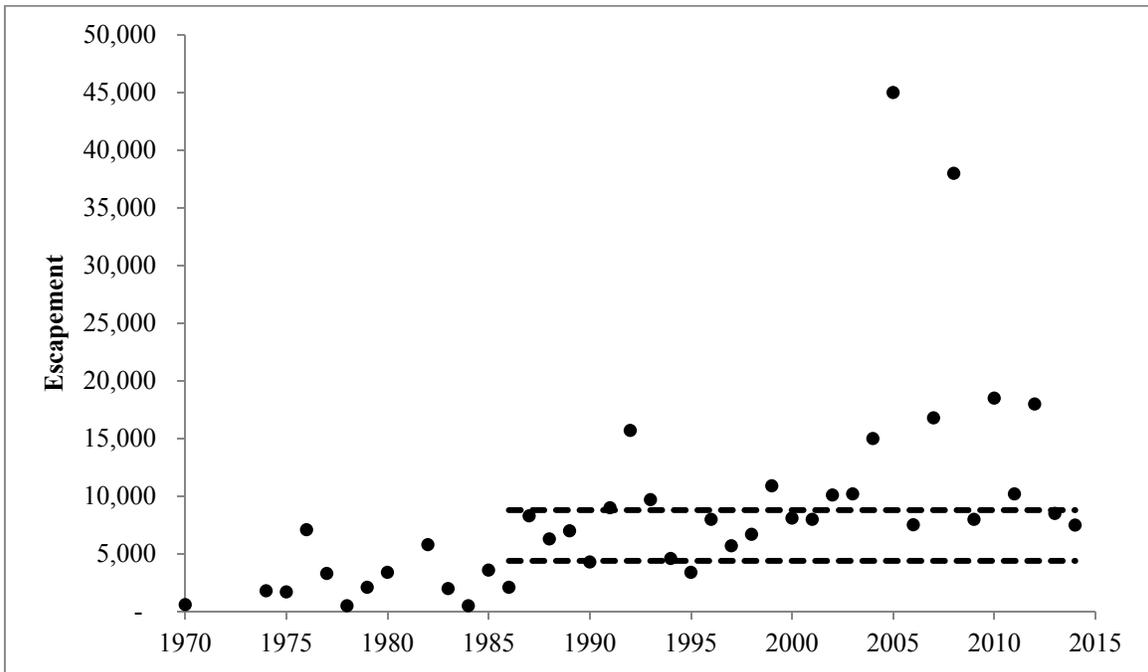
^a The escapement index represents the peak survey, enumeration of carcasses, as well as ancillary and qualitative data.

Appendix G3.–North Creek sockeye salmon escapement graph.

System: North Creek.

Species: Sockeye salmon.

Solid circles represent aerial survey data and dashed lines are the current SEG.



**APPENDIX H. SUPPORTING INFORMATION FOR THE
NELSON RIVER SOCKEYE SALMON ESCAPEMENT
GOAL**

System: Nelson River.

Species: Sockeye salmon.

Description of stock and escapement goal.

Regulatory area:	Alaska Peninsula Management Area Westward Region.
Management division:	Commercial Fisheries.
Primary fishery:	Commercial set and drift gillnet.
Current escapement goal:	BEG: 97,000–219,000 (2004).
Recommended escapement goal:	No change.
Optimal escapement goal:	None.
Inriver goal:	None.
Action points:	None.
Escapement enumeration:	Tower counts, 1962–1988; Weir counts, 1989 to present.
Data summary:	
Data quality	Good for tower counts; excellent for weir counts.
Data type	Tower counts from 1962–1988 and weir counts from 1989 to present. Escapement age data are available from 1985 to present. Stock-specific harvest information is available from 1970 to present.
Comments	Current BEG was based on Ricker spawner-recruit model.

Appendix H2.–Nelson River sockeye salmon escapement table.

System: Nelson River.

Species: Sockeye salmon.

Data available for analysis of escapement goal.

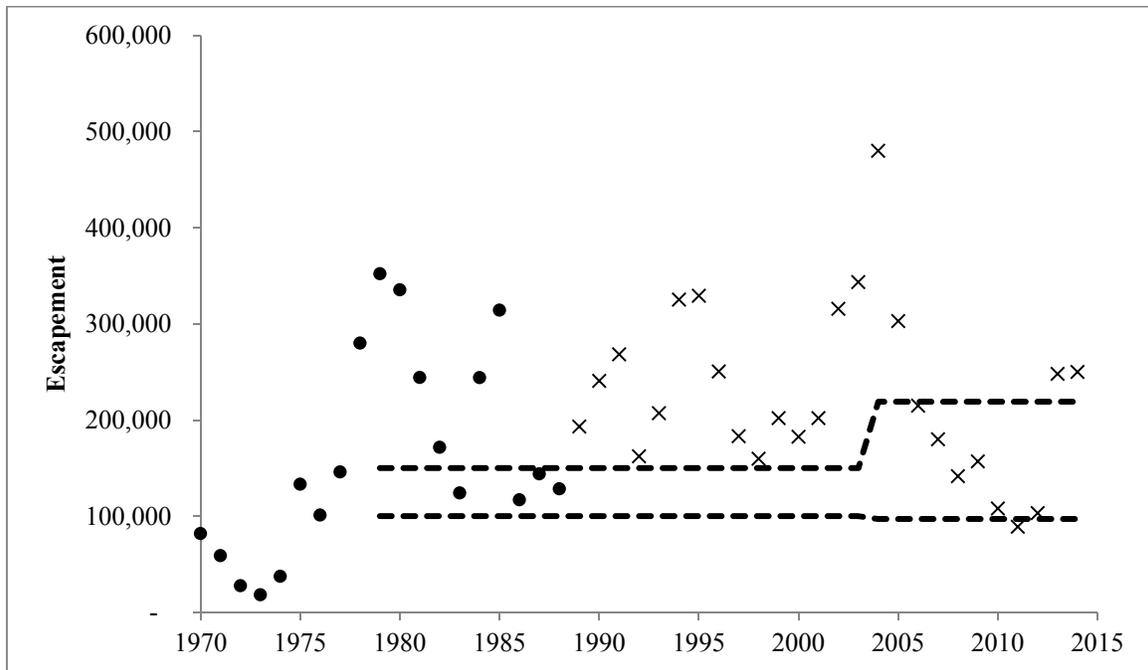
Year	Tower escapement	Weir escapement
1970	81,900	
1971	58,900	
1972	27,600	
1973	18,200	
1974	37,400	
1975	133,100	
1976	101,000	
1977	146,000	
1978	280,000	
1979	352,100	
1980	335,400	
1981	244,200	
1982	171,600	
1983	124,000	
1984	244,100	
1985	314,300	
1986	117,000	
1987	144,000	
1988	128,300	
1989		193,300
1990		240,700
1991		268,400
1992		162,300
1993		207,200
1994		325,300
1995		329,400
1996		250,500
1997		183,100
1998		159,800
1999		202,067
2000		182,700
2001		201,962
2002		315,693
2003		343,511
2004		480,097
2005		303,000
2006		215,000
2007		180,000
2008		141,600
2009		157,000
2010		108,000
2011		89,000
2012		103,300
2013		248,000
2014		250,000

Appendix H3.–Nelson River sockeye salmon escapement graph.

System: Nelson River.

Species: Sockeye salmon.

Solid circles represent tower count data, X-symbols represent weir counts, and dashed lines are the current escapement goal range.



**APPENDIX I. SUPPORTING INFORMATION FOR THE
BEAR LAKE SOCKEYE SALMON ESCAPEMENT GOALS**

System: Bear Lake.

Species: Sockeye salmon.

Description of stock and escapement goals.

Regulatory area	Alaska Peninsula Management Area Westward Region.
Management division:	Commercial Fisheries.
Primary fishery:	Commercial purse seine and drift gillnet.
Previous escapement goal:	SEG: Early Run: 176,000–293,000 (2003). SEG: Late Run: 117,000–195,000 (2003). SEG: Total Run: 293,000–488,000 (2003).
Recommended escapement goal:	No change.
Optimal escapement goal:	None.
Inriver goal:	None.
Action points:	None.
Escapement enumeration:	Tower counts, 1964–1985; Weir counts, 1986 to present.
Data summary:	
Data quality:	Good for tower counts; excellent for weir counts.
Data type:	Tower counts from 1964–1985; weir counts from 1986 to present. Escapement age data are available from 1985 to present and harvest age data are available from 1985 to present for the late run (after July 31). Stock-specific harvest information is available for the late run from 1970 to present. No-stock specific harvest information is available for the early run (prior to August 1).
Comments:	The Bear Lake system is considered spawner-limited and therefore, the spawning habitat model was used to estimate the SEG.

Appendix I2.–Bear Lake early-run sockeye salmon escapement table.

System: Bear Lake early run.

Species: Sockeye salmon.

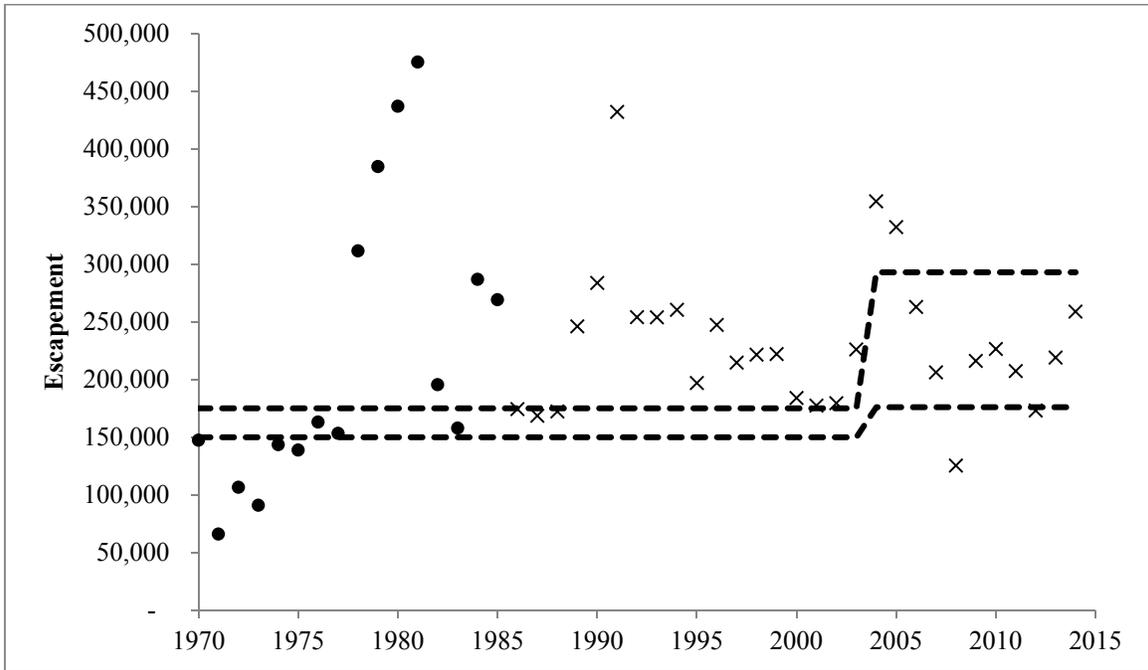
Data available for analysis of escapement goal.

Year	Tower counts	Weir counts
1970	147,367	
1971	65,950	
1972	106,571	
1973	90,998	
1974	143,505	
1975	138,793	
1976	163,135	
1977	153,383	
1978	311,528	
1979	384,613	
1980	436,962	
1981	475,272	
1982	195,497	
1983	157,857	
1984	286,849	
1985	269,261	
1986		174,453
1987		168,683
1988		172,363
1989		246,196
1990		283,854
1991		432,087
1992		254,170
1993		254,012
1994		260,559
1995		197,039
1996		247,371
1997		214,689
1998		221,580
1999		222,110
2000		184,053
2001		177,495
2002		179,480
2003		226,201
2004		354,565
2005		332,248
2006		262,995
2007		206,233
2008		125,526
2009		216,237
2010		226,534
2011		207,451
2012		173,158
2013		219,074
2014		259,046

System: Bear Lake early run.

Species: Sockeye salmon.

Solid circles represent tower count data, X-symbols represent weir counts, and dashed lines are the historical and current SEG.



Appendix I4.–Bear Lake late-run sockeye salmon table.

System: Bear Lake late run.

Species: Sockeye salmon.

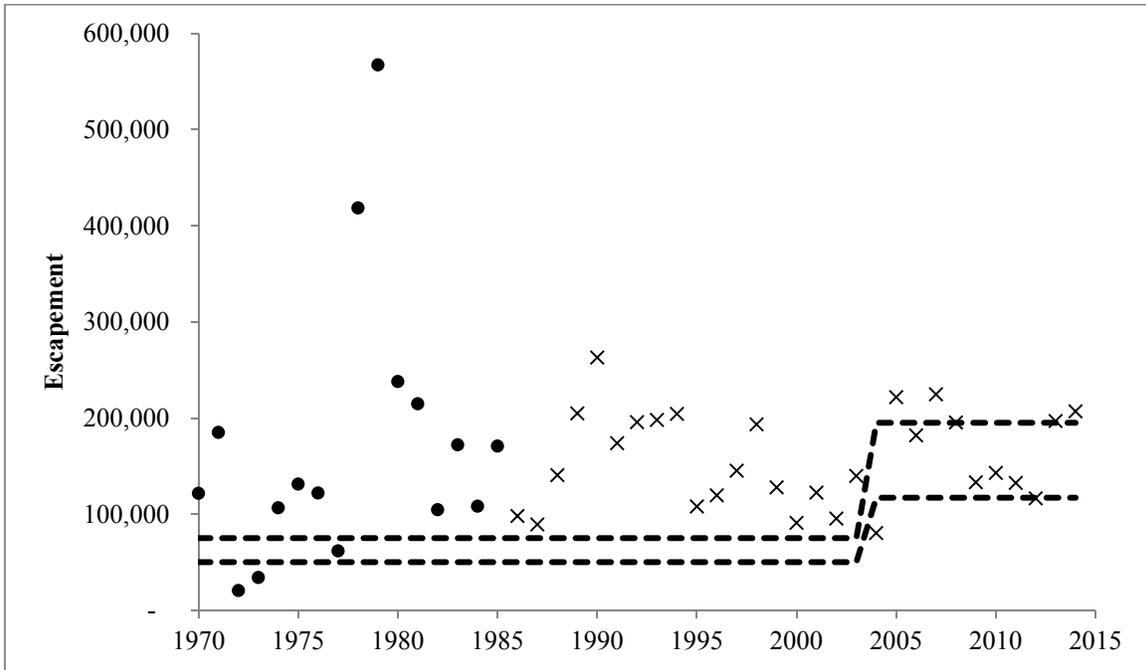
Data available for analysis of escapement goal.

Year	Tower counts	Weir counts
1970		
1971		
1972		
1973		
1974		
1975		
1976		
1977		
1978		
1979		
1980		
1981		
1982		
1983		
1984		
1985		
1986		
1987		
1988		
1989		
1990		
1991		
1992		
1993		
1994		
1995		
1996		
1997		
1998		
1999		
2000		
2001		
2002		
2003		
2004		
2005		
2006		
2007		
2008		
2009		
2010		
2011		
2012		
2013		
2014		

System: Bear Lake late run.

Species: Sockeye salmon.

Solid circles represent tower count data, X-symbols represent weir counts, and dashed lines are the historic and current SEG.



**APPENDIX J. SUPPORTING INFORMATION FOR THE
SANDY RIVER SOCKEYE SALMON ESCAPEMENT GOAL**

Appendix J1.—Description of stock and escapement goal for Sandy River sockeye salmon.

System: Sandy River.

Species: Sockeye salmon.

Description of stock and escapement goals.

Regulatory area	Alaska Peninsula Management Area Westward Region.
Management division:	Commercial Fisheries.
Primary fishery:	Commercial purse seine and drift gillnet.
Previous escapement goal:	SEG: 34,000–74,000 (2007).
Recommended escapement goal:	No change.
Optimal escapement goal:	None.
Inriver goal:	None.
Action points:	None.
Escapement enumeration:	Aerial survey, 1960–1993; Tower counts, 1962–1964; Weir counts, 1994 to present.
Data summary:	
Data quality:	Fair for aerial survey/tower count; good for weir counts.
Data type:	Weir counts from 1994 to 2011 are available and escapement age information is available during weir counts. No stock-specific harvest information is available.
Comments:	SEG based on percentile method.

Appendix J2.–Sandy River sockeye salmon escapement table.

System: Sandy River.

Species: Sockeye salmon.

Data available for analysis of escapement goal.

Year	Escapement index ^a	Weir counts
1970	25,000	
1971	30,000	
1972	8,400	
1973	5,100	
1974	16,500	
1975	40,000	
1976	43,000	
1977	50,200	
1978	64,000	
1979	61,000	
1980	76,000	
1981	51,500	
1982	61,300	
1983	28,000	
1984	19,000	
1985	11,500	
1986	6,900	
1987	8,700	
1988	34,500	
1989	36,000	
1990	17,500	
1991	75,200	
1992	21,200	
1993	49,300	
1994		115,000
1995		125,000
1996		64,000
1997		38,000
1998		52,000
1999		58,000
2000		40,000
2001		51,000
2002		49,000
2003		66,000
2004		32,000
2005		101,000
2006		48,000
2007		44,700
2008		32,200
2009		36,000
2010		37,000
2011		37,500
2012		27,100
2013		42,000
2014		59,000

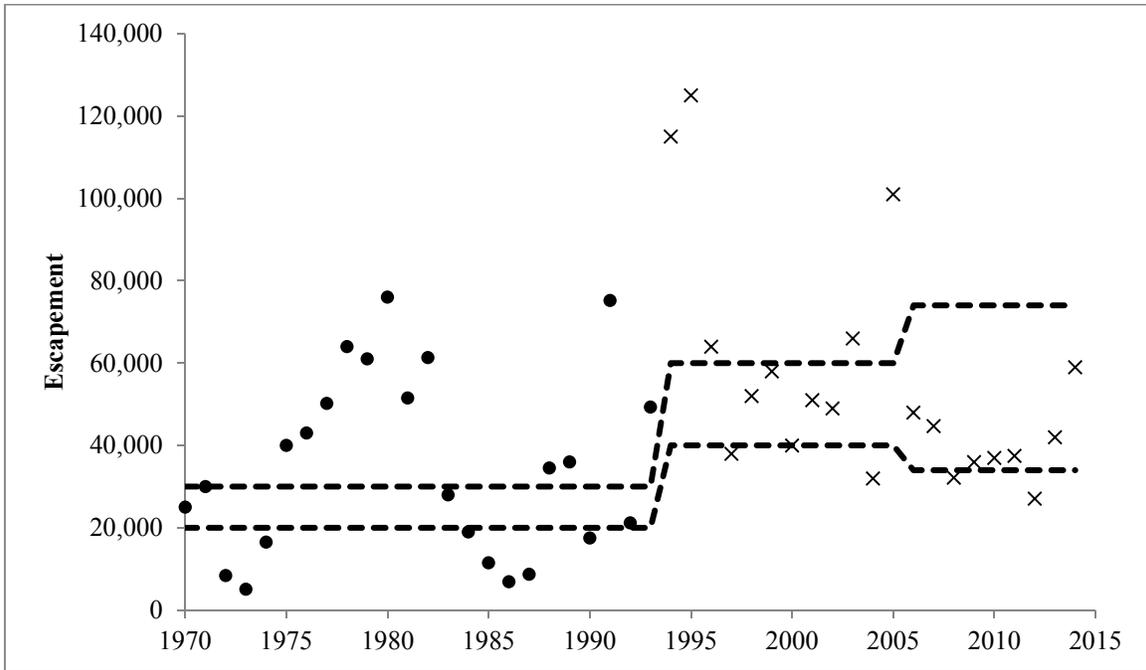
^a The escapement index represents peak survey, enumeration of carcasses, and ancillary and qualitative data.

Appendix J3.–Sandy River sockeye salmon escapement graph.

System: Sandy River.

Species: Sockeye salmon.

Solid circles represent aerial survey data, X-symbols represent weir counts, and dashed lines are the current SEG.



**APPENDIX K. SUPPORTING INFORMATION FOR THE
ILNIK RIVER SOCKEYE SALMON ESCAPEMENT GOAL**

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

System: Ilnik River.

Species: Sockeye salmon.

Description of stock and escapement goals.

Regulatory area	Alaska Peninsula Management Area Westward Region.
Management division:	Commercial Fisheries.
Primary fishery:	Commercial drift and set gillnet.
Previous escapement goal:	SEG: 40,000–60,000 (1991).
Recommended escapement goal:	No change.
Optimal escapement goal:	None.
Inriver goal:	None.
Action points:	None.
Escapement enumeration:	Aerial survey, 1960–1990; Weir count, 1991 to present.
Data summary:	
Data quality	Fair for aerial surveys; good for weir counts.
Data type	Fixed-wing aerial surveys from 1970–1990; intermittent during 1960s. Weir counts from 1991 to present, with escapement age data available during weir counts. No stock-specific harvest information is available.
Comments	Current escapement based on percentile, euphotic volume analysis, smolt biomass as a function of zooplankton biomass, and lake surface area methods.

Appendix K2.–Ilnik River sockeye salmon escapement table.

System: Ilnik River.

Species: Sockeye salmon.

Data available for analysis of escapement goal.

Year	Escapement Index ^a	Weir Counts
1970	15,300	
1971	26,100	
1972	13,100	
1973	16,000	
1974	14,500	
1975	40,500	
1976	37,500	
1977	30,000	
1978	23,100	
1979	97,200	
1980	97,600	
1981	97,500	
1982	42,500	
1983	28,600	
1984	29,500	
1985	27,000	
1986	66,800	
1987	30,700	
1988	26,900	
1989	16,500	
1990	35,700	
1991		135,000
1992		45,000
1993		70,000
1994		75,000
1995		39,000
1996		62,000
1997		82,000
1998		50,000
1999		75,000
2000		95,000
2001		58,000
2002		43,000
2003		69,000
2004		82,000
2005		154,000
2006		88,000
2007		93,000
2008		44,300
2009		66,000
2010		59,000
2011		43,000
2012		61,000
2013		51,000
2014		59,000

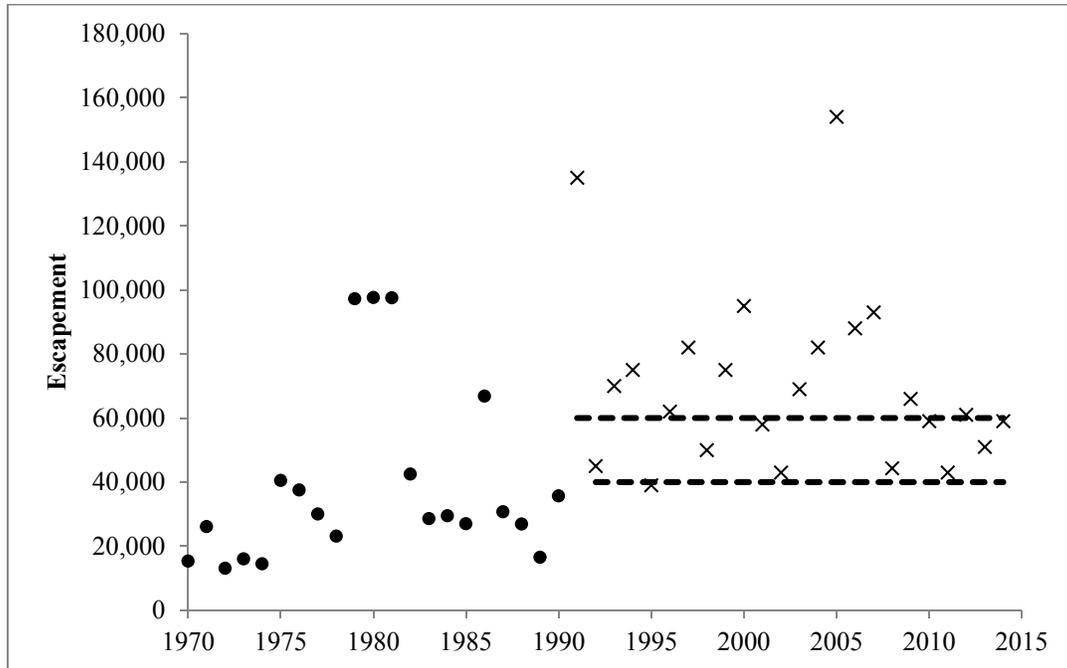
^a The estimated total escapement represents the peak survey, enumeration of carcasses, as well as ancillary and qualitative data.

Appendix K3.–Ilnik River sockeye salmon escapement graph.

System: Ilnik River.

Species: Sockeye salmon.

Solid circles represent aerial survey data, X-symbols represent weir counts, and dashed lines are the current SEG.



**APPENDIX L. SUPPORTING INFORMATION FOR THE
MESHUK RIVER SOCKEYE SALMON ESCAPEMENT
GOAL**

System: Meshik River.

Species: Sockeye salmon.

Description of stock and escapement goals.

Regulatory area:	Alaska Peninsula Management Area Westward Region.
Management division:	Commercial Fisheries.
Primary fishery:	Commercial drift and set gillnet.
Current escapement goal:	SEG: 25,000–100,000 (2010).
Recommended escapement goal:	SEG: 48,000–86,000
Optimal escapement goal:	None.
Inriver goal:	None.
Action points:	None.
Escapement enumeration:	Aerial survey, 1970 to present.
Data summary:	
Data quality	Poor.
Data type	Fixed-wing aerial surveys from 1960 to present; missing data points throughout period. 1990 to present includes increased aerial survey effort. No stock-specific harvest information is available.
Data contrast	1990–2014 = 12.2.
Methodology	Percentile.
Criteria for SEG	High contrast, low to moderate exploitation.
Percentiles	20 th –60 th .

Appendix L2.–Meshik River sockeye salmon escapement.

System: Meshik River.

Species: Sockeye salmon.

Data available for analysis of escapement goal.

Year	Meshik escapement index ^a	Yellow Bluff and Red Bluff	Combined Meshik System index
1970	13,100		13,100
1971	29,300		29,300
1972	3,700		3,700
1973	6,500		6,500
1974	1,200		1,200
1975	4,800		4,800
1976	25,500		25,500
1977	15,100		15,100
1978			17,900
1979	93,100		93,100
1980	15,000		15,000
1981	23,700		23,700
1982	13,725		13,725
1983	8,850		8,850
1984	25,500		25,500
1985	26,500		26,500
1986	28,050		28,050
1987	26,300		26,300
1988	27,000		27,000
1989	5,700		5,700
1990	22,550	3,650	26,200
1991	19,480	5,300	24,780
1992	21,100	11,300	32,400
1993	-	-	-
1994	35,700	10,000	45,700
1995	67,600	18,000	85,600
1996	59,850	100	59,950
1997	14,600	500	15,100
1998	51,400	6,300	57,700
1999	62,200	12,500	74,700
2000	157,700	26,000	183,700
2001	100,50	11,500	112,000
2002	36,150	-	-
2003	94,000	20,000	114,000
2004	82,200	20,000	102,200
2005	96,100	15,000	111,100
2006	114,010	24,000	138,010
2007	45,400	12,000	57,400
2008	61,250	22,000	83,250
2009	63,500	24,500	88,000
2010	46,200	17,500	63,700
2011	86,800	7,100	93,900
2012	43,800	7,100	50,900
2013	65,400	20,000	85,400
2014	93,900	20,800	114,700

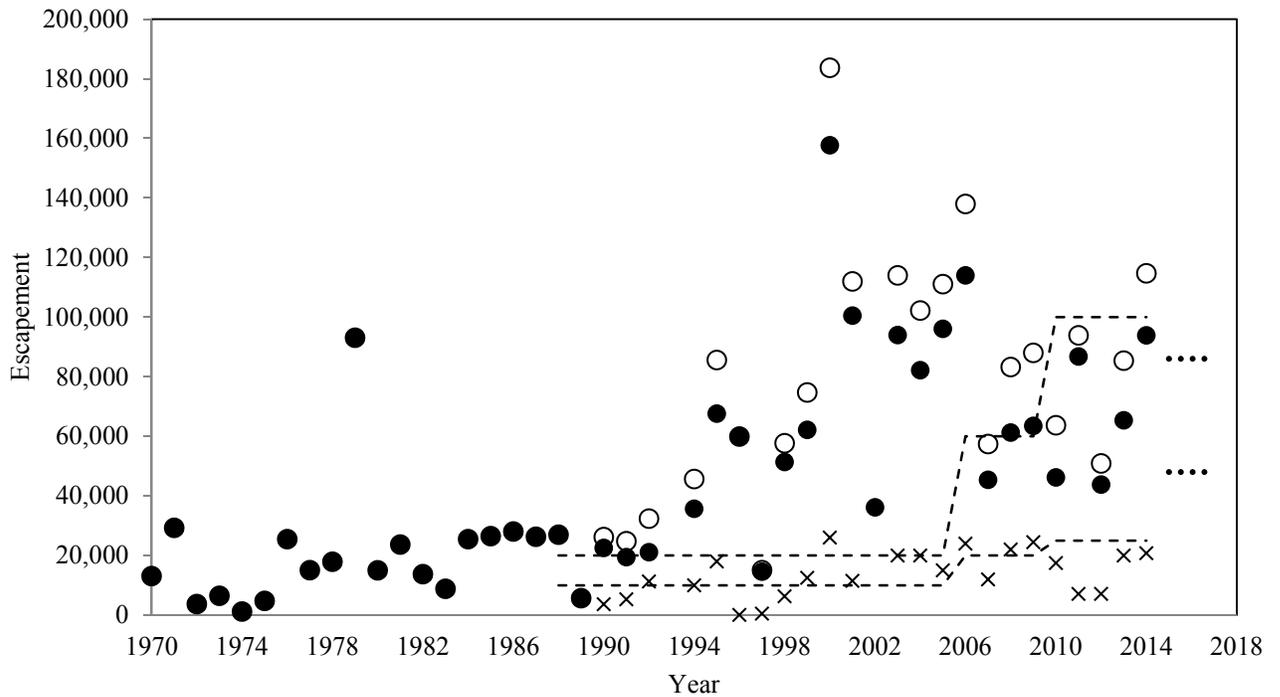
^a The escapement index represents the peak survey, enumeration of carcasses, as well as ancillary and qualitative data.

Appendix L3.–Meshik River sockeye salmon escapement graph.

System: Meshik River.

Species: Sockeye salmon.

Observed escapement by year (solid circles for Meshik mainstem only; Xs for Red Bluff and Yellow Bluff creeks; open circles for combined Meshik, Red Bluff, and Yellow Bluff creeks), current SEG range (dashed lines), and 2015 recommended SEG (dotted lines).



**APPENDIX M. SUPPORTING INFORMATION FOR THE
CINDER RIVER SOCKEYE SALMON ESCAPEMENT
GOAL**

Appendix M1.–Description of stock and escapement goal for Cinder River sockeye salmon.

System: Cinder River.

Species: Sockeye salmon.

Description of stock and escapement goals.

Regulatory area:	Alaska Peninsula Management Area Westward Region.
Management division:	Commercial Fisheries.
Primary fishery:	Commercial drift and set gillnet.
Current escapement goal:	SEG: 12,000–48,000 (2007).
Recommended escapement goal:	36,000–94,000
Optimal escapement goal:	None.
Inriver goal:	None.
Action points:	None.
Escapement enumeration:	Aerial survey, 1970 to present.
Data summary:	
Data quality	Poor.
Data type	Fixed-wing aerial surveys from 1960 to present; missing data points throughout time period. 1990 to present includes increased aerial survey effort. No stock-specific harvest information is available.
Data contrast	1990-2014= 10.9 (Cinder only), 12.4 (Cinder River and Mud Creek combined). 2003-2014= 2.4 (Cinder only), 2.5 (Cinder River and Mud Creek combined).
Methodology	Percentile.
Criteria for SEG	High contrast, low exploitation.
Percentiles	20 th –60 th .
Comments	The percentile method used data from 1991 to present as those data represent better quality aerial surveys. Prior years have an insufficient number of years of aerial survey data for Mud Creek.

Appendix M2.–Cinder River sockeye salmon escapement table.

System: Cinder River.

Species: Sockeye salmon.

Data available for analysis of escapement goal.

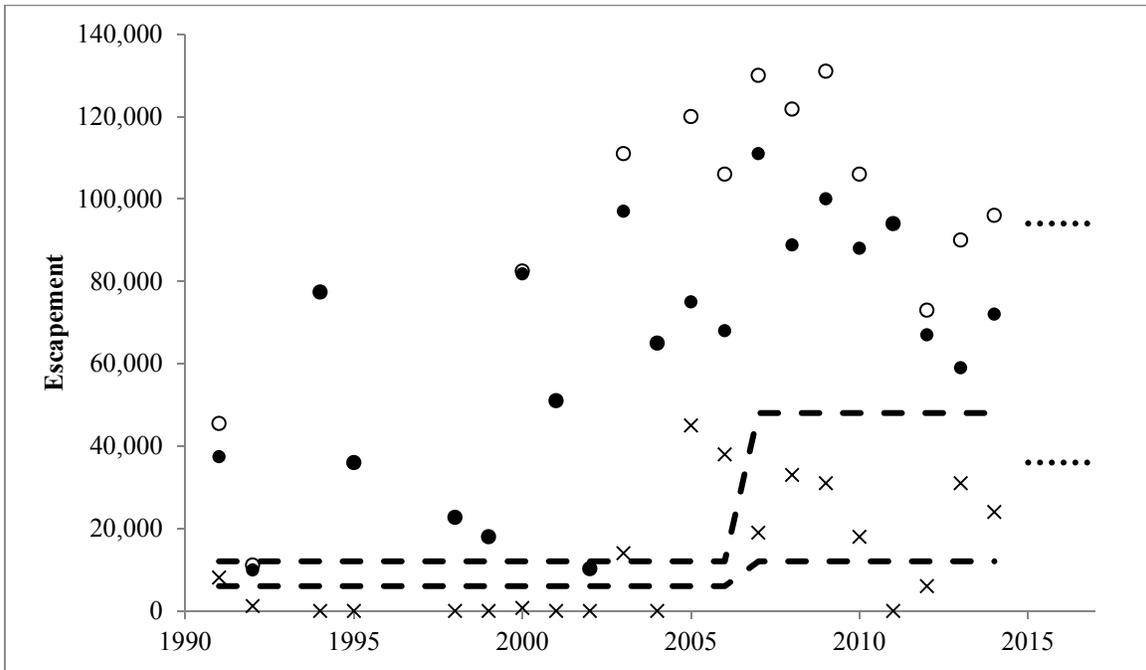
Year	Cinder escapement index	Mud escapement index	Combined escapement index
1991	37,400	8,100	45,500
1992	9,900	1,200	11,100
1993			
1994	77,400	0	77,400
1995	36,000	0	36,000
1996			
1997			
1998	22,700	3	22,703
1999	18,000	0	18,000
2000	81,800	700	82,500
2001	51,000	0	51,000
2002	10,200	0	10,200
2003	97,000	14,000	111,000
2004	65,000	0	65,000
2005	75,000	45,000	120,000
2006	68,000	38,000	106,000
2007	111,000	19,000	130,000
2008	88,800	33,000	121,800
2009	100,000	31,000	131,000
2010	88,000	18,000	106,000
2011	94,000	0	94,000
2012	67,000	6,000	73,000
2013	59,000	31,000	90,000
2014	72,000	24,000	96,000

Appendix M3.—Cinder River sockeye salmon escapement graph.

System: Cinder River.

Species: Sockeye salmon.

Observed escapement by year (solid circles for Cinder River only; Xs for Mud Creek only; open circles for combined); historical and current SEG range (dashed lines); and 2015 recommended SEG (dotted line).



**APPENDIX N. SUPPORTING INFORMATION FOR THE
MCLEES LAKE SOCKEYE SALMON ESCAPEMENT
GOAL**

Appendix N1.–Description of stock and escapement goal for McLees Lake sockeye salmon.

System: McLees Lake.

Species: Sockeye salmon.

Description of stock and escapement goal.

Regulatory area	Aleutian Islands Management Area Westward Region.
Management division:	Commercial Fisheries.
Primary fishery:	Commercial purse seine and subsistence.
Current escapement goal:	SEG: 10,000–60,000 (2009; weir only).
Recommended escapement goal:	None.
Optimal escapement goal:	None.
Inriver goal:	None.
Action points:	None.
Escapement enumeration:	Aerial survey, 1974–2003; Weir counts, 2001 to present.
Data summary:	
Data quality	Fair for aerial survey counts; good for weir counts.
Data type	No stock-specific harvest information is available.
Comments	The SEG of 10,000 to 60,000 sockeye salmon is only used during years that the weir is in place.

Appendix N2.–McLees Lake sockeye salmon escapement table.

System: McLees Lake.

Species: Sockeye salmon.

Data available for analysis of escapement goal.

Year	Escapement index ^a	Weir counts
1974	2,500	
1975	5,600	
1976		
1977	900	
1978	2,020	
1979	1,100	
1980	3,400	
1981		
1982	291	
1983		
1984	300	
1985		
1986	1,900	
1987	1,500	
1988		
1989		
1990	2,500	
1991		
1992	6,500	
1993		
1994	16,500	
1995	2,850	
1996	2,700	
1997	11,000	
1998	5,800	
1999	1,025	
2000	4,400	
2001	34,000	
2002	58,000	
2003	14,500	
2004		
2005		
2006		
2007		
2008		
2009		
2010		
2011		
2012		
2013		
2014		

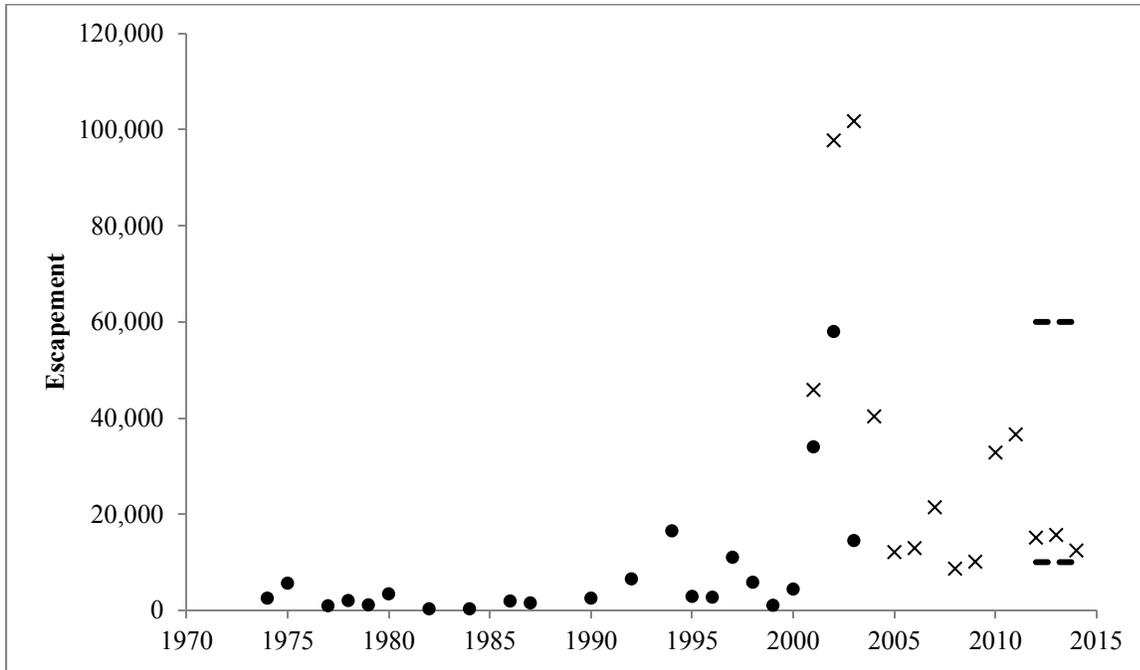
^a The escapement index represents the peak survey, enumeration of carcasses, as well as ancillary and qualitative data. Missing values are years when surveys were not completed.

Appendix N3.–McLees Lake sockeye salmon escapement graph.

System: McLees Lake.

Species: Sockeye salmon.

Solid circles represent aerial survey data, X-symbols represent weir counts, and the dashed lines represent the current SEG.



**APPENDIX O. SUPPORTING INFORMATION FOR THE
NELSON RIVER COHO SALMON ESCAPEMENT GOAL**

System: Nelson River.

Species: Coho salmon.

Description of stock and escapement goal.

Regulatory area:	Alaska Peninsula Management Area Westward Region.
Management division:	Commercial Fisheries.
Primary fishery:	Commercial set and drift gillnet.
Current escapement goal:	SEG: 18,000 (2004).
Recommended escapement goal:	No change.
Optimal escapement goal:	None.
Inriver goal:	None.
Action points:	None.
Escapement enumeration:	Aerial survey, 1968 to present.
Data summary:	
Data quality	Fair for aerial survey counts.
Data type	Fixed-wing aerial surveys from 1968 to present. No stock-specific harvest information is available.
Comments	Current SEG was based on risk analysis.

Appendix O2.–Nelson River coho salmon escapement table.

System: Nelson River.

Species: Coho salmon.

Data available for analysis of escapement goal.

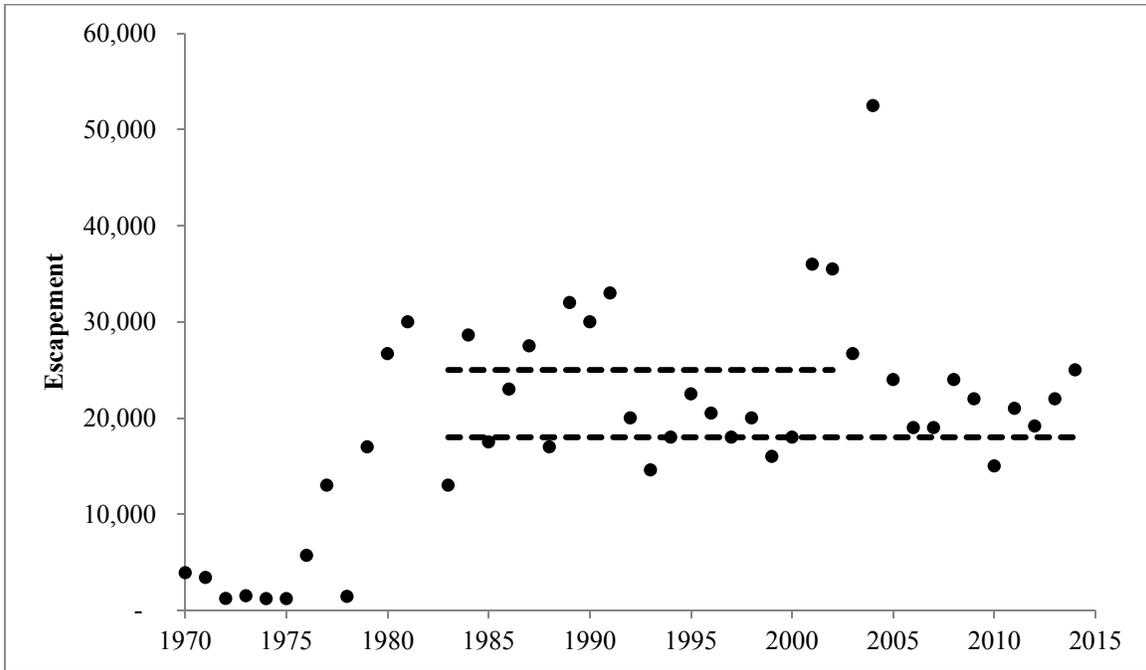
Year	Escapement index ^a
1970	3,900
1971	3,400
1972	1,210
1973	1,500
1974	1,200
1975	1,200
1976	5,700
1977	13,000
1978	1,425
1979	17,000
1980	26,700
1981	30,000
1982	
1983	13,000
1984	28,630
1985	17,500
1986	23,000
1987	27,500
1988	17,000
1989	32,000
1990	30,000
1991	33,000
1992	20,000
1993	14,600
1994	18,000
1995	22,500
1996	20,500
1997	18,000
1998	20,000
1999	16,000
2000	18,000
2001	36,000
2002	35,500
2003	26,700
2004	52,500
2005	24,000
2006	19,000
2007	19,000
2008	24,000
2009	22,000
2010	15,000
2011	21,000
2012	19,160
2013	22,000
2014	25,000

^aThe escapement index represents peak survey, enumeration of carcasses, ancillary and qualitative data. Missing values are years surveys were not completed.

System: Nelson River.

Species: Coho salmon.

Observed escapement by year (solid circles) with historic SEG and current SEG threshold (dashed lines).



**APPENDIX P. SUPPORTING INFORMATION FOR THE
ILNIK RIVER COHO SALMON ESCAPEMENT GOAL**

System: Ilnik River.

Species: Coho salmon.

Description of stock and escapement goal.

Regulatory area:	Alaska Peninsula Management Area Westward Region.
Management division:	Commercial Fisheries.
Primary fishery:	Commercial set and drift gillnet.
Current escapement goal:	SEG: 9,000 (2009).
Recommended escapement goal:	No change.
Optimal escapement goal:	None.
Inriver goal:	None.
Action points:	None.
Escapement enumeration:	Aerial survey, 1968 to present.
Data summary:	
Data quality	Poor.
Data type	Fixed-wing aerial surveys sporadically 1968 to 1985; consistently surveyed 1985 to present. No stock-specific harvest information is available.
Comments	Current SEG was based on risk analysis.

Appendix P2.–Ilnik River coho salmon escapement table.

System: Ilnik River.

Species: Coho salmon.

Data available for analysis of escapement goal.

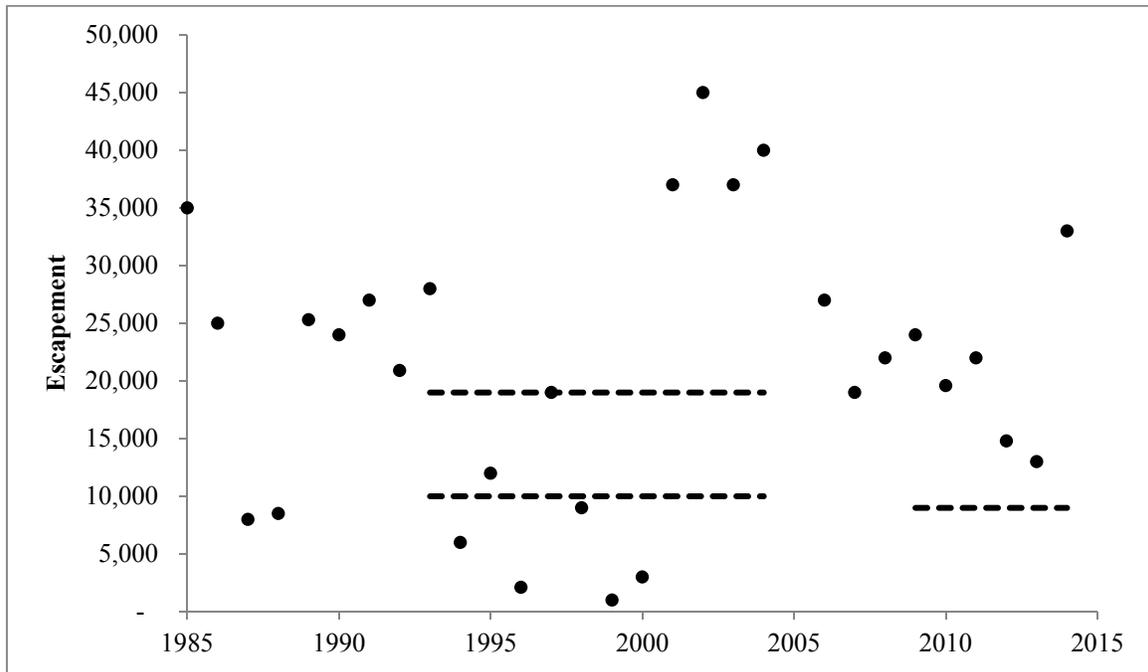
Year	Escapement index ^a
1985	35,000
1986	25,000
1987	8,000
1988	8,500
1989	25,300
1990	24,000
1991	27,000
1992	20,900
1993	28,000
1994	6,000
1995	12,000
1996	2,100
1997	19,000
1998	9,000
1999	1,000
2000	3,000
2001	37,000
2002	45,000
2003	37,000
2004	40,000
2005	
2006	27,000
2007	19,000
2008	22,000
2009	24,000
2010	19,600
2011	22,000
2012	14,800
2013	13,000
2014	33,000

^a The escapement index represents the peak survey, enumeration of carcasses, as well as ancillary and qualitative data. Missing values are years when surveys were not completed.

System: Ilnik River.

Species: Coho salmon.

Observed escapement by year (solid circles) and current SEG threshold (dashed line).



**APPENDIX Q. SUPPORTING INFORMATION FOR THE
SOUTH PENINSULA PINK SALMON ESCAPEMENT
GOALS**

Appendix Q1.–Description of stock and escapement goals for South Peninsula pink salmon.

System: South Peninsula.

Species: Pink salmon.

Description of stock and escapement goal.

Regulatory area:	Alaska Peninsula Management Area Westward Region.
Management division:	Commercial Fisheries.
Primary fishery:	Commercial purse seine and set and drift gillnet.
Current escapement goal:	SEG: Even year: 1,864,600–3,729,300 (2007). SEG: Odd year: 1,637,800–3,275,700 (2007).
Recommended escapement goal:	SEG: Even/Odd year. 1,750,000–4,000,000.
Optimal escapement goal:	None.
Inriver goal:	None.
Action points:	None.
Escapement enumeration:	Aerial survey, 1968 to present.
Data summary:	
Data quality	Fair.
Data type	Fixed-wing aerial surveys for most years 1960 to present. No stock-specific harvest information is available.
Comments	Recommended change to escapement goal based on an update to Ricker stock recruitment analysis.

Appendix Q2.–South Peninsula aggregate pink salmon escapement, total harvest, and brood year recruitment, 1975 to 2014.

System: South Peninsula.

Species: Pink salmon.

Data available for analysis of escapement goal.

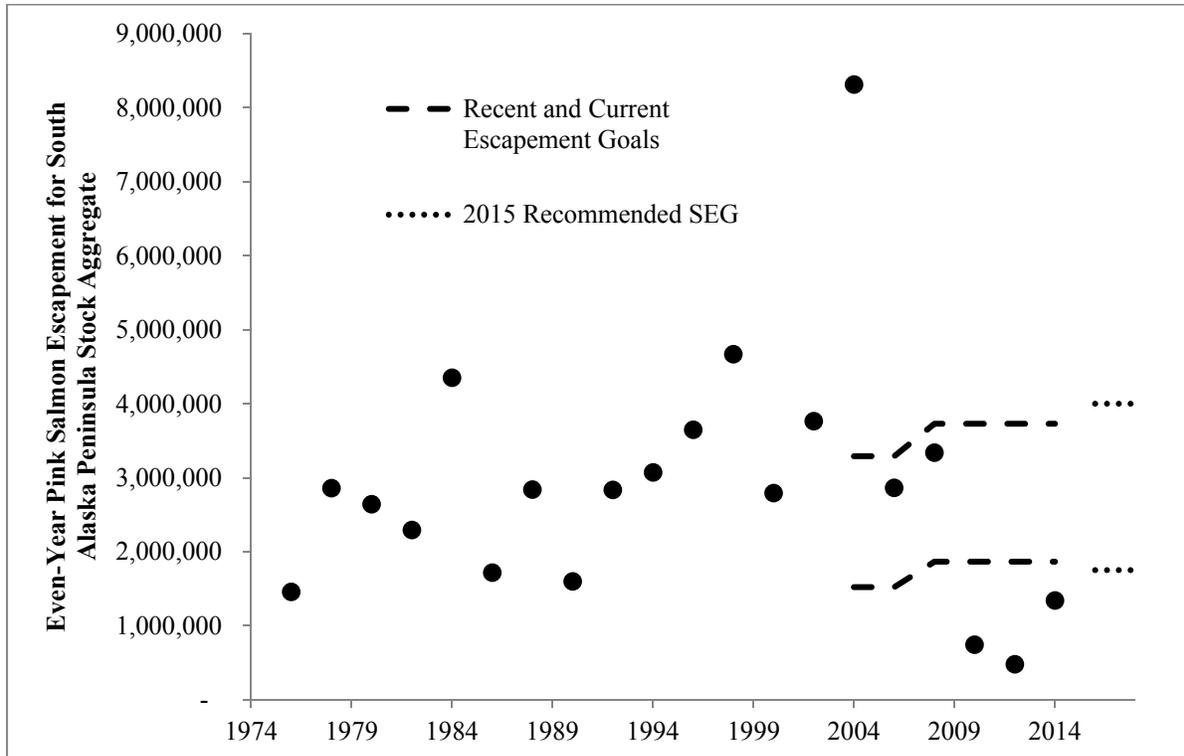
Year	Escapement	Total harvest ^a	Recruitment	R/S
1975	552,100	55,395	4,113,817	7.5
1976	1,456,400	2,300,748	8,284,540	5.7
1977	2,677,800	1,436,017	8,980,149	3.4
1978	2,858,700	5,425,840	8,801,269	3.1
1979	2,629,500	6,350,649	6,829,503	2.6
1980	2,641,600	6,159,669	6,993,466	2.6
1981	2,306,800	4,522,703	3,576,093	1.6
1982	2,293,000	4,700,466	14,713,689	6.4
1983	851,200	2,724,893	5,913,566	6.9
1984	4,351,600	10,362,089	5,378,871	1.2
1985	1,613,800	4,299,766	2,698,805	1.7
1986	1,716,700	3,662,171	9,667,154	5.6
1987	1,540,500	1,158,305	8,783,157	5.7
1988	2,839,600	6,827,554	3,884,568	1.4
1989	1,870,900	6,912,257	12,903,424	6.9
1990	1,598,400	2,286,168	11,908,705	7.5
1991	2,946,800	9,956,624	12,820,896	4.4
1992	2,834,400	9,074,305	9,722,866	3.4
1993	2,990,100	9,830,796	22,523,513	7.5
1994	3,071,725	6,651,141	5,444,530	1.8
1995	6,406,300	16,117,213	6,948,735	1.1
1996	3,647,550	1,796,980	12,128,294	3.3
1997	5,243,275	1,705,460	13,201,054	2.5
1998	4,668,065	7,460,229	5,883,882	1.3
1999	5,015,310	8,185,744	6,887,202	1.4
2000	2,792,985	3,090,897	5,787,715	2.1
2001	2,965,136	3,922,066	9,483,367	3.2
2002	3,762,800	2,024,915	14,481,357	3.8
2003	5,511,220	3,972,147	13,600,587	2.5
2004	8,311,410	6,169,947	5,707,867	0.7
2005	6,165,634	7,434,953	9,522,831	1.5
2006	2,862,250	2,845,617	13,938,442	4.9
2007	2,680,213	6,842,618	8,175,290	3.1
2008	3,338,370	10,600,072	1,185,176	0.4
2009	3,067,000	5,108,290	6,616,906	2.2
2010	742,912	442,264	664,044	0.9
2011	2,494,950	4,121,956	9,623,217	3.9
2012	478,910	185,134	1,843,076	3.8
2013	2,320,790	7,302,427		
2014	1,340,380	502,696		

^a Total harvest was estimated using reported harvest from July 15 through the end of the season to more accurately estimate harvest of local stocks and exclude fish bound for other areas.

System: South Peninsula (even years).

Species: Pink salmon.

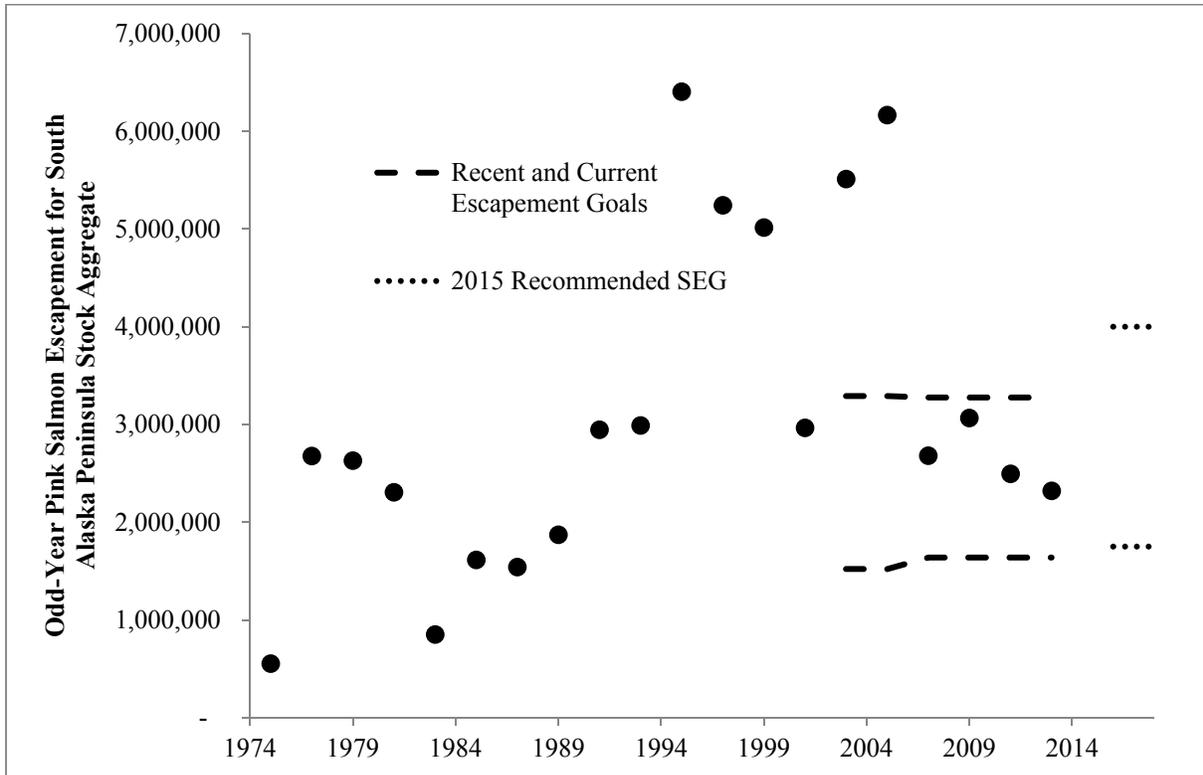
Observed escapement by year (solid circles), historical and current SEG (dashed line), 2015 recommended SEG (dotted line).



System: South Peninsula (odd- years).

Species: Pink salmon.

Observed escapement by year (solid circles), historical and current SEG (dashed line), 2015 recommended SEG (dotted line).

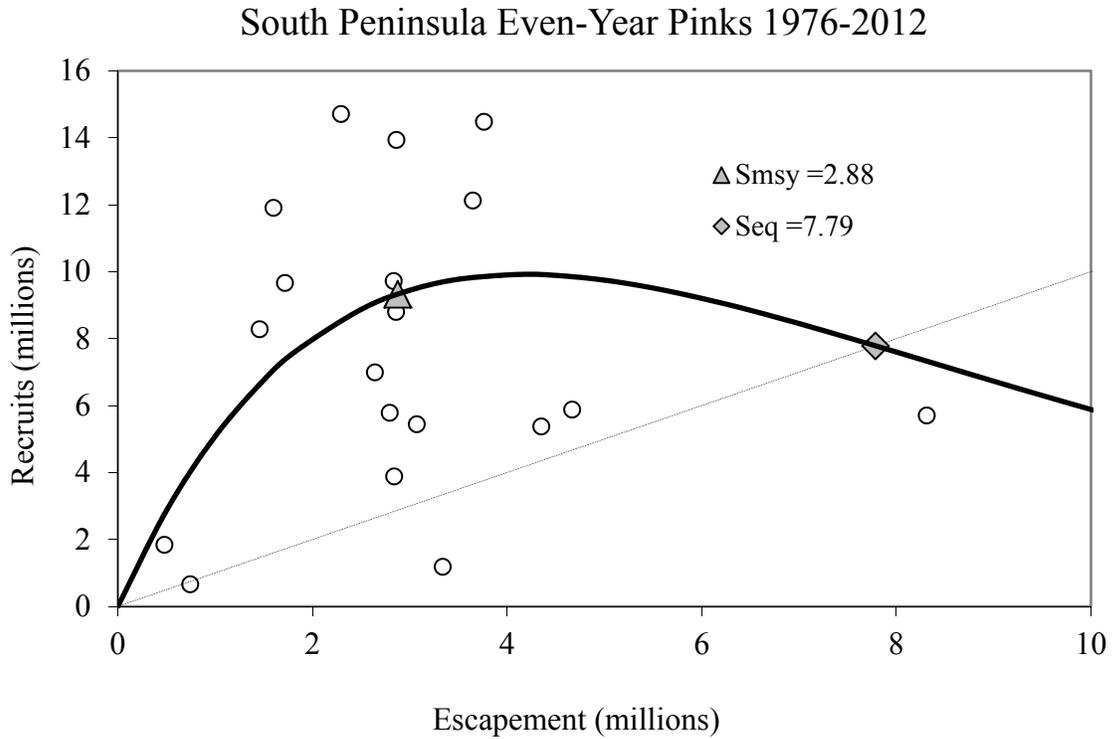


Appendix Q5. South Peninsula aggregate even-year Ricker spawner-recruit curve with S_{msy} and S_{eq} identified.

System: South Peninsula (even- years).

Species: Pink salmon.

South Peninsula aggregate even-year Ricker spawner-recruit curve with S_{msy} and S_{eq} identified.

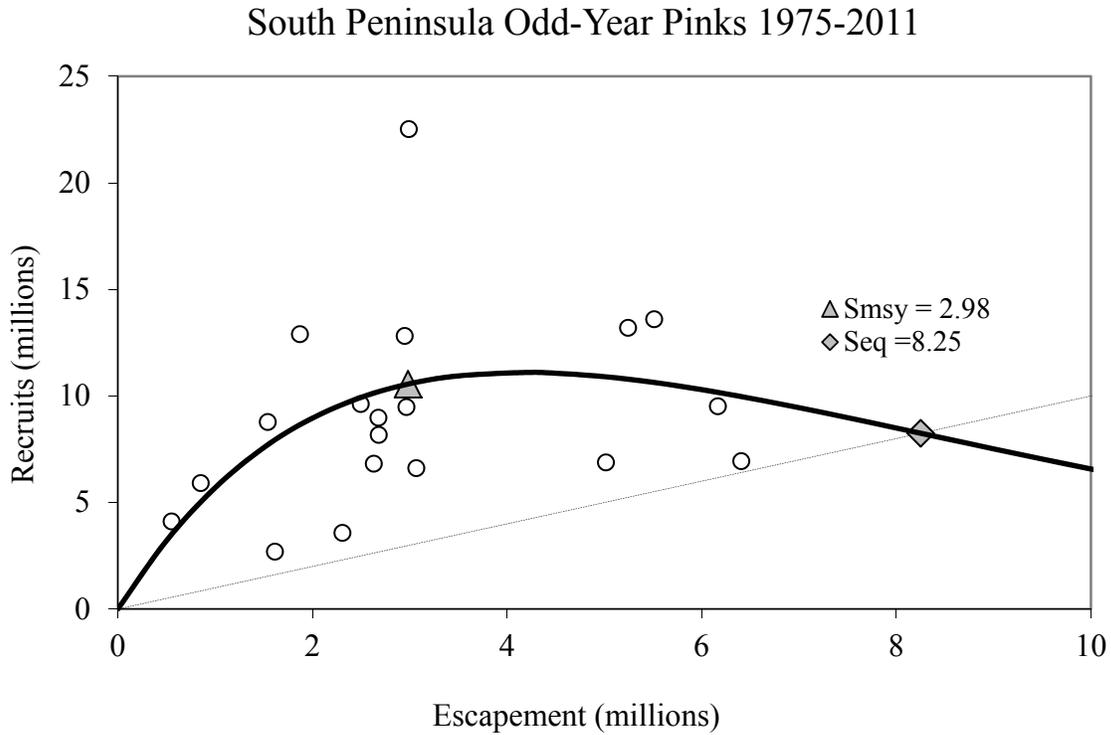


Appendix Q6. South Peninsula aggregate odd-year Ricker spawner-recruit curve with S_{msy} and S_{eq} identified.

System: South Peninsula (odd- years).

Species: Pink salmon.

South Peninsula aggregate odd-year Ricker spawner-recruit curve with S_{msy} and S_{eq} identified.



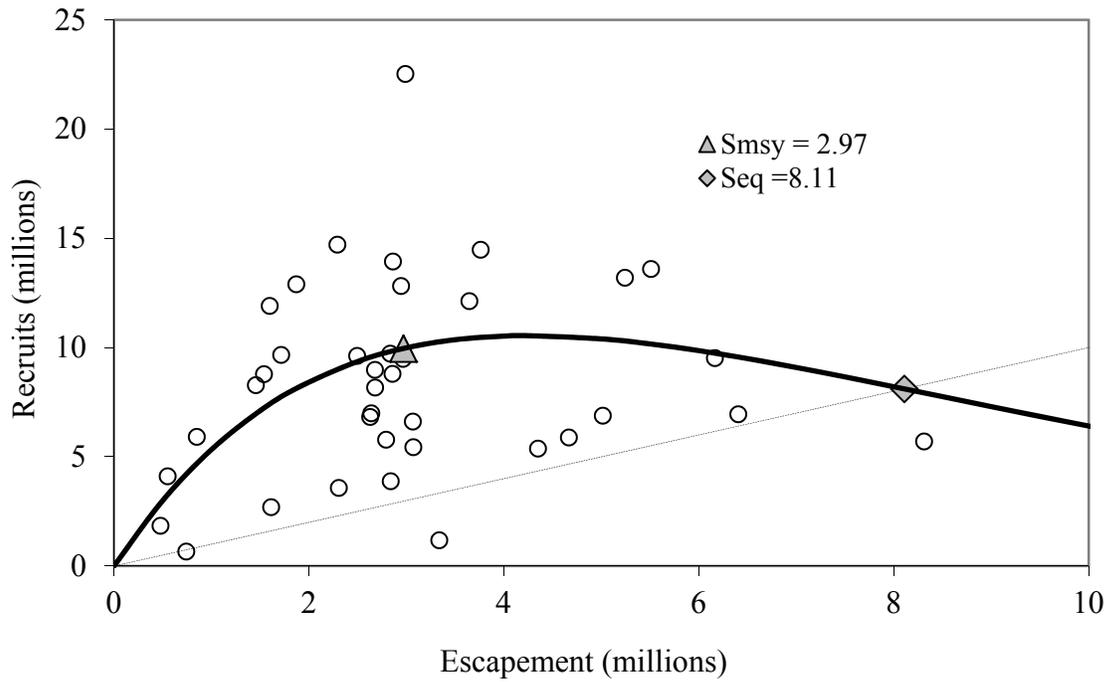
Appendix Q7. South Peninsula aggregate all-years Ricker spawner-recruit curve with S_{msy} and S_{eq} identified.

System: South Peninsula (all- years).

Species: Pink salmon.

South Peninsula aggregate all-year Ricker spawner-recruit curve with S_{msy} and S_{eq} identified.

South Peninsula Pinks 1975-2012



**APPENDIX R. SUPPORTING INFORMATION FOR THE
SOUTHEASTERN DISTRICT CHUM SALMON
ESCAPEMENT GOAL**

System: Southeastern District.

Species: Chum salmon.

Description of stock and escapement goal.

Regulatory area:	Alaska Peninsula Management Area Westward Region.
Management division:	Commercial Fisheries.
Primary fishery:	Commercial purse seine and set gillnet.
Current escapement goal:	SEG: 106,400–212,800 (1992).
Recommended escapement goal:	No change.
Optimal escapement goal:	None.
Inriver goal:	None.
Action points:	None.
Escapement enumeration:	Aerial survey, 1960 to present.
Data summary:	
Data quality	Fair.
Data Type	Fixed-wing aerial surveys from 1960 to present. Since 1987, a total of 28 streams used as an index. No-stock specific harvest information is available.
Comments	Current SEG was based on percentile method.

Appendix R2.–Southeastern District chum salmon escapement table.

System: Southeastern District.

Species: Chum salmon.

Data available for analysis of escapement goal.

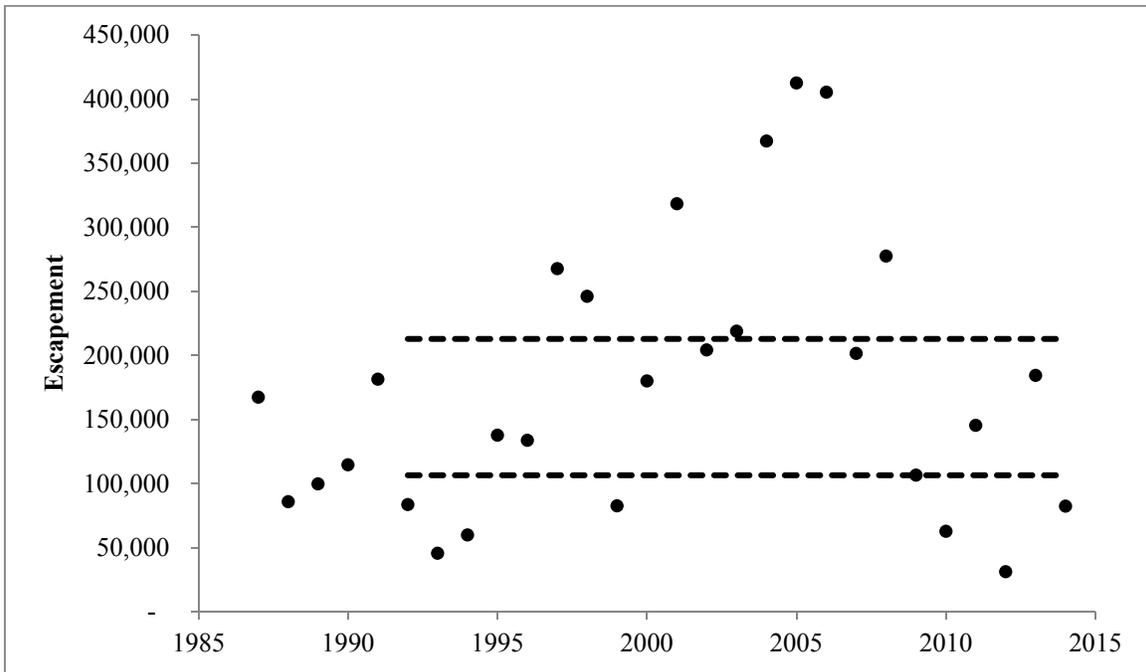
Year	Escapement index ^a
1987	167,300
1988	85,700
1989	99,650
1990	114,595
1991	181,365
1992	83,450
1993	45,550
1994	59,800
1995	137,650
1996	133,600
1997	267,650
1998	246,025
1999	82,550
2000	179,950
2001	318,300
2002	204,150
2003	218,810
2004	367,200
2005	412,500
2006	405,300
2007	201,451
2008	277,450
2009	106,500
2010	62,612
2011	145,300
2012	31,072
2013	184,350
2014	82,300

^a The escapement index represents the peak survey, enumeration of carcasses, as well as ancillary and qualitative data.

System: Southeastern District.

Species: Chum salmon.

Observed escapement by year (solid circles) and current SEG (dashed line).



**APPENDIX S. SUPPORTING INFORMATION FOR THE
SOUTH CENTRAL DISTRICT CHUM SALMON
ESCAPEMENT GOAL**

Appendix S1.–Description of stock and escapement goal for South Central District chum salmon.

System: South Central District.

Species: Chum salmon.

Description of stock and escapement goal.

Regulatory area:	Alaska Peninsula Management Area Westward Region.
Management division:	Commercial Fisheries.
Primary fishery:	Commercial purse seine and set gillnet.
Current escapement goal:	SEG: 89,800–179,600 (1992).
Recommended escapement goal:	No change.
Optimal escapement goal:	None.
Inriver goal:	None.
Action points:	None.
Escapement enumeration:	Aerial survey, 1960 to present.
Data summary:	
Data quality	Fair.
Data type	Fixed-wing aerial surveys from 1960 to present. Indexed total escapement 1987 to present. No stock-specific harvest information is available.
Comments	Current SEG was based on percentile method.

Appendix S2.–South Central District chum salmon escapement table.

System: South Central District.

Species: Chum salmon.

Data available for analysis of escapement goal.

Year	Escapement index ^a
1987	161,900
1988	183,400
1989	89,530
1990	96,280
1991	163,990
1992	110,640
1993	126,800
1994	151,900
1995	187,100
1996	173,800
1997	274,400
1998	144,300
1999	253,500
2000	84,100
2001	155,500
2002	129,400
2003	79,000
2004	184,800
2005	235,700
2006	119,600
2007	126,000
2008	140,450
2009	18,600
2010	85,600
2011	169,000
2012	86,190
2013	155,050
2014	95,000

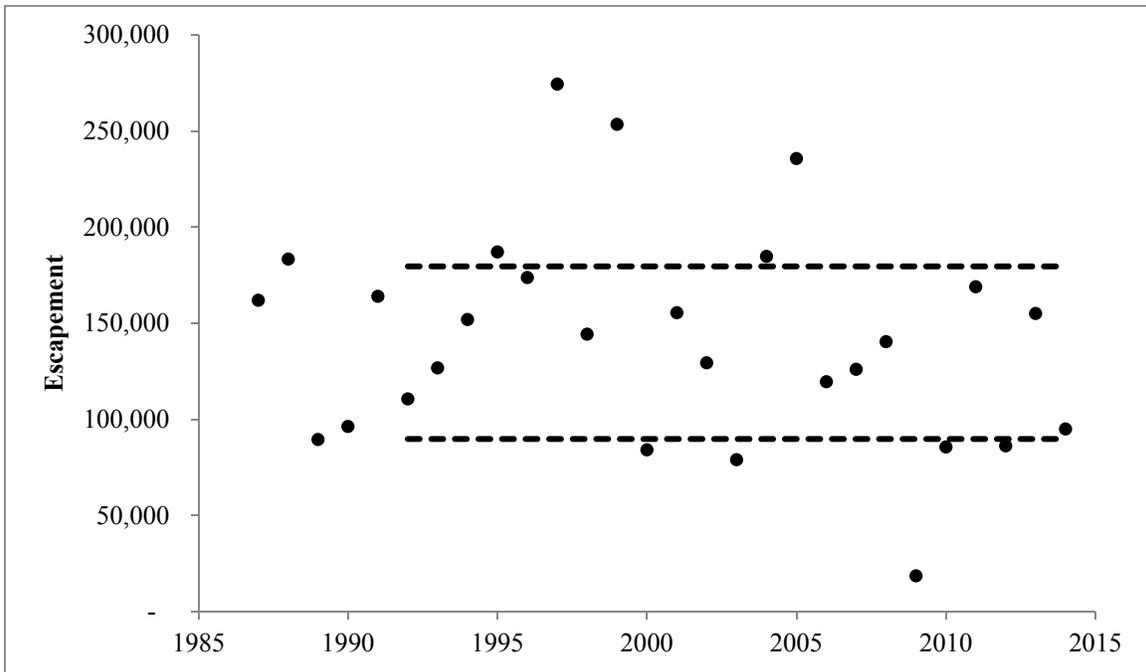
^a The escapement index represents the peak survey, enumeration of carcasses, as well as ancillary and qualitative data.

Appendix S3.–South Central District chum salmon escapement graph.

System: South Central District.

Species: Chum salmon.

Observed escapement by year (solid circles) and current SEG (dashed line).



**APPENDIX T. SUPPORTING INFORMATION FOR THE
SOUTHWESTERN DISTRICT CHUM SALMON
ESCAPEMENT GOAL**

System: Southwestern District.

Species: Chum salmon.

Description of stock and escapement goal.

Regulatory area:	Alaska Peninsula Management Area Westward Region.
Management division:	Commercial Fisheries.
Primary fishery:	Commercial purse seine and set and drift gillnet.
Current escapement goal:	SEG: 133,400–266,800 (1992).
Recommended escapement goal:	No change.
Optimal escapement goal:	None.
Inriver goal:	None.
Action points:	None.
Escapement enumeration:	Aerial survey, 1960 to present.
Data summary:	
Data quality	Fair.
Data type	Fixed-wing aerial surveys from 1960 to present. Indexed total escapement 1987 to present. No stock-specific harvest information is available.
Comments	Current SEG was based on percentile method.

Appendix T2.–Southwestern District chum salmon escapement table.

System: Southwestern District.

Species: Chum salmon.

Data available for analysis of escapement goal.

Year	Escapement index ^a
1987	291,100
1988	226,200
1989	120,830
1990	142,770
1991	241,600
1992	141,000
1993	224,080
1994	365,900
1995	401,150
1996	302,100
1997	263,700
1998	351,410
1999	388,130
2000	257,225
2001	277,021
2002	268,000
2003	193,030
2004	180,000
2005	317,910
2006	231,935
2007	398,010
2008	171,250
2009	385,730
2010	142,650
2011	176,425
2012	87,230
2013	163,200
2014	130,745

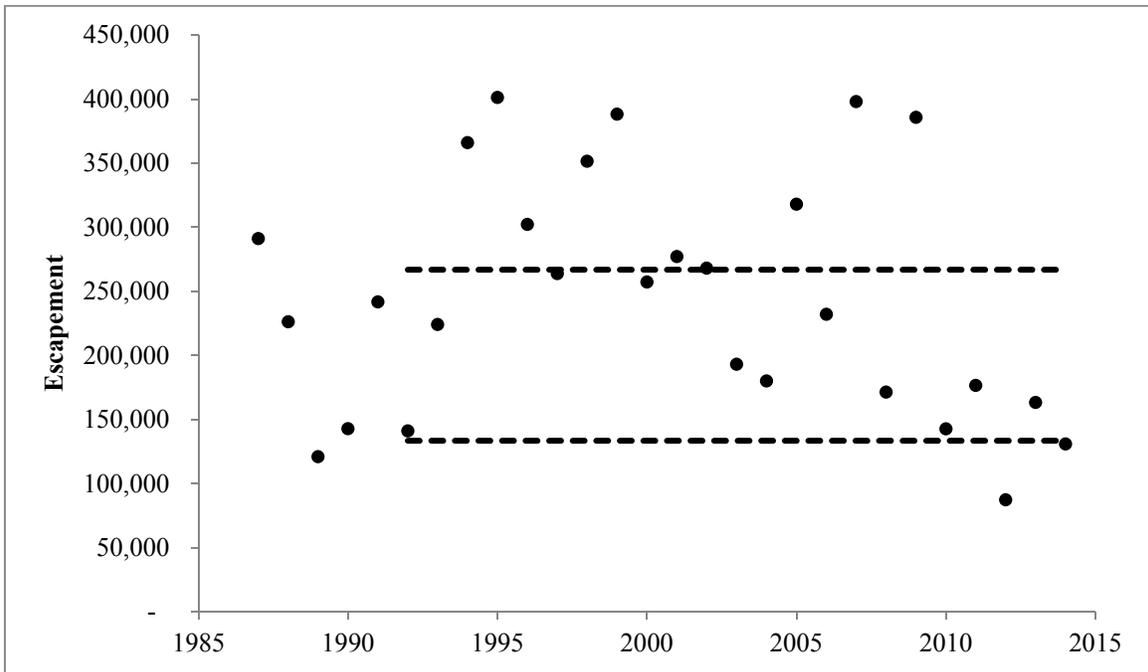
^a The escapement index represents the peak survey, enumeration of carcasses, as well as ancillary and qualitative data.

Appendix T3.–Southwestern District chum salmon escapement graph.

System: Southwestern District.

Species: Chum salmon.

Observed escapement by year (solid circles) and current SEG (dashed line).



**APPENDIX U. SUPPORTING INFORMATION FOR THE
NORTHWESTERN DISTRICT CHUM SALMON
ESCAPEMENT GOAL**

Appendix U1.–Description of stock and escapement goal for Northwestern District chum salmon.

System: **Northwestern District.**

Species: **Chum salmon.**

Description of stock and escapement goal.

Regulatory area:	Alaska Peninsula Management Area Westward Region.
Management division:	Commercial Fisheries.
Primary fishery:	Commercial purse seine and set and drift gillnet.
Current escapement goal:	SEG: 100,000–215,000 (2007).
Recommended escapement goal:	No change.
Optimal escapement goal:	None.
Inriver goal:	None.
Action points:	None.
Escapement enumeration:	Aerial survey, 1980 to present.
Data summary:	
Data quality	Fair.
Data type	Fixed-wing aerial surveys from 1980 to present. Indexed total escapement 1987 to present. No stock-specific harvest information is available.
Comments	Current SEG was based on Ricker analysis.

Appendix U2.–Northwestern District chum salmon escapement table.

System: Northwestern District.

Species: Chum salmon.

Data available for analysis of escapement goal.

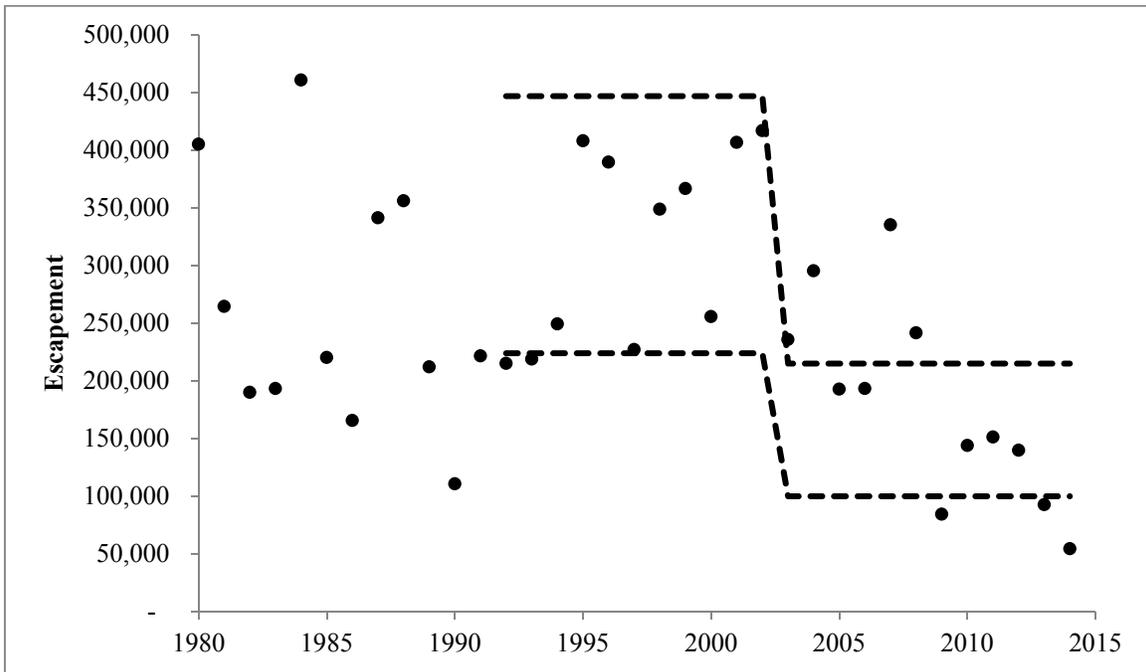
Year	Escapement index ^a
1980	405,300
1981	264,600
1982	190,200
1983	193,500
1984	460,900
1985	220,400
1986	165,700
1987	341,500
1988	356,200
1989	212,300
1990	110,905
1991	221,800
1992	215,300
1993	219,030
1994	249,420
1995	408,300
1996	389,730
1997	227,200
1998	349,000
1999	366,800
2000	255,800
2001	406,812
2002	417,100
2003	236,000
2004	295,600
2005	192,965
2006	193,460
2007	335,450
2008	241,750
2009	84,460
2010	144,100
2011	151,400
2012	140,000
2013	92,800
2014	54,525

^a The escapement index represents the peak survey, enumeration of carcasses, as well as ancillary and qualitative data.

System: **Northwestern District.**

Species: **Chum salmon.**

Observed escapement by year (solid circles) and current SEG (dashed line).



**APPENDIX V. SUPPORTING INFORMATION FOR THE
NORTHERN DISTRICT CHUM SALMON ESCAPEMENT
GOAL**

Appendix VI.–Description of stock and escapement goal for Northern District chum salmon.

System: Northern District.

Species: Chum salmon.

Description of stock and escapement goal.

Regulatory area:	Alaska Peninsula Management Area Westward Region.
Management division:	Commercial Fisheries.
Primary fishery:	Commercial purse seine and set and drift gillnet.
Current escapement goal:	SEG: 119,600–239,200 (2007).
Recommended escapement goal:	No change.
Optimal escapement goal:	None.
Inriver goal:	None.
Action points:	None.
Escapement enumeration:	Aerial survey, 1982 to present.
Data summary:	
Data quality	Fair.
Data type	Fixed-wing aerial surveys from 1982 to present. Indexed total escapement 1987 to present. No stock-specific harvest information is available.
Comments	Current SEG was based on Ricker analysis.

Appendix V2.–Northern District chum salmon escapement table.

System: Northern District.

Species: Chum salmon.

Data available for analysis of escapement goal.

Year	Escapement index ^a
1982	267,500
1983	199,100
1984	409,300
1985	123,900
1986	77,900
1987	161,400
1988	144,100
1989	102,300
1990	115,530
1991	81,450
1992	136,400
1993	183,350
1994	230,800
1995	347,700
1996	436,400
1997	160,985
1998	380,350
1999	299,475
2000	338,900
2001	285,900
2002	262,710
2003	214,660
2004	139,350
2005	103,675
2006	382,583
2007	243,334
2008	228,537
2009	154,131
2010	145,310
2011	96,952
2012	140,418
2013	137,251
2014	191,586

^a The escapement index represents the peak survey, enumeration of carcasses, as well as ancillary and qualitative data.

System: Northern District.

Species: Chum salmon.

Observed escapement by year (solid circles) and current SEG (dashed line).

