Review of Salmon Escapement Goals in the Alaska Peninsula and Aleutian Islands Management Areas, 2006

by

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Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	$(F, t, \chi^2, etc.)$
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	E
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	log_2, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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ABSTRACT

In April 2006, a salmon escapement goal interdivisional team, including staff from the Divisions of Commercial Fisheries and Sport Fish, was formed to review Pacific salmon *Oncorhynchus* spp. escapement goals in the Alaska Peninsula and Aleutian Islands Management Area (Area M). This report is the result of the review, 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). This comprehensive review of the 27 existing salmon escapement goals in Area M resulted in recommendations to leave 17 goals unchanged, change 5 goals, reclassify 4 goals from biological escapement goals (BEGs) to sustainable escapement goals (SEGs), and eliminate 1 goal.

The current Nelson River Chinook salmon BEG range of 2,400 to 4,400, as established in 2003, should remain unchanged. When a spawner-recruit analysis was conducted, which included additional data available for this review, the results did not change significantly.

Of the 14 Area M sockeye salmon escapement goals, 9 should remain unchanged, 4 goals should be changed, and 1 goal should be eliminated. The current Swanson Lagoon SEG range of 8,000 to 16,000 sockeye salmon should be changed to a SEG range of 6,000 to 16,000 based on a percentile analysis using data from 1990, when the current goal was established, through 2005. The current Sandy River sockeye salmon SEG range of 40,000 to 60,000 should be changed to a SEG range of 34,000 to 74,000 following evaluation of escapement data using the percentile method. A risk analysis was also conducted to ensure that the lower range of this goal is acceptable in terms of minimizing the risk of triggering a management concern. The current Meshik River SEG range of 10,000 to 20,000 sockeye salmon should be changed to a SEG range of 20,000 to 60,000 based on a percentile analysis using data from 1990 to 2005. Cinder River's current SEG range of 6,000 to 12,000 sockeye salmon should be changed to a SEG range of 12,000 to 48,000 based on a percentile analysis using data from 1990 to 2005. Finally, the sockeye salmon escapement goal for Middle Lagoon should be eliminated because of the lack of reliable escapement estimates; aerial survey conditions for this stock are difficult, resulting in inconsistent data collection and unreliable escapement estimates, and will likely not improve in the future. In addition, it is difficult to actively manage escapements in season at this system due to turbid water conditions in the lower portion of the system. A cluster analysis of escapement data suggested that escapement trends at Middle Lagoon are related to the escapement trends of Thin Point Lake sockeye salmon. Therefore, it seems reasonable to monitor the Middle Lagoon sockeye salmon stock using Thin Point Lake sockeye salmon escapement trends as a proxy.

After examining the McLees Lake sockeye salmon weir data and historical aerial survey data, there were insufficient data at this time to develop a goal. Assessment of this stock should continue, so that a goal could potentially be developed in the future.

The current Thin Point Lake coho salmon SEG of 3,000 and the current Nelson River coho salmon SEG of 18,000 should remain unchanged. There is not any recent information that would warrant changing the current SEGs for these stocks.

Four South Peninsula pink salmon escapement goals (even- and odd-year goals for two aggregate stocks) were evaluated during this review. The current South Peninsula pink salmon BEG ranges of 1,864,600 to 3,729,300 for even years and 1,637,800 to 3,275,700 for odd years should be changed to SEGs with the same ranges. This recommendation is based on spawner-recruit analyses using two additional years of data, which corroborated the current goal ranges. SEGs are recommended for these aggregates because escapement data were collected (and will continue to be collected) by aerial survey and provided indices of escapements rather than total escapement estimates, which are unknown.

The Bechevin Bay pink salmon SEG for even years (31,000) and the SEG for odd years (1,600) should remain unchanged. These recommendations are based on risk analyses, which indicate that these goals should minimize the risk of triggering a management concern when the concern is not warranted.

There were no additional data for assessment of Unalaska pink salmon stocks. There is no need at this time to determine goals for Unalaska pink salmon stocks because they are rarely harvested and the previous SEGs were eliminated during the last escapement goal evaluation in 2003.

The current South Peninsula chum salmon SEG ranges of 106,400 to 212,800 for the Southeastern District, 89,800 to 179,600 for the South Central District, and 133,400 to 266,800 for the Southwestern District should remain unchanged. The upper range (1,600) of the SEG for the Unimak District should be eliminated and the lower range

should remain at 800. These recommendations are based on the results of percentile analyses (except for the Unimak District, which is corroborated by a risk analysis).

The North Peninsula chum salmon escapement goals should be changed from BEGs to SEGs while keeping the ranges unchanged as follows: Northwestern District - SEG of 100,000 to 215,000, Northern District - SEG of 119,600 to 239,200. Similar to South Peninsula pink salmon, SEGs are recommended because escapements are indexed by aerial surveys and the accuracy of these surveys in indexing the total escapement is unknown.

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

INTRODUCTION

This report documents a review of the existing escapement goals for Alaska Peninsula and Aleutian Islands Management Areas (Area M; Figure 1) salmon stocks based on the 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). The Alaska Board of Fisheries (BOF) adopted these policies into regulation in 2000 and 2001, respectively, to ensure that the state's salmon stocks would be conserved, managed, and developed using the sustained yield principle.

Important terms referred to in this document are:

1) "*biological escapement goal* (BEG) as defined in the SSFP: the escapement that provides the greatest potential for maximum sustained yield (MSY); …" and,

2) "*sustainable escapement goal* (SEG) as defined in the SSFP: 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 due to the absence of a stock specific catch estimate;…".

3) "*escapement*": The number of fish that have escaped the fishery, have entered the fresh water, and are assumed to spawn.

4) "*total escapement*": The estimate of escapement in which each fish is individually enumerated, typically using a counting weir.

5) "*index escapement*": The estimate of escapement in which salmon are counted in groups, typically using aerial surveys. This estimate is calculated using the peak survey of a given stream in a given year as well as an estimate of carcasses and ancillary and qualitative data. This estimate is less accurate than a total escapement estimate.

Most escapement goals for stocks of the five Pacific salmon species (Chinook *Oncorhynchus tshawytscha*, sockeye *O. nerka*, coho *O. kisutch*, pink *O. gorbuscha*, and chum *O. keta* salmon) in the Alaska Peninsula and Aleutian Islands Management Areas were implemented in the early 1990s (Nelson and Lloyd 2001). Prior to 2003, escapement goals for Area M salmon stocks were based on average escapement estimates and spawning habitat availability.

The Area M salmon escapement goals were reviewed by the Alaska Department of Fish and Game (ADF&G) in 2003 (Nelson et al. 2006). ADF&G staff determined the appropriate goal type (BEG or SEG as defined in the SSFP) for each Area M salmon stock with an existing goal, based on the quality and quantity of available data, and then determined the most appropriate methods to evaluate the escapement goal ranges. The review resulted in changing 20 goals, eliminating 12 goals, and leaving 16 goals unchanged (Nelson et al. 2006).

In April 2006, a Salmon Escapement Goal Interdivisional Review Team (hereafter referred to as the team) was formed to review the existing Area M salmon escapement goals. The team included the following staff from the Division of Commercial Fisheries (CFD) and Division of Sport Fish (SFD): Steven G. Honnold (CFD), Jim McCullough (CFD), Mark Witteveen (CFD), Bob Murphy (CFD), Ivan Vining (CFD), Aaron Poetter (CFD), James Jackson (CFD), Daniel Doolittle (CFD), Philip Tschersich (CFD), M. Birch Foster (CFD), Dave Sterritt (CFD), Doug Eggers (CFD), Jim Hasbrouck (SFD), Bob Clark (SFD), David Bernard (SFD), and Donn Tracy (SFD).

The purpose of the team was to 1) determine 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) determine the most appropriate methods to evaluate the escapement goal ranges, 3) estimate the escapement goal for each stock and compare these estimates with the current goal, 4) determine if a goal could be developed for any stocks or stock-aggregates that currently have no goal, and 5) develop recommendations for each goal evaluated and present these recommendations to the Directors of the Division of Commercial Fisheries and Division of Sport Fish for approval.

STUDY AREA

The Alaska Peninsula and Aleutian Islands combined commercial salmon fishery registration area, collectively referred to as Area M, comprises two separate management areas: 1) the Alaska Peninsula Management Area and 2) the Aleutian Islands Management Area (Figure 1).

The 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 (5 AAC 09.100). The area is divided into six 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 except the Atka-Amlia Islands Area described in 5 AAC 11.101 (5 AAC 12.100; Figure 1). Parts of the Aleutian Islands area are separated into four 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 (minimum) known salmon streams are consistently monitored for escapement (Holmes 1997).

BACKGROUND

Escapement goals are currently established for one Chinook salmon system in Area M (Nelson et al. 2006), which is located west of Port Moller along the North Peninsula (Table 1; Figure 3). Chinook salmon escapements at this system are primarily monitored by aerial survey. There are no spawning stocks of Chinook salmon documented in the South Peninsula or Aleutian Islands.

A total of 14 sockeye salmon stocks (13 systems) in Area M have established escapement goals (Nelson et al. 2006). Four of these stocks are located along the South Peninsula and 10 are

located along the North Peninsula (Table 1; Figure 3). All of these stocks directly affect the daily management of associated fisheries and six of these systems currently have weirs for direct enumeration of escapement. Escapements of the remaining stocks are monitored by aerial surveys. One sockeye salmon stock (McClees Lake), which does not have an established escapement goal (eliminated during the 2003 review) but was reviewed by the team, is located on Unalaska Island (Figure 4). This stock is harvested by subsistence fishers in the area and the USFWS has operated a weir at this system the last several years.

Coho salmon are not monitored in many Area M streams due to the difficulty and expense of conducting surveys during late fall. However, there are established escapement goals for two coho stocks (Nelson et al. 2006), one of which is located on the South Peninsula and the other is found on the North Peninsula (Table 1; Figure 3). There are no established coho salmon escapement goals for the Aleutian Islands.

Pink salmon are generally a high volume commercial species in Area M and are managed as aggregates of streams by district, section, or area. Some areas have different odd- and even year-year goals. A total of four stock-aggregate pink salmon escapement goals have been established in Area M (Nelson et al. 2006; Table 1; Figure 2). These stock-aggregate goals comprise the respective sums of aerial survey escapement objectives for 148 individual index streams (Nelson et al. 2006). All but five of the index streams are located along the South Peninsula or on Unalaska Island.

A total of six stock-aggregate escapement goals have been established for chum salmon in Area M (Nelson et al. 2006; Table 1; Figure 2). These stock-aggregate goals comprise the respective sums of aerial survey escapement objectives for 136 individual index streams (Nelson et al. 2006). Sixty-seven of these index streams are located along the South Peninsula and 69 are found along the North Peninsula. There are no established chum salmon escapement goals for the Aleutian Islands.

METHODS

During the review process, escapement goals were evaluated for 1 Chinook, 14 sockeye, and 2 coho salmon stocks (Table 1). In addition, 4 pink and 6 chum salmon stock-aggregate goal ranges were reviewed (Table 1). We conducted our review similarly to the 2003 review (Nelson et al. 2006), primarily updating previous analyses using stock assessment data from 2003 to 2005. We did not review or analyze data for most stocks in which goals were eliminated in 2003. We reviewed the McLees Lake sockeye salmon stock data even though the goal was eliminated in 2003 because the U.S. Fish and Wildlife Service (USFWS) has operated a weir at this system the last several years and are interested in having the department develop an escapement goal if the data warrant one. Formal meetings via teleconference, to discuss and develop recommendations, were held on April 27, 2006 and July 26, 2006. 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 Bue and Hasbrouck (2001). This evaluation was used to

initially determine the appropriate type of escapement goal to apply to each stock, as defined in the SSFP and EGP.

BIOLOGICAL ESCAPEMENT GOAL DETERMINATION

If sufficient time series of escapement and total return estimates were available, contrast in the escapement data (the ratio of the largest escapement to the smallest escapement) was sufficiently large (> 4.0; CTC 1999), and estimates were sufficiently accurate and precise, then the data were considered sufficient to attempt to estimate the escapement level with the greatest potential to provide maximum sustained yield (MSY). This level of spawning escapement is identified as S_{msy} (CTC 1999; Hilborn and Walters 1992). Spawner-return data were analyzed using a Ricker (1954) mathematical stock recruitment model to estimate S_{msy}. BEG ranges surrounding S_{msy} were calculated as the escapement estimates that produced yields equal to 90% of MSY (CTC 1999). The carrying capacity was estimated by the Ricker model as the escapement level which will provide an equivalent level of yield (Quinn and Deriso 1999). Carrying capacity is defined as S_{eq} and is the expected annual abundance of spawners when the stock has not been exploited. Results were not used if the model fit the data poorly or if model assumptions were violated. Hilborn and Walters (1992), Quinn and Deriso (1999), and the Chinook Technical Committee (CTC 1999) provide good descriptions of the Ricker model and diagnostics to assess model fit. All Ricker models were tested and corrected for residual autocorrelation when necessary.

When auxiliary data were available (e.g., limnology, smolt age and size) additional analyses were performed and results were compared to sockeye salmon stock-recruit model results. In cases where sufficient data existed but determining a scientifically defensible BEG was still not possible, other methods were used to establish an SEG.

SUSTAINABLE ESCAPEMENT GOAL DETERMINATION

If total return estimates were not available because harvest and/or age were not consistently measured, then the data were considered of fair to poor quality. These data would not provide an accurate estimate of S_{msy} and subsequent BEG. As a result, these data were evaluated using other methods to establish an SEG. Methods used to develop SEGs included the percentile approach, cluster analyses of count data, risk analyses, and limnological models.

The percentile approach followed the methods of Bue and Hasbrouck (2001) whereby the contrast of the escapement data and the exploitation rate of the stock were used to select the percentiles of observed of annual escapement estimates to be used for estimating the SEG. Low contrast (<4) implies that stock productivity is known for only a limited range of escapements. According to this approach, percentiles of the total range of observed annual escapements that are used to estimate an SEG for a stock with low contrast should be relatively wide, in an attempt to improve future knowledge of stock productivity. In cases where data contrast was less than 4 and the exploitation rate was low, the lower end of the SEG range was the 15th percentile of the escapement data and the upper end of the range was the maximum escapement estimate. Alternately, in cases where contrast was larger, the percentiles of observed annual escapement estimates used to estimate an SEG were narrowed. For stocks with high contrast and at least moderate exploitation, the lower end of the SEG range was increased from the 15th to the 25th percentile as a precautionary measure for stock protection.

The risk analysis method (Bernard et al. *unpublished*) was used to establish an SEG, in the form of a precautionary reference point (PRP), from a time series of observed escapement estimates using probability distributions. This method is based on estimating the risk of management error

and is particularly appropriate in situations where a particular stock (or stock aggregate) is not "targeted" and observed escapement estimates are the only reliable data available. In essence, this analysis begins with estimating the probability of detecting escapement falling below the SEG in a predetermined number of consecutive years (k). For example, if we believe there is cause for concern when escapement falls below the SEG for 3 consecutive years, k would be equal to 3. Simultaneously, a second probability is estimated, that is the probability of taking action (e.g., closing a fishery to protect the stock) for 3 consecutive years when no action was needed. This analysis assumes that escapement observations follow a lognormal distribution and have a stationary mean (no temporal trend). If there is temporal trend, the method can still be used but in a more deterministic way. A time series model is estimated from the data, then new data are simulated from the time series model, assuming the error in the model is lognormal. Probability models are developed from the simulated data to estimate the chance of detecting the escapement falling below the SEG in a predetermined number of consecutive years, while simultaneously estimating the chance of taking action for the same number of consecutive years.

There were two limnological models used in this escapement goal review to corroborate the percentile, cluster, and risk analyses and estimate SEGs. The euphotic volume (EV) model estimated adult escapement in part by determining the volume of lake water capable of primary production necessary to sustain a rearing juvenile fish population (Koenings and Burkett 1987). The EV indicated a level of phytoplankton forage (primary production) available to zooplankton, and thus a level of zooplankton forage available for rearing juvenile fish. It was inferred from the model that lakes with shallower light penetration would result in lower adult production compared to lakes with deeper light penetration because the shallower lakes would not have the primary production necessary to sustain a large rearing population. The EV model assumed that the lake was deep enough to achieve 1% light penetration in the water column. Rearing capacity is reached when nursery lakes produce threshold-sized smolt (about 60 mm or 2-g). Sockeye salmon life-stage survivals at a lake's rearing limitation based on euphotic volume (per EV unit) include 800-900 adult escapement, 110,000 spring fry, 33,000 fall fry, 23,000 threshold-sized smolt, and 2,500 total adults produced (35% escapement and 65% harvested). Survival rates were determined from multiyear measurements at over a dozen nursery lakes (stocks), which averaged 21% for spring fry-to-smolt survival and 12% for smolt-to-adult survival. Harvest rates for these stocks were about 65% for escapements of about 900 adults per EV unit.

The second limnological model (i.e., zooplankton model), estimated smolt production based on the amount of available zooplankton biomass fed upon by smolt of a targeted threshold-size, in a lake of known area (Koenings and Kyle 1997). The zooplankton model, like the EV model, relied upon the premise that the availability of forage to juvenile fish could impact their survival and subsequently, adult production. The zooplankton model further assumed that zooplankton were the only available forage. Adult production was calculated using marine survival rates applied to a range of smolt sizes. A marine survival rate of 12% was used for threshold-sized (2.0-g) smolt and a marine survival rate of 21% was used for optimum-sized (5.0-g) smolt. For systems where smolt size and abundance data were available, average smolt sizes and known marine survivals were used. Depending on the average size of smolt, marine survival rates within the range of 12% or 21% were used for systems without known marine survival rates.

Cluster analysis (Everitt et al. 2001) was performed on groups of systems to test whether all systems needed to be continually monitored. For the cluster analysis, a Pearson's distance measure was used to minimize the effects of scale on determining similarities (Manly 1994). The

cluster analysis was done to determine if a smaller system (few salmon escaping annually), that are difficult to survey were similar to other larger systems (more escapement), that are easier to survey. If there was sufficient similarity found, it would provide confidence that the smaller system was being maintained at a sustainable level, even though monitored less frequently.

CHINOOK SALMON

Nelson River
Escapement goal background and previous review

Nelson River is located in the Nelson Lagoon Section of the Northern District of the Alaska Peninsula Management Area (Figures 2 and 3). 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). 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). Escapement has been counted almost every year since 1974 from either a tower (1974-1988) or a weir (1989-present), but since 1985 the tower or weir project ended when the sockeye salmon escapement was completed. This occurs before most of the Chinook salmon run has passed. 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.

An escapement goal review of this system was conducted during 2003 (Nelson et al. 2006) using a Ricker spawner-recruit model (Ricker 1954) and meta-analysis watershed area (habitat-based) model (Parken *unpublished*). Both models provided similar estimates of the escapement that would produce maximum sustained yield (S_{msy}) and carrying capacity (S_{eq}). Because both models provided similar estimates, the authors concluded that the escapement goal should be reclassified as a BEG with a range from 2,400 to 4,400 Chinook salmon (Table 1).

2006 review

Stock-specific harvest and escapement estimates were obtainable since 1974, but age data were available only since 1985 to the present for Nelson River Chinook salmon. Recent run data were examined to determine if a change in the escapement goal is justified. The Ricker spawner-recruit model was performed with the additional two years of brood year data to see if there was a significant change in the estimate.

SOCKEYE SALMON

Orzinski Lake
Escapement goal background and previous review

Orzinski Lake is located in the Northwest Stepovak Section of the Southeastern District Mainland (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). 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 (Nelson et al. 2006). The

authors concluded that these analyses reasonably corroborated the existing SEG and no change was warranted (Table 1).

2006 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. The percentile approach was performed with the additional two years of escapement data to see if there was a significant change in the estimate.

Thin Point Lake
Escapement goal background and previous review

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). 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).

2006 review

Stock-specific harvest estimates for Thin Point Lake sockeye salmon were not available. Recent escapement data were examined to determine if a change in the escapement goal was justified. The percentile approach was performed with the additional two years of escapement data to see if there was a significant change in the estimate.

Mortensens Lagoon
Escapement goal background and previous review

Mortensens Lagoon is located in the Mortensens Lagoon 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). Aerial surveys have been used to estimate escapement into Mortensens Lagoon from 1968 to the present and a weir has been used from 2001 to 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 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).

2006 review

Stock-specific harvest estimates for Mortensens Lagoon sockeye salmon were not available. Recent escapement data were examined to determine if a change in the escapement goal was justified. The percentile approach was performed with the additional two years of escapement data to see if there was a significant change in the estimate.

Middle Lagoon
Escapement goal background and previous review

Middle Lagoon is located in the Morzhovoi Bay Section of the Southwestern District (Figures 2 and 3). The first published escapement goal range for Middle Lagoon was developed in the late 1980s and set at 16,000 to 32,000 sockeye salmon (Nelson and Lloyd 2001). Aerial surveys have been used to estimate escapement into Middle Lagoon from 1972 to the present and a weir was used in 1995 and 1996.

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).

2006 review

Stock-specific harvest estimates for Middle Lagoon sockeye salmon were not available. Recent escapement data were examined to determine if a change in the escapement goal was justified. The percentile approach was performed with the additional two years of escapement data to see if there was a significant change in the estimate.

Christianson Lagoon
Escapement goal background and previous review

Christianson Lagoon is located in the Urilla 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). Aerial surveys have been used to estimate escapement into Christianson Lagoon from 1960 to the present.

An escapement goal review of this system was conducted during 2003. All available stock assessment data were analyzed using the percentile method (Nelson et al. 2006). The authors concluded that the analysis reasonably corroborated the existing SEG and no change was warranted (Table 1).

2006 review

Stock-specific harvest estimates for Christianson Lagoon sockeye salmon were not available. Recent escapement data were examined to determine if a change in the escapement goal was justified. The percentile approach was performed with the additional two years of escapement data to see if there was a significant change in the estimate.

Swanson Lagoon
Escapement goal background and previous review

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). Aerial surveys have been used to estimate escapement into Swanson Lagoon from 1960 to the present.

An escapement goal review of this system was conducted during 2003. All available stock assessment data were analyzed using the percentile method (Nelson et al. 2006). The authors

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 (Table 1).

2006 review

Stock-specific harvest estimates for Swanson Lagoon sockeye salmon were not available. Recent escapement data were examined to determine if a change in the escapement goal was justified. The percentile approach was performed with the additional two years of escapement data to see if there was a significant change in the estimate.

North Creek
Escapement goal background and previous review

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). Aerial surveys have been used to estimate escapement into North Creek from 1960 to the present.

An escapement goal review of this system was conducted during 2003. All available stock assessment data were analyzed using the percentile method (Nelson et al. 2006). The authors concluded that the analysis reasonably corroborated the existing SEG and no change was warranted (Table 1).

2006 review

Stock-specific harvest estimates for North Creek sockeye salmon were not available. Recent escapement data were examined to determine if a change in the escapement goal was justified. The percentile approach was performed with the additional two years of escapement data to see if there was a significant change in the estimate.

Nelson River
Escapement goal background and previous review

Nelson River is located in the Nelson Lagoon Section of the Northern District (Figures 2 and 3). The first published escapement for Nelson River was developed in 1979 and set as an SEG with a range 100,000 to 150,000 sockeye salmon (Nelson and Lloyd 2001). 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 was conducted during 2003. All available stock assessment data were analyzed using the Ricker spawner-recruit model, percentile method, euphotic volume analysis, smolt biomass as a function of zooplankton biomass, and lake surface area method (Nelson et al. 2006). The authors concluded that the escapement goal should be reclassified as a BEG with a range from 97,000 to 219,000 sockeye salmon (Table 1).

2006 review

Stock-specific harvest estimates for Nelson River sockeye salmon were available from 1970 to the present. Recent run data were examined to determine if a change in the escapement goal was justified. The Ricker spawner-recruit model and percentile method were performed with the additional two years of escapement data to see if there was a significant change in the estimate.

Bear Lake
Escapement goal background and previous review

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). Tower counts were used to estimate escapement into Bear River from 1964 to 1985 and a weir has been used from 1989 to the present.

An escapement goal review of this system was conducted during 2003. All available stock assessment data were analyzed using the Ricker spawner-recruit model, percentile method, euphotic volume analysis, smolt biomass as a function of zooplankton biomass, and lake surface area method (Nelson et al. 2006). The authors concluded 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; Table 1).

2006 review

Stock-specific harvest estimates were not available for early-run Bear Lake sockeye salmon; therefore, recent escapement data were examined using the percentile approach to determine if a change in the escapement goal was justified. Escapement and harvest data were examined for the late run; however, the two additional years of run data were not expected to change the results of the previous spawner-recruit analysis. Thus late-run escapements were examined using the percentile approach. The combined escapements for both runs were also examined and applied to the percentile algorithm to assess the overall Bear Lake sockeye salmon escapement goal. The additional two years of sockeye smolt and limnology data were used to re-analyze the juvenile rearing capacity of Bear Lake using the euphotic volume and smolt biomass as a function of zooplankton biomass analyses.

Sandy River
Escapement goal background and previous review

Sandy River is located in the Bear River Section of the Northern District (Figures 2 and 3). An aerial indexed total escapement goal range of 20,000 to 30,000 was developed in the 1970s (Nelson and Lloyd 2001). In 1994, a weir was established for Sandy River and the goal range was doubled to 40,000 to 60,000 to account for more complete counts made at the weir (Nelson and Lloyd 2001).

An escapement goal review of this system was conducted during 2003. All available stock assessment data were analyzed using the percentile method, euphotic volume analysis, smolt biomass as a function of zooplankton biomass, and lake surface area method (Nelson et al. 2006). The authors 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 (Table 1).

2006 review

Stock-specific harvest estimates for Sandy River sockeye salmon were not available. The percentile method was performed with the additional two years of weir escapement data to see if there was a significant change in the estimate. The percentile method was also performed using

the aerial surveys and weir counts combined. The latter analysis accounts for years when aerial survey estimates from Sandy Lake were doubled, while aerial survey estimates from the spawning grounds were not adjusted. The adjustments to aerial survey estimates from Sandy Lake were based on the results of an unpublished experiment in which managers estimated the difference between aerial surveys and weir counts (R. Murphy; Commercial Fisheries Biologist, ADF&G, Kodiak, personal communication).

Ilnik River
Escapement goal background and previous review

The Ilnik River is located in the Ilnik Section of the Northern District and consists of four distinct spawning populations: Ilnik River, Willie Creek, Ocean River, and Wildman Lake (Figures 2 and 3). The current escapement goal range for the Ilnik River system was developed in 1991 and set at 40,000 to 60,000 sockeye salmon (Nelson and Lloyd 2001). 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 was conducted during 2003. All available stock assessment data were analyzed using the percentile method, euphotic volume analysis, smolt biomass as a function of zooplankton biomass, and lake surface area method (Nelson et al. 2006). The authors concluded that the current escapement goals had produced sufficient returns and found that no change was warranted (Table 1).

2006 review

Stock-specific harvest estimates for Ilnik River sockeye salmon were not available. Recent escapement estimates and age compositions were examined to determine if a change in the escapement goal was justified. The percentile approach was performed with the additional two years of escapement data to see if there was a significant change in the estimate.

Meshik River
Escapement goal background and previous review

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). Aerial surveys have been used to estimate escapement into Meshik River from 1960 through the present.

An escapement goal review of this system was conducted during 2003. All available stock assessment data were analyzed using the percentile method and the authors concluded that the analysis reasonably corroborated the existing SEG and no change was warranted (Nelson et al. 2006; Table 1).

2006 review

Stock-specific harvest estimates for Meshik River sockeye salmon were not available. Recent escapement estimates were examined to determine if a change in the escapement goal was justified. The percentile approach was performed with the additional two years of escapement data to see if there was a significant change in the estimate.

Cinder River
Escapement goal background and previous review

Cinder River is located in the Cinder River Section of the Northern District (Figures 2 and 3). The SEG range of 6,000 to 12,000 was initially established in the late 1980s and was based on average peak escapements (Nelson and Lloyd 2001). Aerial surveys have been used to estimate escapement into Cinder River from 1960 through the present.

An escapement goal review of this system was conducted during 2003. All available stock assessment data were analyzed using the percentile method and the authors concluded that the analysis reasonably corroborated the existing SEG and no change was warranted (Nelson et al. 2006; Table 1).

2006 review

Stock-specific harvest estimates for Cinder River sockeye salmon were not available. Recent escapement estimates were examined to determine if a change in the escapement goal was justified. The percentile approach was performed with the additional two years of escapement data to see if there was a significant change in the estimate.

McLees Lake
Escapement goal background and previous review

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). 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 USFWS since 2001. No sockeye salmon were observed during aerial surveys of McLees Lake until 1974.

An escapement goal review of this system was conducted during 2003. All available stock assessment data were analyzed using the percentile method from uncorrected aerial survey numbers (Nelson et al. 2006). The authors concluded that with limited aerial survey estimates, only two years of weir counts, and no history of management action ever exercised, the goal would be eliminated but reevaluated in three years (Table 1).

2006 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 were examined and applied to the percentile approach to determine if an escapement goal (currently no goal) was justified.

Cluster Analysis of South and North Peninsula Sockeye Salmon Systems
For the South Peninsula, Middle Lagoon, Thin Point Lake, and Mortensens Lagoon sockeye salmon escapements estimated from 1977 to 2005 aerial surveys and Orzinski Lake sockeye salmon escapements estimated from weir counts (1990 to 2005) and aerial surveys (1977-1989) were examined for similarities through time using cluster analysis (Johnson and Wichern 1998).

For the North Peninsula, Christianson Lagoon, Swanson Lagoon, and North Creek sockeye salmon escapements estimated from 1970 to 2005 aerial surveys and Nelson River, Bear River

(early run, late run, and both runs combined), Sandy River, and Ilnik River sockeye salmon escapements estimated from weir counts (1990 to 2005) and aerial surveys (1977-1989) were examined for similarities through time using cluster analysis (Johnson and Wichern 1998).

A Pearson's distance measure was used for the cluster analysis to minimize the effects of scale on determining similarities (Manly 1994). The cluster analysis was intended to determine if smaller systems (few sockeye salmon escape annually) that are difficult to survey were similar to other systems. If sufficient similarities were found, it would provide confidence that the smaller system was being maintained at a sustainable level, even though monitored less frequently.

COHO SALMON

Thin Point Lake
Escapement goal background and previous review

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 coho salmon was developed in 1993 and a range was set at 3,000 to 6,000 fish (Nelson and Lloyd 2001). Aerial surveys were used to estimate coho salmon escapement into Thin Point Lake from 1968 through the present.

An escapement goal review of this system was conducted during 2003; however, the lack of reliable escapement data resulted in the team recommendation to retain only the lower end (3,000) of the SEG to be used as a threshold to alert managers to potential over harvest or changes in productivity (Nelson et al. 2006; Table 1).

2006 review

Stock-specific harvest estimates for Thin Point Lake coho salmon were not available. Recent escapement estimates were examined to determine if a change in the escapement goal was justified.

Nelson River
Escapement goal background and previous review

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). Aerial surveys were used to estimate coho salmon escapement into Nelson River from 1968 through the present.

An escapement goal review of this system was conducted during 2003 using a risk analysis (Nelson et al. 2006). The review team concluded that the lower end (18,000) of the existing goal was appropriate as a threshold (Table 1).

2006 review

Stock-specific harvest estimates were not available for the Nelson River coho salmon fisheries. Recent escapement estimates were examined to determine if a change in the escapement goal was justified.

PINK SALMON

Pink salmon escapement estimates in Area M are based on aerial surveys of spawning fish from fixed-wing aircraft. 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 Shaul and Dinnocenzo (2003).

South Peninsula
Escapement goal background and previous review

Even- and odd-year pink salmon escapement goals by district were first established in 1992 (Nelson and Lloyd 2001). The sum of the district escapement goal ranges for the South 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 total indexed escapement estimates were aggregated into a single South Peninsula area-wide escapement that was used, along with the total pink salmon catch of the South Peninsula, to develop a single Ricker spawner-recruit model (Ricker 1954). Ricker spawner-recruit models were developed from even-year, odd-year and combined even- and odd-year escapement and catch data. The model developed using the combined even- and odd-year escapement and catch data was considered the best model (Nelson et al. 2006). 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).

2006 review

The analysis in this manuscript is an update to the 2003 Ricker spawner-recruit model, adding escapement and catch data from 2004 and 2005. For this escapement goal review, models were not developed for even- and odd-year pink salmon separately since the combined model was recommended during the 2003 review (Nelson et al. 2006).

Bechevin Bay
Escapement goal background and previous review

The Bechevin Bay Section pink salmon escapement goals were established in 1992; the even-year goal range was 33,200 to 66,400 fish and the odd-year goal range was 2,400 to 4,800 fish (Nelson and Lloyd 2001). These escapement goals were changed during an escapement review in 2003, retaining only lower ranges of the escapement goals of 31,000 and 1,600 for even- and odd-years, respectively (Nelson et al. 2006).

In 2003, even- and odd-year pink salmon escapement goal estimates were calculated using a risk analysis approach (Nelson et al. 2006). This technique was developed for stocks that are caught incidentally during more dominant fisheries. The escapement goal is established to minimize the need to disrupt the more dominate fishery, while maintaining a sustainable population of the less dominant stock (Bernard et al. *unpublished*).

2006 review

The risk analysis was performed for this review after adding the total index escapement estimate of 2004 and 2005 for the Bechevin Bay Section to the even- and odd-year escapement data from the previous assessment.

CHUM SALMON

Chum salmon escapement estimates in Area M are based primarily on aerial surveys of spawning fish from fixed-wing aircraft. Total indexed escapement estimates were calculated by Area M management biologists, with estimation techniques outlined in Shaul and Dinnocenzo (2003).

South Peninsula
Escapement goal background and previous review

Chum salmon escapement goals, aggregated by district, were established in 1992 (Nelson and Lloyd 2001) and remained unchanged after the previous escapement goal review in 2003 (Nelson et al. 2006). The current chum salmon escapement goal ranges are: Southeastern District - 106,400 to 212,800, South Central District - 89,800 to 179,600, Southwestern District - 133,400 to 266,800, and Unimak District - 800 to 1,600 (Table 1).

2006 review

The Southeast, South Central, and the Southwest districts aggregated escapement goals were evaluated using a percentile approach (Bue and Hasbrouck 2001), after updating the total indexed escapement estimates with 2004 and 2005 total escapement estimates.

Chum salmon from the Unimak District are caught incidentally in other fisheries. There is little or no directed commercial, subsistence, or sport harvest on chum salmon from this area, so for this review a risk analysis (Bernard et al. *unpublished*) was performed for Unimak District chum salmon.

North Peninsula
Escapement goal background and previous review

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). Separate Ricker spawner-recruit models (Ricker 1954) were developed for the Northwestern and Northern districts during the previous escapement goal review in 2003 (Nelson et al. 2006). From these analyses, the Northwestern District escapement goal was changed to a range of 100,000 to 215,000 and no change was recommended for the Northern District escapement goal (Table 1).

2006 review

The spawner-recruit models were developed from age data collected from 1980 to 1992 for the Northwestern District chum salmon and from 1982 to 1999 for the Northern District chum salmon. Due to no new age data being available to re-evaluate the model, no analyses were done during this review for these chum salmon district escapement goals.

RESULTS

CHINOOK SALMON

Nelson River
The data available for the Nelson River Chinook salmon escapement goal analysis and the associated results of those analyses are located in Table 1 and Appendix A.

Stock Status

The current Nelson River Chinook salmon BEG range is 2,400 to 4,400 (Table 1; Appendix A1). Before the goal was implemented in 2004, escapements were generally within or above the BEG range (Appendices A2 and A3). Escapements were 7,664 in 2004 and 4,993 in 2005, which were above the BEG range. This stock is lightly exploited with incidental harvest in the commercial fisheries and minor sport fish take.

Evaluation of Recent Data

A Ricker spawner-recruit model was fit to the Nelson River fully recruited brood year spawner-recruit data from 1981 to 1998. Over this period, Chinook salmon escapements averaged 4,646 (range: 1,800 to 12,561) and total returns averaged 6,961 Chinook salmon (range: 4,447 to 11,132). The contrast of the Nelson River escapement data was 7.0, which was greater than the recommended minimum contrast of 4.0 (CTC 1999). The model, adjusted for bias in log-transforming the data (Hilborn 1985) and to again account for significant serial autocorrelation among the residuals of the standard Ricker model at lag-2 (Noakes et al. 1987; Pankratz 1991), was significant (P=0.02). The S_{msy} was estimated at 3,056 Chinook salmon with a 90% MSY range of 1,977 to 4,272 while S_{eq} was estimated at 7,550 Chinook salmon.

Escapement Goal Recommendation

Estimates from the habitat-based model did not change since the last review (Nelson et al. 2006). The addition of 2004 and 2005 spawner-recruit data had little effect on the results of the spawner-recruit model. The current goal is based on results of the habitat-based model. Because results of both models are very similar, the team recommended not changing the current BEG range of 2,400 to 4,400 (Table 1).

SOCKEYE SALMON

Orzinski Lake

The data available for the Orzinski Lake sockeye salmon escapement goal analyses and the associated results of those analyses are located in Table 1 and Appendix B.

Stock Status

The current Orzinski Lake sockeye salmon SEG range is 15,000 to 20,000 fish (Table 1; Appendix B1). Before the goal was implemented, escapement estimates fell below the lower range in the early 1970s and was generally above the upper range in the late 1970s (Appendices B2 and B3). The escapements estimated by weir counts (since 1990) were generally higher than estimates derived through aerial surveys. Factors contributing to the large escapements into Orzinski Lake in recent years include limitations on harvest opportunities in the management plan and a reduction in fishing effort. Escapements were 75,450 in 2004 and 44,797 in 2005, which were well above the upper escapement goal (Table 1; Appendices B2 and B3).

Evaluation of Recent Data

A SEG for Orzinski Lake sockeye salmon was estimated according to the percentile algorithm using weir escapement estimates from 1990-2005. Moderate contrast in the escapement estimates resulted in an SEG range of 22,300 to 44,310 sockeye salmon (15th to 85th percentiles).

Escapement Goal Recommendation

No new information is available that indicates that this goal should be changed. Recent large escapements may reveal more information concerning the upper range of the escapement goal; however, that data will not be available until the brood years from those escapements are fully recruited. No change to the current goal is recommended.

Thin Point Lake

The data available for the Thin Point Lake sockeye salmon escapement goal analysis and the associated results of those analyses are located in Table 1 and Appendix C.

Stock Status

The current Thin Point Lake sockeye salmon SEG range is 14,000 to 28,000 (Table 1; Appendix C1). The estimated escapements were generally below the goal range until 1987; at this point, escapements began increasing substantially (Appendices C2 and C3). The Thin Point Lake escapement was estimated to be above the upper range of the goal at 34,500 in 2004 and within the SEG range at 21,000 in 2005.

Evaluation of Recent Data

A SEG for Thin Point sockeye salmon was estimated according to the percentile algorithm using expanded aerial survey escapement estimates from 1970 to 2005. High contrast in the escapement estimates and high exploitation of this stock resulted in an SEG range of 7,475 to 22,325 (25th to 75th percentiles).

Escapement Goal Recommendation

The current escapement goal estimate using the percentile approach remained unchanged from 2003 (Nelson et al. 2006). The limnology data has also remained unchanged. Based on this information, the team concluded that there was no compelling evidence to change the existing SEG.

Mortensens Lagoon

The data available for the Mortensens Lagoon sockeye salmon escapement goal analysis and the associated results of those analyses are located in Table 1 and Appendix D.

Stock Status

The current Mortensens Lagoon sockeye salmon SEG range is 3,200 to 6,400 (Table 1; Appendix D1). In general, the historic escapement estimates have fallen within the SEG range, although before the goals were in place, escapements were within or below the range, and after the goals were implemented the escapements were within or above the range (Appendices D2 and D3). Escapements were 7,215 in 2004 and 21,703 in 2005, exceeding the upper range of the goal.

Evaluation of Recent Data

A SEG for Mortensens Lagoon sockeye salmon was estimated according to the percentile algorithm using expanded aerial survey escapement estimates from 1970 to 2005. High contrast in the escapement estimates and high exploitation of this stock resulted in a SEG range of 3,318 to 6,250 (25th to 75th percentiles).

Escapement Goal Recommendation

The current escapement goal estimate using the percentile approach corroborated the 2003 escapement goal review results for Mortensens Lagoon (Nelson et al. 2006). Based on this information, the team concluded that no change was warranted to the existing SEG.

Middle Lagoon

The data available for the Middle Lagoon sockeye salmon escapement goal analysis and the associated results of those analyses are located in Table 1 and Appendix E.

Stock Status

The current Middle Lagoon sockeye salmon SEG range is 16,000 to 32,000 (Table 1; Appendix E1). Escapement estimates were generally lower before the SEG was in place, and have been increasing in the last two decades (Appendices E2 and E3). However, poor visibility during aerial surveys and the tendency of these sockeye salmon to hold in the lagoon for extended periods may be significant factors in many of the low escapement estimates. Additionally, the interest in harvesting the Middle Lagoon sockeye salmon stock has declined in recent years. The 2004 escapement estimate of 39,400 exceeded the upper range of the goal and the 2005 escapement estimate of 7,000 fell below the lower range of the goal.

Evaluation of Recent Data

Although the sockeye salmon escapement estimates for Middle Lagoon are not considered reliable, a SEG for Middle Lagoon sockeye salmon was estimated according to the percentile algorithm using aerial survey escapement estimates from 1972 to 2005. Due to the high contrast in the escapement estimates and recent decrease to moderate exploitation of this stock, the estimated SEG range was 5,100 to 23,575 (25th to 75th percentiles).

Escapement Goal Recommendation

Due to the uncertainty of the aerial survey estimates and decreased exploitation of this stock, the team was not comfortable with the SEG based on the percentile approach. Because of the similarity between Middle Lagoon and Thin Point Lake estimated escapements (see cluster analysis below) and the data quality, the team recommended eliminating the existing SEG.

Christianson Lagoon

The data available for the Christianson Lagoon sockeye salmon escapement goal analysis and the associated results of those analyses are located in Table 1 and Appendix F.

Stock Status

The current Christianson Lagoon sockeye salmon SEG range is 25,000 to 50,000 (Table 1; Appendix F1). Before the late 1980s, escapements generally fell below the lower range of the goal, although in some years escapements were well in excess of the upper end of the goal (Appendices F2 and F3). Estimated escapements were within the range most of the time after the SEG was implemented. Escapement estimates exceeded the upper limit of the goal in 2004 and 2005.

Evaluation of Recent Data

A SEG for Christianson Lagoon sockeye salmon was estimated according to the percentile algorithm using aerial survey escapement estimates from 1970 to 2005. High contrast in the

escapement estimates and high exploitation of this stock resulted in a SEG range of 24,850 to 47,350 (25th to 75th percentiles).

Escapement Goal Recommendation

Escapement levels have remained relatively constant and according to area managers, escapement estimates, based on aerial surveys, are reasonable. Although it is unknown whether the variation in escapement estimates in this time series arose from varying exploitation rates due to management actions or from changes in stock productivity, the SEG estimate based on the percentile approach supports the current escapement goal. Managing for the current SEG has continued to result in desired escapement levels as well as surplus production. The team felt that no change to the existing SEG was warranted.

Swanson Lagoon

The data available for the Swanson Lagoon sockeye salmon escapement goal analysis and the associated results of those analyses are located in Table 1 and Appendix G.

Stock Status

The current sockeye salmon SEG range for Swanson Lagoon is 8,000 to 16,000 (Table 1; Appendix G1). Before the SEG was implemented in 1990, escapement estimates generally fell either below or within the lower portion of the range; in some years, escapements were extremely low (Appendices G2 and G3). Estimated escapements were generally within the SEG range during 1991 to 2003, although escapements were often near the lower end or below the range. The 2004 escapement estimate exceeded the upper range of the goal and the 2005 escapement estimate fell below the lower range of the goal.

Evaluation of Recent Data

A SEG for Swanson Lagoon sockeye salmon was estimated according to the percentile algorithm using aerial survey escapement estimates from 1970 to 2005 and from 1990 to 2005 to address observed changes in escapement levels. The escapement estimates showed high contrast and exploitation of this stock has been low in recent years. The estimated SEG range using this approach was from 2,250 to 9,775 for the 1970 to 2005 data and 6,175 to 12,250 for the 1990 to 2005 data (15th to 75th percentiles).

Escapement Goal Recommendation

According to area managers it is difficult to estimate escapement in this system using aerial surveys because inclement weather conditions typically result in poor visibility. Given the uncertainty of the escapement estimates, and the percentile method results, the team recommended reducing the lower range to 6,000 fish and maintaining the upper range of 16,000 fish. The team felt this was warranted as the general tendency has been for the escapements to fall towards the lower end or below the 8,000 fish range [six of 16 years (38%) from 1990 to 2005 have been below the range] and returns have continued to be strong. Widening the range would also improve management of the system.

North Creek

The data available for the North Creek sockeye salmon escapement goal analysis and the associated results of those analyses are located in Table 1 and Appendix H.

Stock Status

The current SEG range for North Creek sockeye salmon is 4,400 to 8,800 (Table 1; Appendix H1). Escapements in this system generally have increased from low levels since the 1970s and 1980s, and have met or exceeded the SEG range in recent years (Appendices H2 and H3). Escapement estimates exceeded the upper range of the goal in 2004 and 2005.

Evaluation of Recent Data

A SEG for North Creek sockeye salmon was estimated according to the percentile algorithm using aerial survey escapement estimates from 1970 to 2005. High contrast in the escapement estimates and high exploitation of this stock resulted in a SEG range of 3,000 to 8,475 (25th to 75th percentiles).

Escapement Goal Recommendation

Although it is unknown whether the variation in escapement estimates in this time series arose from varying exploitation rates due to management actions or from changes in stock productivity, the SEG based on the percentile approach supports the current escapement goal. Moreover, recent escapements have increased despite increasing exploitation rates. The team felt that no change to the existing SEG was warranted.

Nelson River

The data available for the Nelson River sockeye salmon escapement goal analysis and the associated results of those analyses are located in Table 1 and Appendix I.

Stock Status

The current Nelson River sockeye salmon BEG range is 97,000 to 219,000 (Table 1; Appendix I1). Prior to the implementation of this BEG in 2004, when the SEG range was 100,000 to 150,000, escapements were within or above the SEG range after 1974 (Appendices I2 and I3). Since the current goal was implemented, estimated escapements have been above the BEG range. Escapements above the upper goal range were due primarily to high numbers of "jacks" and low proportion of females. In addition, it has often been difficult for the fleet to harvest surplus fish despite extended fishery openings.

Evaluation of Recent Data

A Ricker spawner-recruit model was fit to the Nelson River fully recruited brood year spawner-recruit data from 1975 to 1998. Over this period, sockeye salmon escapements averaged about 237,000 (range: 101,000 to 480,000) and total returns averaged about 526,000 sockeye salmon (range: 191,000 to 847,000). The contrast of the Nelson River escapement data was 4.8, which was above the recommended minimum contrast of 4 (CTC 1999). The multiplicative error model was significant ($P<0.001$). The S_{msy} was estimated at 148,000 sockeye salmon with a 90% MSY range of 94,000 to 211,000 while S_{eq} was estimated at 405,000 sockeye salmon. No autocorrelation was found in the residuals of the model.

Escapement Goal Recommendation

The addition of 2004 and 2005 spawner-recruit data did not improve the contrast of the escapement data. The subsequent spawner-recruit model was significant with no autocorrelation in the residuals. The spawner-recruit model also suggested a maximum escapement (S_{eq}) of about 405,000 sockeye salmon, which due to measurement error maybe an underestimate

(Hilborn and Walters 1992). These results corroborated the findings from past escapement goal analyses (Nelson et al. 2006) and thus the team recommended not changing the current BEG range of 97,000 to 219,000 (Table 1).

Bear Lake

The data available for the Bear Lake sockeye salmon escapement goal analysis and the associated results of those analyses are located in Table 1 and Appendix J.

Stock Status

The current SEG ranges for Bear Lake sockeye salmon are 176,000 to 293,000 for the early run and 117,000 to 195,000 for the late run or a total sockeye salmon SEG range of 293,000 to 488,000 (Table 1; Appendix J1). Early-run escapements were below the current SEG range from the mid 1960s through the late 1970s and have fluctuated within and above the range since the late 1970s (Appendices J2 and J3) while late-run escapements have been generally below and within the current SEG range from the mid 1960s through the most recent season. (Appendices J4 and J5). Recent year (1986-2005) total escapements (early and late runs combined) have generally been within the total run SEG range (Appendices J6 and J7). Escapements above the upper goal range were due primarily to a high number of "jacks" and decreasing fishing effort toward the end of the run.

Evaluation of Recent Data

Percentile Approach

A SEG for early-run Bear Lake sockeye salmon was estimated using the percentile algorithm using tower estimates and weir counts from 1970 to 2005. Data after 1969 were considered more accurate than earlier data, so only counts from 1970 to 2005 were used in this analysis. Medium contrast in the escapement estimates of the early-run stock resulted in a SEG range of 170,039 to 327,068 (15th to the 85th percentiles). A SEG for late-run Bear Lake sockeye salmon was estimated according to the percentile algorithm using tower estimates and weir counts from 1970-2005. High contrast in the escapement estimates of this stock resulted in a SEG range of 105,997 to 196,370 (25th to the 75th percentiles). A SEG for total run of Bear Lake sockeye salmon was estimated according to the percentile algorithm using tower estimates and weir counts from 1970 to 2005. Medium contrast in the escapement estimates of this stock resulted in a SEG range of 260,750 to 552,200 (15th to 85th percentiles).

Euphotic Volume Analysis

Based on average EV, the adult production of Bear Lake is expected to be roughly 1,295,000 sockeye salmon annually. If applied in proportion to existing goals, an early-run SEG range of 192,000 to 321,000 sockeye salmon and a late-run SEG range of 128,000 to 214,000, for a combined SEG range of 320,000 to 535,000 sockeye salmon, is appropriate based on the EV of Bear Lake.

Smolt Biomass as a Function of Zooplankton Biomass

If applied in proportion to existing goals, the smolt biomass model estimated an early-run SEG range of 129,000 to 214,000 sockeye salmon and a late-run SEG range of 86,000 to 143,000

sockeye salmon. A combined SEG range of 215,000 to 357,000 sockeye salmon, is appropriate based on the zooplankton biomass of Bear Lake and assuming 13.0 g smolt.

Escapement Goal Recommendation

The team used several approaches to estimate an SEG for both runs combined. Due to medium escapement data contrast (4-8), this approach resulted in a SEG range of 260,750 to 552,200. This estimate is similar to the SEG estimates from the models using past limnology and spawning habitat data. The SEGs estimated using the EV model and zooplankton model corroborate the existing goal and are similar to past spawning habitat and lake surface area models and the actual historic escapement levels that have continued to provide desired escapement levels as well as surplus production. Therefore, the team recommended not changing the current Bear Lake SEGs.

Sandy River

The data available for the Sandy River sockeye salmon escapement goal analyses and the associated results of those analyses are located in Table 1 and Appendix K.

Stock Status

The current Sandy River sockeye salmon SEG range is 40,000 to 60,000 fish (Table 1; Appendix K1). The escapements estimated by weir counts (since 1994) were generally higher than estimates derived through aerial surveys (Appendices K2 and K3). The weir counts also tend to be near or within the current escapement goal except in 1994, 1995, and 2005 when escapements were quite large (> 100,000 fish).

Evaluation of Recent Data

Weir counts from 1994 to 2005 and aerial surveys from 1980 to 1993, with adjustments to lake estimates, were applied to the percentile algorithm to calculate a SEG for Sandy Lake sockeye salmon. High contrast (15) in the escapement estimates and low exploitation of this stock resulted in a SEG range of 34,250 to 74,400 (15th to 75th percentiles).

Escapement Goal Recommendation

The escapement goal was not changed during the last escapement goal review in 2003 even though the percentile approach, as applied only to weir counts, suggested raising the upper range of the SEG (Nelson et al. 2006). This was due to low contrast in the weir count data, limnology data (although limited) that did not support higher escapements into the lake, and because the goal had been providing for desired escapements as well as surplus production. During our review, after adjusting the aerial surveys and combining them with the weir counts, the increased escapement data provides greater contrast, and suggests a range of 34,400 to 74,400. It is recommended that the current goal be changed to 34,000 to 74,000.

Ilnik River

The data available for the Ilnik River system sockeye salmon escapement goal analyses and the associated results of those analyses are located in Table 1 and Appendix L.

Stock Status

The current Ilnik River system sockeye salmon SEG range is 40,000 to 60,000 fish (Table 1; Appendix L1). Before the goal was implemented in 1991, escapement estimates generally fell below the lower range (using aerial surveys) and have been within or above the goal range in all

years except one since the weir was installed in 1991 (Appendices L2 and L3). Escapements during the 2004 and 2005 seasons since the last review of this stock were 82,000 and 154,000 fish, respectively, both well above the upper range of the SEG.

Evaluation of Recent Data

Weir counts from 1991 to 2005 were applied to the percentile algorithm to calculate a SEG for Ilnik River sockeye salmon. Low contrast (3.9) in the escapement estimates resulted in a SEG range of 45,500 to 154,000 (15th to maximum percentiles), which was similar to results in 2003 (44,600 to 135,000).

Escapement Goal Recommendation

No new information is available that indicates that this goal should be changed. Escapements have remained relatively steady since the weir has been used to estimate escapement. When the relatively large 2005 brood year escapement is fully recruited, more information may be available concerning the appropriate upper end of this escapement goal. No change to the current goal is recommended.

Meshik River

The data available for the Meshik River system sockeye salmon escapement goal analyses and the associated results of those analyses are located in Table 1 and Appendix M.

Stock Status

The current Meshik River system sockeye salmon SEG range is 10,000 to 20,000 fish (Table 1; Appendix M1). Since 1970, estimated escapements were generally within or above the current escapement goal and escapements have increased in recent years (Appendices M2 and M3). The high variability in the escapement estimates is likely due to the size and remoteness of the river system, resulting in sporadic aerial surveys conducted under variable conditions. Escapements during the 2004 and 2005 seasons, since the last review of this stock, were 82,200 and 96,100 fish, respectively, both well above the upper escapement goal.

Evaluation of Recent Data

Fishery management changes have required increased aerial survey effort on Meshik River during the last 16 years (1990-2005). During this period of improved monitoring, escapement estimates have increased. Thus, these data (contrast = 131.4, low exploitation) were applied to the percentile algorithm and resulted in an escapement goal estimate of 20,000 to 60,000 sockeye salmon (15th and 75th percentiles).

Escapement Goal Recommendation

The results from the percentile analysis using 1990 to 2005 data better reflect the current escapement trends of the Meshik River stock. The team recommends changing the Meshik River sockeye salmon SEG range to 20,000 to 60,000 fish.

Cinder River

The data available for the Cinder River system sockeye salmon escapement goal analyses and the associated results of those analyses are located in Table 1 and Appendix N.

Stock Status

The current Cinder River system sockeye salmon SEG range is 6,000 to 12,000 fish (Table 1; Appendix N1). From 1970 through 1980, estimated escapements were generally below the current SEG range, but since 1980 most escapements have been within or above the range; the upper range of the SEG has been greatly exceeded in some recent years (Appendices N2 and N3). The high variability in the escapement estimates is likely due to the size and remoteness of the river system, resulting in sporadic aerial surveys conducted under variable conditions. Escapements during the 2004 and 2005 seasons, since the last review of this stock, were 55,050 and 96,000 fish, respectively, both well above the upper range of the escapement goal.

Evaluation of Recent Data

In conjunction with the increased monitoring effort on the Meshik River, aerial surveys of Cinder River increased during 1990 to 2005. During this period of improved monitoring (also due to fishery management changes), escapement estimates have increased. Thus, these data (contrast = 793.3, low exploitation) were applied to the percentile algorithm and resulted in an SEG range of 12,000 to 48,000 sockeye salmon (15th and 75th percentiles).

Escapement Goal Recommendation

The results from the percentile analyses using 1990 to 2005 data better reflect recent Cinder River sockeye salmon escapement trends. The team recommends changing the Cinder River sockeye salmon SEG range to 12,000 to 48,000 fish.

McLees Lake

The data available for the McLees Lake sockeye salmon escapement goal analyses and the associated results of those analyses are located in Table 1 and Appendix O.

Stock Status

Currently, there is no escapement goal for McLees Lake; the published SEG range of 4,000 to 6,000 fish was eliminated in 2004 (Table 1; Appendix O1). Peak aerial survey estimates of escapement ranged from 291 to 16,500 sockeye salmon from 1974 to 2000 (Appendices O2 and O3). Since 2001, the USFWS has operated a weir on McLees Lake. From 2001 to 2003, paired aerial survey and weir counts were conducted and indicated that aerial surveys underestimated the abundance of sockeye salmon in the McLees Lake system; not only due to visibility but late timing of the aerial surveys (i.e., mortality of sockeye escaped). The sockeye salmon escapements into McLees Lake in 2002 and 2003 were unprecedented, roughly 100,000 fish during both seasons. Recent year escapements in 2004 and 2005 dropped considerably to around 40,000 and 12,000 fish, respectively.

Evaluation of Data

An SEG for McLees Lake sockeye salmon was estimated according to the percentile algorithm using aerial survey peak count estimates from 1974 to 2003. High contrast in the escapement estimates (349.8) and low exploitation of this stock resulted in a SEG range of 1,036 to 6,325 (15th to 75th percentiles). An alternative percentile approach was calculated using only weir data (2001 to 2005). High contrast in the escapement estimates still existed (8.4) and low exploitation estimated resulted in a SEG range of 29,036 to 97,780.

Escapement Goal Recommendation

Although McLees Lake supports a significant subsistence fishery, commercial fishing activity is extremely infrequent and no management action has ever been implemented on the subsistence fishery. Funding and logistic limitations have prevented thorough aerial survey coverage of this system. Establishing a sound, scientific-based SEG is difficult with the substantial contrast in magnitudes between the historical surveys and limited number of recent weir counts. The weir project on McLees Lake did operate in 2006 and while funding is not definite for the future, USFWS is optimistic that a secure funding source will be in place soon for continued escapement monitoring of the system into the future. Based on this information, the team recommends not establishing an escapement goal for McClees Lake sockeye salmon until further stock assessment data are collected.

Cluster Analysis of South and North Peninsula Sockeye Salmon Systems

Escapement estimates for Orzinski Lake, Thin Point Lake, Mortensens Lagoon, and Middle Lagoon sockeye salmon were compared using cluster analysis. The pattern of similarity indicated that only Thin Point Lake and Middle Lagoon were strongly related (Figure 5).

Escapement estimates for Christianson Lagoon, Swanson Lagoon, North Creek, Nelson River, Bear Lake (early, late, and total runs), Sandy River, and Ilnik River sockeye salmon were compared using cluster analysis. The pattern of similarity indicated that late-run Bear Lake and total-run Bear Lake sockeye salmon were very strongly related (Figure 6), which was predicted since the late-run run comprised the majority of the total Bear Lake sockeye salmon run. There were also strong similarities between Christianson Lagoon, Nelson River, early-run Bear Lake, and Ilnik River sockeye salmon. North Creek, Sandy River, and Swanson Lagoon were not similar to any other systems.

Escapement Goal Recommendations

The cluster analysis indicated that either the Thin Point Lake or Middle Lagoon SEG could be eliminated, as long as the other is actively monitored. Both systems are of similar magnitude, in terms of escapement; however, Thin Point Lake is believed by managers to have a higher exploitation rate and is managed in season more aggressively than Middle Lagoon. Due to the results of the cluster analysis, the difficulty in surveying Middle Lagoon in-season due to the turbidity of the water, and because Middle Lagoon is less aggressively managed than Orzinski Lake and Thin Point Lake, the team recommends eliminating the escapement goal for Middle Lagoon.

The cluster analysis results indicated that Christianson Lagoon escapements had strong similarities with Ilnik River, early-run Bear Lake, and Nelson River escapements over time. However, due to the geographic distance between Christianson Lagoon and these other systems, the team felt it was not prudent to eliminate the escapement goal despite the similarities.

COHO SALMON

Thin Point Lake
The data available for the Thin Point Lake coho salmon escapement goal analysis and the associated results of those analyses are located in Table 1 and Appendix P.

Stock Status

The current Thin Point Lake coho salmon SEG threshold is 3,000 fish (Table 1; Appendix P1). Estimated escapements from 1992 to 2005 met the SEG threshold (Appendices P2 and P3). During the two years since the Thin Point Lake escapement goal was evaluated in 2003, escapements were above the SEG threshold (9,600 in 2004 and 17,500 in 2005). Escapement estimates continue to be hampered by late-season weather conditions, water clarity, and aircraft availability.

Evaluation of Recent Data

The difficulties of late-season aerial surveys continue to limit the number and quality of surveys for this stock. Stock assessment data collected since the last escapement goal review were limited, of poor quality, and did not improve our ability to estimate a SEG; the escapement data available for this stock are insufficient to estimate an SEG.

Escapement Goal Recommendation

The team agreed that, due to insufficient data, no change was warranted for the Thin Point Lake coho salmon SEG threshold.

Nelson River
The data available for the Nelson River coho salmon escapement goal analysis and the associated results of those analyses are located in Table 1 and Appendix Q.

Stock Status

The current Nelson River coho salmon SEG threshold is 18,000 fish (Table 1; Appendix Q1). Estimated escapements during the 1990s, with two exceptions (1993 and 1999), met the SEG threshold (Appendices Q2 and Q3). During the two years since the Nelson River escapement goal was evaluated in 2003, escapements were above the SEG threshold (52,500 in 2004 and 24,000 in 2005). Escapement estimates continue to be hampered by late-season weather conditions, water clarity, and aircraft availability.

Evaluation of Recent Data

The difficulties of late-season aerial surveys continue to limit the number and quality of surveys for this stock. Stock assessment data collected since the last escapement goal review were limited, of poor quality, and did not improve our ability to estimate a SEG; the escapement data available for this stock are insufficient to estimate an SEG.

Escapement Goal Recommendation

The team agreed that, due to insufficient data, no change was warranted for the Nelson River coho salmon SEG threshold.

PINK SALMON

South Peninsula
The data available for the South Peninsula pink salmon escapement goal analyses and the associated results of those analyses are located in Table 1 and Appendix R.

Stock Status

The current South Peninsula pink salmon BEG ranges are 1,864,600 to 3,729,300 fish in even-years and 1,637,800 to 3,275,700 fish in odd years (Table 1; Appendix R1). 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 R2 and R3). After about 1994, the escapements have usually been above the upper range. Escapement estimates during the 2004 and 2005 seasons, since the last review of this stock, were 8,311,410 and 6,165,634 fish, respectively, both well above the upper escapement goal ranges, making them the highest and third highest escapements on record.

Evaluation of Recent Data

Total estimated escapement and harvest from 2004 and 2005 were added to the previous data to reanalyze the Ricker spawner-recruit model (for both even- and odd-years combined) for pink salmon from the South Peninsula. The escapement goal range was estimated to be 1,670,100 to 3,795,400 fish.

Escapement Goal Recommendation

The spawner-recruit model shows little change from the previous model. Although the 2004 and 2005 escapements were very high for this area, it is not anticipated that these levels will harm the South Peninsula pink salmon stocks, since pink salmon are generally less affected by over-escapement than other salmon such as sockeye and chinook (Quinn and Deriso 1999). No change to the current goal is recommended. However, since the annual escapement data are collected by aerial survey and provide indices of escapements rather than total escapement estimates, the team decided to reclassify the goals from BEGs to SEGs.

Bechevin Bay Section

The data available for the Bechevin Bay pink salmon escapement goal analyses and the associated results of those analyses are located in Table 1 and Appendix S.

Stock Status

The current Bechevin Bay Section pink salmon SEG threshold is 31,000 fish in even years and 1,600 fish in odd years (Table 1; Appendix S1). Escapement estimates fell below the even-year goal only three times since 1988, and below the odd-year goal only four times since 1987 (Appendices S2 and S3). Escapements during the 2004 and 2005 seasons were estimated at 84,300 and 8,720 fish, respectively, both well above their respective even- and odd-year escapement goals.

Evaluation of Recent Data

Total estimated escapement from 2004 and 2005 were added to the previous data to reanalyze even- and odd-year risk analyses from Bechevin Bay pink salmon escapement. There was still autocorrelation in the even-year escapement values, requiring the autocorrelation be taken into account for the even-year risk analysis. A drop in the even-year mean escapement of 80% led to a threshold of 38,000 fish. At this escapement level, there was an estimated risk of 21.5% that an 80% drop in the mean even-year escapement would not be detected during three consecutive years, or there would be unwarranted restrictions in three consecutive years. At the current even-year escapement goal of 31,000 fish, there would be an estimated risk of 26.7% of not detecting

an 80% drop in the mean even-year escapement in three consecutive years, and an estimated risk of 15.1% there would be unwarranted restrictions in three consecutive years.

Autocorrelation was not detected in the odd-year escapement values. A 95% drop in the odd-year mean escapement led to a threshold of 1,700 fish. At this escapement level, there was an estimated risk of 4.5% that a 95% drop from the mean escapement would not be detected during three consecutive years, or there would be unwarranted restrictions in three consecutive years. At the current escapement goal of 1,600 there would be an estimated risk of 4.8% of not detecting a 95% drop in the mean escapement in three consecutive years, and an estimated risk of 3.8% there would be unwarranted restrictions in three consecutive years.

Escapement Goal Recommendation

The addition of the Bechevin Bay Section 2004 and 2005 escapements had little effect on the results of either risk analyses. Both risk models show relatively low probabilities of not detecting a significant drop in the mean escapement and unwarranted restrictions. No changes to the current SEG thresholds are recommended.

CHUM SALMON

Southeastern District

The data available for the chum salmon escapement goal analyses and the associated results of those analyses are located in Table 1 and Appendix T.

Stock Status

The current Southeastern District chum salmon SEG range is 106,400 to 212,800 fish (Table 1; Appendix T1). During the last 10 years, escapement estimates generally increased, and for nine years were within or exceeded the SEG range (Appendices T2 and T3). Escapement estimates in 2004 (367,200) and 2005 (412,500) were well above the upper bound of the escapement goal.

Evaluation of Recent Data

Southeastern District chum salmon escapement estimates from 1987 to 2005 were applied to the percentile algorithm to estimate an aggregate escapement goal. Escapement data had high contrast (9.1) and the stock was considered to have low exploitation. The resulting aggregate escapement goal estimate was 83,200 to 232,000 (15th to 75th percentile).

Escapement Goal Recommendation

The SEG estimate was similar to the results of the 2003 evaluation (82,910 to 235,139; Nelson et al. 2006); therefore, the team recommended no change to the current SEG.

South Central District

The data available for the chum salmon escapement goal analyses and the associated results of those analyses are located in Table 1 and Appendix U.

Stock Status

The current South Central District chum salmon SEG range is 89,800 to 179,600 fish (Table 1; Appendix U1). Escapement estimates have been within or near the current SEG range for most years since 1987 (Appendices U2 and U3). Escapement estimates during the 2004 and 2005 seasons were 184,800 and 235,700 fish, respectively, both above the upper bound of the current SEG.

Evaluation of Recent Data

South Central District chum salmon escapement estimates from 1987 to 2005 were applied to the percentile algorithm to estimate an aggregate escapement goal. Escapement data had low contrast (3.5) and the stock was considered to have high exploitation. The resulting aggregate escapement goal estimate was 94,000 to 274,000 (15th percentile to maximum).

Escapement Goal Recommendation

The SEG estimate was similar to the results of the 2003 evaluation (92,230 to 274,400), which suggested increasing the upper range of the goal (Nelson et al. 2006). However, the team agreed with the previous assessment that an increase in the contrast in the data would not facilitate any further, more comprehensive, analysis. Therefore, the team recommended no change to the current SEG.

Southwestern District

The data available for the chum salmon escapement goal analyses and the associated results of those analyses are located in Table 1 and Appendix V.

Stock Status

The current Southwestern District chum salmon SEG range is 133,400 to 266,800 fish (Table 1; Appendix V1). Escapement estimates were within or exceeded the SEG range for all years from 1987 to 2005, except in 1989 when the escapement (120,830) was below the lower range of the goal (Appendices V2 and V3). Escapement estimates during the 2004 and 2005 seasons were 180,000 and 317,910 fish, respectively.

Evaluation of Recent Data

Southwestern District chum salmon escapement estimates from 1987 to 2005 were applied to the percentile algorithm to estimate an aggregate escapement goal. Escapement data had low contrast (3.3) and the stock was considered to have high exploitation. The resulting aggregate escapement goal estimate was 168,000 to 401,000 (15th percentile to maximum).

Escapement Goal Recommendation

The SEG estimate was similar to the results of the 2003 evaluation (157,074 to 401,150), which suggested increasing the upper range of the goal (Nelson et al. 2006). However, the team agreed with the previous assessment that an increase in the contrast in the data would not facilitate any further, more comprehensive, analysis. Therefore, the team recommended no change to the current SEG.

Unimak District

The data available for the chum salmon escapement goal analyses and the associated results of those analyses are located in Table 1 and Appendix W.

Stock Status

The current Unimak District chum salmon SEG range is 800 to 1,600 fish (Table 1; Appendix W1). Escapement estimates were below the SEG range 10 years during 1987 to 2005, including 2004, when the escapement was 400 fish (Appendices W2 and W3). In 2005, the escapement was estimated to be 4,200 chum salmon.

Evaluation of Recent Data

There was no autocorrelation in the escapement values from 1987 to 2005. An 80% drop in the mean escapement led to a threshold of 600 fish. At this escapement level, there was an estimated risk of 6.1% that an 80% drop from the mean escapement would not be detected during three consecutive years, or there would be unwarranted restrictions in three consecutive years. At the current lower range of the SEG of 800 chum salmon there would be an estimated risk of 3.5% of not detecting an 80% drop in the mean escapement in three consecutive years, and an estimated risk of 16.2% there would be unwarranted restrictions in three consecutive years.

Escapement Goal Recommendation

The risk analysis generally supports the lower range of the current escapement goal of 800 fish. The team felt the current escapement goal should be changed from a range of 800 to 1,600 fish, to a SEG threshold of 800 fish.

Northwestern District

The data available for the chum salmon escapement goal analyses and the associated results of those analyses are located in Table 1 and Appendix X.

Stock Status

The current Northwestern District chum salmon BEG range is 100,000 to 215,000 fish (Table 1; Appendix W1). Escapement estimates have been within the current BEG range only five times from 1980 to 2005, and above the upper range of the BEG for all other years (Appendices X2 and X3). Escapement estimates during the 2004 and 2005 seasons were 295,600 and 192,965 fish, respectively.

Evaluation of Recent Data

The spawner-recruit model for the Northwestern District chum salmon was developed from age data collected from 1980 to 1992. There have been no further age data collected for this stock, since the last escapement goal review in 2003; therefore, we did not update the spawner-recruit model during our review.

Escapement Goal Recommendation

There is no new analysis or information to justify a change to the current BEG range. However, since the annual escapement data are collected by aerial survey and provide indices of escapements rather than total escapement estimates, the team decided to reclassify the goal from a BEG to a SEG.

Northern District

The data available for the chum salmon escapement goal analyses and the associated results of those analyses are located in Table 1 and Appendix Y.

Stock Status

The current Northern District chum salmon BEG range is 119,600 to 239,200 fish (Table 1; Appendix Y1). Escapements declined during the early 1980s, remaining just below or near the lower bound of the BEG range (Appendices Y2 and Y3). From 1992 to 1996 there was a fairly steady increase in escapement, then a steady decline through 2005. Escapement estimates during the 2004 and 2005 seasons were 139,650 and 103,675 fish, respectively; the 2005 escapement estimate was below the lower range of the BEG for the first time since 1991.

Evaluation of Recent Data

The spawner-recruit model for the Northern District chum salmon was developed from age data collected from 1982 to 1999. There has been no further age data collected for this stock, since the last escapement goal review in 2003; therefore, we did not update the spawner-recruit model during our review.

Escapement Goal Recommendation

There is no new analysis or information to justify a change to the current BEG range. However, since the annual escapement data are collected by aerial survey and provide indices of escapements rather than total escapement estimates, the team decided to reclassify the goal from a BEG to a SEG.

SUMMARY OF RECOMMENDATIONS

Our comprehensive review of the 27 existing salmon escapement goals in Area M resulted in consensus to leave 17 goals unchanged, change 5 goals, reclassify 4 goals (from BEGs to SEGs), and eliminate 1 goal (Table 1). This would result in 26 escapement goals for Area M including: 1 BEG for Chinook salmon, 1 BEG and 12 SEGs for sockeye salmon, 2 SEGs for coho salmon, 4 aggregate SEGs for pink salmon, and 6 aggregate SEGs for chum salmon.

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TABLES AND FIGURES

Table 1.–Current escapement goals, escapements observed from 2003 through 2005, and escapement goal recommendations in 2006 for Chinook, sockeye, coho, pink, and chum salmon stocks of the Alaska Peninsula Management and Aleutian Islands Areas.

System	Escapement Data[a]	Current Escapement Goal Type (BEG, SEG)	Range			Escapements 2003	2004	2005	2006 Recommendation
Chinook Salmon									
Nelson River	WC	BEG	2,400	to	4,400	5,154	7,664	4,993	No change
Sockeye Salmon									
Orzinski Lake	WC	SEG	15,000	to	20,000	70,690	75,450	44,797	No change
Thin Point Lake	PAS	SEG	14,000	to	28,000	40,000	34,500	21,000	No change
Mortensens Lagoon	PAS	SEG	3,200	to	6,400	16,804	7,215	21,703	No change
Middle Lagoon	PAS	SEG	16,000	to	32,000	27,300	39,400	7,000	Eliminate
Christianson Lagoon	PAS	SEG	25,000	to	50,000	52,200	75,400	54,500	No change
Swanson Lagoon	PAS	SEG	8,000	to	16,000	16,100	24,300	3,500	Change: SEG: 6,000-16,000
North Creek	PAS	SEG	4,400	to	8,800	10,200	15,000	45,000	No change
Nelson River	WC	BEG	97,000	to	219,000	343,511	480,097	303,000	No change
Bear Lake									
Early	WC	SEG	176,000	to	293,000	226,201	354,565	332,248	No change
Late	WC	SEG	117,000	to	195,000	139,799	80,435	221,752	No change
Total	WC	SEG	293,000	to	488,000	366,000	435,000	554,000	No change
Sandy River	WC	SEG	40,000	to	60,000	66,000	32,000	101,000	Change: SEG 34,000-74,000
Ilnik River	WC	SEG	40,000	to	60,000	69,000	82,000	154,000	No change
Meshik River	PAS	SEG	10,000	to	20,000	94,000	82,200	96,100	Change: SEG 20,000 - 60,000
Cinder River	PAS	SEG	6,000	to	12,000	88,700	55,050	96,000	Change: SEG 12,000 - 48,000
McLees Lake	WC/PAS	none				101,793	40,328	12,097	No change
Coho Salmon									
Thin Point Lake	PAS	SEG	3,000			25,000	9,600	17,500	No change
Nelson River	PAS	SEG	18,000			28,000	52,500	24,000	No change

-Continued-

Table 1. -Page 2 of 2.

System	Escapement Data[a]	Type (BEG, SEG)	Escapement Goal Range			Escapements 2003	2004	2005	2006 Recommendation
Pink Salmon									
South Peninsula Total -even years	PAS	BEG	1,864,600	to	3,729,300		8,311,410		Reclassify as SEG
South Peninsula Total -odd years	PAS	BEG	1,637,800	to	3,275,700	5,511,220		6,165,634	Reclassify as SEG
Bechevin Bay Section-even years	PAS	SEG	31,000				84,300		No change
Bechevin Bay Section-odd years	PAS	SEG	1,600			800		8,720	No change
Chum Salmon									
Southeastern District	PAS	SEG	106,400	to	212,800	218,810	367,200	412,500	No change
South Central District	PAS	SEG	89,800	to	179,600	79,000	184,800	235,700	No change
Southwestern District	PAS	SEG	133,400	to	266,800	193,030	180,000	317,910	No change
Unimak District	PAS	SEG	800	to	1,600	200	400	4,200	Change: SEG: 800
Northwestern District	PAS	BEG	100,000	to	215,000	236,000	295,600	192,965	Reclassify as SEG
Northern District	PAS	BEG	119,600	to	239,200	214,660	139,350	103,675	Reclassify as SEG

[a] PAS = Peak Aerial Survey, WC= Weir Count.
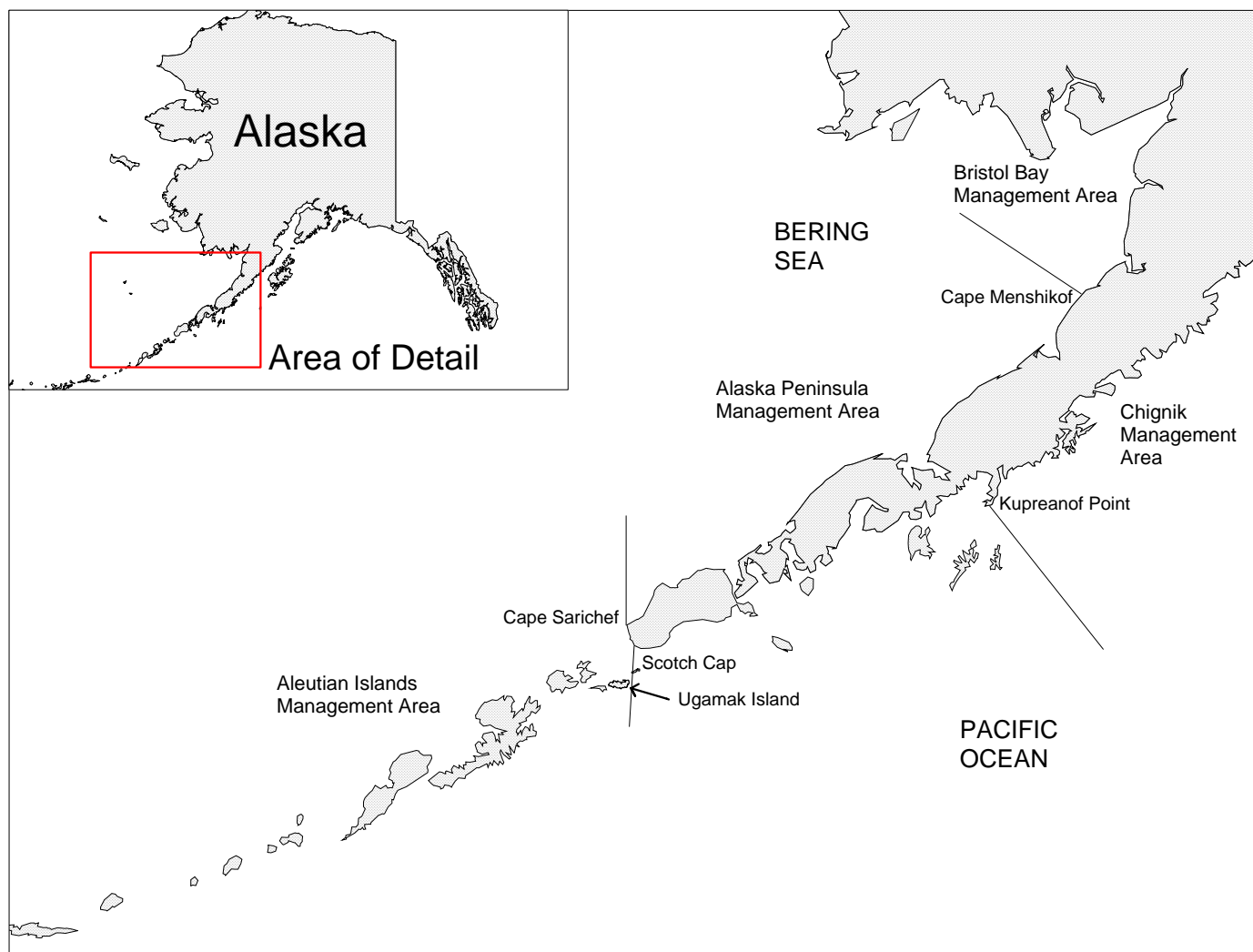
Figure 1.–Map of the Alaska Peninsula and Aleutian Islands Management Areas.
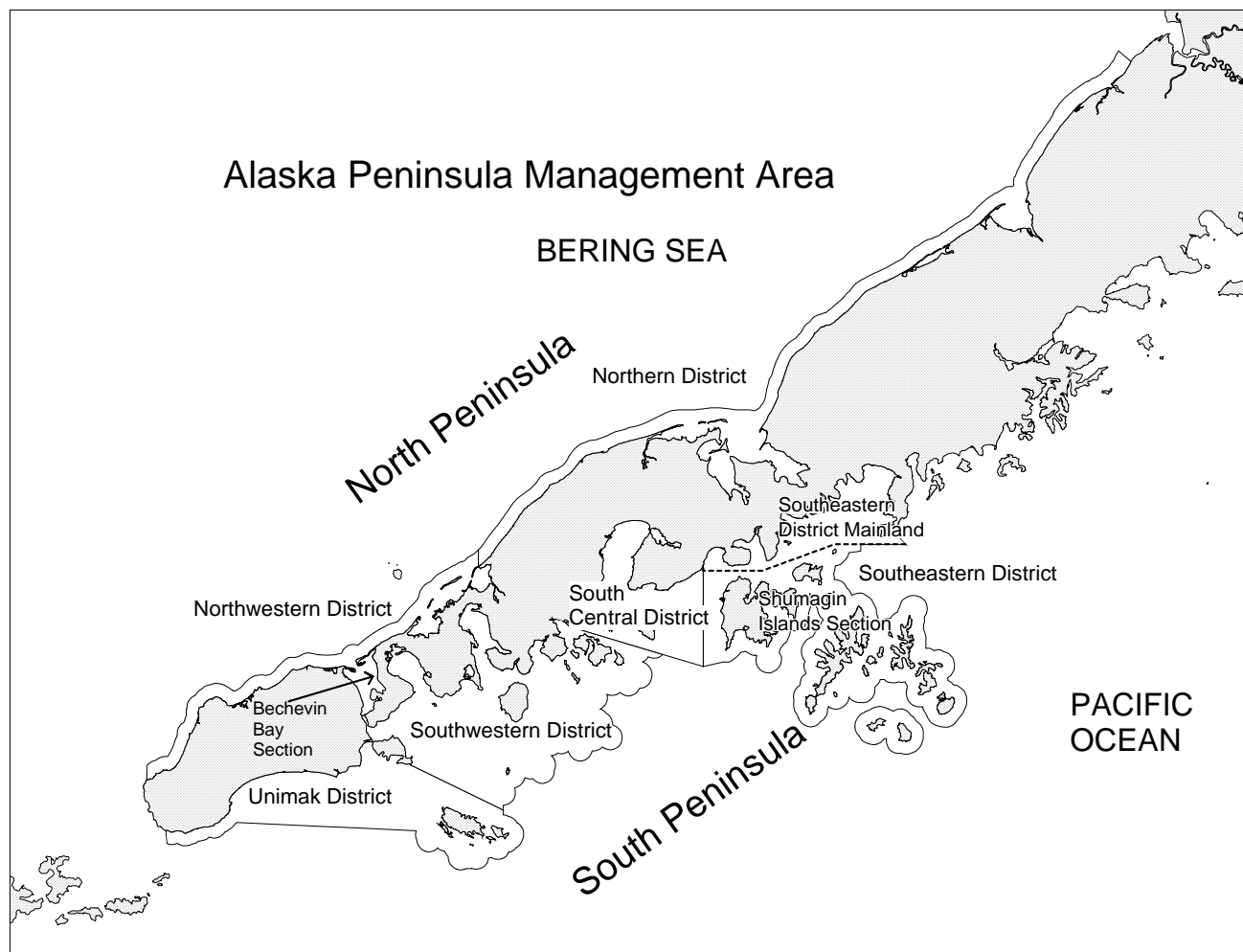
Figure 2.–Map of the Alaska Peninsula Management Area with the commercial salmon fishing districts depicted.
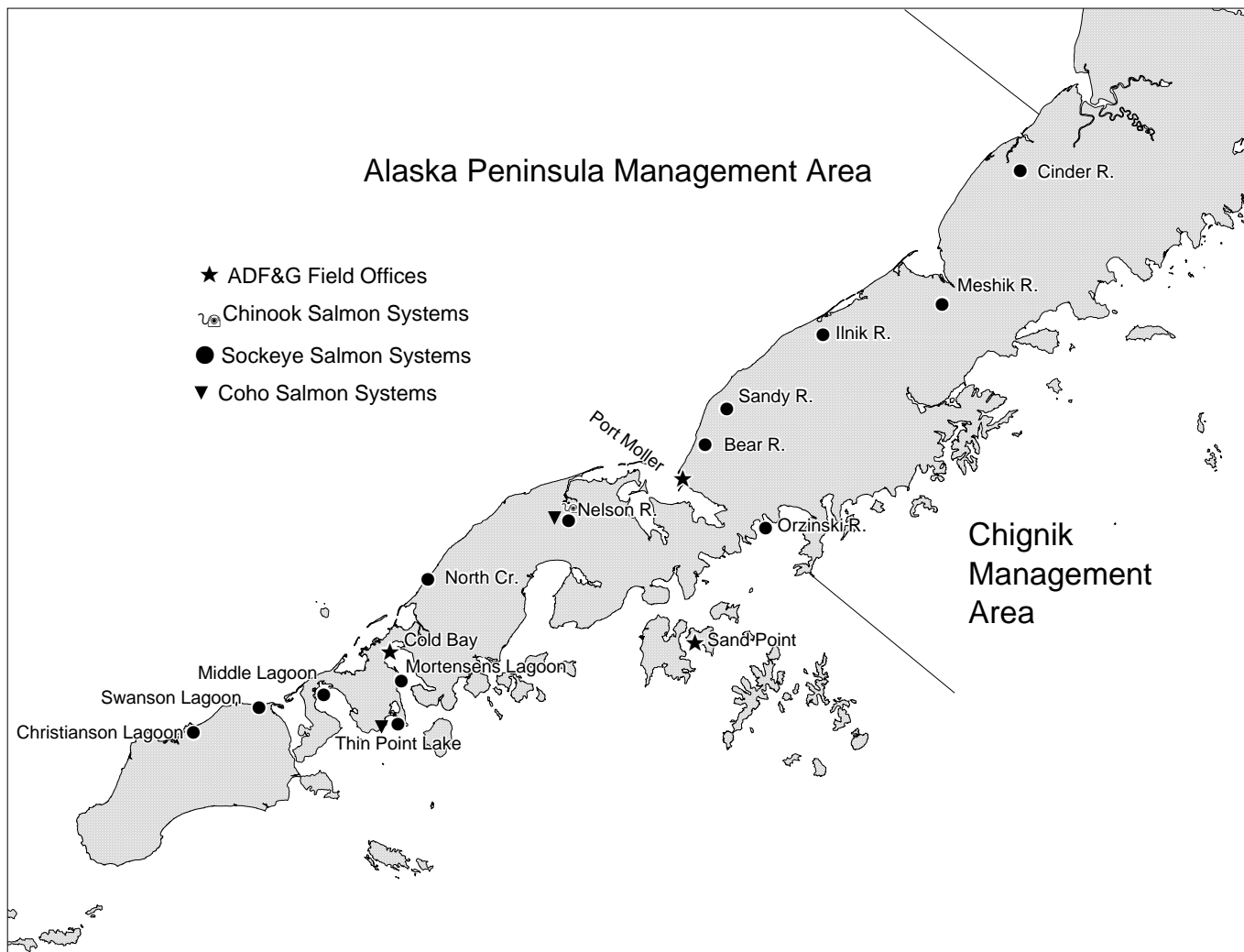
Figure 3.–Map of the Alaska Peninsula Management Area with the major sockeye, coho, and Chinook salmon systems depicted.
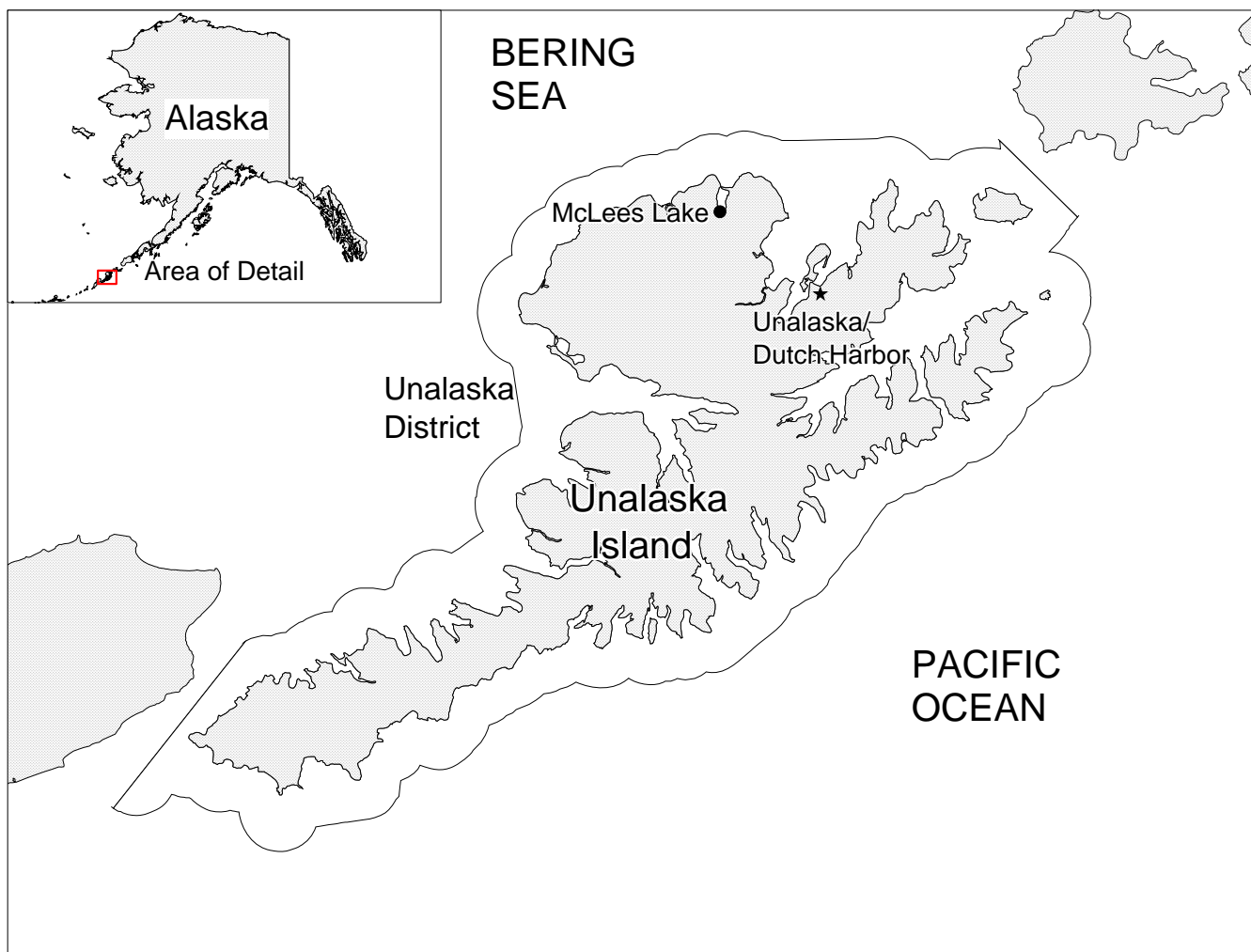
Figure 4.–Map of Unalaska Island within the Aleutian Islands Management Area with McLees Lake depicted.

Cluster Tree
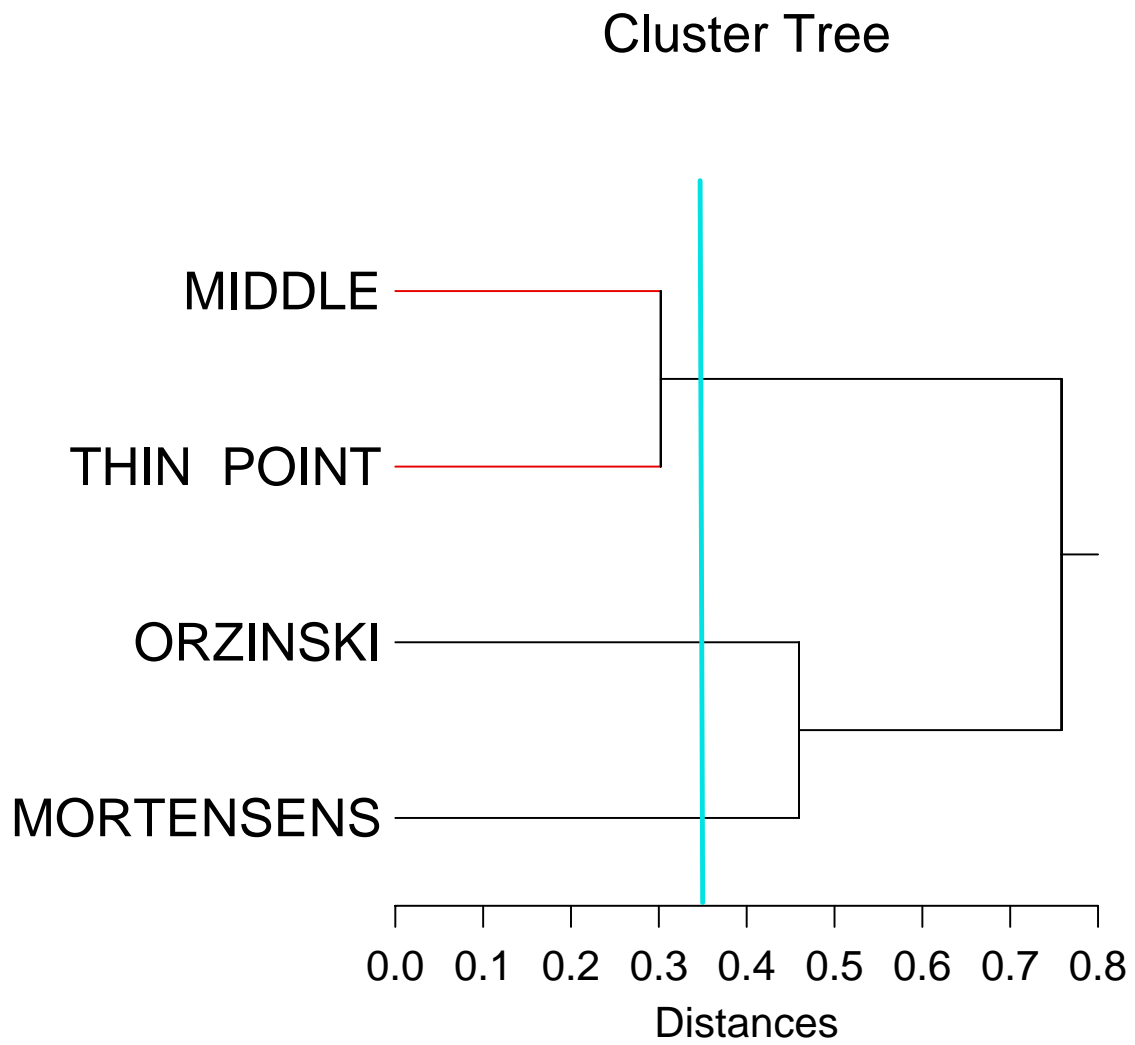
Figure 5.–Cluster Analysis diagram for Middle Lagoon, Thin Point Lake, Orzinski Lake, and Mortensens Lagoon sockeye salmon. Distances between systems below the vertical line at a distance measure of 0.35 represent have strong similarities.
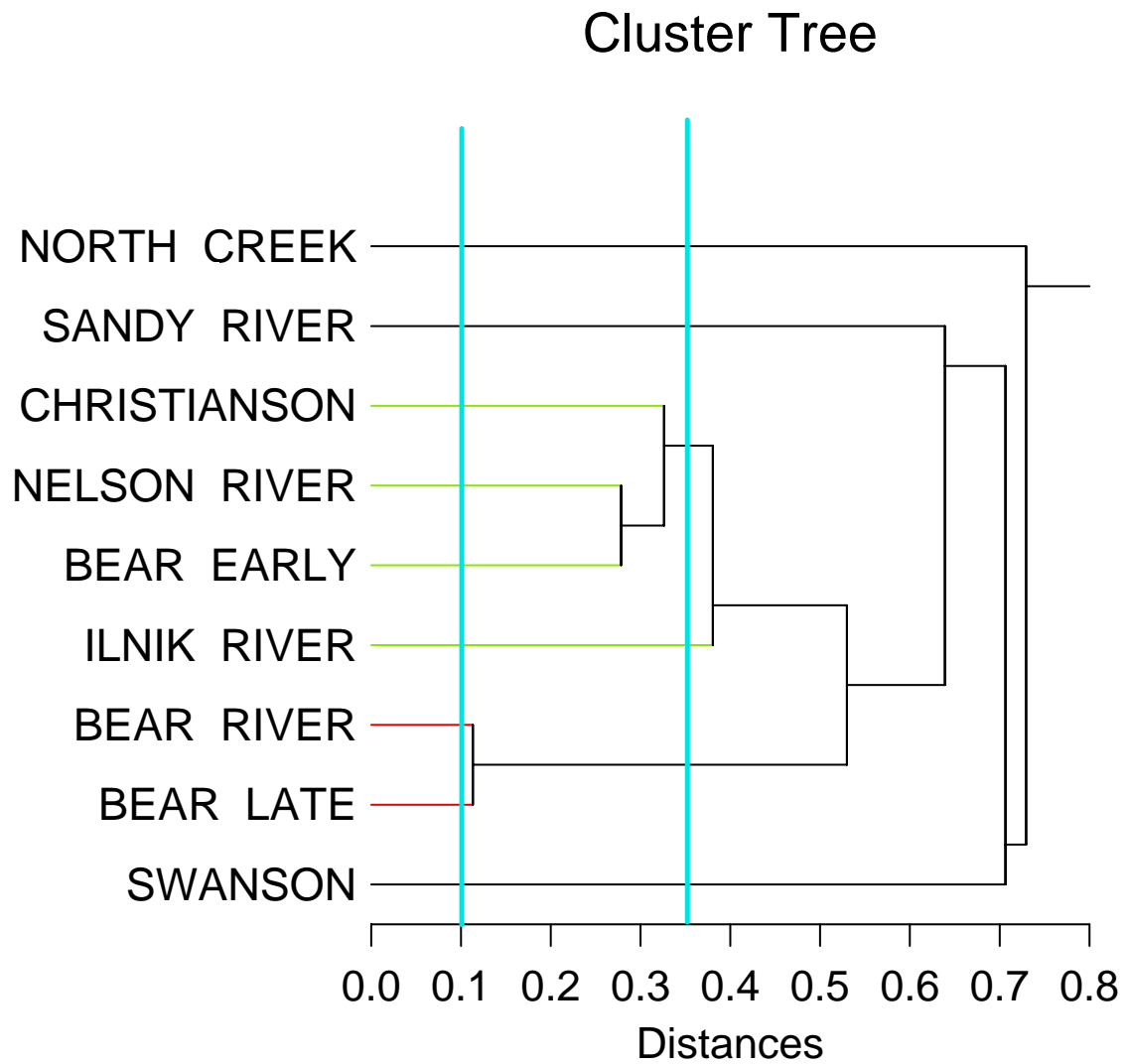
Figure 6.–Cluster Analysis diagram for North Creek, Sandy Lake, Christianson Lagoon, Nelson River, Bear Lake early run, Ilnik River, Bear River total run, Bear River late run, and Swanson Lagoon sockeye salmon. Distances between systems below the vertical line at a distance measure of 0.35 have strong similarities and below the vertical line at 0.10 very strong similarities.

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: 2,400-4,4,00 (2004)
Recommended escapement goal:	No change recommended
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement Enumeration:	Aerial survey, 1963 – present. Tower counts, 1974 – 1987. Weir counts, 1989 – 2005.
Data summary:	
Data quality	Good for aerial survey, tower and weir counts.
Data Type	Escapement either final tower or weir count, or sum aerial survey count conducted in late July with cumulative tower or weir count on that same day, from 1974 to 2005. Stock specific harvest information is available from 1970 to 2005. Harvest age data are available from 1985 to 2003.
Contrast	7.0 for brood years used in analysis
Methodology	Ricker stock-recruit model
Autocorrelation	AR (2)
Criteria for BEG	Habitat-based meta-analysis and Ricker spawner recruit
Comments	Both the habitat and spawner recruit models support the current BEG and no change is recommended.

Appendix A2.–Nelson River Chinook salmon escapement, 1981-2005.

System: Nelson River

Species: Chinook salmon

Data available for analysis of escapement goal.

Year	Total Escapement
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

Appendix A3.–Nelson River Chinook salmon escapement, 1981-2005 and current escapement goal range.

System: **Nelson River**

Species: **Chinook salmon**

Observed escapement by year (solid circles for tower counts, Xs for weir counts), current BEG range of 2,400-4,400 (dashed lines).

Nelson River Chinook Salmon

BEG Range = 2,400 - 4,400
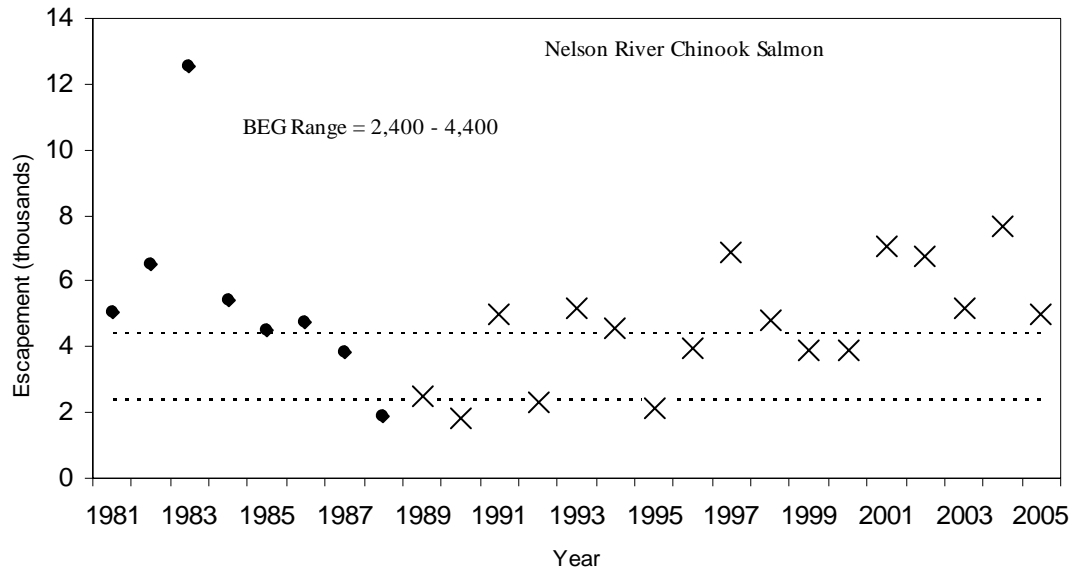
APPENDIX B. SUPPORTING INFORMATION FOR THE ORZINSKI RIVER SOCKEYE SALMON ESCAPEMENT GOAL

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 to 20,000 (1980)
Recommended escapement goal:	No change recommended
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Aerial survey, 1970 – 1989.
	Weir counts, 1990 – present.
Data summary:	
Data quality	Fair for aerial surveys, good for weir enumeration.
Data type	Fixed-wing aerial surveys from 1960 to 1989, weir counts from 1990 to present with escapement age data during weir counts. No stock specific harvest information is available.
Data contrast	62.9 for all data, 5.0 for weir data
Methodology	Percentile
Criteria for SEG	Medium contrast, high exploitation.
Percentiles	15th to 85th
Comments	SEG estimates based on percentile approach reasonably supported the current goal. There was no compelling evidence to change the current goal.

System: **Orzinski Lake**

Species: **Sockeye salmon**

Data available for analysis of escapement goal.

Year	Total Escapement [a]	Peak Aerial Survey	Weir Counts
1970	4,450	4,050	
1971	11,100	6,600	
1972	6,500	6,500	
1973	1,200	1,200	
1974	61,500	40,000	
1975	22,500	17,800	
1976	24,600	24,600	
1977	17,000	14,000	
1978	22,000	13,000	
1979	20,000	20,000	
1980	12,100	12,100	
1981	14,000	14,000	
1982	9,000	9,000	
1983	21,300	21,300	
1984	19,300	18,550	
1985	14,000	14,000	
1986	10,300	10,300	
1987	11,400	11,400	
1988	19,500	16,400	
1989	16,700	12,000	
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

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

Appendix B3.–Orzinski Lake sockeye salmon escapement, 1970-2005 and current escapement goal range.

System: Orzinski Lake

Species: Sockeye salmon

Observed escapement by year (solid circles for aerial surveys, Xs for weir counts) and current SEG range (dashed lines).
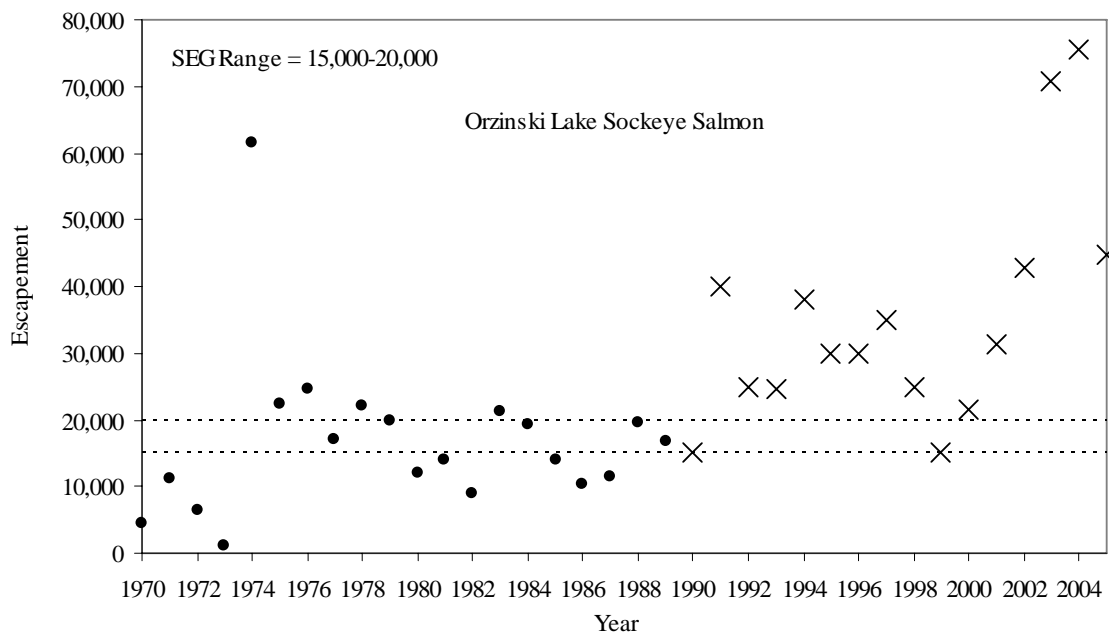
APPENDIX C. SUPPORTING INFORMATION FOR THE THIN POINT LAKE SOCKEYE SALMON ESCAPEMENT GOAL

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

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 set gillnet and purse seine
Current escapement goal:	SEG: 14,000 to 28,000 (late 1980s)
Recommended escapement goal:	No change recommended
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Aerial survey, 1968 – present.
	Weir counts, 1994 –1998.
Data summary:	
Data quality	Fair for aerial surveys, poor for weir counts.
Data type	Fixed-wing aerial surveys from 1968 to present, weir counts from 1994 to 1998 with escapement age data during weir counts. 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.
Data contrast	72.9
Methodology	Percentile
Criteria for SEG	High contrast, high exploitation
Percentile	25th to 75th
Comments	SEG estimates based on percentile approach support the current goal.

Appendix C2.–Thin Point Lake sockeye salmon escapement, 1970-2005.

System: **Thin Point Lake**

Species: **Sockeye salmon**

Data available for analysis of escapement goal.

Year	Index Escapement [a]	Peak Aerial Survey
1970	1,100	770
1971	1,300	800
1972	1,300	700
1973	700	700
1974	16,000	14,000
1975	6,100	4,900
1976	20,500	11,000
1977	17,700	5,000
1978	7,400	5,000
1979	6,900	3,000
1980	12,000	3,300
1981	7,500	2,300
1982	8,800	2,300
1983	6,500	2,400
1984	5,000	900
1985	7,500	4,100
1986	12,400	800
1987	8,700	3,000
1988	23,500	2,000
1989	21,500	1,700
1990	15,000	5,200
1991	35,800	2,800
1992	32,600	4,000
1993	22,600	2,000
1994	25,000	
1995	31,700	
1996	9,000	
1997	10,000	2,000
1998	21,000	
1999	20,500	2,400
2000	12,000	2,700
2001	47,900	3,400
2002	51,000	8,000
2003	40,000	11,200
2004	34,500	9,800
2005	21,000	9,000

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

–Thin Point Lake sockeye salmon escapement, 1970-2005 and current escapement goal range.

System: Thin Point Lake

Species: Sockeye salmon

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

SEG Range = 14,000-28,000   Thin Point Sockeye Salmon
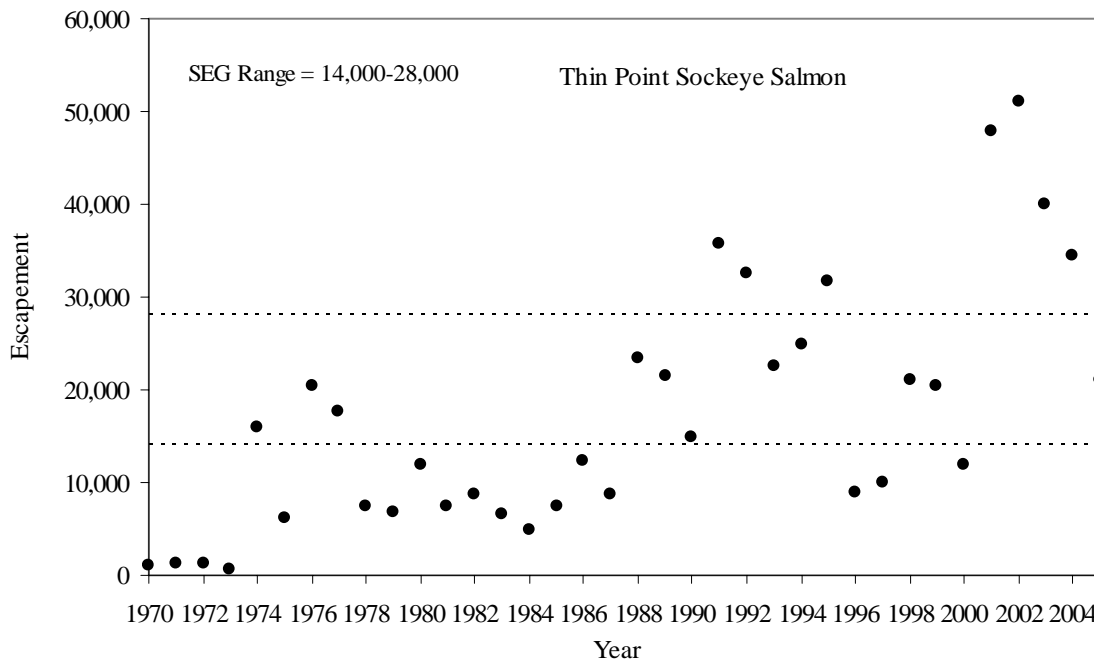
APPENDIX D. SUPPORTING INFORMATION FOR THE MORTENSEN LAGOON SOCKEYE SALMON ESCAPEMENT GOAL

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 set gillnet and purse seine
Current escapement goal:	SEG: 3,200 to 6,400 (late 1980s)
Recommended escapement goal:	No change recommended
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Aerial survey, 1970 – present.
	Weir counts, 2001 – present.
Data summary:	
Data quality	Poor for aerial surveys, good for weir counts.
Data type	Fixed-wing aerial surveys from 1970 to present, weir counts from 2001 to present with escapement age data during weir counts. No stock specific harvest information is available.
Data contrast	27.1
Methodology	Percentile
Criteria for SEG	High contrast, high exploitation
Percentiles	25th to 75th
Comments	SEG estimates based on percentile approach supported the current goal.

Appendix D2.–Mortensens Lagoon sockeye salmon escapement, 1970-2005.

System: **Mortensens Lagoon**

Species: **Sockeye salmon**

Data available for analysis of escapement goal.

Year	Index Escapement [a]	Peak Aerial Survey
1970	800	800
1971	800	800
1972	1,000	1,000
1973	1,250	1,250
1974	3,070	3,070
1975	4,000	4,000
1976	3,400	3,400
1977	5,700	5,700
1978	13,000	13,000
1979	5,900	5,900
1980	2,600	2,100
1981	3,800	2,800
1982	1,800	1,800
1983	5,750	3,400
1984	4,700	4,700
1985	4,400	2,800
1986	1,620	1,400
1987	4,000	3,200
1988	6,000	2,300
1989	4,300	2,400
1990	6,200	1,800
1991	7,100	7,050
1992	9,100	5,700
1993	6,400	4,000
1994	4,300	2,800
1995	8,300	7,900
1996	2,200	1,060
1997	5,200	1,300
1998	5,300	2,100
1999	3,600	1,500
2000	3,800	1,500
2001	9,100	5,500
2002	5,200	4,000
2003	16,804	6,500
2004	7,215	6,400
2005	21,703	17,500

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

Appendix D3.–Mortensens Lagoon sockeye salmon escapement, 1970-2005 and current escapement goal range.

System: Mortensens Lagoon

Species: Sockeye salmon

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

SEG Range = 3,200-6,400

Mortensen Lagoon Sockeye Salmon
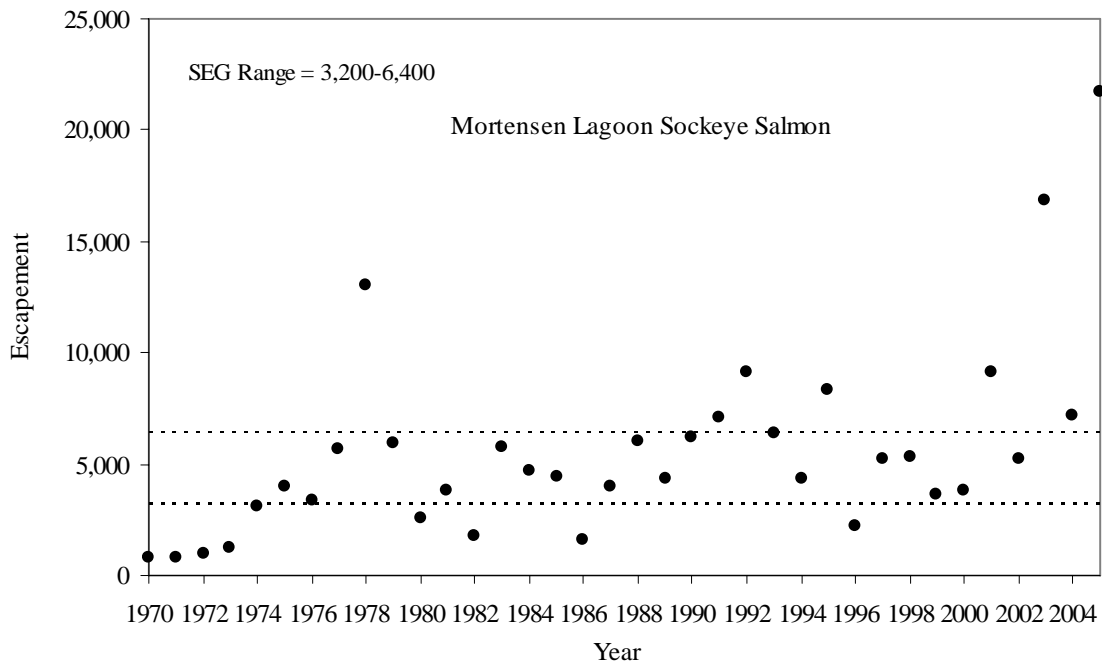
APPENDIX E. SUPPORTING INFORMATION FOR THE MIDDLE LAGOON SOCKEYE SALMON ESCAPEMENT GOAL

System: Middle 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 set gillnet and purse seine
Current escapement goal:	SEG: 16,000 to 32,000 (late 1980s)
Recommended escapement goal:	Eliminate current goal
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Aerial survey, 1960 – present.
	Weir counts 1995 and 1996
Data summary:	
Data quality	Poor
Data type	Fixed-wing aerial surveys from 1960 to present, intermittent in 1960s. No stock specific harvest information is available.
Data contrast	91.2
Methodology	Percentile
Criteria for SEG	High contrast, moderate exploitation
Percentiles	25th to 75th
Comments	Due to the difficulty of inseason management, cluster analysis results, and the interest in this system by user groups, the team recommends eliminating the current SEG

System: Middle Lagoon

Species: sockeye salmon

Data available for analysis of escapement goal.

Year	Index Escapement [a]	Peak Aerial Survey
1972	500	160
1973	900	1,000
1974	15,000	5,000
1975	5,700	500
1976	3,200	1,060
1977	9,000	3,000
1978	4,900	1,620
1979	900	2,500
1980	3,000	2,000
1981	1,200	1,000
1982	5,800	2,000
1983	2,600	3,600
1984	900	900
1985	7,500	2,500
1986	16,200	5,400
1987	21,000	7,000
1988	7,200	5,700
1989	14,000	8,000
1990	40,300	14,100
1991	16,500	7,100
1992	9,300	5,500
1993	25,500	13,700
1994	29,100	10,300
1995	40,700	21,000
1996	11,600	3,900
1997	23,500	10,400
1998	20,500	10,000
1999	23,600	13,700
2000	14,400	6,000
2001	45,600	20,500
2002	39,000	23,000
2003	27,300	13,800
2004	39,400	14,400
2005	7,000	4,400

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

Appendix E3.–Middle Lagoon sockeye salmon escapement, 1972-2005 and current escapement goal range.

System: **Middle Lagoon**

Species: **Sockeye salmon**

Observed escapement by year (solid circles) and current SEG range (dashed lines).
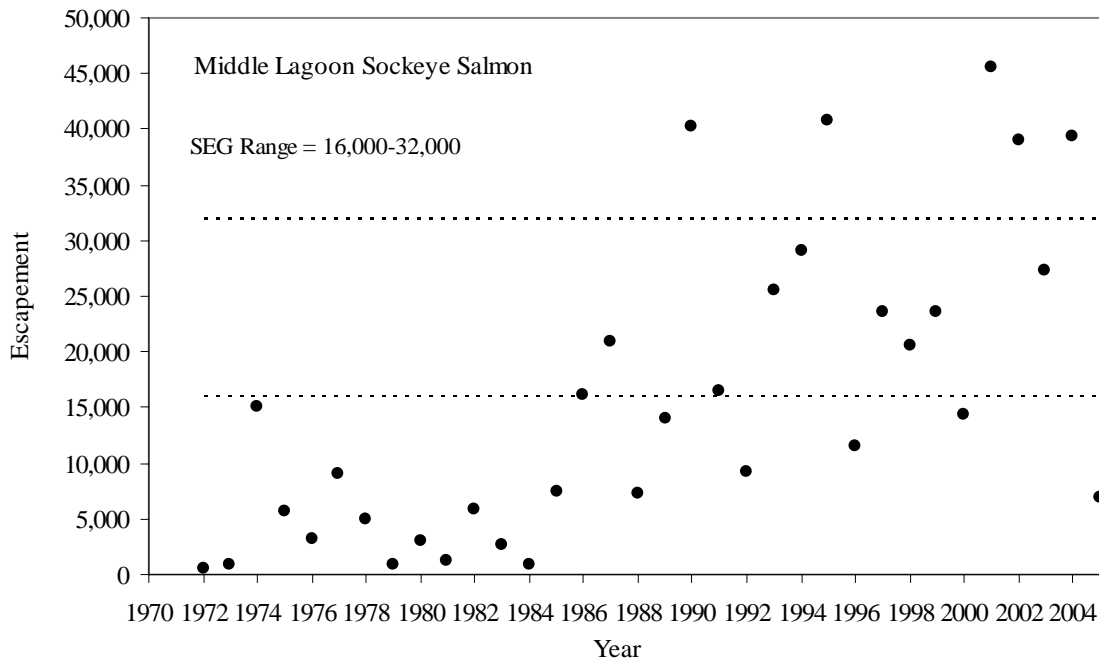
APPENDIX F. SUPPORTING INFORMATION FOR THE CHRISTIANSON LAGOON SOCKEYE SALMON ESCAPEMENT GOAL

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

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 and drift gillnet
Current escapement goal:	SEG: 25,000 to 50,000 (1980s)
Recommended escapement goal:	No change recommended
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Aerial survey, 1971 – present.
Data summary:	
Data quality	Poor
Data type	Fixed-wing aerial surveys from 1960 to present, intermittent during 1960s. No stock specific harvest information is available.
Data contrast	24.3
Methodology	Percentile
Criteria for SEG	High contrast, high exploitation
Percentiles	25th to 75th
Comments	SEG estimates based on percentile approach support the current goal.

Appendix F2.–Christianson Lagoon sockeye salmon escapement, 1971-2005.

System: **Christianson Lagoon**

Species: **Sockeye salmon**

Data available for analysis of escapement goal.

| Year	Index Escapement [a]	Peak Aerial Survey
1970		
1971	29,500	29,540
1972	3,900	4,330
1973	4,100	4,070
1974	3,100	3,050
1975	10,400	10,400
1976	19,400	21,035
1977	13,700	2,200
1978	10,200	10,150
1979	25,600	24,700
1980	75,300	60,700
1981	59,100	59,100
1982	25,500	25,500
1983	13,500	13,300
1984	63,000	63,000
1985	25,800	25,700
1986	36,800	36,800
1987	24,200	22,300
1988	29,700	29,700
1989	46,700	44,700
1990	45,600	43,600
1991	64,900	61,900
1992	28,000	27,500
1993	30,600	44,700
1994	37,800	37,800
1995	41,800	41,800
1996	25,600	18,260
1997	33,200	33,300
1998	38,600	34,800
1999	48,000	48,000
2000	49,400	45,000
2001	36,400	36,400
2002	42,700	54,700
2003	52,200	52,200
2004	75,400	75,400
2005	54,500	51,300

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

Appendix F3.–Christianson Lagoon sockeye salmon escapement, 1970-2005 and the current escapement goal range.

System: **Christianson Lagoon**

Species: **Sockeye salmon**

Observed escapement by year (solid circles) and current SEG range (dashed lines).
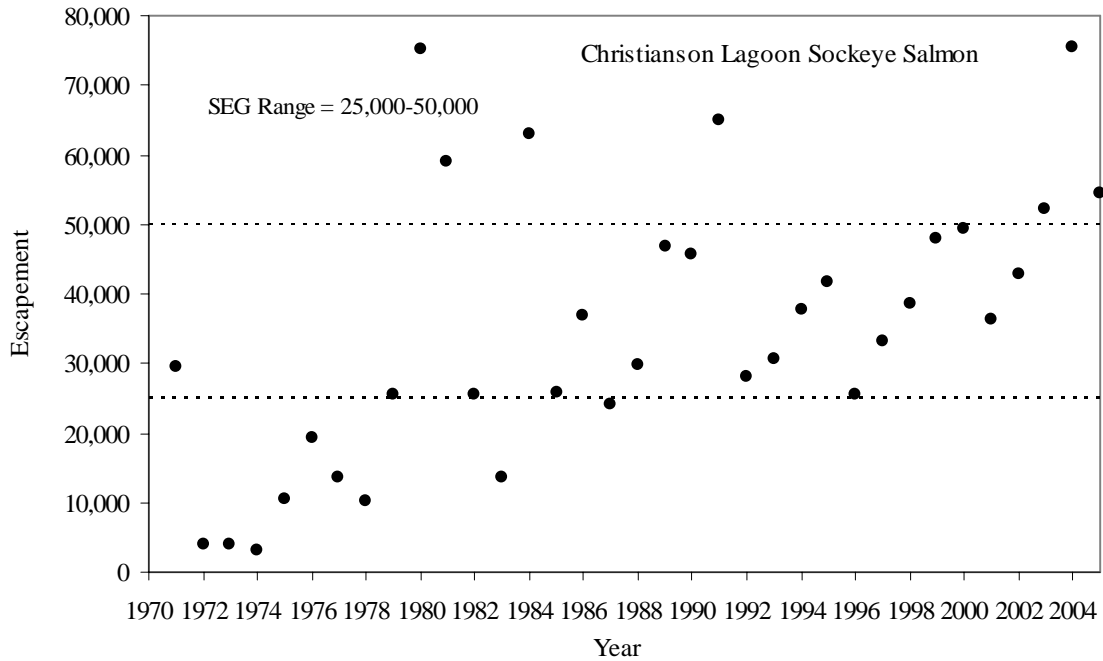
APPENDIX G. SUPPORTING INFORMATION FOR THE SWANSON LAGOON SOCKEYE SALMON ESCAPEMENT GOAL

Appendix G1.–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: 8,000 to 16,000 (1990)
Recommended escapement goal:	SEG: 6,000 to 16,000
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Aerial survey, 1960 – present.

Data summary:

Data quality	Poor
Data type	Fixed-wing aerial surveys from 1960 to present. No stock specific harvest information is available.
Data contrast	329.0
Methodology	Percentile
Criteria for SEG	High contrast, low exploitation.
Percentiles	15th to 75th
Comments	Data uncertainty, trends in the current escapement levels from 1990 to 2005, and the results of the percentile approach support changing the lower range of the SEG.

System: **Swanson Lagoon**

Species: **Sockeye salmon**

Data available for analysis of escapement goal.

| Year	Index Escapement [a]	Peak Aerial Survey
1970	700	475
1971	300	50
1972	200	320
1973	100	50
1974	500	360
1975	1,400	70
1976	2,600	2,000
1977	12,000	10,700
1978	8,100	8,500
1979	8,400	6,600
1980	9,700	2,700
1981	600	500
1982	1,800	1,500
1983	300	300
1984	5,500	2,800
1985	3,400	3,100
1986	7,400	5,700
1987	9,600	8,700
1988	5,700	3,000
1989	5,500	2,700
1990	32,900	31,000
1991	11,200	10,000
1992	15,400	6,900
1993	7,600	5,800
1994	9,700	6,600
1995	10,300	7,000
1996	9,300	1,260
1997	7,800	2,000
1998	5,000	4,100
1999	7,900	5,700
2000	5,700	1,500
2001	10,600	8,600
2002	10,000	8,500
2003	16,100	15,800
2004	24,300	24,300
2005	3,500	3,500

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

Appendix G3.–Swanson Lagoon sockeye salmon escapement, 1970-2005 and the current escapement goal range.

System:　　Swanson Lagoon

Species:　　Sockeye salmon

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

Swansons Lagoon Sockeye Salmon

SEG Range = 8,000-16,000
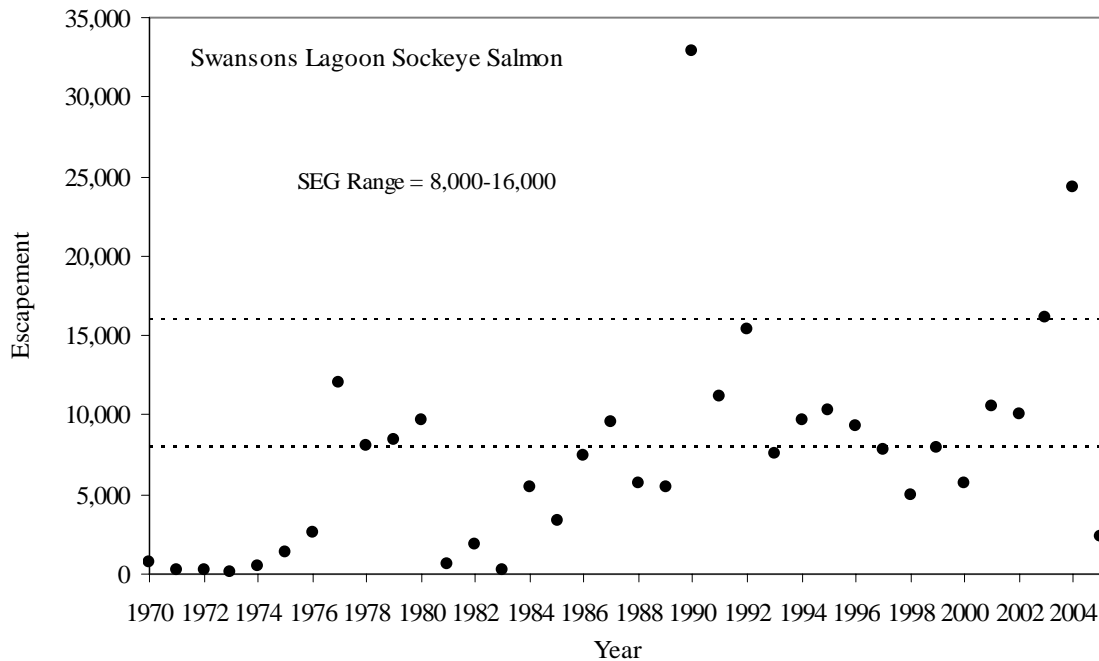
APPENDIX H. SUPPORTING INFORMATION FOR THE NORTH CREEK SOCKEYE SALMON ESCAPEMENT GOAL

Appendix H1.-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 drift and set gillnet
Current escapement goal:	SEG: 4,400 to 8,800 (late 1980s)
Recommended escapement goal:	No change recommended
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Aerial survey, 1960 – present.
Data summary:	
Data quality	Poor
Data type	Fixed-wing aerial surveys from 1960 to present. No stock specific harvest information is available.
Data contrast	90.0
Methodology	Percentile
Criteria for SEG	High contrast, high exploitation
Percentiles	25th to 75th
Comments	SEG estimates based on percentile approach support the current goal.

Appendix H2.–North Creek sockeye salmon escapement, 1970-2005.

System: North Creek

Species: Sockeye salmon

Data available for analysis of escapement goal.

| Year	Index Escapement [a]	Peak Aerial Survey
1970	600	600
1971		0
1972		0
1973		0
1974	1,800	1,800
1975	1,700	1,650
1976	7,100	7,000
1977	3,300	3,300
1978	500	500
1979	2,100	2,100
1980	3,400	3,350
1981		100
1982	5,800	5,800
1983	2,000	2,000
1984	500	500
1985	3,600	3,600
1986	2,100	2,100
1987	8,300	8,300
1988	6,300	6,300
1989	7,000	7,000
1990	4,300	5,100
1991	9,000	9,900
1992	15,700	15,700
1993	9,700	6,600
1994	4,600	4,600
1995	3,400	3,400
1996	8,000	8,000
1997	5,700	5,700
1998	6,700	6,700
1999	10,900	10,900
2000	8,100	8,100
2001	8,000	8,000
2002	10,100	10,100
2003	10,200	0
2004	15,000	15,000
2005	45,000	45,000

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

Appendix H3.–North Creek sockeye salmon escapement, 1970-2005 and current escapement goal range.

System: North Creek

Species: Sockeye salmon

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

North Creek Sockeye Salmon

SEG Range = 4,400-8,800
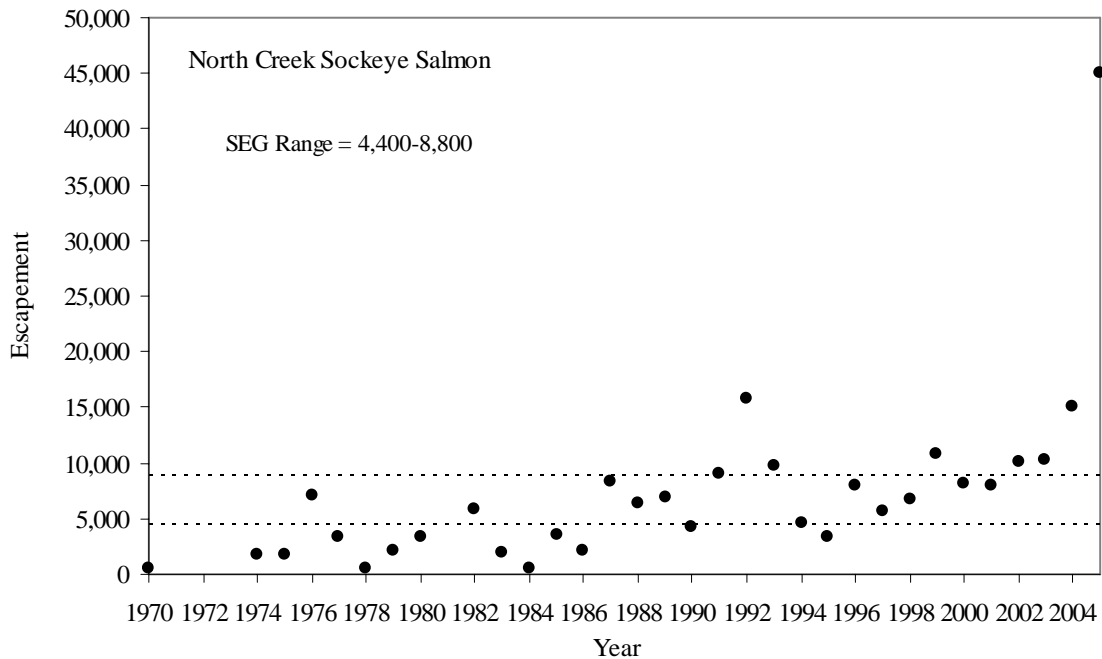
APPENDIX I. SUPPORTING INFORMATION FOR THE NELSON RIVER SOCKEYE SALMON ESCAPEMENT GOAL

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 drift and set gillnet
Current escapement goal:	BEG: 97,000 to 219,000 (2004)
Recommended escapement goal:	No change recommended
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Tower counts, 1962 – 1988.
	Weir counts, 1989 – present.
Data summary:	
Data quality	Good for tower counts, excellent for weir counts.
Data type	Tower counts from 1962 to 1988 and weir counts from 1989 to 2003. Escapement age data are available from 1985 to 2005 and harvest age data are available from 1985 to 2005. Stock specific harvest information is available from 1970 to 2005.
Contrast	86.4 (tower and weir), 3.0 (weir only), 4.8 (1976-2005: data used for Ricker analysis.
Methodology	Ricker stock-recruit model
Autocorrelation	None
Comments	Ricker curve using 1975-1998 brood years was significant using multiplicative error and supports the existing BEG

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

Appendix I3.–Nelson River sockeye salmon escapement, 1970-2005 and current escapement goal range.

System: Nelson River

Species: Sockeye salmon

Observed escapement by year (solid circles for aerial surveys, Xs for weir counts) and current BEG range (dashed lines).

BEG Range = 97,000-219,000   Nelson River Sockeye Salmon
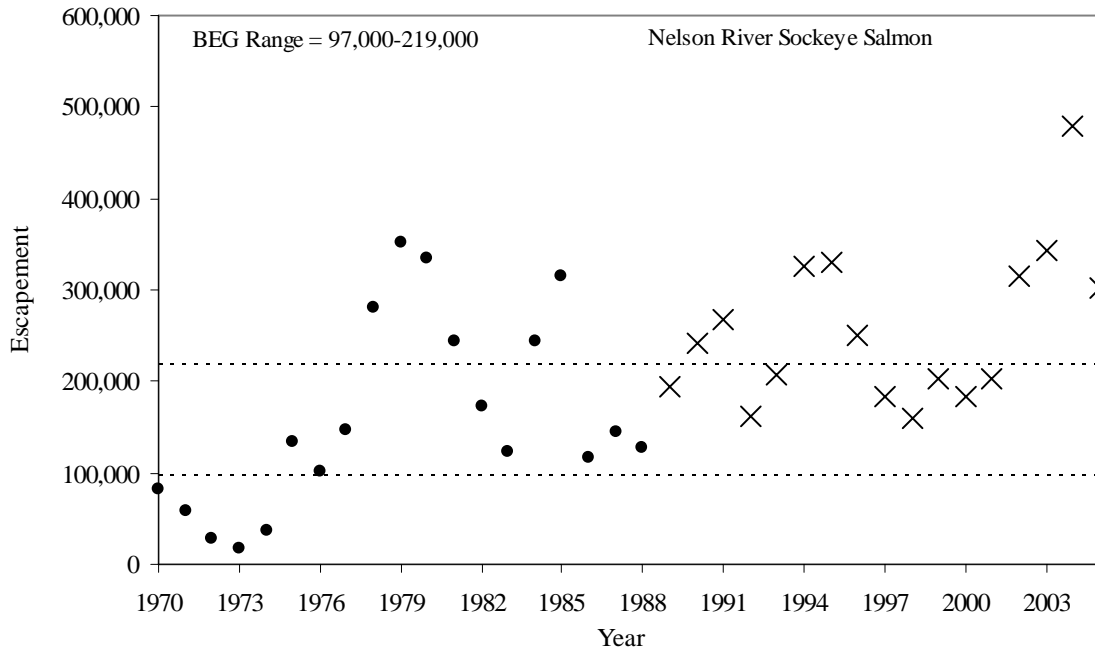
APPENDIX J. SUPPORTING INFORMATION FOR THE BEAR LAKE SOCKEYE SALMON ESCAPEMENT GOAL

System: Bear Lake total run

Species: Sockeye salmon

Description of stocks and escapement goals.

Regulatory area	Alaska Peninsula Management Area – Westward Region
Management division:	Commercial Fisheries
Primary fishery:	Commercial purse seine and drift gillnet
Current escapement goals:	SEG: Early Run: 176,000 to 293,000 (2004)
	SEG: Late Run: 117,000 to 195,000 (2004)
	SEG: Total Run: 293,000 to 488,000 (2004)
Recommended escapement goals:	No change recommended
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Tower counts, 1964 – 1990.
	Weir counts, 1991 – present.
Data summary:	
Data quality	Good for tower counts, excellent for weir counts.
Data type	Tower counts from 1964 to 1990, weir counts from 1991 to 2005. Escapement age data are available from 1985 to 2005 and harvest age data are available from 1985 to 2005 for the late run (after July 31). Stock specific harvest information is available for the late run from 1970 to 2003. No stock specific harvest information is available for the early run (prior to August 1).
Data contrast	7.8 (early), 27.7 (late), 8.3 (total)
Methodology	Percentile, Euphotic volume analysis, Smolt biomass as a function of zooplankton biomass
Criteria for SEG	Medium contrast (early), high contrast (late and total), high exploitation
Percentiles	15th to 85th (early), 25th to 75th (late), 15th to 85th (total)
Comments	Limnological data, 1993 – 1995 and 2000 – 2005. Smolt age and size data from grab samples are variably available from 1967 to 2003. The Bear Lake system is considered spawner-limited.

Appendix J2.–Bear Lake early-run sockeye salmon escapement, 1964-2005.

System: **Bear Lake early run**

Species: **Sockeye salmon**

Data available for analysis of escapement goals.

Year	Tower Counts	Weir Counts
1964	152,336	
1965	60,211	
1966	104,237	
1967	134,696	
1968	63,235	
1969	164,820	
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		173,579
1987		174,605
1988		172,340
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		178,480
2003		226,201
2004		354,565
2005		332,248

System: Bear Lake early run

Species: Sockeye salmon

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

Appendix J4.–Bear Lake late-run sockeye salmon escapement, 1964-2005.

Year	Tower Counts	Weir Counts
1964	137,664	
1965	54,789	
1966	75,763	
1967	35,304	
1968	86,765	
1969	196,180	
1970	121,633	
1971	185,050	
1972	20,429	
1973	34,002	
1974	106,495	
1975	131,207	
1976	121,865	
1977	61,617	
1978	418,472	
1979	567,387	
1980	238,038	
1981	214,728	
1982	104,503	
1983	172,143	
1984	108,151	
1985	170,739	
1986		98,921
1987		83,395
1988		140,660
1989		204,804
1990		262,946
1991		173,913
1992		195,830
1993		197,988
1994		204,441
1995		107,961
1996		119,629
1997		145,311
1998		193,420
1999		127,890
2000		90,947
2001		122,505
2002		96,520
2003		139,799
2004		80,435
2005		221,752

Appendix J5.–Bear Lake late-run sockeye salmon escapement, 1964-2005 and current escapement goal range.
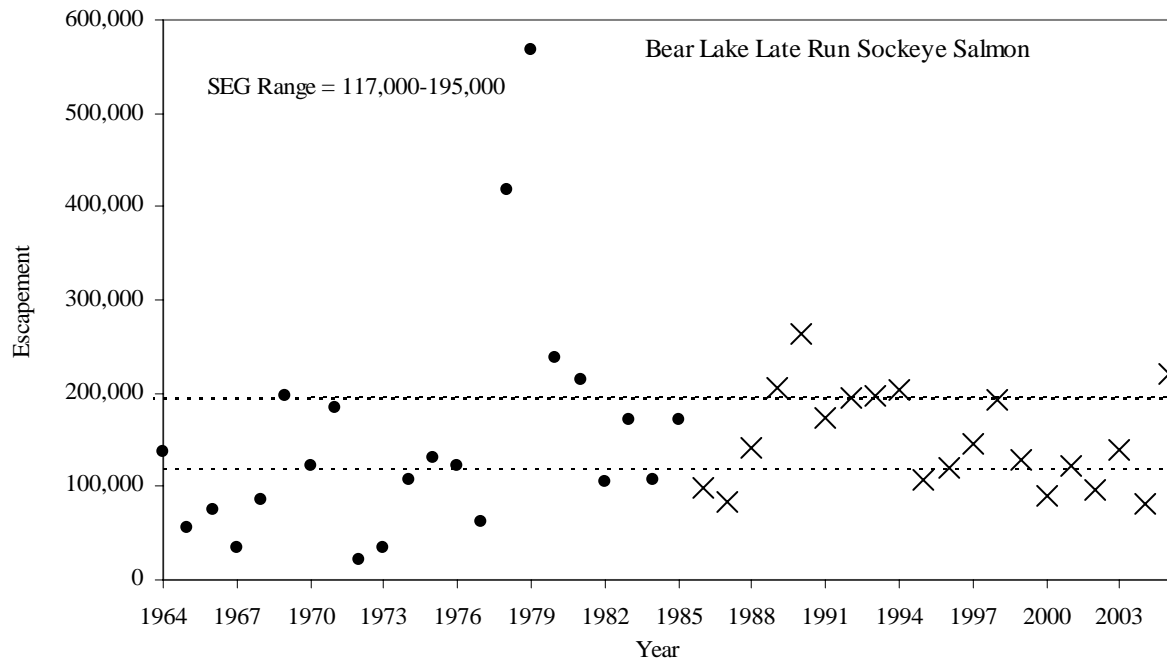
Appendix J6.–Bear Lake total-run sockeye salmon escapement, 1964-2005.

Year	Tower Counts	Weir Counts
1964	290,000	
1965	115,000	
1966	180,000	
1967	170,000	
1968	150,000	
1969	361,000	
1970	269,000	
1971	251,000	
1972	127,000	
1973	125,000	
1974	250,000	
1975	270,000	
1976	285,000	
1977	215,000	
1978	730,000	
1979	952,000	
1980	675,000	
1981	690,000	
1982	300,000	
1983	330,000	
1984	395,000	
1985	440,000	
1986		272,500
1987		258,000
1988		313,000
1989		451,000
1990		546,800
1991		606,000
1992		450,000
1993		452,000
1994		465,000
1995		305,000
1996		367,000
1997		360,000
1998		415,000
1999		350,000
2000		275,000
2001		300,000
2002		275,000
2003		366,000
2004		435,000
2005		554,000

Appendix J7.–Bear Lake total-run sockeye salmon escapement, 1964-2005 and current escapement goal range.

SEG Range = 293,000-488,000

Bear LakeTotal Run Sockeye Salmon
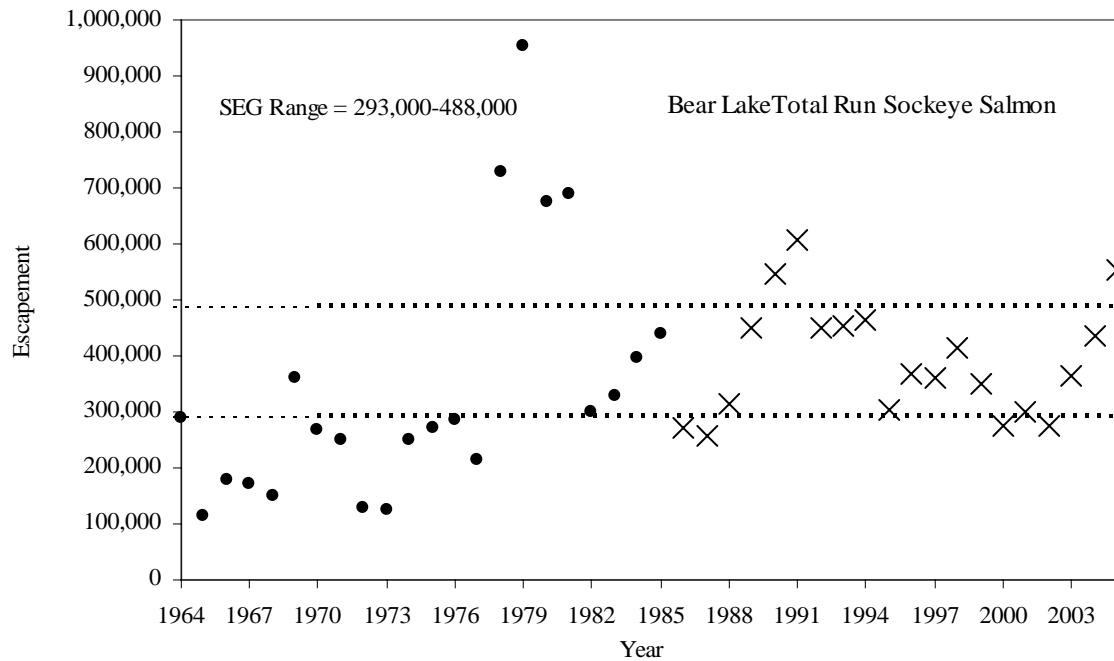
APPENDIX K. SUPPORTING INFORMATION FOR THE SANDY RIVER SOCKEYE SALMON ESCAPEMENT GOAL

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

System: Sandy 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 purse seine and drift gillnet
Current escapement goal:	SEG: 40,000 to 60,000 (1994)
Recommended escapement goal:	SEG: 34,000 to 74,000
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Aerial survey, 1960 – 1993.
	Tower counts, 1962 – 1964.
	Weir counts, 1994 – present.
Data summary:	
Data quality	Fair for aerial survey/tower counts, good for weir counts.
Data type	Weir counts from 1994 to 2005 are available and escapement age information is available during weir counts. No stock specific harvest information is available.
Data contrast	14.9 (aerial and weir), 3.9 (weir only)
Methodology	Percentile
Criteria for SEG	High contrast, low exploitation
Percentiles	15th to 75th
Comments	Percentile analysis using adjusted aerial surveys and weir counts indicate 34,000 to 74,000 is a more appropriate goal.

System: Sandy River

Species: Sockeye salmon

Data available for analysis of escapement goal.

Year	Total Escapement [a]	Peak Aerial Survey	Weir Counts
1970	25,000	21,800	
1971	30,000	30,000	
1972	8,400	8,400	
1973	5,100	10,000	
1974	16,500	16,500	
1975	40,000	38,350	
1976	43,000	43,050	
1977	100,000	100,000	
1978	64,000	64,000	
1979	61,000	61,000	
1980	76,000	76,000	
1981	51,500	51,700	
1982	61,300	57,200	
1983	28,000	28,000	
1984	19,000	19,000	
1985	11,500	11,000	
1986	6,900	14,000	
1987	8,900	8,900	
1988	34,500	34,500	
1989	36,000	36,000	
1990	17,500	17,500	
1991	75,200	75,200	
1992	21,200	8,900	
1993	49,300	46,300	
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

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

System: **Sandy River**

Species:Sockeye salmon

Observed escapement by year (solid circles for aerial surveys, Xs for weir counts) and current SEG range (dashed lines).
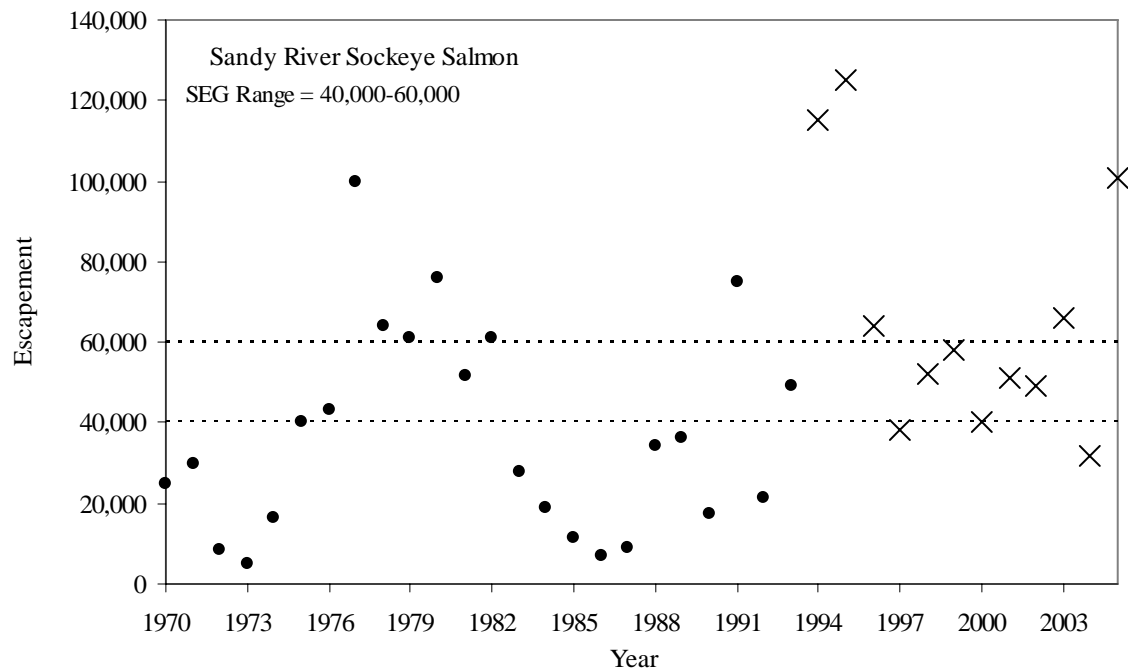
APPENDIX L. SUPPORTING INFORMATION FOR THE ILNIK RIVER SOCKEYE SALMON ESCAPEMENT GOAL

Appendix L1.–Description of stock and escapement goal for Ilnik River sockeye salmon.

System: Ilnik 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 drift and set gillnet
Current escapement goal:	SEG: 40,000 to 60,000 (1991)
Recommended escapement goal:	No change recommended
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Aerial survey, 1970 – 1990.
	Weir count, 1991 – present.
Data summary:	
Data quality	Fair for aerial surveys, good for weir counts.
Data type	Fixed-wing aerial surveys from 1960 to 1990, intermittent during 1960s. Weir counts from 1991 to 2005 with escapement age data available during weir counts. No stock specific harvest information is available.
Data contrast	3.9
Methodology	Percentile method
Criteria for SEG	Low contrast, high exploitation
Percentiles	15th to maximum
Comments	Current escapement levels have produced sufficient returns for escapement and harvestable surplus, no change is warranted.

System: Ilnik River

Species: Sockeye salmon

Data available for analysis of escapement goal.

Year	Total Escapement [a]	Peak Aerial Survey	Weir Counts
1970	15,300	14,200	
1971	26,100	25,100	
1972	13,100	11,050	
1973	16,000	14,800	
1974	14,500	9,100	
1975	40,500	18,800	
1976	37,500	37,500	
1977	30,000	30,000	
1978	23,100	23,100	
1979	97,200	85,200	
1980	97,600	115,000	
1981	97,500	97,500	
1982	42,500	86,800	
1983	28,600	38,800	
1984	29,500	29,500	
1985	27,000	23,100	
1986	66,800	52,900	
1987	30,700	21,900	
1988	26,900	22,600	
1989	16,500	15,300	
1990	35,700	32,100	
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

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

Appendix L3.–Ilnik River sockeye salmon escapement, 1970-2005 and current escapement goal range.

System: Ilnik River

Species: Sockeye salmon

Observed escapement by year (solid circles for aerial surveys, Xs for weir counts) and current SEG range (dashed lines).
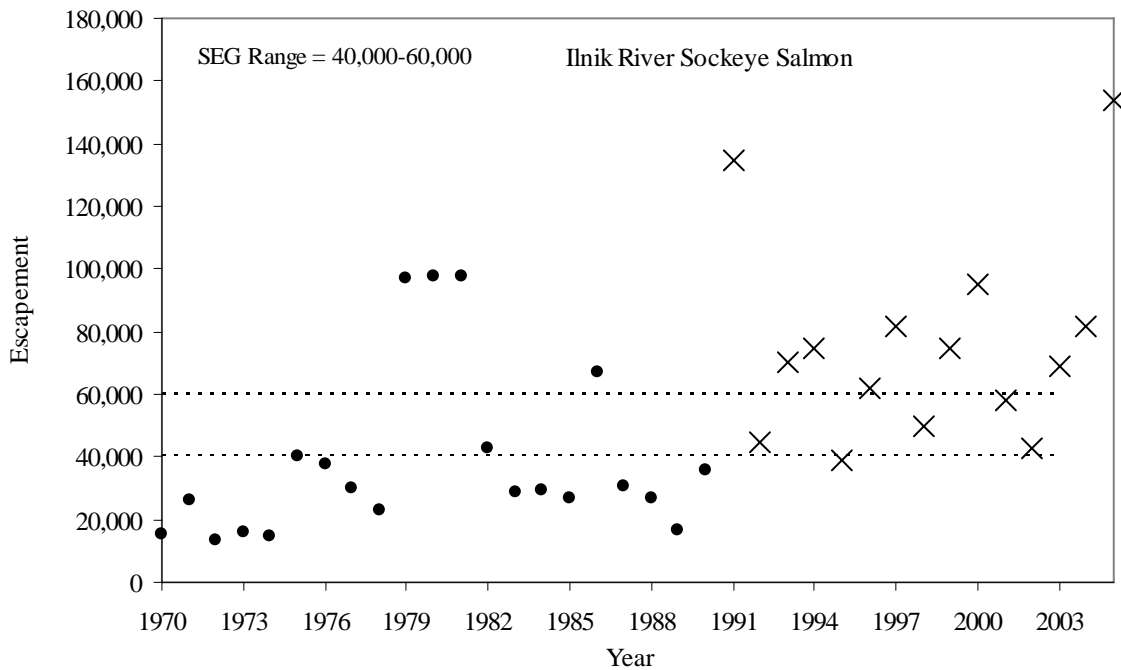
APPENDIX M. SUPPORTING INFORMATION FOR THE MESHIK RIVER SOCKEYE SALMON ESCAPEMENT GOAL

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

System: Meshik 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 drift and set gillnet

Current escapement goal: SEG: 10,000 to 20,000 (late 1980s)

Recommended escapement goal: SEG: 20,000 to 60,000

Optimal escapement goal: none

Inriver goal: none

Action points: none

Escapement enumeration: Aerial survey, 1970 – 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   131.4

   Methodology   Percentile

   Criteria for SEG   High contrast, low exploitation

   Percentiles 15th to 75th

   Comments   Aerial surveys from 1990 to present represent better quality aerial surveys. SEG recommended using the percentile method from those years.

Appendix M2.–Meshik River sockeye salmon escapement, 1970-2005.

System: Meshik River

Species: Sockeye salmon

Data available for analysis of escapement goal.

Year	Index Escapement [a]	Peak Aerial Survey
1970	13,100	4,750
1971	29,300	11,520
1972	3,700	3,700
1973	6,500	4,990
1974	1,200	980
1975	4,800	2,500
1976	25,500	21,650
1977	15,100	14,000
1978	17,900	14,860
1979	93,100	29,880
1980		15,000
1981		23,700
1982		13,725
1983	8,850	
1984	25,500	18,150
1985	26,500	9,500
1986		28,050
1987	26,300	26,275
1988	27,000	18,880
1989	5,700	6,010
1990	22,550	22,540
1991	19,480	19,480
1992	21,100	15,000
1993		
1994	35,700	35,700
1995	67,600	52,030
1996	59,850	59,850
1997		12,600
1998	51,400	48,200
1999	62,200	33,100
2000	157,700	121,500
2001	100,500	100,500
2002	47,250	36,150
2003	94,000	83,600
2004	82,200	40,000
2005	96,100	64,000

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

Appendix M3.–Meshik River sockeye salmon escapement, 1970-2005 and current escapement goal range.

System: Meshik River

Species: Sockeye salmon

Observed escapement by year (solid circles) and current SEG range (dashed lines).
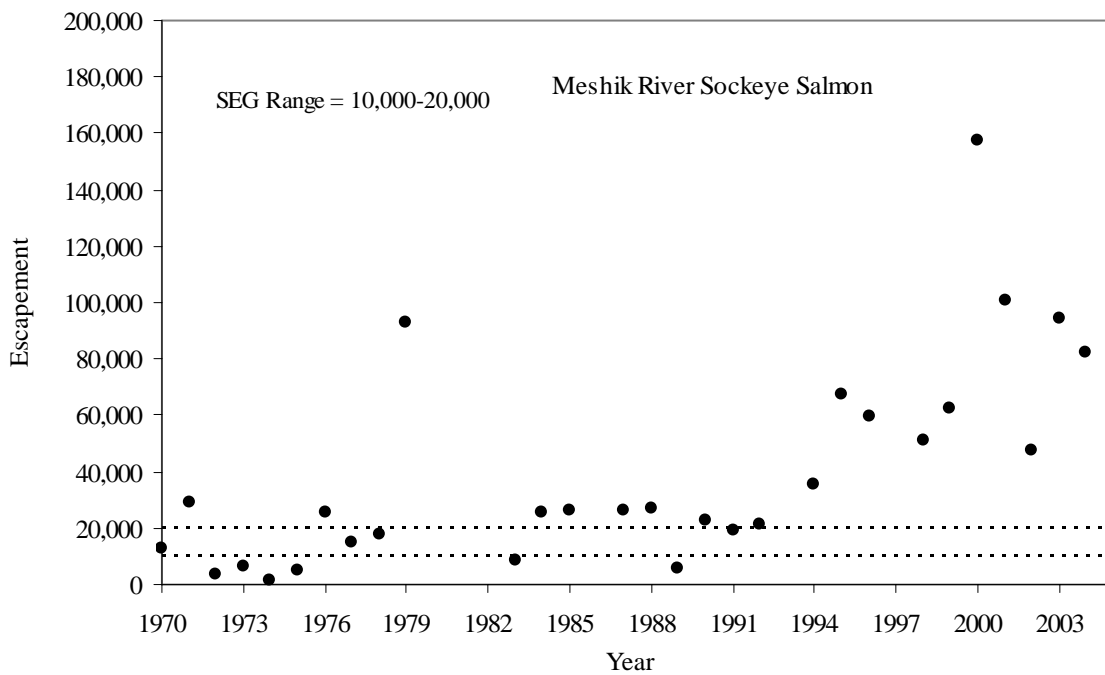
APPENDIX N. SUPPORTING INFORMATION FOR THE CINDER RIVER SOCKEYE SALMON ESCAPEMENT GOAL

Appendix N1.–Description of stock and escapement goal for Cinder River sockeye salmon.

System: Cinder 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 drift and set gillnet
Current escapement goal:	SEG: 6,000 to 12,000 (late 1980s)
Recommended escapement goal:	SEG: 12,000 to 48,000
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Aerial survey, 1970 – 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	793.3
Methodology	Percentile
Criteria for SEG	High contrast, low exploitation
Percentiles	15th to 75th
Comments	Aerial surveys from 1990 to present represent better quality aerial surveys. SEG recommended using the percentile method from those years.

Appendix N2.–Cinder River sockeye salmon escapement, 1970-2005.

System: **Cinder River**

Species: **Sockeye salmon**

Data available for analysis of escapement goal.

Year	Index Escapement [a]	Peak Aerial Survey
1970	950	925
1971	2,300	1,810
1972	450	330
1973	2,250	2,250
1974	1,300	1,280
1975	300	260
1976	8,500	5,800
1977		3,900
1978	3,300	2,900
1979	5,000	4,680
1980	23,400	23,360
1981	100,750	100,750
1982		
1983		
1984	10,350	10,325
1985	11,650	11,650
1986	25,650	25,650
1987	127	12,700
1988	1,800	1,810
1989	3,950	3,950
1990	11,850	11,830
1991	39,300	34,800
1992	11,300	11,300
1993		
1994	83,400	83,400
1995	47,500	43,000
1996		
1997	44,000	44,000
1998	57,000	42,900
1999	12,400	12,000
2000	51,000	48,800
2001		51,204
2002	11,500	10,290
2003	88,700	88,700
2004	55,050	25,000
2005	96,100	46,000

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

Appendix N3.–Cinder River sockeye salmon escapement, 1970-2005 and current escapement goal range.

System: Cinder River

Species: Sockeye salmon

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

Cinder River Sockeye Salmon

SEG Range = 6,000-12,000
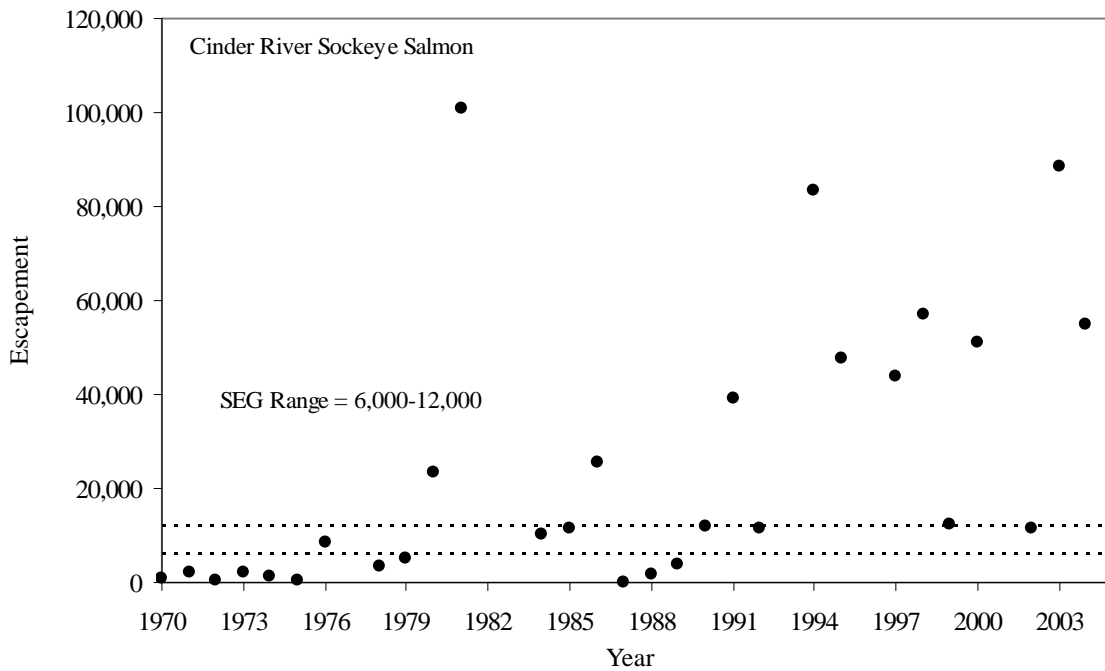
APPENDIX O. SUPPORTING INFORMATION FOR THE MCLEES LAKE SOCKEYE SALMON ESCAPEMENT GOAL

Appendix O1.–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 – Westward Region
Management division:	Commercial Fisheries
Primary fishery:	Commercial purse seine
Current escapement goal:	None (eliminated in 2004)
Recommended escapement goal:	No change recommended
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Aerial survey, 1974– 2003.
	Weir counts, 2001 – present.
Data summary:	
Data quality	Fair for aerial survey counts, good for weir counts.
Data type	No stock specific harvest information is available.
Data contrast	349.8
Methodology	Percentile
Criteria for SEG	High contrast, low exploitation
Percentiles	15th to 75th
Comments	Will reevaluate in three years.

System: **McLees Lake**

Species: **Sockeye salmon**

Data available for analysis of escapement goal.

Year	Peak Aerial Survey[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	45,866
2002	58,000	97,780
2003	14,500	101,793
2004		40,328
2005		12,097

[a] The 1994 peak survey estimate of 16,500 pink salmon was changed to sockeye salmon based on qualitative information concerning the aerial surveyor, timing, and historic species identified in the lake.

System: **McLees Lake**

Species: **Sockeye salmon**

Observed escapement by year (solid circles for aerial surveys, Xs for weir counts).
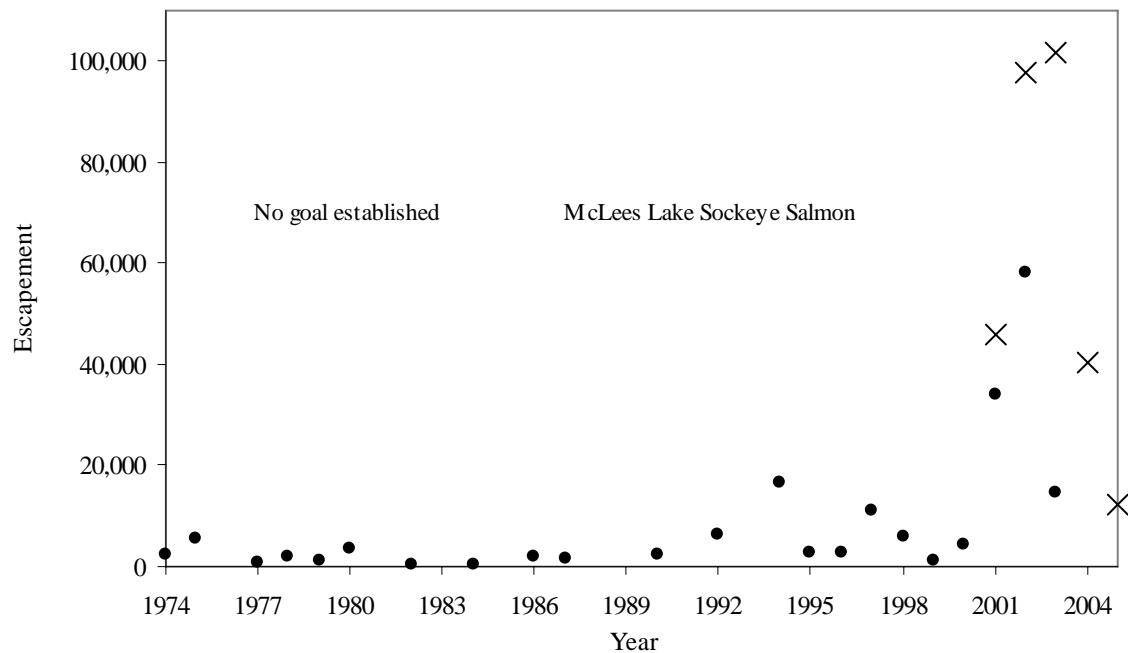
APPENDIX P. SUPPORTING INFORMATION FOR THE THIN POINT LAKE COHO SALMON ESCAPEMENT GOAL

Appendix P1.–Description of stock and escapement goal for Thin Point Lake coho salmon.

System: Thin Point Lake

Species: Coho salmon

Description of stock and escapement goal.

Regulatory area	Alaska Peninsula Management Area – Westward Region
Management division:	Commercial Fisheries
Primary fishery:	Commercial drift and set gillnet
Current escapement goal:	SEG Threshold: 3,000 (2004)
Recommended escapement goal:	No change recommended
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Aerial survey, 1968– present.
Data summary:	
Data quality	Fair for aerial survey counts.
Data type	Fixed-wing aerial surveys from most years during 1968 to present. No stock specific harvest information is available.
Data contrast	280.0
Methodology	None
Comments	Since the 2004 and 2005 escapements were well above the threshold, no further analyses were deemed necessary.

System: Thin Point Lake

Species: Coho salmon

Data available for analysis of escapement goal.

Year	Peak Survey
1968	700
1969	5,000
1970	600
1971	
1972	
1973	100
1974	
1975	100
1976	200
1977	4,700
1978	600
1979	
1980	2,000
1981	1,300
1982	900
1983	
1984	
1985	3,500
1986	1,000
1987	400
1988	5,000
1989	4,800
1990	4,200
1991	1,200
1992	15,000
1993	3,200
1994	13,000
1995	13,000
1996	11,000
1997	3,500
1998	4,400
1999	5,000
2000	20,000
2001	28,000
2002	18,000
2003	25,000
2004	9,600
2005	17,500

System: **Thin Point Lake**

Species: **Coho salmon**

Observed escapement by year (solid circles for aerial surveys) and current SEG (dashed line).
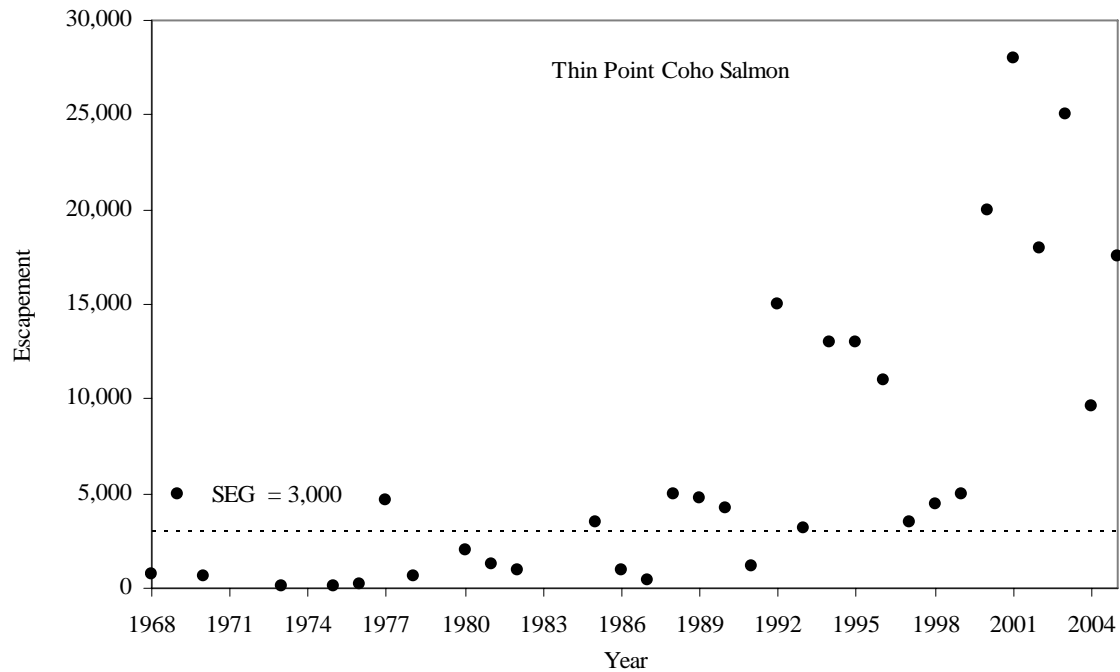
APPENDIX Q. SUPPORTING INFORMATION FOR THE NELSON RIVER COHO SALMON ESCAPEMENT GOAL

Appendix Q1.–Description of stock and escapement goal for Nelson River coho salmon.

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 drift and set gillnet
Current escapement goal:	SEG Threshold: 18,000 (2004)
Recommended escapement goal:	No change recommended
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Aerial survey, 1968– present.

Data summary:

Data quality	Fair for aerial survey counts.
Data type	Fixed-wing aerial surveys from most years during 1968 to present. No stock specific harvest information is available.
Data contrast	43.8
Methodology	None
Comments	Since the 2004 and 2005 escapements were well above the threshold, no further analyses were deemed necessary.

System: Nelson River

Species: Coho salmon

Data available for analysis of escapement goal.

Year	Peak Survey
1968	22,000
1969	11,000
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	38,000
2003	28,000
2004	52,500
2005	24,000

System: **Nelson River**

Species: **Coho salmon**

Observed escapement by year (solid circles for aerial surveys) and current SEG (dashed line).
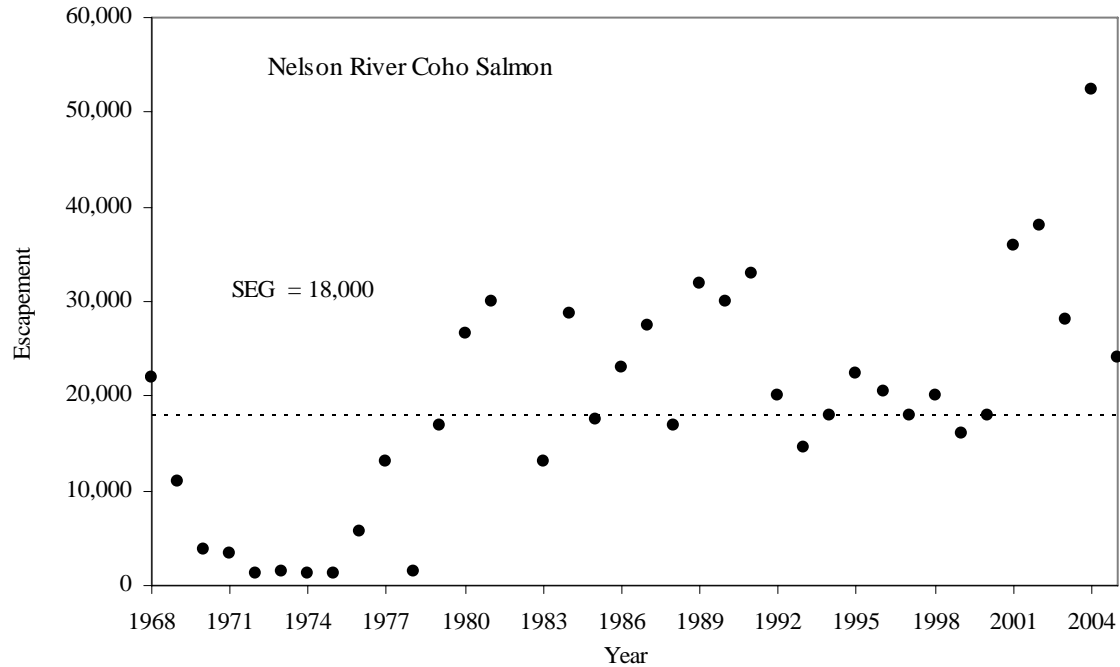
APPENDIX R. SUPPORTING INFORMATION FOR THE SOUTH PENINSULA PINK SALMON ESCAPEMENT GOALS

Appendix R1.–Description of stocks and escapement goals for South Peninsula pink salmon.

System: South Peninsula

Species: Pink salmon

Description of stocks and escapement goals.

Regulatory area:	Alaska Peninsula Management Area – Westward Region
Management division:	Commercial Fisheries
Primary fishery:	Commercial purse seine and set and drift gillnet (with some area-specific restrictions).
Current escapement goal:	BEG: Even year: 1,864,600 to 3,729,300 (2004)
	BEG: Odd year: 1,637,800 to 3,275,700 (2004)
Recommended escapement goal:	SEG: Even year: 1,864,600 to 3,729,300
	SEG: Odd year: 1,637,800 to 3,275,700
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Aerial survey, 1968 – present. Since 1987, a total of 143 streams are used as an index for section-wide escapement. Total estimated escapement for individual streams was calculated assuming a 21-day stream life of all fish within a stream, plus all fish observed in saltwater near the mouth during the last survey of the season.
Data summary:	
Data quality	Fair
Data type	Fixed-wing aerial surveys from most years during 1960 to present. Indexed total escapement 1987-present. No stock specific harvest information is available.
Contrast (even)	5.7
Contrast (odd)	11.6
Methodology	Ricker stock-recruit model
Autocorrelation	None
Comments	The addition of 2004 and 2005 harvest and escapement data had virtually no effect on the current stock-recruit model. The team decided no change in the current goals were needed, however since aerial surveys are the primary source of escapement data the goals were changed from BEGs to SEGs.

System: South Peninsula

Species: Pink salmon

Data available for analysis of escapement goals.

Year	Index Escapement
1968	823,300
1969	2,474,900
1970	1,298,900
1971	702,700
1972	111,400
1973	110,800
1974	284,400
1975	552,100
1976	1,456,400
1977	2,677,800
1978	2,858,700
1979	2,629,500
1980	2,641,600
1981	2,307,500
1982	2,293,000
1983	851,200
1984	3,811,600
1985	1,614,100
1986	1,716,700
1987	1,540,500
1988	2,839,600
1989	1,870,900
1990	1,598,400
1991	2,946,800
1992	2,834,400
1993	2,990,140
1994	3,071,725
1995	6,406,300
1996	3,647,550
1997	5,243,275
1998	4,668,065
1999	5,015,000
2000	2,792,985
2001	2,965,120
2002	3,762,800
2003	5,511,220
2004	8,311,410
2005	6,165,634

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

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Appendix R3.–South Peninsula even-year pink salmon escapement, 1968-2004 and current escapement goal range.

System: **South Peninsula (even years)**

Species: **Pink salmon**

Observed escapement by year (solid circles for aerial surveys) and current BEG range (dashed lines).

South Peninsula Pink Salmon
Even years

BEG Range = 1,864,600 - 3,729,300
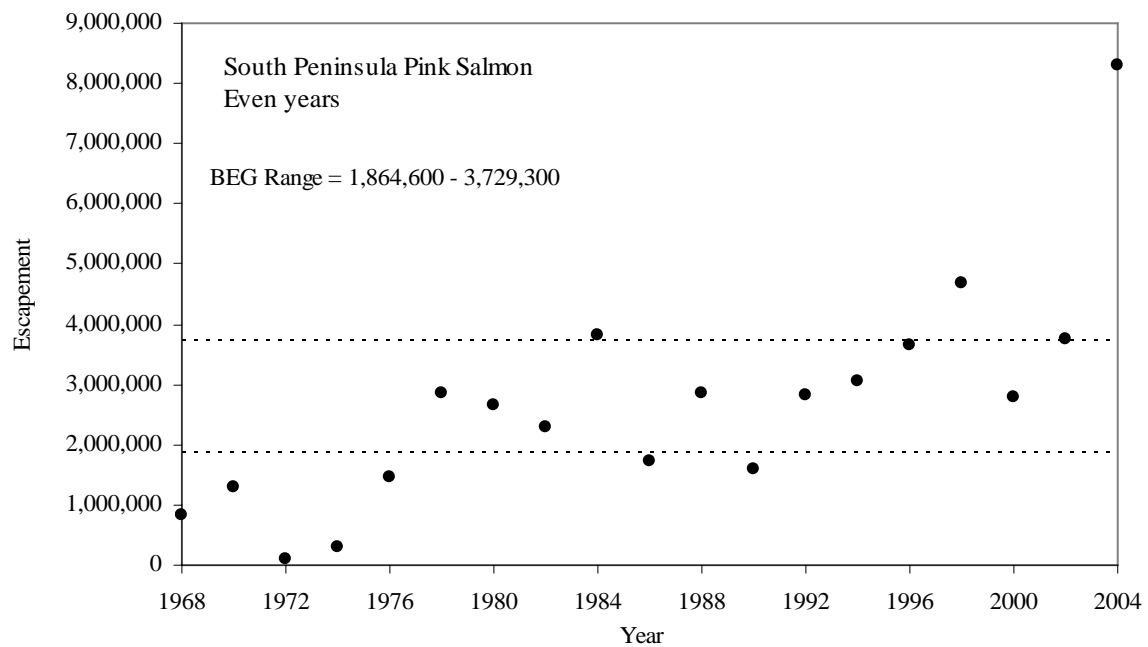
Appendix R4.–South Peninsula odd-year pink salmon escapement, 1969-2005 and current escapement goal range.

System: **South Peninsula (odd years)**

Species: **Pink salmon**

Observed escapement by year (solid circles for aerial surveys) and current BEG range (dashed lines).

South Peninsula Pink Salmon
Odd years

BEG Range = 1,637,800 - 3,275,700

APPENDIX S. SUPPORTING INFORMATION FOR THE BECHEVIN BAY PINK SALMON ESCAPEMENT GOALS

Appendix S1.–Description of stocks and escapement goals for Bechevin Bay Section pink salmon.

System: Bechevin Bay Section

Species: Pink salmon

Description of stocks and escapement goals.

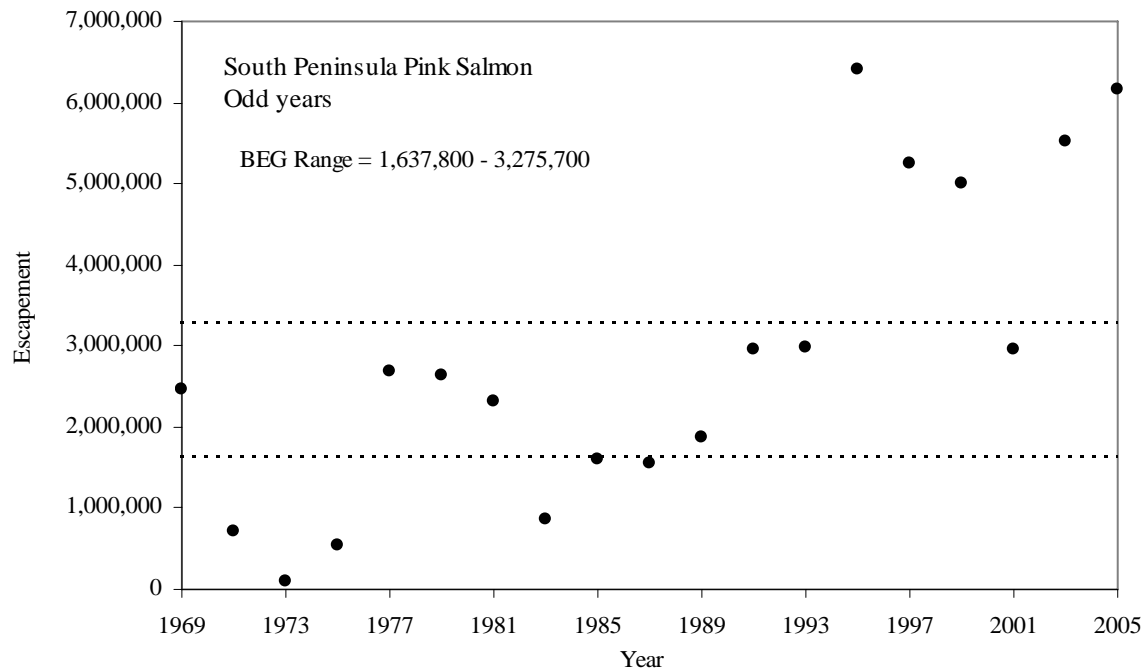|	
Regulatory area	Alaska Peninsula Management Area – Westward Region
Management division:	Commercial Fisheries
Primary fishery:	Commercial purse seine and set and drift gillnet.
Current escapement goal:	SEG Threshold: Even Year: 31,000
	SEG Threshold: Odd Year: 1,600
Recommended escapement goal:	No change recommended
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Aerial survey, 1960 – present. Since 1987, a total of 5 streams are used as an index for section-wide escapement. Total estimated escapement for individual streams was calculated assuming a 21-day stream life of all fish within a stream, plus all fish observed in saltwater near the mouth during the last survey of the season.
Data summary:	
Data quality	Fair
Data type	Fixed-wing aerial surveys from most years during 1960 to present. Indexed total escapement 1987-present. No stock specific harvest information is available.
Data contrast (even)	18.4
Data contrast (odd)	20.7
Methodology	Risk Analysis
Comments	The risk analysis, with the addition of 2004 and 2005 escapement data, indicated the current goals would provide protection to the stock without limiting fishing opportunities.

Appendix S2.–Bechevin Bay Section pink salmon escapement, 1987-2005.

System: **Bechevin Bay Section**

Species: **pink salmon**

Data available for analysis of escapement goals.

Year	Index Escapement[a]
1987	1,100
1988	26,700
1989	1,900
1990	21,800
1991	1,200
1992	49,400
1993	700
1994	93,700
1995	5,000
1996	197,400
1997	4,000
1998	120,500
1999	14,500
2000	35,900
2001	6,100
2002	10,700
2003	800
2004	84,300
2005	8,720

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

Appendix S3.–Bechevin Bay Section even-year pink salmon escapement, 1988-2004 and current escapement goal.

System: Bechevin Bay Section (even years)

Species: Pink salmon

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

Bechevin Bay Section Pink Salmon
Even years

SEG = 31,000
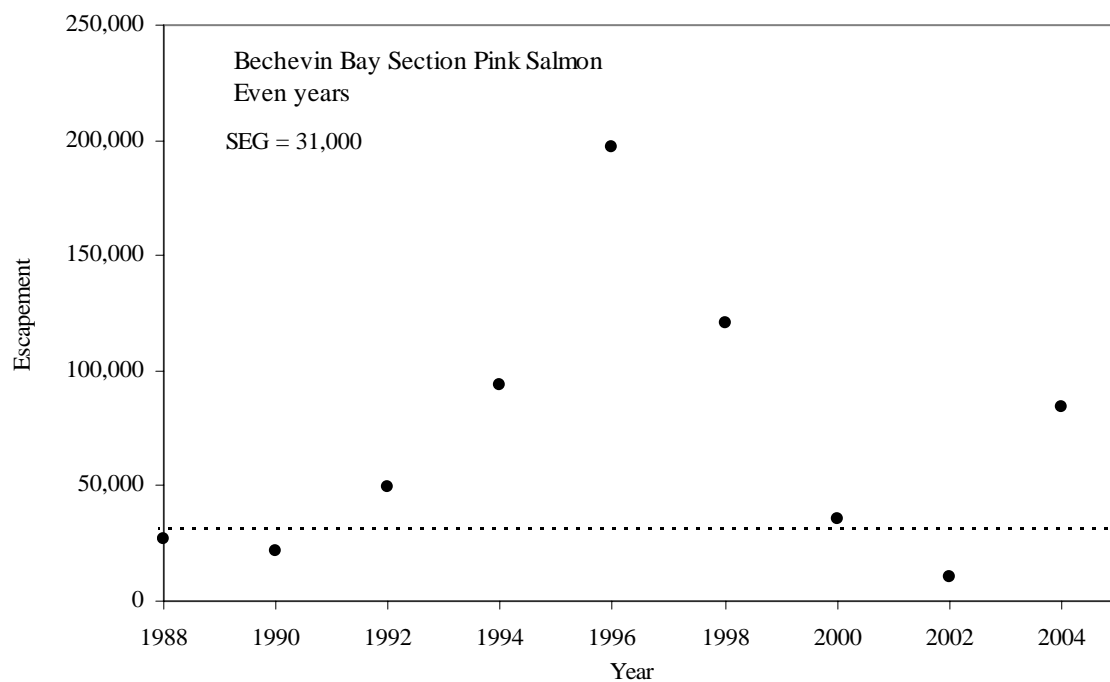
Appendix S4.–Bechevin Bay Section odd-year pink salmon escapement, 1987-2005 and current escapement goal.

System: **Bechevin Bay Section (odd years)**

Species:Pink salmon

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

Bechevin Bay Section Pink Salmon
Odd years

SEG = 1,600

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

Appendix T1.–Description of stocks and escapement goal for Southeastern District chum salmon.

System: Southeastern District

Species: Chum salmon

Description of stocks and escapement goal.

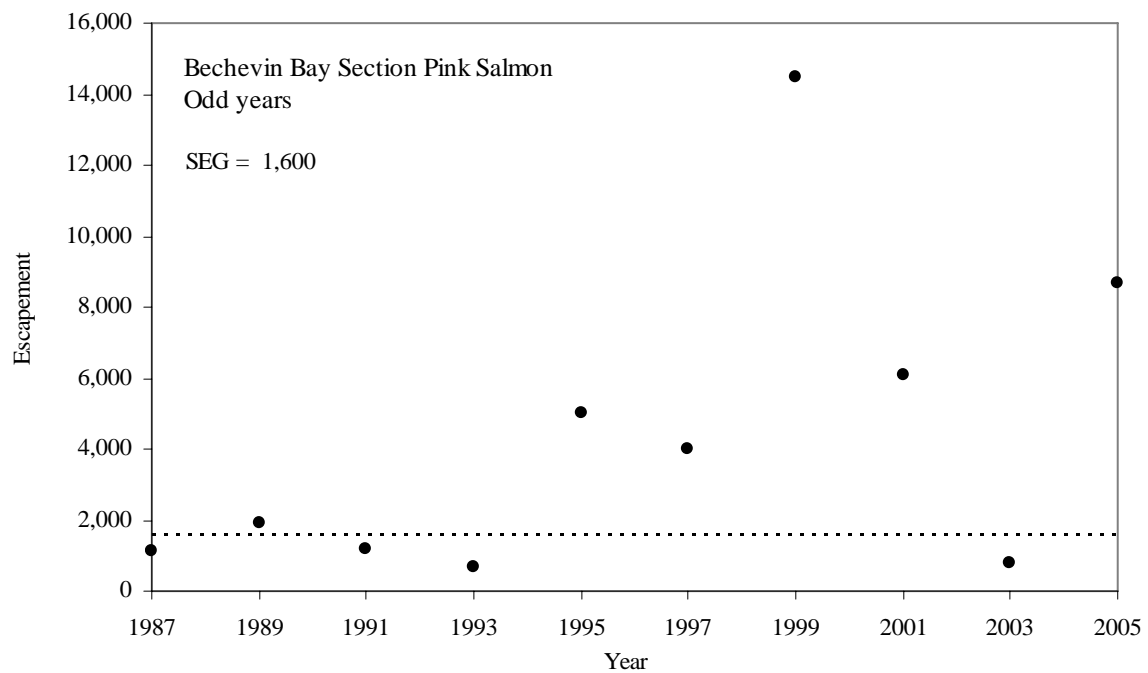|	
Regulatory area	Alaska Peninsula Management Area – Westward Region
Management division:	Commercial Fisheries
Primary fishery:	Commercial set gillnet and purse seine.
Current escapement goal:	SEG: 106,400 to 212,800 (1992)
Recommended escapement goal:	No change recommended
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Aerial survey, 1960 – present. Since 1987, a total of 28 streams are used as an index for district-wide escapement. Total estimated escapement for individual streams was calculated assuming a 21-day stream life of all fish within a stream, plus all fish observed in saltwater near the mouth during the last survey of the season.
Data summary:	
Data quality	Fair
Data type	Fixed-wing aerial surveys from most years during 1960 to present. Indexed total escapement 1987-present. No stock specific harvest information is available.
Data contrast	9.1
Methodology	Percentile
Criteria for SEG	High contrast, low exploitation
Percentiles:	15th to 75th estimate
Comments	Recent escapements have provided harvestable surplus and the addition of the 2004 and 2005 escapements had little effect on the percentile estimates; therefore, no change is warranted.

System: Southeastern District

Species: Chum salmon

Data available for analysis of escapement goal.

Year	Index Escapement[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

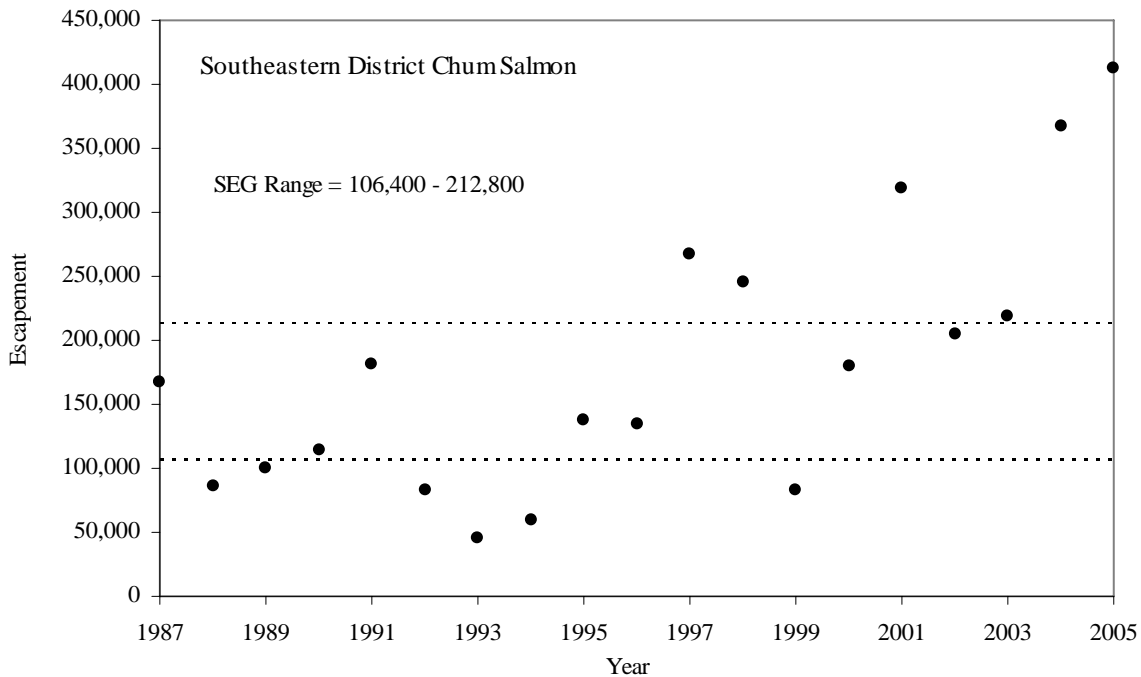[a] The estimated total escapement represents the peak survey, enumeration of carcasses, as well as ancillary and qualitative data.

System: **Southeastern District**

Species: **Chum salmon**

Observed escapement by year (solid circles for aerial surveys) and current SEG range (dashed lines).

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

Appendix U1.–Description of stocks and escapement goal for South Central District chum salmon.

System: South Central District

Species: Chum salmon

Description of stocks 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: 89,800 to 179,600 (1992)
Recommended escapement goal:	No change recommended
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Aerial survey, 1960 – present. Since 1987, a total of 13 streams are used as an index for district-wide escapement. Total estimated escapement for individual streams was calculated assuming a 21-day stream life of all fish within a stream, plus all fish observed in saltwater near the mouth during the last survey of the season.
Data summary:	
Data quality	Fair
Data type	Fixed-wing aerial surveys from most years during 1960 to present. Indexed total escapement 1987-present. No stock specific harvest information is available.
Data contrast	3.5
Methodology	Percentile
Criteria for SEG	Low contrast, high exploitation.
Percentiles	15th to maximum estimate
Comments	Recent escapements have provided harvestable surplus; therefore, no change is warranted.

Appendix U2.–South Central District chum salmon escapement, 1987-2005.

System: **South Central District**

Species: **Chum salmon**

Data available for analysis of escapement goal.

Year	Index Escapement[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

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

System: South Central District

Species:Chum salmon

Observed escapement by year (solid circles for aerial surveys) and current SEG range (dashed lines).

South Central District Chum Salmon

SEG Range = 89,800 - 179,600
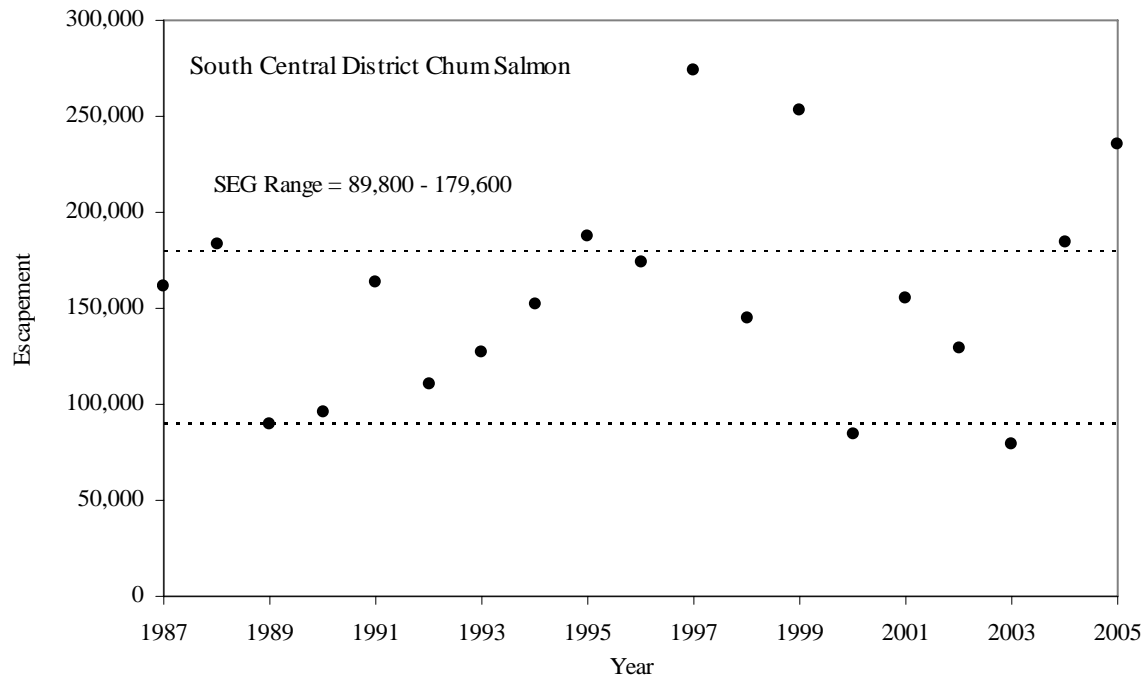
APPENDIX V. SUPPORTING INFORMATION FOR THE SOUTHWESTERN DISTRICT CHUM SALMON ESCAPEMENT GOAL

Appendix V1.–Description of stocks and escapement goal for Southwestern District chum salmon.

System: Southwestern District

Species: Chum salmon

Description of stocks 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 (with some area-specific restrictions).
Current escapement goal:	SEG: 133,400 to 266,800 (1992)
Recommended escapement goal:	No change recommended
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Aerial survey, 1960 – present. Since 1987, a total of 23 streams are used as an index for district-wide escapement. Total estimated escapement for individual streams was calculated assuming a 21-day stream life of all fish within a stream, plus all fish observed in saltwater near the mouth during the last survey of the season.
Data summary:	
Data quality	Fair
Data type	Fixed-wing aerial surveys from most years during 1960 to present. Indexed total escapement 1987-present. No stock specific harvest information is available.
Data contrast	3.3
Methodology	Percentile
Criteria for SEG	Low contrast, high exploitation
Percentiles	15th to maximum estimate
Comments	Recent escapements have provided harvestable surplus; therefore, no change is warranted.

System: **Southwestern District**

Species: **Chum salmon**

Data available for analysis of escapement goal.

Year	Index Escapement[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

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

System: **Southwestern District**

Species:Chum salmon

Observed escapement by year (solid circles for aerial surveys) and current SEG range (dashed lines).

Southwestern District Chum Salmon
SEG Range = 133,400 - 266,800
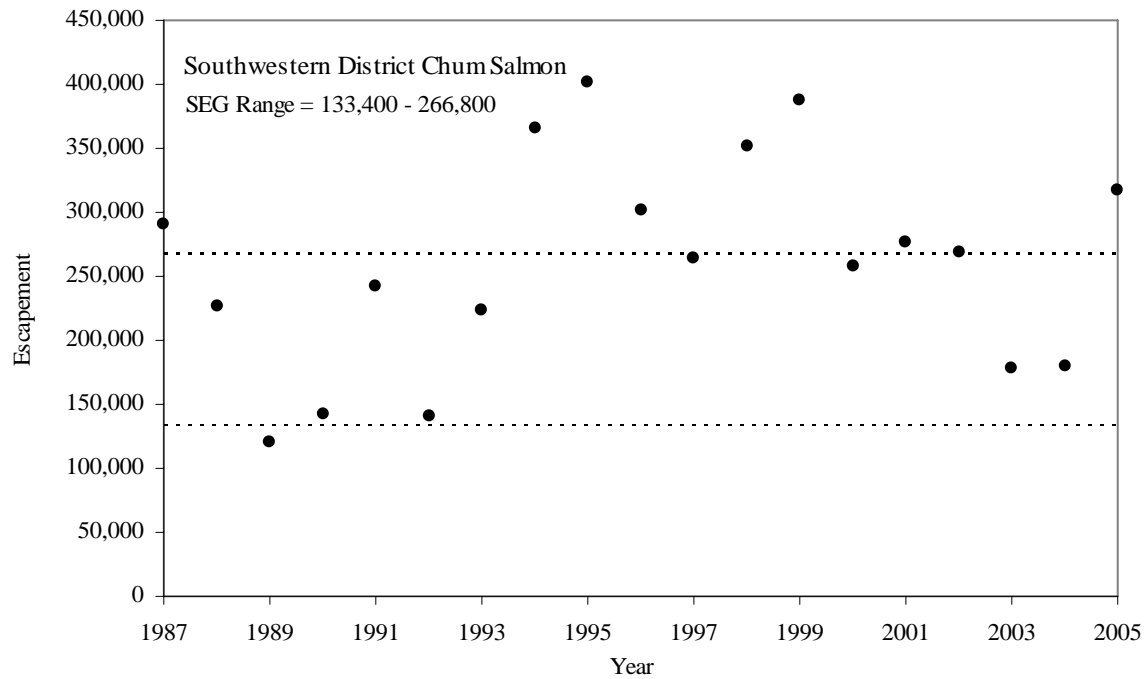
APPENDIX W. SUPPORTING INFORMATION FOR THE UNIMAK DISTRICT CHUM SALMON ESCAPEMENT GOAL

System: Unimak District

Species: Chum salmon

Description of stocks 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: 800 to 1,600 (1992)
Recommended escapement goal:	SEG Threshold: 800
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Aerial survey, 1960 – present. Since 1987, a total of three streams are used as an index for district-wide escapement. Total estimated escapement for individual streams was calculated assuming a 21-day stream life of all fish within a stream, plus all fish observed in saltwater near the mouth during the last survey of the season.
Data summary:	
Data quality	Fair
Data type	Fixed-wing aerial surveys from most years during 1960 to present. Indexed total escapement 1987-present. No stock specific harvest information is available.
Data contrast	21.0
Methodology	Risk Analysis
Autocorrelation	None
Comments	The risk analysis indicated the current lower goal would provide protection to the stock without limiting fishing opportunities.

Appendix W2.–Unimak District chum salmon escapement, 1987-2005.

System: Unimak District

Species: Chum salmon

Data available for analysis of escapement goal.

Year	Index Escapement[a]
1987	400
1988	1,100
1989	450
1990	800
1991	600
1992	400
1993	600
1994	1,500
1995	500
1996	800
1997	3,300
1998	500
1999	1,000
2000	800
2001	400
2002	1,200
2003	200
2004	400
2005	4,200

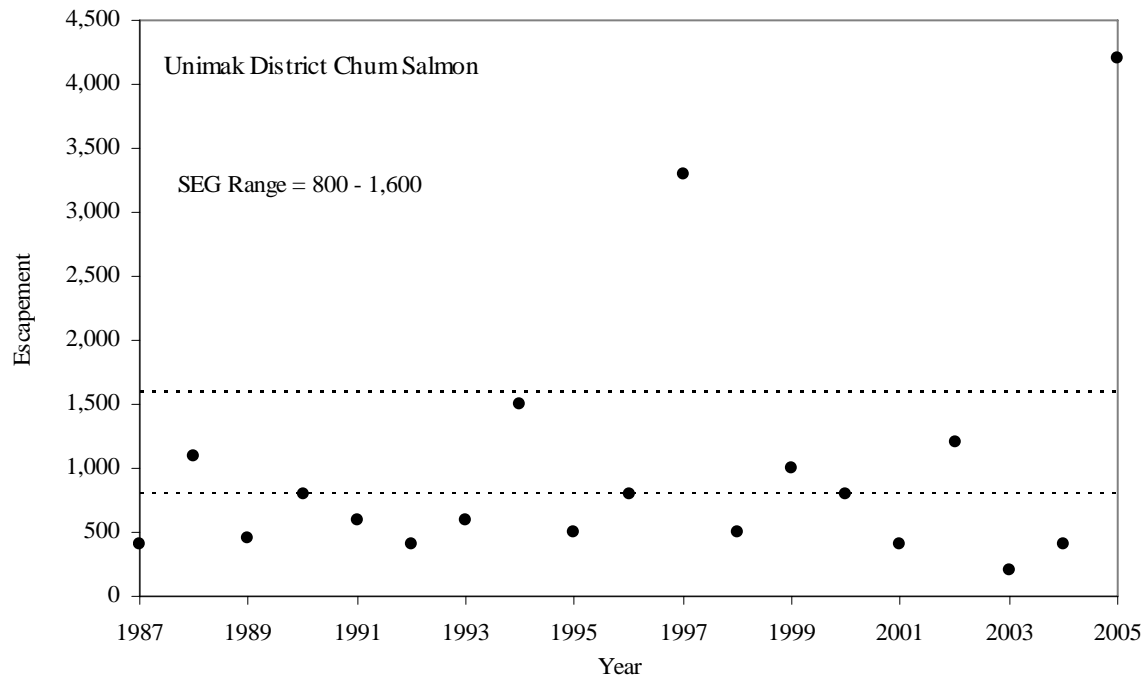[a] The estimated total escapement represents the peak survey, enumeration of carcasses, as well as ancillary and qualitative data.

System: **Unimak District**

Species:Chum salmon

Observed escapement by year (solid circles for aerial surveys) and current SEG range (dashed lines).

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

Appendix X1.–Description of stocks and escapement goal for Northwestern District chum salmon.

System: Northwestern District

Species: Chum salmon

Description of stocks 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 (with some area-specific restrictions).
Current escapement goal:	BEG: 100,000 to 215,000 (2004)
Recommended escapement goal:	SEG: 100,000 to 215,000
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Aerial survey, 1980 – present. Since 1987, a total of 25 streams are used as an index for district-wide escapement. Total estimated escapement for individual streams was calculated assuming a 21-day stream life of all fish within a stream, plus all fish observed in saltwater near the mouth during the last survey of the season.
Data summary:	
Data quality	Fair
Data type	Fixed-wing aerial surveys from most years during 1960 to present. Indexed total escapement 1987-present. No stock specific harvest information is available.
Contrast	3.8
Methodology	Ricker stock-recruit
Autocorrelation	None
Comments	No new age data from the fishery or escapement were available for further analysis; therefore no change to the current goal was made. However, since aerial surveys are used as an index for escapement estimates, the goal was changed from a BEG to a SEG.

Appendix X2.–Northwestern District chum salmon escapement, 1980-2005.

System: **Northwestern District**

Species: **Chum salmon**

Data available for analysis of escapement goal.

Year	Index Escapement[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	386,730
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

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

Appendix X3.–Northwestern District chum salmon escapement, 1980-2005 and current escapement goal range.

System: Northwestern District

Species:Chum salmon

Observed escapement by year (solid circles for aerial surveys) and current BEG range (dashed lines).
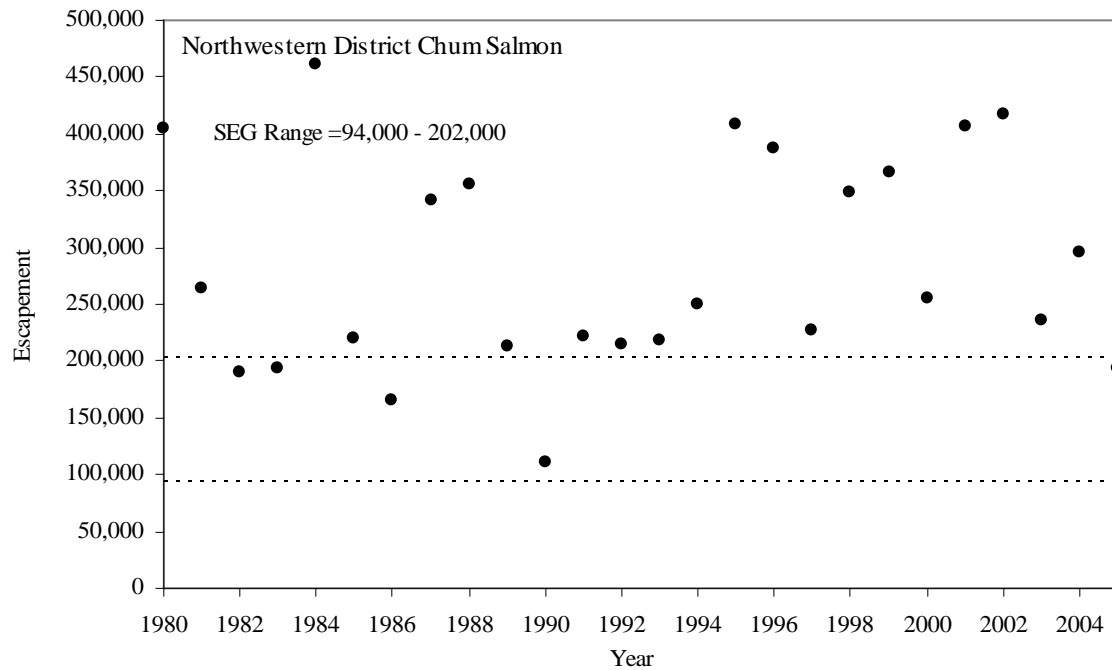
**APPENDIX Y. SUPPORTING INFORMATION FOR THE
NORTHERN DISTRICT CHUM SALMON ESCAPEMENT GOAL**

Appendix Y1.–Description of stocks and escapement goal for Northern District chum salmon.

System: **Northern District**

Species: **Chum salmon**

Description of stocks 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 (with some area-specific restrictions.
Current escapement goal:	BEG: 119,600 to 239,200 (2004)
Recommended escapement goal:	SEG: 119,600 to 239,200
Optimal escapement goal:	none
Inriver goal:	none
Action points:	none
Escapement enumeration:	Aerial survey, 1982 – present. Since 1987, a total of 44 streams are used as an index for district-wide escapement. Total estimated escapement for individual streams was calculated assuming a 21-day stream life of all fish within a stream, plus all fish observed in saltwater near the mouth during the last survey of the season.
Data summary:	
Data quality	Fair
Data type	Fixed-wing aerial surveys from most years during 1960 to present. Indexed total escapement 1987-present. No stock specific harvest information is available.
Contrast	5.4
Methodology	Ricker stock-recruit model
Autocorrelation	None
Comments	No new age data from the fishery or escapement were available for further analysis; therefore no change to the current goal was made. However, since aerial surveys are used as an index for escapement estimates, the goal was changed from a BEG to a SEG.

Appendix Y2.–Northern District chum salmon escapement, 1982-2005.

System: **Northern District**

Species: **Chum salmon**

Data available for analysis of escapement goal.

Year	Index Escapement[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

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

Appendix Y3.–Northern District chum salmon escapement, 1982-2005 and current escapement goal range.

System: **Northern District**

Species:Chum salmon

Observed escapement by year (solid circles for aerial surveys) and current BEG range (dashed lines).

Northern District Chum Salmon
BEG Range = 119,600 - 239,200