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A Review of Escapement Goals for Salmon Stocks in Lower Cook Inlet Alaska, 2016

by

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November 2016

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

Symbols and Abbreviations

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Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Mathematics, statistics

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

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A REVIEW OF ESCAPEMENT GOALS FOR SALMON STOCKS IN LOWER COOK INLET, ALASKA, 2016

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ABSTRACT

The Alaska Department of Fish and Game (ADF&G) interdivisional escapement goal review committee (committee) reviewed Pacific salmon *Oncorhynchus spp*. escapement goals for major river systems in Lower Cook Inlet (LCI). There were 41 escapement goals evaluated in LCI during this review. Except for 2 Chinook salmon *Oncorhynchus tshawytscha* stocks (Anchor and Ninilchik rivers) and 4 sockeye salmon *O. nerka*, stocks (English Bay, Bear, Mikfik, and Chenik lakes), salmon escapements in LCI are primarily monitored by single or multiple aerial and/or foot surveys of appropriate stream reaches. The resulting escapement indices do not provide absolute abundance estimates suitable for estimating biological escapement goals (BEG). Consequently, ADF&G developed sustainable escapement goals (SEG) for 3 Chinook, 12 chum *O. keta*, 18 pink *O. gorbuscha*, and 8 sockeye salmon stocks monitored in LCI. There are no escapement goals for coho salmon *O. kisutch* in LCI. Escapement performance for Chinook, chum, pink, and sockeye salmon relative to the existing goals has been good during the past 4 years, with a harvestable surplus available in 33–100% of streams during most years. Because most of the current goals were implemented 15 years ago and new methods were recently developed for establishing SEGs, the committee recommended changing 37 of 41 escapement goals for salmon stocks in LCI to incorporate the additional escapement data and new methods.

Key words Lower Cook Inlet, sustainable escapement goals, Chinook salmon, *Oncorhynchus tshawytscha*, chum salmon, *O. keta*, pink salmon, *O. gorbuscha*, sockeye salmon, *O. nerka*, coho salmon, *O. kisutch*, escapement, Southern District, Outer District, Eastern District, Kamishak District, Alaska Board of Fisheries, BOF.

INTRODUCTION

The Alaska Department of Fish and Game (ADF&G) reviews escapement goals for Lower Cook Inlet (LCI) salmon stocks on a schedule that corresponds to the Alaska Board of Fisheries (BOF) 3-year cycle for considering area regulatory proposals. In this report, we describe LCI salmon escapement goals that were reviewed in 2016 and present information from the past 3 years in the context of these goals. A brief summary of LCI stock assessment and management methods is also provided, along with a review of the methods to develop new sustainable escapement goals (SEGs) for 37 salmon stocks in LCI during this BOF cycle.

Following adoption of ADF&G's Salmon Escapement Goal Policy in 1992, Fried (1994) documented all existing escapement goals for LCI. Under this policy, escapement goals were categorized as biological escapement goals (BEG), optimal escapement goals, or inriver goals. At that time, all escapement goals in LCI, including 3 Chinook *Oncorhynchus tshawytscha*, 13 chum *O. keta*, 31 pink *O. gorbuscha*, and 8 sockeye salmon *O. nerka*, were considered BEGs.

Since 2001, escapement goals have been reviewed 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 BOF adopted these policies into regulation during the winter of 2000–2001 to ensure that the state's salmon stocks were conserved, managed, and developed using the sustained yield principle. The EGP states that it is ADF&G's responsibility to document existing salmon escapement goals for all salmon stocks that are currently managed for an escapement goal and to review existing, or propose new, escapement goals on a schedule that conforms to the BOF's regular cycle of consideration of area regulatory proposals. For this review, there are 2 important terms defined in the SSFP:

5 AAC 39.222(f)(3) "biological escapement goal" or "(BEG)" means the escapement that provides the greatest potential for maximum sustained yield; BEG will be the primary management objective for the escapement unless an optimal escapement or inriver run goal has been adopted; BEG will be developed from the best available biological information, and should be scientifically defensible on the basis of available biological information; BEG will be

determined by the department and will be expressed as a range based on factors such as salmon stock productivity and data uncertainty; the department will seek to maintain evenly distributed salmon escapements within the bounds of a BEG; and

5 AAC 39.222(f)(36) "sustainable escapement goal" or "(SEG)" means a level of escapement, indicated by an index or an escapement estimate, that is known to provide for sustained yield over a 5 to 10 year period, used in situations where a BEG cannot be estimated or managed for; the SEG is the primary management objective for the escapement, unless an optimal escapement or inriver run goal has been adopted by the BOF; the SEG will be developed from the best available biological information; and should be scientifically defensible on the basis of that information; the SEG will be determined by the department and will take into account data uncertainty and be stated as either an "SEG range" or "lower bound SEG"; the department will seek to maintain escapements within the bounds of the SEG range or above the level of a lower bound SEG.

Salmon management in LCI, to the extent possible, has focused on terminal fishing areas associated with individual streams. Consequently, escapement goals in LCI were developed for each of the 47 stocks (3 Chinook, 12 chum, 24 pink, and 8 sockeye salmon) that historically received fishing pressure. The escapement goal of each of these stocks was reviewed in 2001 under the 2 previously mentioned BOF policies, resulting in 47 new SEGs (Otis 2001). Area review of LCI escapement goals in 2004 (Otis and Hasbrouck 2004) resulted in changes to 4 stocks. The escapement goal for Anchor River Chinook salmon was eliminated because a sonar and weir project begun in 2003 indicated historical aerial surveys did not accurately index total escapement. It was anticipated that continuation of the sonar/weir project would provide sufficient data to conduct more comprehensive analyses and recommend a new goal during the 2007 review (Otis and Hasbrouck 2004). In 2004, ADF&G eliminated the escapement goals for Little and Big Kamishak river pink salmon because no fishery targets these stocks and escapement monitoring was inconsistent. Additionally, ADF&G replaced the individual goals for pink salmon in Bear and Salmon creeks in Resurrection Bay with a single SEG representing both streams. In 2007, ADF&G increased the SEG for McNeil River chum salmon, effectively restoring the previous long-standing goal to encourage greater seeding of upriver spawning habitats and increase streamwide production once that run recovers. ADF&G also increased the length of the escapement monitoring period and, consequently, the SEG for Ninilchik River Chinook salmon (550–1,300), and established a lower-bound SEG (5,000) for Anchor River Chinook salmon (Otis and Szarzi 2007; Szarzi et al. 2007). Area review of LCI escapement goals in 2010 (Otis et al. 2010) led to changes for 7 stocks. The Anchor River Chinook salmon goal was converted from a lower bound SEG (5,000) to an SEG range of 3,800–10,000 fish; SEG ranges for Delight Creek and Chenik Lake were transitioned from aerial survey to weir- and video-based goals, respectively, to account for new monitoring methods; and the SEG ranges for 4 pink salmon stocks in Resurrection Bay (Bear/Salmon creeks, Thumb Cove, Humpy Cove, and Tonsina Creek) were eliminated because they were modest producers that rarely received commercial fishing effort and were therefore inconsistently monitored. Area review of LCI goals in 2013 (Otis et al. 2013) led to changes for 2 stocks. The committee recalibrated the SEG for sockeye salmon at Mikfik Lake from an aerial survey-based SEG to one based on remote video, the current monitoring method. The committee also created a pink salmon escapement goal for Dogfish Lagoon Creeks stock, which was being targeted for commercial fishing due to improved market conditions for this species.

During the 2016 review process, escapement goals for the following stocks were reviewed:

- Chinook salmon: Deep Creek; and Anchor and Ninilchik rivers.
- Chum salmon: Iniskin Bay; Ursus Cove; Cottonwood, Island, and Port Dick creeks; Dogfish Lagoon; and Port Graham, Rocky, Big Kamishak, Little Kamishak, McNeil, and Bruin rivers.
- Pink salmon: Port Chatham; Humpy, China Poot, Tutka, Barabara, Windy (right), Windy (left), Port Dick, Island, S. Nuka Island, Desire Lake, Sunday, Brown's Peak, and Dogfish Lagoon creeks; and Seldovia, Port Graham, Rocky, and Bruin rivers.
- Sockeye salmon: English Bay; Amakdedori Creek; and Delight, Desire, Bear, Aialik, Mikfik, and Chenik lakes.

During winter of 2015–2016, ADF&G established an escapement goal review committee (hereafter referred to as the committee), consisting of Divisions of Commercial Fisheries and Sport Fish personnel (Table 1). The committee formally met via teleconference on November 9 and December 15, 2015 and on February 5, 2016 to review escapement goals and develop recommendations. The committee also communicated by email. Committee recommendations are reviewed by ADF&G regional and headquarters staff prior to being adopted by ADF&G as escapement goals per the SSFP and EGP.

OBJECTIVES

Objectives of the 2016 review were to:

1) Review existing goals to determine whether they were still appropriate given (a) new data collected since the last review, (b) current assessment techniques, and (c) current management practices;
2) Review the methods used to establish the existing goals to determine whether alternative methods should be investigated;
3) Consider any new stocks for which there may be sufficient data to develop a goal; and
4) Recommend new goals if appropriate and eliminate existing goals that are no longer appropriate.

METHODS

ASSESSING ESCAPEMENT AND HARVEST

The LCI commercial salmon fishery management area is comprised of all waters west of the longitude of Cape Fairfield, north of the latitude of Cape Douglas, and south of the latitude of Anchor Point, and is divided into 5 fishing districts (Figure 1). Barren Islands District is the only district with no commercial salmon fisheries, with the remaining 4 districts (Southern, Outer, Eastern, and Kamishak Bay) separated into approximately 39 subdistricts and sections to facilitate commercial fisheries management of discrete stocks of salmon (Hollowell et al. 2016). The LCI sport fisheries management area includes the waters west of the longitude of Gore Point, north of the latitude of Cape Douglas and south of a line from the south end of Chisik Island to the south bank of the Kasilof River (Figure 2). The area includes the Anchor and

Ninilchik rivers and Deep Creek, which flow into Cook Inlet along the west side of the lower Kenai Peninsula, and adjacent marine sport fisheries. Salmon streams in the management areas (Figures 1 and 2) primarily produce pink and chum salmon, but also support smaller and less numerous runs of sockeye, coho *O. kisutch*, and Chinook salmon.

Escapements for most systems in LCI are monitored by foot survey, aerial survey, or a combination of both. Such surveys provide only an index of escapement due to the lack of supporting data such as accurate estimates of stream life and observer efficiency. The indices are a measurement that provides information about the relative level of the escapement. These measurements provide information on trends of escapement across years, but provide limited information on the total number of fish in the escapement. Escapement indices for stocks of pink and chum salmon are calculated by applying the area-under-the-curve (AUC) method (Bue et al. 1998; Neilson and Geen 1981), which accounts for multiple sightings of the same fish during consecutive surveys by applying an average stream-life factor. An average stream life (SL) of 17.5 d has historically been used for all pink and chum salmon stocks in LCI, except McNeil River chum salmon, which uses a SL of 13.8 d based on the results of a 2-year telemetry study (Peirce et al. 2011).

Consistent weir data exist only for Anchor and Ninilchik river Chinook salmon, and Bear and English Bay lakes sockeye salmon. Weir data provide a count or an estimate of the total number of fish in the escapement (i.e., total fish in the spawning population), expressed in units comparable to the estimates of total fish harvested for the same stock. Weir data exist for some other species-year-system combinations, but are not complete or consistent. Since the late 1990s, LCI staff have been developing and testing a digital time-lapse video recording system to remotely census fish runs in small, clear streams (Otis and Dickson 2002). On select streams (e.g., Mikfik and Chenik), this technology has allowed replacement of aerial survey indices with escapement estimates more appropriate for developing census rather than index-based escapement goals. In 2010, LCI staff transitioned the Chenik Lake sockeye salmon SEG from an aerial-survey to a remote-video based goal and in 2013 sufficient data were available to do the same for Mikfik Lake sockeye salmon.

Chinook salmon escapements were monitored since 1962 using a combination of foot and aerial surveys. Starting in 1976, single helicopter surveys indexed Chinook salmon escapements. Since then, Chinook salmon at Deep Creek has continued to be indexed using a single survey during peak spawning. On the Ninilchik River, escapement monitoring transitioned to a broodstock weir in the late 1980s. During most years, the weir was only operated in July; however, from 1999 to 2005 the entire escapement was monitored. Weir counts of naturally-produced Chinook salmon were used to develop index-based escapement goals. In 2016, an instream motion sensing video incorporated within the broodstock weir provided a method for developing an escapement goal based on the entire run. Escapement monitoring of Anchor River Chinook salmon transitioned to using a Dual-Frequency Identification Sonar (DIDSON; Belcher et al. 2002) in 2003, then a combination of DIDSON and weir counts beginning in 2004. These counts, along with inriver sport harvest data, have been used to leverage aerial survey data to develop a time series with sufficient data to allow spawner-recruit analysis for developing escapement goals.

All landings of commercially harvested fish are documented on a “fish ticket”. Commercial harvest data are obtained from the fish ticket database. Estimates of sport harvest are from the postal survey conducted annually by the Division of Sport Fish (e.g., Romberg 2015).

HISTORICAL DEVELOPMENT OF ESCAPEMENT GOALS

Escapement goals for Deep Creek and Ninilchik and Anchor river Chinook salmon stocks were first adopted in 1993, representing the average of the escapement indices in each system (Fried 1994). In 1999, point goals were changed to ranges by multiplying the respective point goal by 0.8 and 1.6, similar to the method used to estimate the escapement range that produces 90% or more of the maximum sustained yield (MSY; Eggers 1993).

Chum salmon escapement surveys began to be consistently flown in the early 1970s. Escapement goals were established from these indices beginning in 1979. Many of the original goals were based on a subjective assessment of the quality of available spawning habitat and the level of commercial harvests resulting from various levels of escapement (Fried 1994). In the case of McNeil River chum salmon, managers targeted the upper end of the escapement goal range during years when more fish successfully ascended McNeil Falls and reached the plentiful, high-quality spawning habitat available upstream.

Pink salmon escapement surveys began during the 1960s with many starting in either 1960 or 1962. Pink salmon escapement goals for some systems were first established in 1970, while goals for many other systems were established in either 1976 or 1982. Origins of these goals are not well documented. Those in the Outer and Eastern districts were based on quantitative estimates of available spawning areas, assuming an optimal density of 1.5–2.0 spawners per square meter (Fried 1994).

Aerial surveys to monitor sockeye salmon escapement indices began in LCI in 1960. In the case of Bear Lake, a complete count or estimate of escapements has been monitored through a weir since 1960. Although escapement goals were first established for sockeye salmon in 1982, goals for additional systems were added throughout the 1980s. Methods and rationales for setting these goals were generally not well documented.

DEVELOPMENT OF CURRENT ESCAPEMENT GOALS

The majority of escapement goals in LCI are based on foot or aerial surveys. The surveys typically cover less than 100% of the stream due to practical constraints (e.g., dense riparian areas, etc.) and different people have conducted the surveys over the years under a wide variety of conditions. While the commercial fisheries in LCI primarily occur in terminal areas, stock mixing sometimes takes place, especially in areas such as Port Dick and Akumwarvik bays where it can be challenging to allocate commercial harvest to specific stocks. Also, a lack of annual age composition data for many stocks precludes construction of accurate brood tables and adds to the uncertainty in determining total return for many stocks. In 2001, with the definitions of escapement goals adopted into policy by the BOF and the uncertainties in estimating escapements and stock-specific commercial harvests, ADF&G changed all LCI goals to SEGs (Otis 2001).

Beginning in 2001, the SEG for most stocks within the management area was developed using percentiles of observed escapement estimates or indices that also incorporated contrast in the escapement data and estimated harvest rates (Bue and Hasbrouck[1]; Otis 2001; Otis and

[1] Bue, B. G. and J. J. Hasbrouck. *Unpublished*. Escapement goal review of salmon stocks of Upper Cook Inlet. Alaska Department of Fish and Game, Report to the Board of Fisheries, November 2001 (and February 2002), Anchorage. Subsequently referred to as Bue and Hasbrouck.

Hasbrouck 2004; Otis and Szarzi 2007; Otis et al. 2010, Otis et al. 2013). This method for setting SEGs became known as the Percentile Approach (Clark et al. 2014). To calculate the percentiles, escapement data were first ranked from the smallest to the largest value, with the smallest value representing the 0th percentile (i.e., none of the escapement values are less than the smallest). The percentile of all remaining escapement values was a summation of 1/(n-1), where n is the number of escapement values. Contrast in the escapement data was simply the maximum observed value divided by the minimum observed value. As contrast increased, the percentiles used to estimate the SEG range were narrowed, primarily from the upper range, to allow the SEG to include a wide range of escapements. For exploited stocks with a high contrast, the lower end of the SEG range was increased to the 25th percentile as a precautionary measure for stock protection. The percentiles used for four different tiers of contrast and exploitation were as follows:

Escapement Contrast	SEG Range
Low Contrast (<4)	15th Percentile to max observation
Medium Contrast (4 to 8)	15th to 85th Percentile
High Contrast (>8); At Least Moderate Exploitation	25th to 75th Percentile
High Contrast (>8); Low Exploitation	15th to 75th Percentile

All resulting SEG ranges were rounded to the nearest 50 fish. Percentiles were calculated for nearly all stocks using aerial and foot survey escapement indices from 1976 through 2001 (through 2000 for Chinook salmon stocks). Aerial and foot survey data prior to 1976 were excluded due to inconsistencies in data collection methods. Survey data since 1976 were not used for 3 stocks: Ninilchik River Chinook salmon, Tutka Lagoon Creek pink salmon, and Bear Lake sockeye salmon.

The Ninilchik River Chinook salmon SEG was based on the weir count of naturally-produced Chinook salmon observed between July 8–24 from 1994 to 2000. This river has been stocked since 1988 with hatchery-produced Chinook salmon from Ninilchik River brood stock. Hatchery-stocked fish have been marked with an adipose fin clip. Early in the stocking program, only a portion of each release group was marked, but beginning in 1995, all stocked fish were marked. During 1994–2000, a weir was consistently in place to collect brood stock and count fish, examining each fish for a missing adipose fin. Based on the marking and recovery data, ADF&G estimated the number of hatchery-stocked fish that passed through the weir. The number of naturally-produced fish was estimated by subtracting the estimated number of hatchery fish from the total number of fish observed. Wild fish sacrificed during egg takes were not subtracted from the count used to develop the SEG. The Ninilchik River weir count is still considered an index because it does not account for all Chinook salmon in the escapement. Nonetheless, weir counts are considered more reliable than aerial surveys.

In 2007, the Ninilchik River Chinook salmon SEG was changed from 400–800 to 550–1,300 by extending the number of days of weir counts annually that the goal is based upon from 17 (July 8–24) to 29 (July 3–31) and subtracting the wild fish sacrificed for egg takes during the period. Bounds were the 15th percentile and maximum wild escapement upstream of the broodstock weir during July 3 and 31 each year from 1999 to 2007 (Otis and Szarzi 2007). The change was to represent a greater proportion of the wild escapement to encompass more of the variability in run timing and reduce the likelihood of mistaking a low escapement count for late run timing.

For Tutka Lagoon Creek pink salmon, survey data from 1959 to 1975 were used to exclude years with hatchery supplementation, which began in 1976 and continued until 2005. The Tutka Bay Lagoon Hatchery began rearing and releasing pink salmon again in 2011/2012 after a 7-year hiatus. For Bear Lake sockeye salmon, weir data from 1985 to 2001 were used because prior to 1985 the lake was managed to limit sockeye salmon production in favor of coho salmon.

REVIEW OF CURRENT ESCAPEMENT GOALS

Clark et al. (2014) provided a comprehensive evaluation of the Percentile Approach used to establish sustainable escapement goals for stocks that lack sufficient stock productivity information. Since it came into use in 2001, the Percentile Approach has been the principal method used to develop nearly half of the escapement goals currently in use throughout Alaska (Munro and Volk 2016). While the concept and basis for the Percentile Approach as a proxy for S_{MSY} was considered robust, Clark et al. (2014) offered the following summation of their review:

> *"All of [our] analyses indicate that the four tiers of the Percentile Approach are likely sub-optimal as proxies for determining a range of escapements around SMSY. The upper bounds of SEGs developed with this approach may actually be unsustainable in that they may specify spawning escapement that is close to or exceeds the carrying capacity of the stock. The lower bound percentile of SEG Tier 1 (25%) also appears somewhat higher than necessary. Escapements in the lower 60 to 65 percentiles are optimal across a wide range of productivities, serial correlation in escapements, and measurement error in escapements."*

Clark et al. (2014) recommended that the 4-tiers of the Percentile Approach be replaced with the following 3 tiers for stocks with low to moderate (<0.40) average harvest rates:

- Tier 1 – high contrast (>8) and high measurement error (aerial and foot surveys) with low to moderate average harvest rates (<0.40), the 20th to 60th percentiles;
- Tier 2 – high contrast (>8) and low measurement error (weirs, towers) with low to moderate average harvest rates (<0.40), the 15th to 65th percentiles;
- Tier 3 – low contrast ($\leq$8) with low to moderate average harvest rates (<0.40), the 5th to 65th percentiles

Both percentile approaches have been used to develop SEGs in LCI, so to avoid confusion, hereafter we will refer to Bue and Hasbrouck's method as the 4-tier Percentile Approach and Clark et al.'s (2014) method as the 3-tier Percentile Approach. Clark et al. (2014) recommended not using the Percentile Approach for stocks with average harvest rates $\geq$0.40, or those that have both very low contrast ($\leq$4) and high measurement error. For a more comprehensive review and analysis of the Percentile Approach, see Clark et al. (2014).

RESULTS AND DISCUSSION

Fifteen years have elapsed since most of the current goals in LCI were implemented and a new Percentile Approach was recently published (Clark et al. 2014). Therefore, during this escapement goal review period area staff applied the new Clark et al. (2014) approach to the longer time series of available escapement data. This resulted in substantive changes to the SEGs for most pink, chum, and sockeye salmon stocks in LCI. Consequently, the committee recommended changing 37 of 41 escapement goals for salmon stocks in LCI (Table 2).

All 30 of the pink and chum salmon stocks in LCI were monitored using aerial and/or ground survey and their observed escapement contrast and harvest rates made them Tier 1 stocks under the above guidelines. For the same reasons, 4 of the 8 sockeye salmon stocks in LCI were also Tier 1 stocks. Three of the 4 remaining sockeye salmon stocks (Bear, Mikfik and Chenik lakes) also exhibited high escapement contrast and moderate exploitation, but were categorized as Tier 2 stocks because their escapement was monitored using remote video, a method with low measurement error. The remaining sockeye salmon stock (Desire Lake) was considered a Tier 3 stock because it had low escapement contrast. Ninilchik River Chinook salmon were considered Tier 3 due to low contrast in the escapements and low to moderate harvest rates. Deep Creek Chinook salmon exhibited all the traits of a Tier 1 stock: it was monitored by aerial survey, had high escapement contrast and a low harvest rate.

The following sections provide additional information, by species, on recommendations made by the committee for each of the 41 salmon stocks in LCI that have escapement goals. Also provided is a review of recent salmon escapements relative to the current and recommended goals. Relevant details for each Chinook, chum, pink, and sockeye salmon stock reviewed, including all data used in the analysis, can be found in Appendices A, B, C, and D, respectively.

CHINOOK SALMON

Chinook salmon escapements from 2013 to 2016 were sufficient to meet their respective escapement goals (Figure 3), with the exception of the Anchor River, which failed to meet escapement in 2014 (Table 2). High, turbid water conditions prevented an effective survey of Deep Creek in 2016. The committee recommends changes to all 3 existing escapement goals for LCI Chinook salmon stocks (Table 2).

Anchor River

In 2016, the spawner-recruit model that was used to develop the current goal was repeated using aerial survey data from 1997 through 2008, available escapement, age and harvest data through 2015, and assumed marine harvest rates. The committee recommended a new SEG range of 3,800–7,600 based on yield curves produced from the analysis (Table 3). The spawning escapement for maximum sustainable yield was estimated as 5,700 fish (Bayes posterior median).

Deep Creek

The current SEG (350–800) was evaluated using the Clark et al. (2014) Percentile Approach but it produced a very narrow goal range (374–559) that would have been difficult to manage for in season, particularly since the aerial survey to assess escapement doesn't occur until after the in-river sport fishery closes. Hence, the committee recommended a lower bound SEG of 350 fish (Table 3).

Ninilchik River

The current SEG is 550–1,300 wild Chinook salmon counted through a weir from July 3–31. In 2016 the use of a weir and instream video equipment facilitated a cost-effective way to monitor the entire escapement. From 1999 to 2005, the Ninilchik River weir was operated to monitor the entire escapement from mid-May through early August. From 2006 to 2015, the weir was operated from late June into August to index escapement and for broodstock collection. By leveraging the 1999–2005 weir counts, the total escapement from 2006–2015 was estimated.

Annual total escapement from 1999–2015 was then used to establish an SEG following Clark et al. (2014). The committee recommended a new SEG range of 750–1,300 as assessed for the entire wild Chinook salmon run (Table 3).

CHUM SALMON

Recent chum salmon escapements have been sufficient, relative to the current SEGs, to provide a harvestable surplus for most stocks. Between 2013 and 2016, LCI chum salmon escapements were below the current SEG range 33% of the time and within or above the SEG range 66% of the time (n = 48; Figure 4). Relatively modest runs, lack of tender service, as well as robust pink salmon runs to other districts in Area H have contributed to diminished commercial fishing effort in the Kamishak District. This in turn has contributed to several chum salmon systems with escapements above the SEG range (Table 2).

The committee recommended changing 11 of the 12 existing SEGs for LCI chum salmon stocks. In most cases where an SEG change is recommended, there were 14 years of additional escapement data since the current goals were implemented and application of the 3-tier Percentile Approach (Clark et al. 2014) resulted in a substantive change to the SEG range (Table 4). Even in cases where the new approach did not result in a substantive change, the committee recommended changing the goal to be consistent in our use of the most current and robust methods available for setting SEGs for stocks lacking productivity information.

All 12 LCI chum salmon stocks with escapement goals were monitored by aerial and/or ground survey and were classified as Tier 1 stocks under the guidelines prescribed by Clark et al. (2014). The average escapement contrast for LCI chum salmon stocks was 48 (range 10–350) and the average harvest rate was 0.19 (range 0.11–0.34). Applying the 3-tier Percentile Approach to the longer time series of available escapement data resulted in at least one end of the SEG range increasing for some stocks (e.g., Rocky River, Little Kamishak River) and decreasing for others (e.g., Port Graham River, Island Creek). However, for most chum salmon stocks where an SEG change was recommended, both the lower and upper end of the SEG range decreased, with the lower end dropping 6% and the upper end dropping 14%, on average (Table 4). This relative change was to be expected, given that the current SEG range for these stocks was based on the 25th–75th percentiles, whereas Clark et al. (2014) suggest that the 20th–60th percentiles are more appropriate for stocks exhibiting Tier 1 characteristics. It's important to note that the additional 14 years of available escapement data for most stocks included escapements above and below the current SEG range and encompassed periods of high and low escapement. The ability to set robust SEGs for stocks lacking productivity information is enhanced when long time series of high contrast escapement data are available (Clark et al. 2014).

Relevant details for each chum salmon stock reviewed, including all data used in the analysis, can be found in Appendices B1–B12. McNeil River was the only chum salmon SEG the committee recommended not changing. The reasons for that recommendation to retain the current goal are described in detail in Otis and Szarzi (2007) and in a separate report to the BOF (Otis et al. 2016).

PINK SALMON

Recent pink salmon escapements have been sufficient, relative to the current SEGs, to provide a harvestable surplus for most stocks. Between 2013 and 2016, LCI pink salmon escapements were below the current SEG range 23% of the time and within or above the current SEG range

77% of the time (n = 71; Figure 5). Relatively modest runs, lack of tender service, and robust pink salmon runs in other districts of LCI have contributed to diminished commercial fishing effort, in the Kamishak District. This in turn contributed to several pink salmon systems with escapements above their existing SEG range (Table 2).

The committee recommended changing 17 of the 18 existing SEGs for LCI pink salmon stocks. In most cases where an SEG change is recommended, there were 14 years of additional escapement data since the current goals were implemented and application of the 3-tier Percentile Approach resulted in a substantive change to the SEG range (Table 5). Even in cases where the new approach did not result in a substantive change, the committee recommended changing the goal to be consistent in the use of the most current and robust methods available for setting SEGs for stocks lacking productivity information.

All 18 pink salmon stocks with escapement goals in LCI were monitored by aerial and/or ground survey and were classified as Tier 1 stocks under the guidelines prescribed by Clark et al. (2014). The average escapement contrast for LCI pink salmon stocks was 321 (range 11–1,974) and the average harvest rate was 0.27 (range 0.11–0.50). Applying the 3-tier Percentile Approach to the longer time series of available escapement data resulted in at least one end of the SEG range increasing for some stocks (e.g., Windy Creek Left, Rocky River, Island Creek) and decreasing for others (e.g., Humpy Creek, Dogfish Lagoon, Desire Creek). For most LCI pink salmon stocks where an SEG change was recommended, the upper end of the SEG range decreased by 13% (Table 5). This 13% drop was similar to the reduction in the upper percentile recommended by Clark et al. (2014) to set the SEG range for Tier 1 stocks (75th down to 60th). However, recent escapements were large enough to offset the corresponding 5% drop in the percentile now used to set the lower bound of the SEG (25th down to 20th), resulting in a 2% average increase in the low end of the SEG range (Table 5). Similar to chum salmon, the additional 14 years of available data for most pink salmon stocks included escapements above and below the current SEG range and encompassed periods of high and low escapement. The ability to set robust SEGs for stocks lacking productivity information is enhanced when long time series of high contrast escapement data are available (Clark et al. 2014).

Relevant details for each pink salmon stock reviewed, including all data used in the analysis, can be found in Appendices C1–C18. Tutka Creek is the only pink salmon SEG the committee recommended not changing. The committee reasoned that the close proximity of Tutka Creek to the Tutka Lagoon Hatchery, which recently began producing pink salmon again, made it difficult to revise the SEG range at this time. However, the committee also recommended retaining the current SEG for this stock to maintain historical levels of natural production in Tutka Creek in case the hatchery ceases operation, or has a mechanical failure that results in loss of a year class.

SOCKEYE SALMON

Annual escapement for most LCI sockeye salmon stocks since the last escapement goal review has generally fallen within or above the current escapement goal range (Table 2). From 2013 to 2016, LCI sockeye salmon escapements were below their respective SEG ranges 35% of the time and within or above their SEG ranges 65% of the time (n = 32; Figure 6).

The committee recommended changing 6 of the 8 existing SEGs for LCI sockeye salmon stocks. In most cases where an SEG change was recommended, there were 14 years of additional escapement data since the current goal was implemented and application of the 3-tier Percentile Approach resulted in a substantive change to the SEG range (Table 6). Even in cases where the

new approach did not result in a substantive change, the committee recommended changing the goal to be consistent in the use of the most current and robust methods available for setting SEGs for stocks lacking productivity information.

Four of the 8 sockeye salmon stocks in LCI with escapement goals were monitored by aerial survey. Three of these stocks (Delight, Aialik, Amakdedori) were classified as Tier 1 stocks, but the fourth (Desire Lake) had low escapement contrast (7) and was, therefore, considered a Tier 3 stock under the guidelines prescribed by Clark et al. (2014). Two of the remaining sockeye salmon stocks (Bear and English Bay lakes) were monitored by weir and the other two (Mikfik and Chenik lakes) were monitored by remote video, both of which are methods exhibiting low measurement error. Chenik, Mikfik, and Bear lakes were all considered Tier 2 stocks but English Bay Lakes was considered Tier 1 because aerial survey data were also used in setting the current SEG range.

The average escapement contrast for LCI sockeye salmon stocks was 38 (range 7–104) and the average harvest rate was 0.32 (range 0.03–0.55). Applying the 3-tier Percentile Approach to the longer time series of available escapement data resulted in a net decrease to the SEG range for all stocks. For LCI sockeye salmon stocks where an SEG change was recommended, both the upper and lower ends of the SEG range decreased by an average of 19% (Table 6). This drop was slightly larger than expected for the reduced percentiles recommended for Tier 1–3 stocks by Clark et al. (2014). Unlike LCI pink salmon stocks, the additional 14 years of available data for sockeye salmon stocks included more years of low escapements (Table 2). That trend, along with the lower percentiles used for Tier 1–3 stocks, contributed to the greater relative reduction in SEG ranges for sockeye salmon (Table 6).

As reflected in the different tiers and percentiles recommended by Clark et al. (2014), it is important to account for the measurement error associated with different escapement monitoring methods. Weir and remote video both produce census-quality escapement estimates that are generally higher than aerial or ground survey indices. Hence, it is important to calibrate the escapement goal for each stock to the monitoring method currently being used to manage the associated fishery. Until recently, the Delight Lake sockeye salmon stock was monitored using a weir. Because funding for that project was recently cut, the stock is now being monitored by aerial survey. Accordingly, the committee used historical and recent aerial survey data from Delight Lake to recommend an SEG that is calibrated to the method currently used to monitor and manage this stock.

Bear and English Bay lakes are the only sockeye salmon SEGs the committee recommended not changing (Table 2). Some of the Bear Lake run is naturally produced but the majority comes from hatchery enhancement. A weir is operated on the outlet creek and fish surplus to escapement needs are harvested for cost-recovery. Consequently, escapement to Bear Lake varies very little across years and the current escapement goal is adequate for assuring historical levels of natural production are maintained in the lake.

Natural production from English Bay Lakes has been enhanced through hatchery backstocking during all but 7 years since 1990. This stock is also an important subsistence resource to the residents of Port Graham Subdistrict. The updated SEG analysis would have resulted in narrowing the SEG range for this stock. Narrowing the goal would make it harder to balance subsistence and commercial fishing concerns in an already complex management situation.

Also, backstocking of the lake was recently curtailed and may not continue, which could result in changes to future returns.

Relevant details for each sockeye salmon stock reviewed, including all data used in the analysis, can be found in Appendices D1–D8.

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TABLES AND FIGURES

Table 1.– List of members of the Alaska Department of Fish and Game Cook Inlet salmon escapement goal review committee and other participants who assisted with the escapement goal review.

Name	Position/Management Area[a]	Affiliation
Escapement Goal Committee:		
Clark, Robert	Fisheries Advisor	Division of Sport Fish
Erickson, Jack	Regional Research Coordinator	Division of Commercial Fisheries
Fleischman, Steve	Fisheries Scientist	Division of Sport Fish
Hasbrouck, James	Chief Fisheries Scientist	Division of Sport Fish
Kerkvliet, Carol	Area Research Biologist/LCI	Division of Sport Fish
McKinley, Timothy	Regional Research Coordinator	Division of Sport Fish
Munro, Andrew	Fisheries Scientist	Division of Commercial Fisheries
Otis, Ted	Area Research Biologist/LCI	Division of Commercial Fisheries
Reimer, Adam	Biometrician	Division of Sport Fish
Volk, Eric	Chief Fisheries Scientist	Division of Commercial Fisheries
Willette, Mark	Area Research Biologist/UCI	Division of Commercial Fisheries
Yanusz, Richard	Area Research Biologist/NCI	Division of Sport Fish
Other Participants:		
Baker, Tim	Regional Management Biologist	Division of Commercial Fisheries
Begich, Robert	Area Management Biologist/NKP	Division of Sport Fish
Booz, Michael	Fishery Biologist/LCI	Division of Sport Fish
Bosch, Daniel	Regional Management Biologist	Division of Sport Fish
Brenner, Richard	Fisheries Scientist	Division of Commercial Fisheries
Eskelin, Anthony	Fishery Biologist/NKP	Division of Sport Fish
Evans, David	Biometrician	Division of Sport Fish
Glick, William	Fishery Biologist/UCI	Division of Commercial Fisheries
Hansen, Patricia	Biometrician	Division of Sport Fish
Hollowell, Glenn	Area Management Biologist/LCI	Division of Commercial Fisheries
Ivey, Samuel	Area Management Biologist/NCI	Division of Sport Fish
Oslund, Samantha	Asst. Area Management Biologist/NCI	Division of Sport Fish
Pawluk, Jason	Asst. Area Management Biologist/NKP	Division of Sport Fish
Shields, Patrick	Area Management Biologist/UCI	Division of Commercial Fisheries
St Saviour, Adam	Fishery Biologist/NKP	Division of Sport Fish
Vania, Tom	Regional Supervisor	Division of Sport Fish

[a] LCI = Lower Cook Inlet, UCI = Upper Cook Inlet, NCI = Northern Cook Inlet, NKP = Northern Kenai Peninsula.

Table 2.–Current sustainable escapement goals (SEGs), recent escapements, and recommended action in 2016 for salmon stocks in Lower Cook Inlet, Alaska.

Species/System	Escapement Data[a]	Escapement Goal Type	Escapement Goal Range	Recent Escapements 2013	2014	2015	2016	Recommendation
Chinook Salmon								
Anchor River	Sonar/Weir	SEG	3,800–10,000	4,378	2,497	10,048	7,146[b]	Change
Deep Creek	SAS	SEG	350–800	475	601	535	NS	Change
Ninilchik River[c]	Weir	SEG	550–1,300	571	891	874	572[b]	Change
Chum Salmon								
Port Graham River	MFS	SEG	1,450–4,800	1,944	3,735	4,030	2,391	Change
Dogfish Lagoon	MFS	SEG	3,350–9,150	9,300	11,205	13,312	11,260	Change
Rocky River	MAS or MFS	SEG	1,200–5,400	8,148	6,863	3,138	4,620	Change
Port Dick Creek	MAS or MFS	SEG	1,900–4,450	4,133	1,829	13,230	9,323	Change
Island Creek	MAS or MFS	SEG	6,400–15,600	8,772	2,699	18,479	8,210	Change
Big Kamishak River	MAS	SEG	9,350–24,000	3,280	5,676	6,990	9,104	Change
Little Kamishak River	MAS	SEG	6,550–23,800	6,744	15,069	14,370	11,991	Change
McNeil River	MAS	SEG	24,000–48,000	9,498	17,475	20,494	26,262	No Change
Bruin River	MAS	SEG	6,000–10,250	8,942	3,583	11,006	26,598	Change
Ursus Cove	MAS	SEG	6,050–9,850	10,339	5,308	14,783	7,032	Change
Cottonwood Creek	MAS	SEG	5,750–12,000	5,206	7,079	16,962	1,850	Change
Iniskin Bay	MAS	SEG	7,850–13,700	5,928	13,020	7,513	1,089	Change
Pink Salmon								
Humpy Creek	MFS	SEG	21,650–85,550	6,749	44,369	38,025	89,673	Change
China Poot Creek	MFS	SEG	2,900–8,200	7,119	1,409	7,366	698	Change
Tutka Lagoon Creek	MFS	SEG	6,500–17,000	9,541	10,152	81,584	33,242	No Change
Barabara Creek	MFS	SEG	1,900–8,950	17,377	3,558	25,203	2,813	Change
Seldovia River	MFS	SEG	19,050–38,950	36,824	35,895	108,793	15,694	Change
Port Graham River	MFS	SEG	7,700–19,850	11,893	32,295	82,356	14,629	Change

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Table 2.–Page 2 of 2.

Species/System	Escapement Data[a]	Escapement Goal Type	Escapement Goal Range	Recent Escapements 2013	2014	2015	2016	Recommendation
Pink Salmon Cont'd								
Dogfish Lagoon Creeks	MAS or MFS	SEG	1,200–8,400	26,448	8,848	50,058	2,307	Change
Port Chatham	MFS	SEG	7,800–21,000	57,447	10,290	42,613	1,140	Change
Windy Creek Right	MFS	SEG	3,350–10,950	11,704	5,710	17,009	1,400	Change
Windy Creek Left	MFS	SEG	3,650–29,950	47,849	10,147	33,640	500	Change
Rocky River	MAS or MFS	SEG	9,350–54,250	75,791	17,114	107,931	4,300	Change
Port Dick Creek	MAS or MFS	SEG	18,550–58,300	55,828	48,732	98,002	4,819	Change
Island Creek	MAS or MFS	SEG	7,200–28,300	26,004	50,402	50,387	1,735	Change
S. Nuka Island Creek	MAS or MFS	SEG	2,700–14,250	8,442	11,000	8,900	10	Change
Desire Lake Creek	MAS	SEG	1,900–20,200	56,921	443	46,290	169	Change
Bruin River	MAS	SEG	18,650–155,750	15,020	121,569	40,801	86,632	Change
Sunday Creek	MAS	SEG	4,850–28,850	6,132	7,665	60,385	2,130	Change
Brown's Peak Creek	MAS	SEG	2,450–18,800	4,061	4,048	29,141	1,378	Change
Sockeye Salmon								
English Bay[d]	PAS, Weir	SEG	6,000–13,500	10,891	7,832	6,290	7,673	No Change
Delight Lake[e]	PAS, Weir	SEG	7,500–17,650	5,961	22,289	3,220	5,110	Change
Desire Lake	PAS	SEG	8,800–15,200	8,400	11,480	2,830	6,740	Change
Bear Lake[d]	Weir	SEG	700–8,300	8,999	9,090	9,560	9,011	No Change
Aialik Lake	PAS	SEG	3,700–8,000	3,530	450	3,182	400	Change
Mikfik Lake	PAS, Video	SEG	3,400–13,000	4,042	18,062	3,502	10,180	Change
Chenik Lake	PAS, Video	SEG	3,500–14,000	11,333	17,797	19,073	19,510	Change
Amakdedori Creek	PAS	SEG	1,250–2,600	1,540	4,280	2,910	2,240	Change

[a] SAS = Single Aerial Survey, MAS = Multiple Aerial Survey, MFS = Multiple Foot Survey, PAS = Peak Aerial Survey, NS = No Survey.

[b] Preliminary.

[c] Escapement of naturally produced fish upstream of the weir between July 3 and 31 is the basis for the current Ninilchik River Chinook salmon sustainable escapement goal.

[d] Bear Lake and English Bay Lake escapements include only those fish allowed past the weir to spawn naturally in the lake, not those removed for broodstock.

[e] Delight Lake escapements are a combination of weir (2013–2014) and aerial survey counts (2015–2016).

Table 3.–Current and recommended sustainable escapement goals (SEGs) for Lower Cook Inlet Chinook salmon stocks, the percent change, and the rationale for the change.

Appendix Table	Stock	Current SEG Range Lo		Hi	Year Adopted	Recommended SEG Range Lo		Hi	*n*	% Change Lo	Hi	Rationale(s) for SEG Action
A.1	Anchor River	3,800	–	10,000	2011	3,800	–	7,600	13	0%	-24%	[a]
A.2	Deep Creek	350	–	800	2002	350			39	0%		[b,c]
A.3	Ninilchik River	550	–	1,300	2008	750	–	1,300	17	36%	0%	[b,d]
						Average for stocks with an SEG Change:				12%	-12%	

Note: For more details on each stock, refer to the appendix table referenced in column 1.

[a] An updated stock-recruit analysis supported lowering the upper end of the SEG range for the Anchor River.

[b] Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range.

[c] Analysis including recent data yielded a very narrow SEG range, so the committee recommended a lower bound SEG.

[d] Current SEG is based on July 3–31 escapement, but use of remote video now allows monitoring entire run, so the SEG was adjusted accordingly.

Table 4.–Current and recommended sustainable escapement goals (SEGs) for Lower Cook Inlet chum salmon stocks, the percent change, and the rationale for the change.

Appendix Table	Stock	Current SEG Range Lo		Hi	Year Adopted	Recommended SEG Range Lo		Hi	*n*	% Change Lo	% Change Hi	Rationale(s) for SEG Action
B.1	Port Graham River	1,450	–	4,800	2002	1,200	–	2,700	40	-17%	-44%	a,b,c
B.2	Dogfish Lagoon	3,350	–	9,150	2002	3,500	–	8,600	40	4%	-6%	a,c
B.3	Rocky River	1,200	–	5,400	2002	1,500	–	4,400	39	25%	-19%	a,b,c
B.4	Port Dick Creek	1,900	–	4,450	2002	1,900	–	4,300	40	0%	-3%	a,c
B.5	Island Creek	6,400	–	15,600	2002	5,100	–	11,900	40	-20%	-24%	a,b,c
B.6	Big Kamishak River	9,350	–	24,000	2002	6,800	–	15,600	35	-27%	-35%	a,b,c
B.7	Little Kamishak River	6,550	–	23,800	2002	8,000	–	16,800	37	22%	-29%	a,b,c
B.8	McNeil River	24,000	–	48,000	2008	24,000	–	48,000	40	-56%	-54%	d
B.9	Bruin River	6,000	–	10,250	2002	5,200	–	10,000	40	-13%	-2%	a,b,c
B.10	Ursus Cove	6,050	–	9,850	2002	5,900	–	10,100	40	-2%	3%	a,c
B.11	Cottonwood Creek	5,750	–	12,000	2002	5,200	–	12,200	40	-10%	2%	a,c
B.12	Iniskin Bay	7,850	–	13,700	2002	5,900	–	13,600	40	-25%	-1%	a,b,c
						Average for stocks with an SEG Change:				-6%	-14%	

Note: For more details on each stock, refer to the appendix table referenced in column 1.

[a] There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range.

[b] Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range.

[c] To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to.

[d] No change is recommended for McNeil River chum salmon for reasons explained in Otis and Szarzi (2007) and Otis et al. (2016).

Table 5.–Current and recommended sustainable escapement goals (SEGs) for Lower Cook Inlet pink salmon stocks, the percent change, and the rationale for the change.

Appendix Table	Stock	Current SEG Range Lo		Hi	Year Adopted	Recommended SEG Range Lo		Hi	*n*	% Change Lo	% Change Hi	Rationale(s) for SEG Action
C.1	Humpy Creek	21,650	–	85,550	2002	17,500	–	51,400	40	-19%	-40%	a,b,c
C.2	China Poot Creek	2,900	–	8,200	2002	2,500	–	6,300	40	-14%	-23%	a,b,c
C.3	Tutka Creek	6,500	–	17,000	2002	6,500	–	17,000	25	-3%	-18%	d
C.4	Barabara Creek	1,900	–	8,950	2002	2,000	–	5,600	40	5%	-37%	a,b,c
C.5	Seldovia Creek	19,050	–	38,950	2002	21,800	–	37,400	40	14%	-4%	a,b,c
C.6	Port Graham River	7,700	–	19,850	2002	7,700	–	19,700	22	0%	-1%	a,c
C.7	Dogfish Lagoon Creeks	1,200	–	8,400	2014	800	–	7,100	38	-33%	-15%	b,c
C.8	Port Chatham	7,800	–	21,000	2002	7,800	–	18,100	39	0%	-14%	a,b,c
C.9	Windy Creek Right	3,350	–	10,950	2002	3,400	–	11,200	40	1%	2%	a,c
C.10	Windy Creek Left	3,650	–	29,950	2002	5,400	–	27,100	40	48%	-10%	a,b,c
C.11	Rocky River	9,350	–	54,250	2002	11,700	–	54,800	40	25%	1%	a,b,c
C.12	Port Dick Creek	18,550	–	58,300	2002	17,900	–	49,800	40	-4%	-15%	a,b,c
C.13	Island Creek	7,200	–	28,300	2002	9,600	–	32,500	39	33%	15%	a,b,c
C.14	S. Nuka Island Creek	2,700	–	14,250	2002	2,800	–	11,200	36	4%	-21%	a,b,c
C.15	Desire Lake	1,900	–	20,200	2002	1,500	–	18,000	37	-21%	-11%	a,b,c
C.16	Bruin River	18,650	–	155,750	2002	17,800	–	103,000	40	-5%	-34%	a,b,c
C.17	Sunday Creek	4,850	–	28,850	2002	4,400	–	24,900	40	-9%	-14%	a,b,c
C.18	Brown's Peak Creek	2,450	–	18,800	2002	2,600	–	17,500	40	6%	-7%	a,c
						Average for stocks with an SEG Change:				2%	-13%	

Note: For more details on each stock, refer to the appendix table referenced in column 1.

[a] There were 14 years of additional escapement data available to revise the SEG.

[b] Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range.

[c] To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to.

[d] No change is recommended for Tutka Creek pink salmon due to influence from the nearby Tutka Bay Lagoon Hatchery.

Table 6.–Current and recommended sustainable escapement goals (SEGs) for Lower Cook Inlet sockeye salmon stocks, the percent change, and the rationale for the change.

Appendix Table	Stock	Current SEG Range			Year Adopted	Recommended SEG Range			*n*	% Change		Rationale(s) for SEG Action
		Lo		Hi		Lo		Hi		Lo	Hi	
D.1	English Bay	6,000	–	13,500	2002	6,000	–	13,500	40	0%	0%	[a]
D.2	Delight Lake	7,550	–	17,650	2011	5,100	–	10,600	35	-32%	-40%	[b,c,d]
D.3	Desire Lake	8,800	–	15,200	2002	4,800	–	11,900	40	-45%	-22%	[b,c,d]
D.4	Bear Lake	700	–	8,300	2002	700	–	8,300	37	0%	0%	[e]
D.5	Aialik Lake	3,700	–	8,000	2002	3,200	–	5,400	40	-14%	-33%	[b,c,d]
D.6	Mikfik Lake	3,400	–	13,000	2014	3,400	–	11,000	17	0%	-15%	[c,d]
D.7	Chenik Lake	3,500	–	14,000	2011	2,900	–	13,700	20	-17%	-2%	[b,c,d]
D.8	Amakdedori Creek	1,250	–	2,600	2002	1,200	–	2,600	40	-4%	0%	[b,d]
						Average for stocks with an SEG Change:				-19%	-19%	

Note: For more details on each stock, refer to the appendix table referenced in column 1.

[a] Natural production for this stock has been enhanced by hatchery back-stocking, which was discontinued in 2016. Also, applying the 3-tier Percentile Approach (Clark et al. 2014) to all available data for this stock would narrow the escapement goal range, which would further complicate an already challenging management situation that requires balancing subsistence and commercial fishing interests targeting this stock. Hence, the committee recommended no SEG change at this time.

[b] There were several additional years of escapement data available to revise the SEG, including some with escapements outside the current SEG range.

[c] Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range.

[d] To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to.

[e] No change is recommended for Bear Lake sockeye salmon due to the controlled management of this system for the Trail Lakes Hatchery return.

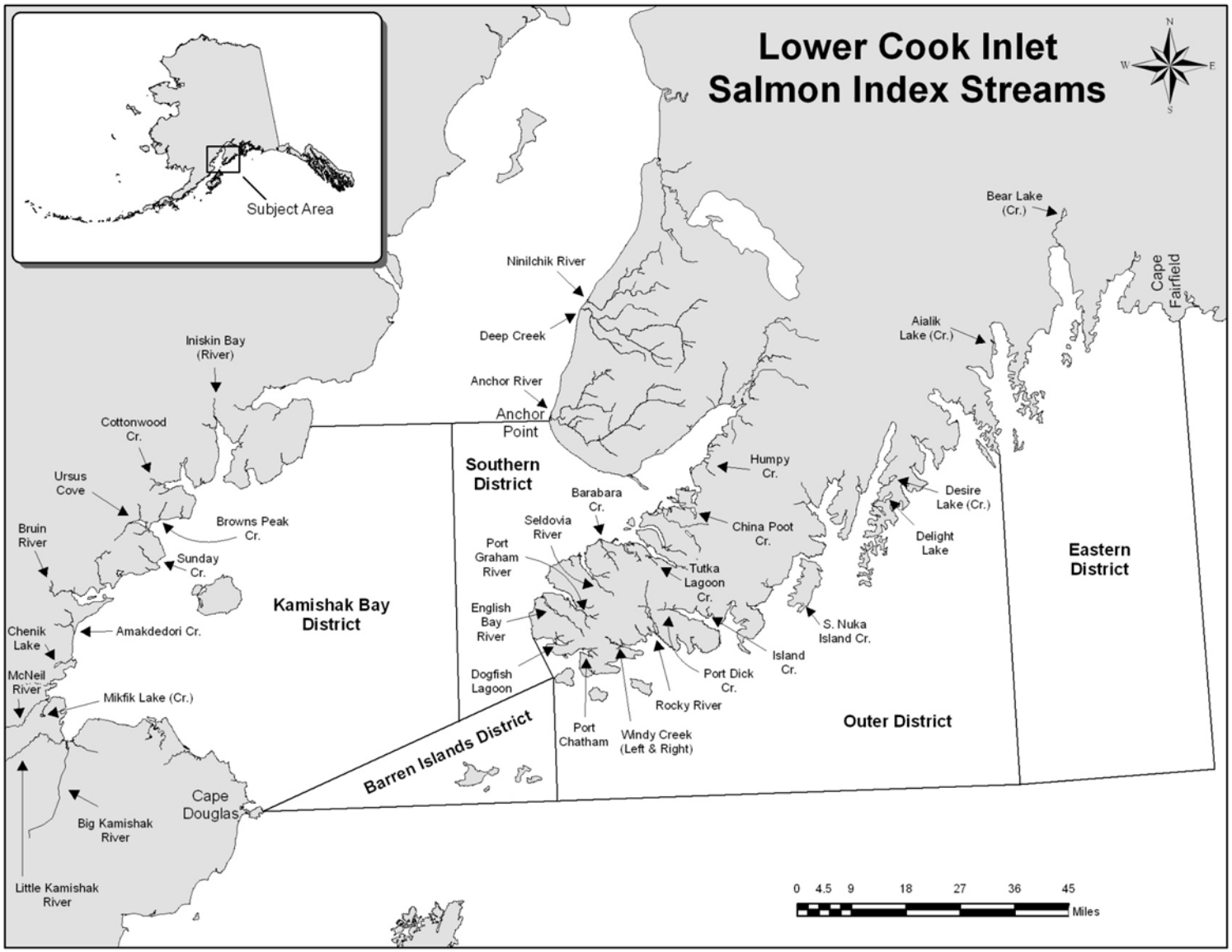

Figure 1.–Lower Cook Inlet commercial fisheries management area, illustrating the locations of salmon-producing streams with escapement goals by district.

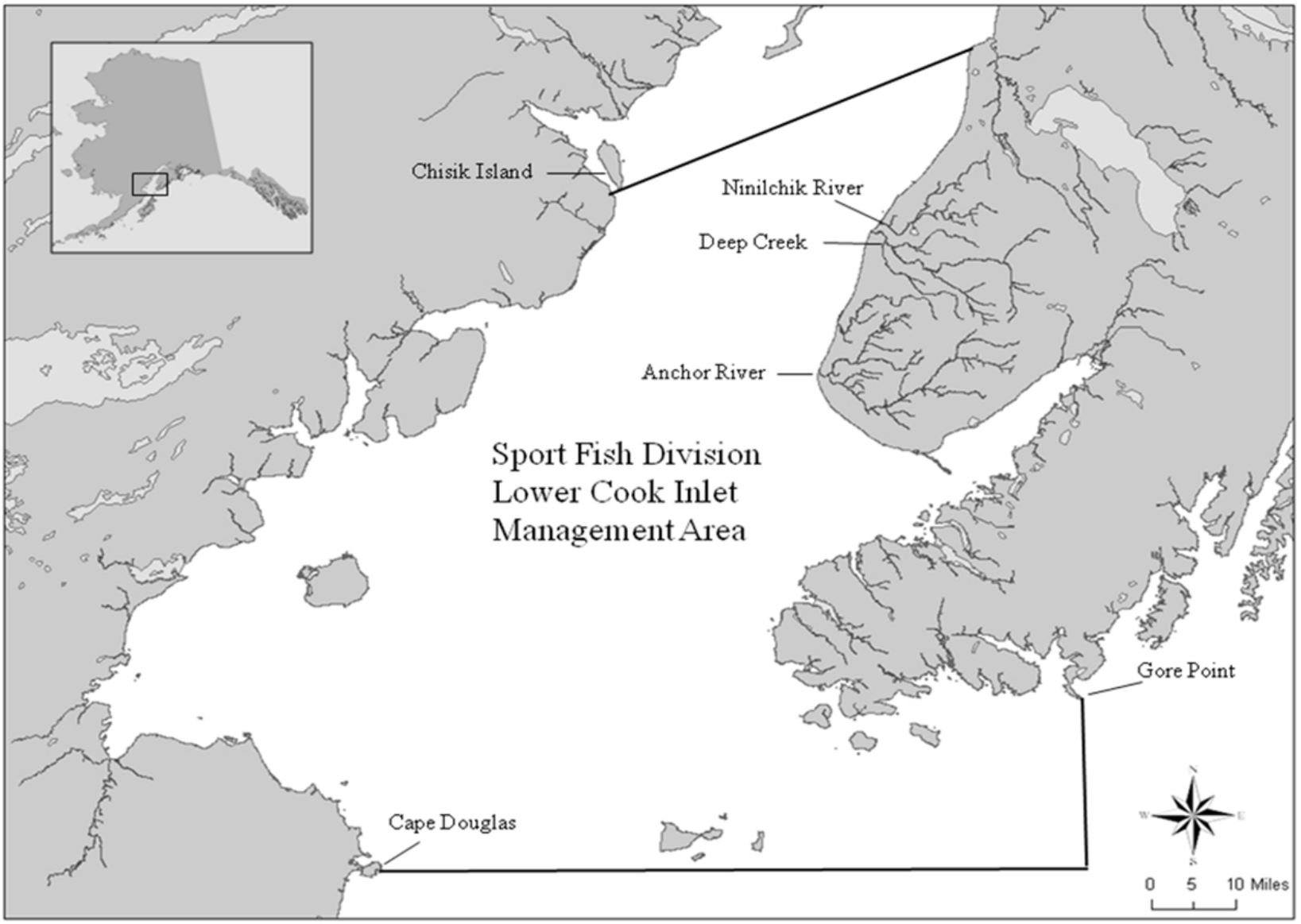

Figure 2.–Lower Cook Inlet sport fish management area, illustrating the locations of Chinook salmon-producing streams with escapement goals.

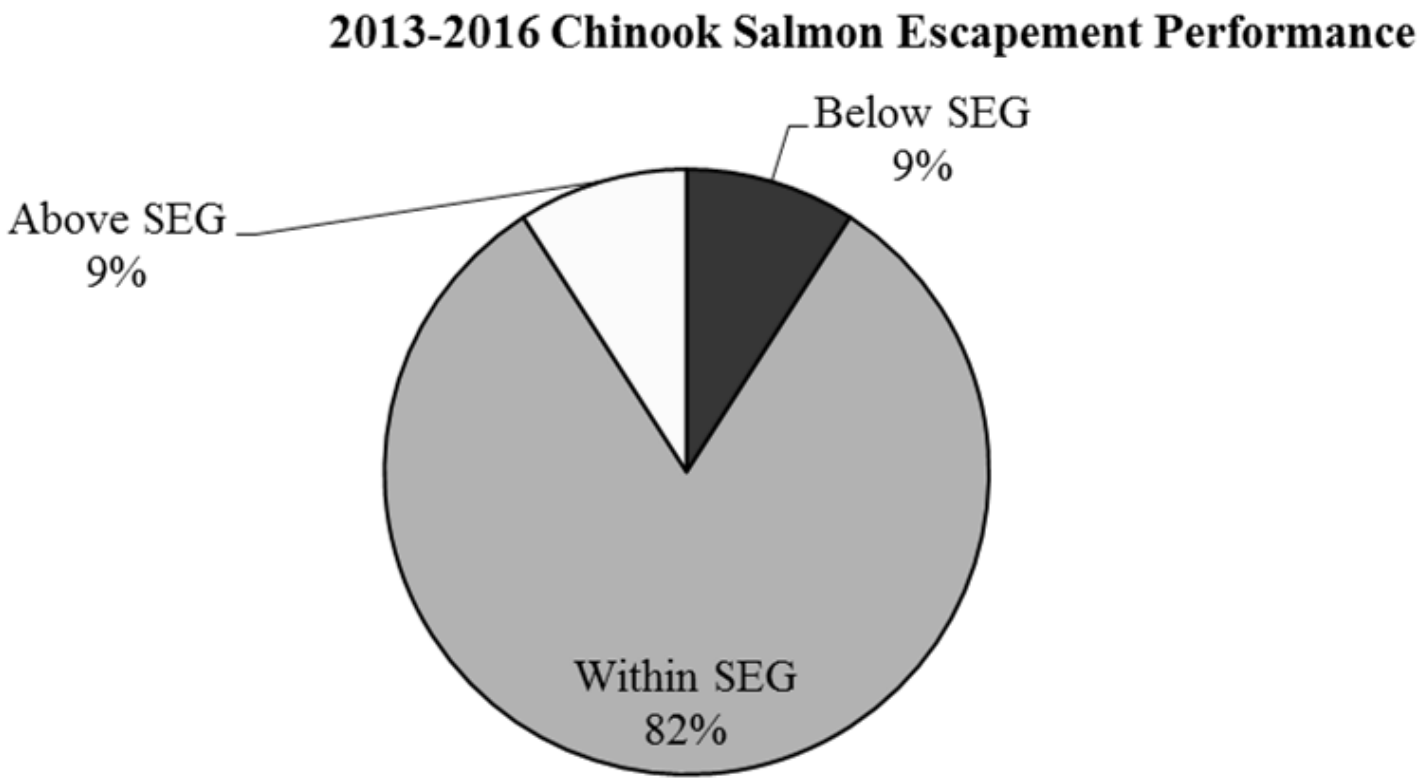

Figure 3.–2013–2016 Lower Cook Inlet Chinook salmon escapement performance for 3 stocks relative to their current sustainable escapement goal range (n = 11; no survey of Deep Creek in 2016).

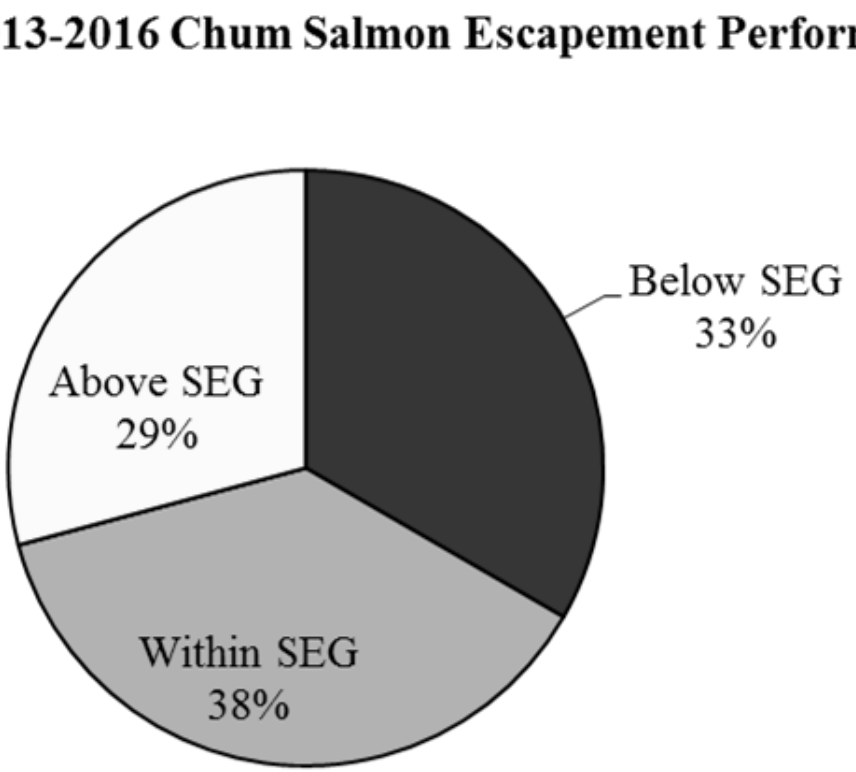

Figure 4.–2013–2016 Lower Cook Inlet chum salmon escapement performance for 12 stocks relative to their current sustainable escapement goal range (n = 48).

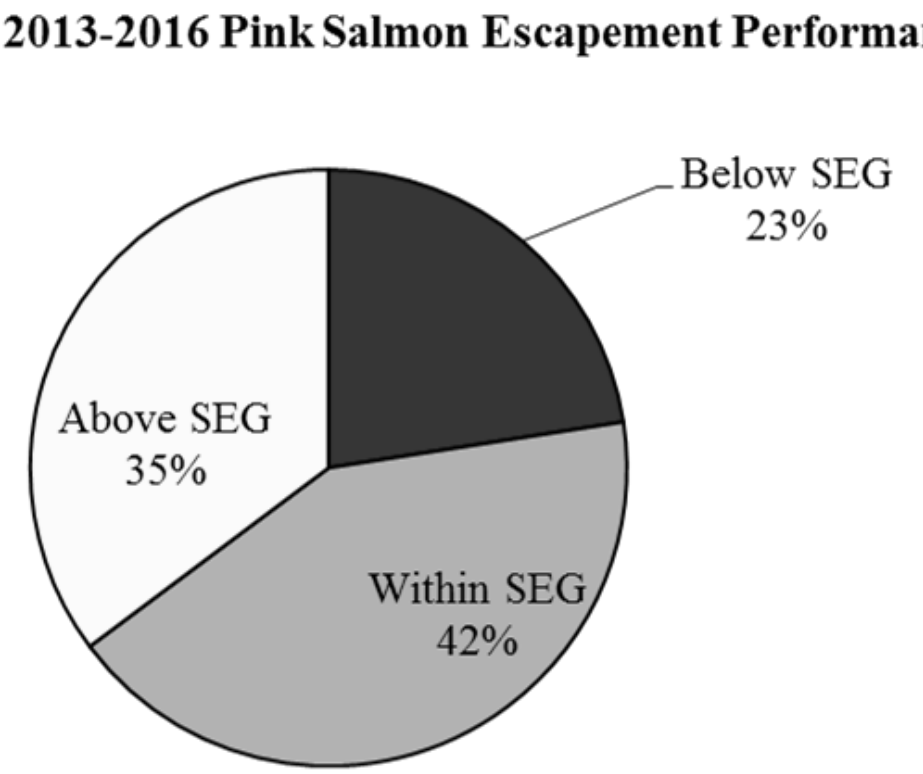

Figure 5.–2013–2016 Lower Cook Inlet pink salmon escapement performance for 18 stocks relative to their current sustainable escapement goal range (n = 71; no SEG for Dogfish Lagoon Creeks in 2013).

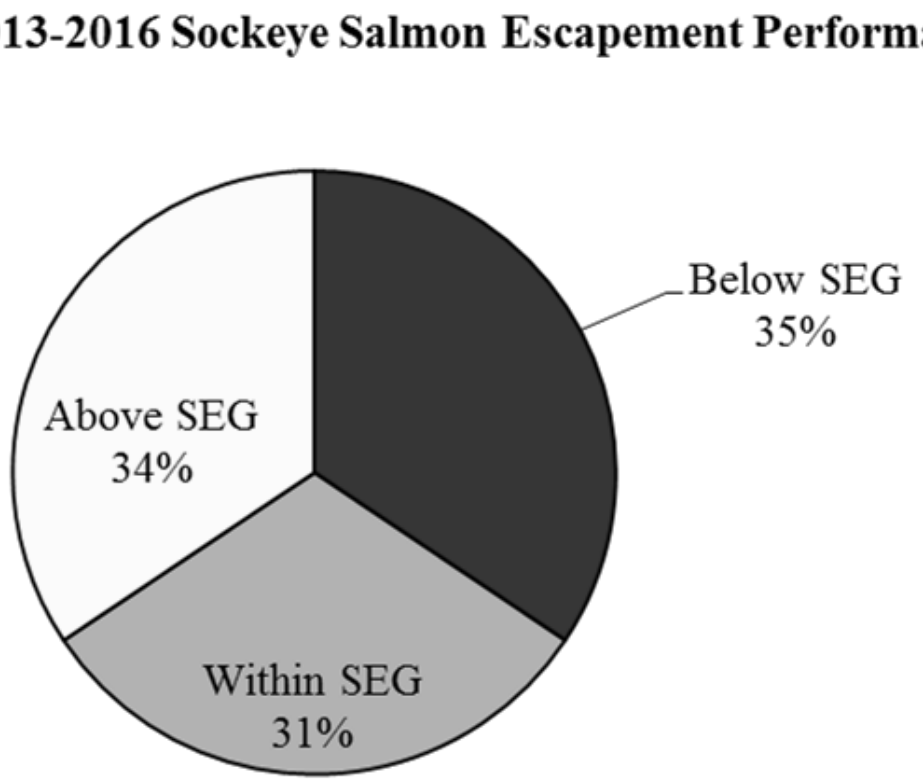

Figure 6.–2013–2016 Lower Cook Inlet sockeye salmon escapement performance for 8 stocks relative to their current sustainable escapement goal range (n = 32).

APPENDIX A: SUPPORTING INFORMATION FOR LOWER COOK INLET CHINOOK SALMON ESCAPEMENT GOALS

Appendix A1.–Escapement data and stock characteristics used to update analysis of Anchor River Chinook salmon escapement goal.

Stock:	Anchor River	**Species:**	Chinook Salmon
Monitoring Method:	Weir/Sonar	**No. of Years:**	13
Analysis Used:	Bayesian full probability model (BFPM).		

Stock Characteristics	Minimum	Maximum	Average	Comments
Sonar/weir Escapement Indices:	2,497	13,273	7,208	Contrast = 5.3
Harvest Rate:	0.05	0.25	0.15	
Current SEG[a]:	3,800	10,000	Year Adopted:	2011
Updated SEG Analysis[b]:	3,800	7,600		
% Difference:	0%	-24%		

Recommendation: Change the SEG to 3,800–7,600 fish

Rationale for Recommendation: The committee recommended lowering the upper end of the SEG range for this stock after examination of yield-curves produced from the Bayesian full-probability spawner–recruit model (BFPM).

Year	Aerial Survey Escapement[c]	Year	Sonar/weir Escapement	
1997	477	2003	13,273	[d]
1998	789	2004	12,016	[d]
1999	685	2005	11,156	[d]
2000	752	2006	8,945	[d]
2001	414	2007	9,622	[d]
2002	748	2008	5,806	[d]
2003	647	2009	3,455	[d]
2004	834	2010	4,449	[d]
2005	651	2011	3,545	[d]
2006	899	2012	4,509	[d]
2007	678	2013	4,388	[e]
2008	528	2014	2,497	[f]
		2015	10,049	[f]

[a] The Bayesian full probability model (BFPM) was used to develop the current SEG range using aerial survey data from 1977 through 2008 and sonar/weir estimates from 2003–2009 (methods of Szarzi et al. 2007, updated with escapement and harvest data through 2009).

[b] The BFPM was used to develop the updated SEG analysis using aerial survey data from 1997 through 2008 and sonar/weir estimates from 2003–2015.

[c] Aerial survey escapement indices during 1997–2008 were derived from single helicopter surveys of the South Fork of the Anchor River, conducted around the peak of the run.

[d] Chinook salmon were monitored in the mainstem Anchor River below the confluence of the North/South forks using DIDSON sonar and/or resistance board weir and/or instream video during 2003–2012. Monitoring occurred throughout the run, except in 2003, when an expansion was applied.

[e] A series of floods rendered the mainstem Anchor River site unsuitable for escapement monitoring. A combination of mainstem DIDSON sonar and weir/video systems operated on both the North and South forks was used to assess escapement throughout the run in 2013.

[f] DIDSON sonar and/or resistance board weirs equipped with instream video were used to monitor Chinook salmon escapement throughout the run on both the North and South forks of the Anchor River during 2014–2015.

Appendix A2.–Escapement data and stock characteristics used to update analysis of Deep Creek Chinook salmon escapement goal.

Stock:	Deep Creek		**Species:**	Chinook Salmon
Monitoring Method:	Single Aerial Survey		**No. of Years:**	39
Analysis Used:	Percentile Approach (Clark et al. 2014)			
Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	63	1,190	589	Contrast = 18.9
Harvest Rate:	Low	Moderate	Low	
Percentiles Used:	0.20			Tier 1
Current SEG[a]:	350	800	Year Adopted:	2002
Updated SEG Analysis[b]:	350			Lower Bound SEG
% Difference:	0%	NA		
Recommendation:	Change to Lower Bound SEG: 350 fish			

Rationale for Recommendation: The committee recommended changing the goal to a Lower Bound SEG because the SEG range that resulted from the updated analysis was too narrow to manage for.

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	1,075	1990	347	2004	1,075
1977	848	1991	294	2005	1,076
1978	582	1992	63	2006	507
1979	726	1993	486	2007	553
1980		1994	364	2008	205
1981	427	1995	229	2009	483
1982	977	1996	193	2010	387
1983	550	1997	136	2011	696
1984	380	1998	676	2012	447
1985	644	1999	1,190	2013	475
1986	976	2000	556	2014	601
1987	968	2001	551	2015	535
1988	409	2002	696		
1989	561	2003	1,008		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to develop the current SEG range using single aerial survey indices from 1976–2000 (Szarzi and Begich 2004).

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using single aerial survey indices from 1976–2015.

[c] Escapement was estimated from single aerial survey data unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix A3.–Escapement data and stock characteristics used to update analysis of Ninilchik River Chinook salmon escapement goal.

Stock:	Ninilchik River		**Species:**	Chinook Salmon
Monitoring Method:	Weir		**No. of Years:**	17
Analysis Used:	Percentile Approach (Clark et al. 2014)			
Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	740	2,076	1,188	Contrast = 2.8
Harvest Rate:	Low	Moderate	Moderate	
Percentiles Used:	0.05	0.65		Tier 3
Current SEG[a]:	550	1,300	Year Adopted:	2008
Updated SEG Analysis[b]:	750	1,300		
% Difference:	36%	0%		
Recommendation:	Change the SEG to 750–1,300 fish			

Rationale for Recommendation: The committee recommended revising the SEG for this stock to change the goal so it represents the entire run and eliminate the SEG index monitoring period.

Year	Escapement[c]	Year	Escapement[c]
1999	1,576	2008	879
2000	1,553	2009	740
2001	1,239	2010	852
2002	1,340	2011	1,012
2003	1,127	2012	763
2004	1,393	2013	853
2005	2,076	2014	1,277
2006	1,429	2015	1,268
2007	825		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to develop the current SEG range using single aerial survey indices from 1997–2007 (Otis and Szarzi 2007).

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using weir counts from 1999–2016.

[c] Escapement was estimated from weir counts unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix A4.–Additional escapement data and associated information used to update analysis of Ninilchik River Chinook salmon escapement goal.

			Wild Chinook Salmon				
Year	Weir Operation Dates	Estimated Percentage of the Run Monitored[a]	Weir Count	Index Count[b]	Expanded Weir Count[c]	Total Removals for Egg Takes	Total Escapement
1999	5/18-8/13	NA	1,644	556	NA	68	1,576
2000	5/17-8/8	NA	1,634	571	NA	81	1,553
2001	5/30-8/5	NA	1,414	891	NA	175	1,239
2002	5/23-8/11	NA	1,516	874	NA	176	1,340
2003	5/16-8/5	NA	1,258	572	NA	131	1,127
2004	5/18-8/5	NA	1,525	556	NA	132	1,393
2005	5/6-8/4	NA	2,241	571	NA	165	2,076
2006	6/30-8/1	74.5	1,139	891	1,530	101	1,429
2007	7/2-8/1	71.2	679	874	954	129	825
2008	6/30-8/7	75.8	772	572	1,019	140	879
2009	6/29-8/6	79.3	620	556	781	41	740
2010	7/1-8/1	73.1	623	571	852	0	852
2011	7/1 - 8/4	75.2	835	891	1,111	99	1,012
2012	6/29 - 8/9	77.2	609	874	789	26	763
2013	7/1 - 8/11	75.9	674	572	888	34	854
2014	7/1 - 7/31	72.3	990	556	1,369	92	1,277
2015	7/1 - 8/2	73.9	1,002	571	1,356	88	1,268
2016[d]	6/1-8/7	NA	1,676	891	NA	145	1,531

[a] The weir was operated over the entire run during 1999–2005.

[b] The weir counts from 3-31 July from 1999–2016.

[c] The weir counts for 2006–2015 were expanded by the average proportion of the run counted from 1999–2005 based on weir operation dates.

[d] Preliminary results based on video weir operation in June for the entire run.

APPENDIX B: SUPPORTING INFORMATION FOR LOWER COOK INLET CHUM SALMON ESCAPEMENT GOALS

Appendix B1.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Port Graham River chum salmon escapement goal.

Stock:	Port Graham River	**Species:**	Chum Salmon
Monitoring Method:	Ground Survey	**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)		

Stock Characteristics	Minimum	Maximum	Average	Comments
Escapement Indices:	400	11,400	2,900	Contrast = 28.5
Harvest Rate:	0.00	0.74	0.17	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	1,450	4,800	Year Adopted:	2002
Updated SEG Analysis[b]:	1,200	2,700		
% Difference:	-17%	-44%		

Recommendation: Change the SEG to 1,200–2,700 fish

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	400	1990	2,600	2004	1,200
1977	5,200	1991	1,100	2005	700
1978	4,800	1992	1,400	2006	2,200
1979	2,200	1993	2,500	2007	1,900
1980	1,100	1994	5,200	2008	1,800
1981	4,800	1995	3,800	2009	1,000
1982	2,500	1996	3,700	2010	1,400
1983	1,900	1997	4,100	2011	1,800
1984	2,100	1998	5,100	2012	700
1985	500	1999	6,600	2013	1,900
1986	600	2000	11,400	2014	3,700
1987	1,500	2001	6,000	2015	4,000
1988	3,000	2002	5,300		
1989	1,300	2003	2,900		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to develop the current SEG range using ground survey indices from 1976–2001 (Otis 2001).

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using ground survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial/ground surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix B2.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Dogfish Lagoon chum salmon escapement goal.

Stock:	Dogfish Lagoon	**Species:**	Chum Salmon
Monitoring Method:	Aerial/Ground Survey	**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)		

Stock Characteristics	Minimum	Maximum	Average	Comments
Escapement Indices:	800	19,600	7,600	Contrast = 24.5
Harvest Rate:	0.00	0.86	0.16	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	3,350	9,150	Year Adopted:	2002
Updated SEG Analysis[b]:	3,500	8,600		
% Difference:	4%	-6%		
Recommendation:	Change the SEG to 3,500–8,600 fish			

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range, and 2) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	3,000	1990	1,000	2004	3,600
1977	6,400	1991	3,100	2005	2,700
1978	9,300	1992	800	2006	5,400
1979	8,200	1993	5,400	2007	4,900
1980	4,000	1994	11,300	2008	6,200
1981	11,500	1995	4,200	2009	4,400
1982	8,500	1996	6,700	2010	12,700
1983	5,300	1997	12,700	2011	12,900
1984	8,600	1998	9,800	2012	8,800
1985	4,900	1999	18,800	2013	9,300
1986	2,500	2000	19,600	2014	11,200
1987	2,000	2001	6,100	2015	13,300
1988	8,600	2002	10,100		
1989	1,800	2003	13,300		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using ground survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using ground survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial/ground surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix B3.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Rocky River chum salmon escapement goal.

Stock:	Rocky River	**Species:**	Chum Salmon
Monitoring Method:	Aerial/Ground Survey	**No. of Years:**	39
Analysis Used:	Percentile Approach (Clark et al. 2014)		

Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	100	35,000	5,700	Contrast = 350
Harvest Rate:	0.00	0.78	0.14	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	1,200	5,400	Year Adopted:	2002
Updated SEG Analysis[b]:	1,500	4,400		
% Difference:	25%	-19%		

Recommendation: Change the SEG to 1,500–4,400 fish

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	12,000	1990	800	2004	17,200
1977	10,500	1991		2005	6,100
1978	6,300	1992	1,700	2006	11,200
1979	35,000	1993	100	2007	1,600
1980	23,000	1994	1,900	2008	3,800
1981	12,500	1995	5,100	2009	2,500
1982	2,800	1996	2,000	2010	1,300
1983	4,000	1997	1,100	2011	4,500
1984	3,500	1998	700	2012	3,200
1985	2,500	1999	5,400	2013	8,100
1986	2,000	2000	4,200	2014	6,900
1987	200	2001	3,000	2015	3,100
1988	300	2002	5,700		
1989	1,200	2003	5,500		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using ground survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using ground survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial/ground surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix B4.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Port Dick Creek chum salmon escapement goal.

Stock:	Port Dick Creek		**Species:**	Chum Salmon
Monitoring Method:	Aerial/Ground Survey		**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)			
Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	1,000	13,200	4,700	Contrast = 13.2
Harvest Rate:	0.00	0.82	0.34	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	1,900	4,450	Year Adopted:	2002
Updated SEG Analysis[b]:	1,900	4,300		
% Difference:	0%	-3%		
Recommendation:	Change the SEG to 1,900–4,300 fish			

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; and 2) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	1,500	1990	1,100	2004	8,600
1977	5,000	1991	7,400	2005	4,800
1978	8,900	1992	5,400	2006	2,800
1979	4,000	1993	2,500	2007	2,800
1980	4,200	1994	3,500	2008	11,800
1981	4,100	1995	3,300	2009	5,600
1982	1,700	1996	2,300	2010	2,400
1983	4,500	1997	1,900	2011	7,100
1984	2,700	1998	1,800	2012	8,400
1985	1,000	1999	2,900	2013	4,100
1986	1,700	2000	3,400	2014	1,800
1987	6,100	2001	1,800	2015	13,200
1988	9,000	2002	12,300		
1989	3,300	2003	5,600		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using ground survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using ground survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial/ground surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix B5.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Island Creek chum salmon escapement goal.

Stock:	Island Creek	**Species:**	Chum Salmon
Monitoring Method:	Aerial/Ground Survey	**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)		

Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	1,000	36,200	11,100	Contrast = 36.2
Harvest Rate:	0.00	0.82	0.34	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	6,400	15,600	Year Adopted:	2002
Updated SEG Analysis[b]:	5,100	11,900		
% Difference:	-20%	-24%		

Recommendation: Change the SEG to 5,100–11,900 fish

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	1,000	1990	2,300	2004	15,100
1977	11,100	1991	17,300	2005	20,700
1978	16,900	1992	6,700	2006	5,600
1979	16,800	1993	3,600	2007	3,100
1980	10,900	1994	8,800	2008	12,900
1981	17,500	1995	7,700	2009	9,300
1982	8,700	1996	6,900	2010	3,400
1983	36,200	1997	5,200	2011	11,800
1984	25,600	1998	3,400	2012	14,900
1985	9,100	1999	16,400	2013	8,800
1986	8,600	2000	12,100	2014	2,700
1987	13,200	2001	6,300	2015	18,500
1988	7,800	2002	15,300		
1989	4,800	2003	16,300		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using ground survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using ground survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial/ground surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix B6.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Big Kamishak River chum salmon escapement goal.

Stock:	Big Kamishak River		**Species:**	Chum Salmon
Monitoring Method:	Aerial Survey		**No. of Years:**	35
Analysis Used:	Percentile Approach (Clark et al. 2014)			
Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	2,500	58,200	17,700	Contrast = 23.3
Harvest Rate:	0.00	0.67	0.15	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	9,350	24,000	Year Adopted:	2002
Updated SEG Analysis[b]:	6,800	15,600		
% Difference:	-27%	-35%		
Recommendation:	Change the SEG to 6,800–15,600 fish			

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	24,000	1990	2,500	2004	57,900
1977		1991	8,700	2005	25,700
1978	23,000	1992	4,500	2006	58,200
1979	15,000	1993	9,100	2007	14,800
1980	10,000	1994		2008	4,500
1981	11,000	1995		2009	15,000
1982	25,000	1996	11,100	2010	
1983	25,000	1997		2011	5,500
1984	19,000	1998	7,100	2012	12,400
1985	6,000	1999	11,600	2013	3,300
1986	24,000	2000	45,300	2014	5,700
1987	12,000	2001	36,300	2015	7,000
1988	15,000	2002	17,400		
1989	30,000	2003	16,400		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using ground survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using ground survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix B7.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Little Kamishak River chum salmon escapement goal.

Stock:	Little Kamishak River		**Species:**	Chum Salmon
Monitoring Method:	Aerial Survey		**No. of Years:**	37
Analysis Used:	Percentile Approach (Clark et al. 2014)			

Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	4,200	45,300	16,300	Contrast = 10.8
Harvest Rate:	0.00	0.71	0.16	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	6,550	23,800	Year Adopted:	2002
Updated SEG Analysis[b]:	8,000	16,800		
% Difference:	22%	-29%		

Recommendation: Change the SEG to 8,000–16,800 fish

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	21,000	1990	7,900	2004	45,300
1977		1991	8,400	2005	12,100
1978	30,000	1992	7,100	2006	42,900
1979	15,000	1993	6,300	2007	15,600
1980	13,000	1994	9,000	2008	21,300
1981	6,000	1995		2009	4,200
1982	18,000	1996	4,400	2010	18,400
1983	25,000	1997		2011	19,300
1984	12,000	1998	9,700	2012	30,300
1985	4,500	1999	8,900	2013	6,700
1986	17,000	2000	26,900	2014	15,100
1987	18,000	2001	27,200	2015	14,400
1988	13,000	2002	16,400		
1989	12,000	2003	22,200		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using ground survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using ground survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix B8.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of McNeil River chum salmon escapement goal.

Stock:	McNeil River	**Species:**	Chum Salmon
Monitoring Method:	Aerial Survey	**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)		

Stock Characteristics	Minimum	Maximum	Average	Comments
Escapement Indices:	6,800	109,100	25,000	Contrast = 16.0
Harvest Rate:	0.00	0.70	0.12	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	24,000	48,000	Year Adopted:	2008
Updated SEG Analysis[b]:	10,700	22,400		
% Difference:	-55%	-53%		

Recommendation: No Change

Rationale for Recommendation: The committee determined there were compelling reasons not to change the SEG range for this stock. McNeil River resides within the McNeil River State Game Sanctuary, which was established by the Alaska Legislature in 1967 to provide permanent protection to brown bears and other fish and wildlife populations for scientific, aesthetic, and educational purposes. Human use and activities in the Sanctuary are managed in a way that is compatible with that purpose and to maintain and enhance unique bear viewing opportunities in the sanctuary. The department last updated the McNeil River SEG range during the 2007–08 BOF cycle (Otis and Szarzi 2007) and the committee determined that that goal is still appropriate. At the November 2016 BOF meeting McNeil River chum salmon were recommended as a stock of concern and more details can be found in the associated action plan (Otis et al. 2016).

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	9,500	1990	13,900	2004	14,600
1977	35,800	1991	6,800	2005	22,500
1978	109,100	1992	23,300	2006	19,300
1979	10,500	1993	19,300	2007	22,300
1980	10,000	1994	15,700	2008	10,800
1981	44,600	1995	12,100	2009	18,400
1982	36,600	1996	24,400	2010	13,800
1983	56,300	1997	32,200	2011	31,000
1984	26,600	1998	19,900	2012	10,400
1985	10,500	1999	10,200	2013	9,500
1986	31,900	2000	17,700	2014	17,500
1987	40,500	2001	16,900	2015	20,500
1988	59,800	2002	17,500		
1989	48,900	2003	30,100		

[a] The current SEG range is based on a long-used historic goal that was revised in 2007 in order to calibrate it to new methods we began using to estimate the escapement of McNeil River chum salmon from periodic aerial surveys (Otis and Szarzi 2007). The area-under-the-curve (AUC) calculations for this stock use a streamlife estimate specific to McNeil River chum salmon and a run-timing model is used to expand the escapement estimates when surveys are curtailed prior to the end of the run.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using aerial survey indices (with a run-timing adjustment) from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial surveys using the area-under-the-curve (AUC) method, adjusted for run-timing, unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix B9.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Bruin River chum salmon escapement goal.

Stock:	Bruin River	**Species:**	Chum Salmon
Monitoring Method:	Aerial Survey	**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)		

Stock Characteristics	Minimum	Maximum	Average	Comments
Escapement Indices:	1,000	21,800	9,500	Contrast = 21.8
Harvest Rate:	0.00	0.84	0.16	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	6,000	10,250	Year Adopted:	2002
Updated SEG Analysis[b]:	5,200	10,000		
% Difference:	-13%	-2%		

Recommendation: Change the SEG to 5,200–10,000 fish

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	4,000	1990	4,000	2004	15,900
1977	18,000	1991	6,000	2005	21,200
1978	4,000	1992	8,500	2006	7,000
1979	15,000	1993	6,000	2007	3,100
1980	15,000	1994	6,100	2008	17,500
1981	10,000	1995	6,600	2009	10,100
1982	10,000	1996	14,900	2010	6,200
1983	5,500	1997	8,800	2011	3,500
1984	8,000	1998	9,400	2012	16,800
1985	2,000	1999	10,300	2013	8,900
1986	1,000	2000	13,600	2014	3,600
1987	10,000	2001	21,800	2015	11,000
1988	7,000	2002	9,900		
1989	8,000	2003	13,100		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using ground survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using ground survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix B10.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Ursus Cove chum salmon escapement goal.

Stock:	Ursus Cove	**Species:**	Chum Salmon
Monitoring Method:	Aerial Survey	**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)		

Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	1,300	41,700	11,200	Contrast = 32.1
Harvest Rate:	0.00	0.71	0.18	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	6,050	9,850	Year Adopted:	2002
Updated SEG Analysis[b]:	5,900	10,100		
% Difference:	-2%	3%		

Recommendation: Change the SEG to 5,900–10,100 fish

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; and 2) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	6,000	1990	3,800	2004	16,000
1977	9,300	1991	1,300	2005	12,200
1978	9,700	1992	1,700	2006	15,700
1979	5,000	1993	7,700	2007	20,900
1980	8,000	1994	6,200	2008	6,500
1981	10,000	1995	11,100	2009	12,900
1982	9,000	1996	7,600	2010	11,800
1983	7,700	1997	6,200	2011	10,600
1984	7,000	1998	4,600	2012	2,800
1985	3,000	1999	21,000	2013	10,300
1986	11,000	2000	41,700	2014	5,300
1987	9,900	2001	37,700	2015	14,800
1988	9,400	2002	17,100		
1989	6,300	2003	30,400		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using ground survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using ground survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix B11.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Cottonwood Creek chum salmon escapement goal.

Stock:	Cottonwood Creek		**Species:**	Chum Salmon
Monitoring Method:	Aerial Survey		**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)			
Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	2,300	72,800	12,800	Contrast = 31.7
Harvest Rate:	0.00	0.90	0.11	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	5,750	12,000	Year Adopted:	2002
Updated SEG Analysis[b]:	5,200	12,200		
% Difference:	-10%	2%		
Recommendation:	Change the SEG to 5,200–12,200 fish			

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; and 2) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	5,000	1990	4,300	2004	16,300
1977	10,000	1991	7,700	2005	17,900
1978	12,500	1992	6,100	2006	13,200
1979	2,500	1993	12,000	2007	12,500
1980	4,200	1994	10,200	2008	11,600
1981	9,000	1995	15,400	2009	19,400
1982	7,000	1996	16,100	2010	15,800
1983	8,300	1997	5,600	2011	4,700
1984	6,500	1998	2,300	2012	4,100
1985	3,000	1999	12,000	2013	5,200
1986	11,000	2000	24,100	2014	7,100
1987	17,000	2001	15,900	2015	17,000
1988	16,000	2002	42,200		
1989	8,000	2003	72,800		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using ground survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using ground survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix B12.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Iniskin River chum salmon escapement goal.

Stock:	Iniskin River	**Species:**	Chum Salmon
Monitoring Method:	Aerial Survey	**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)		

Stock Characteristics	Minimum	Maximum	Average	Comments
Escapement Indices:	3,000	30,800	12,900	Contrast = 10.3
Harvest Rate:	0.00	0.78	0.18	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	7,850	13,700	Year Adopted:	2002
Updated SEG Analysis[b]:	5,900	13,600		
% Difference:	-25%	-1%		

Recommendation: Change the SEG to 5,900–13,600 fish

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	13,500	1990	8,400	2004	22,000
1977	4,400	1991	8,300	2005	16,500
1978	11,400	1992	3,400	2006	15,600
1979	4,000	1993	8,000	2007	5,300
1980	9,300	1994	18,900	2008	20,000
1981	9,000	1995	22,700	2009	30,800
1982	12,800	1996	7,800	2010	19,300
1983	12,000	1997	15,400	2011	16,500
1984	9,800	1998	18,600	2012	3,000
1985	5,000	1999	23,300	2013	5,900
1986	5,900	2000	23,600	2014	13,000
1987	9,100	2001	13,800	2015	7,500
1988	9,500	2002	28,500		
1989	5,900	2003	18,700		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using ground survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using ground survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

APPENDIX C: SUPPORTING INFORMATION FOR LOWER COOK INLET PINK SALMON ESCAPEMENT GOALS

Appendix C1.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Humpy Creek pink salmon escapement goal.

Stock:	Humpy Creek		**Species:**	Pink Salmon
Monitoring Method:	Ground Survey		**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)			
Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	1,700	200,000	52,900	Contrast = 117.6
Harvest Rate:	0.00	0.74	0.28	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	21,650	85,550	Year Adopted:	2002
Updated SEG Analysis[b]:	17,500	51,400		
% Difference:	-19%	-40%		
Recommendation:	Change the SEG to 17,500–51,400 fish			

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	27,200	1990	27,000	2004	28,900
1977	86,000	1991	17,400	2005	93,800
1978	46,100	1992	14,900	2006	48,400
1979	200,000	1993	36,000	2007	54,000
1980	64,400	1994	14,100	2008	90,900
1981	115,000	1995	89,300	2009	5,200
1982	31,900	1996	9,000	2010	70,700
1983	104,000	1997	78,300	2011	1,700
1984	84,200	1998	17,500	2012	67,900
1985	117,000	1999	12,800	2013	6,700
1986	49,700	2000	22,400	2014	44,400
1987	26,600	2001	30,500	2015	38,000
1988	21,400	2002	37,100		
1989	93,000	2003	90,900		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using ground survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using ground survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple ground surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix C2.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of China Poot Creek pink salmon escapement goal.

Stock:	China Poot Creek	**Species:**	Pink Salmon
Monitoring Method:	Ground Survey	**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)		

Stock Characteristics	Minimum	Maximum	Average	Comments
Escapement Indices:	700	20,600	5,800	Contrast = 29.4
Harvest Rate:	0.00	0.97	0.39	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	2,900	8,200	Year Adopted:	2002
Updated SEG Analysis[b]:	2,500	6,300		
% Difference:	-14%	-23%		

Recommendation: Change the SEG to 2,500–6,300 fish

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	2,000	1990	4,200	2004	3,300
1977	3,900	1991	2,600	2005	9,200
1978	11,200	1992	4,100	2006	7,200
1979	20,600	1993	1,600	2007	6,200
1980	12,300	1994	5,700	2008	5,100
1981	5,000	1995	2,000	2009	1,100
1982	3,100	1996	2,800	2010	2,200
1983	14,100	1997	2,800	2011	3,500
1984	8,400	1998	5,700	2012	8,400
1985	1,900	1999	700	2013	7,100
1986	11,500	2000	7,500	2014	1,400
1987	3,100	2001	6,600	2015	7,400
1988	3,900	2002	6,500		
1989	8,500	2003	6,700		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using ground survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using ground survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple ground surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix C3.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Tutka Creek pink salmon escapement goal.

Stock:	Tutka Creek		**Species:**	Pink Salmon
Monitoring Method:	Ground Survey		**No. of Years:**	25
Analysis Used:	Percentile Approach (Clark et al. 2014)			

Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	1,500	30,000	12,200	Contrast = 20.0
Harvest Rate:	0.00	0.90	0.63	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	6,500	17,000	Year Adopted:	2002
Updated SEG Analysis[b]:	6,300	14,000		
% Difference:	-3%	-18%		

Recommendation: No Change

Rationale for Recommendation: The committee determined there were compelling reasons not to change the SEG range for this stock. Tutka Creek is located next to and provides water for the Tutka Bay Lagoon Hatchery (TBLH). Hatchery-produced pink salmon returned to Tutka Bay Lagoon during 1978–2005, and from 2013–present. Escapements to Tutka Creek have been higher during years of hatchery operation and recent otolith analysis has confirmed that a substantial proportion of fish in the creek since the hatchery reopened are of hatchery origin. The current Tutka Creek pink salmon SEG range is based on pre-hatchery (1960–1977) escapements and the committee recommended it be retained as an appropriate level of natural production at Tutka Creek.

Year	Escapement[c]	Year	Escapement[c]
1960	15,000	1974	2,600
1961	15,000	1975	17,600
1962	30,000	1976	11,500
1963	10,000	1977	14,000
1964	20,000	1978–2005	TBLH Returns
1965	20,000	2006	25,800
1966	12,000	2007	5,700
1967	7,000	2008	14,100
1968	7,900	2009	3,800
1969	6,500	2010	2,100
1970	6,500	2011	22,000
1971	16,700	2012	10,400
1972	1,500	2013–present	TBLH Returns
1973	6,500		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using ground survey indices from 1960–1977, the years prior to hatchery influence (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using ground survey indices from 1960–1977 and 2006–2012, years without hatchery-influenced adult returns.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple ground surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix C4.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Barabara Creek pink salmon escapement goal.

Stock:	Barabara Creek		**Species:**	Pink Salmon
Monitoring Method:	Ground Survey		**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)			
Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	200	25,200	7,200	Contrast = 126.0
Harvest Rate:	0.00	0.61	0.12	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	1,900	8,950	Year Adopted:	2002
Updated SEG Analysis[b]:	2,000	5,600		
% Difference:	5%	-37%		
Recommendation:	Change the SEG to 2,000–5,600 fish			

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	200	1990	3,900	2004	5,400
1977	5,700	1991	10,900	2005	14,400
1978	1,400	1992	2,200	2006	3,600
1979	10,000	1993	11,900	2007	25,200
1980	5,800	1994	4,500	2008	16,600
1981	16,800	1995	10,800	2009	2,600
1982	2,100	1996	2,400	2010	13,900
1983	14,800	1997	12,500	2011	8,200
1984	1,000	1998	2,800	2012	1,400
1985	1,600	1999	3,900	2013	17,400
1986	1,800	2000	5,600	2014	3,600
1987	300	2001	2,300	2015	25,200
1988	700	2002	3,200		
1989	4,500	2003	5,100		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using ground survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using ground survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple ground surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix C5.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Seldovia River pink salmon escapement goal.

Stock:	Seldovia River		**Species:**	Pink Salmon
Monitoring Method:	Ground Survey		**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)			

Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	7,600	108,800	38,000	Contrast = 14.3
Harvest Rate:	0.00	0.77	0.20	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	19,050	38,950	Year Adopted:	2002
Updated SEG Analysis[b]:	21,800	37,400		
% Difference:	14%	-4%		
Recommendation:	Change the SEG to 21,800–37,400 fish			

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	25,600	1990	27,800	2004	56,800
1977	35,700	1991	30,000	2005	98,600
1978	24,600	1992	14,700	2006	70,000
1979	43,700	1993	43,400	2007	69,400
1980	65,500	1994	24,400	2008	53,500
1981	62,700	1995	48,500	2009	14,600
1982	38,400	1996	17,800	2010	25,900
1983	27,900	1997	39,100	2011	46,200
1984	14,200	1998	31,500	2012	44,700
1985	22,800	1999	12,200	2013	36,800
1986	28,200	2000	53,500	2014	35,900
1987	7,600	2001	12,300	2015	108,800
1988	16,900	2002	26,900		
1989	26,200	2003	35,100		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using ground survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using ground survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple ground surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix C6.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Port Graham River pink salmon escapement goal.

Stock:	Port Graham River	**Species:**	Pink Salmon
Monitoring Method:	Aerial/Ground Survey	**No. of Years:**	22
Analysis Used:	Percentile Approach (Clark et al. 2014)		

Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	3,800	40,200	18,000	Contrast = 10.6
Harvest Rate:	0.00	0.73	0.21	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	7,700	19,850	Year Adopted:	2002
Updated SEG Analysis[b]:	7,700	19,700		
% Difference:	0%	-1%		

Recommendation: Change the SEG to 7,700–19,700 fish

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 4 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.** Note below that we excluded from analysis years where escapements to the Port Graham River were most likely influenced by strays from the Port Graham Hatchery (PGH). Recent otolith analyses confirmed that a substantial proportion of pink salmon spawning in the Port Graham River in 2014–15 originated in the PGH.

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	6,500	1990	20,100	2004	PGH Returns
1977	20,600	1991	29,000	2005	PGH Returns
1978	6,700	1992	PGH Returns	2006	PGH Returns
1979	32,700	1993	PGH Returns	2007	PGH Returns
1980	40,200	1994	7,600	2008	PGH Returns
1981	18,400	1995	PGH Returns	2009	14,000
1982	28,900	1996	PGH Returns	2010	16,600
1983	4,600	1997	PGH Returns	2011	20,900
1984	10,900	1998	PGH Returns	2012	34,500
1985	26,300	1999	9,700	2013	PGH Returns
1986	17,500	2000	PGH Returns	2014	PGH Returns
1987	3,800	2001	PGH Returns	2015	PGH Returns
1988	7,900	2002	PGH Returns		
1989	19,100	2003	PGH Returns		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using aerial/ground survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using aerial/ground survey indices from years between 1976–2015 when returns to Port Graham River were not influenced by Port Graham Hatchery returns.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial/ground surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix C7.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Dogfish Lagoon Creeks pink salmon escapement goal.

Stock:	Dogfish Lagoon Creeks		**Species:**	Pink Salmon
Monitoring Method:	Aerial/Ground Survey		**No. of Years:**	38
Analysis Used:	Percentile Approach (Clark et al. 2014)			
Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	200	50,100	7,400	Contrast = 250.3
Harvest Rate:	0.00	0.99	0.16	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	1,200	8,400	Year Adopted:	2014
Updated SEG Analysis[b]:	800	7,100		
% Difference:	-33%	-15%		
Recommendation:	Change the SEG to 800–7,100 fish			

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 2) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976		1990	7,100	2004	3,200
1977	8,100	1991	9,300	2005	22,300
1978	600	1992		2006	8,000
1979	7,300	1993	300	2007	4,100
1980	300	1994	1,300	2008	8,000
1981	2,600	1995	13,300	2009	9,200
1982	2,600	1996	2,300	2010	6,300
1983	1,000	1997	20,000	2011	3,900
1984	600	1998	6,700	2012	11,400
1985	200	1999	12,400	2013	26,400
1986	400	2000	11,100	2014	8,800
1987	1,200	2001	2,000	2015	50,100
1988	300	2002	1,300		
1989	200	2003	5,200		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using aerial/ground survey indices from 1977–2013 (Otis et al. 2013). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using aerial/ground survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial/ground surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix C8.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Port Chatham Creek pink salmon escapement goal.

Stock:	Port Chatham Creeks		**Species:**	Pink Salmon
Monitoring Method:	Aerial/Ground Survey		**No. of Years:**	39
Analysis Used:	Percentile Approach (Clark et. al 2014)			
Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	300	57,400	18,000	Contrast = 191.3
Harvest Rate:	0.00	0.89	0.23	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	7,800	21,000	Year Adopted:	2002
Updated SEG Analysis[b]:	7,800	18,100		
% Difference:	0%	-14%		
Recommendation:	Change the SEG to 7,800–18,100 fish			

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976		1990	27,800	2004	26,400
1977	14,200	1991	23,800	2005	44,400
1978	300	1992	4,300	2006	24,200
1979	20,800	1993	22,200	2007	14,500
1980	7,700	1994	3,300	2008	16,400
1981	11,200	1995	14,000	2009	25,300
1982	2,000	1996	8,600	2010	3,000
1983	3,500	1997	42,700	2011	15,800
1984	7,800	1998	22,200	2012	5,400
1985	8,900	1999	10,700	2013	57,400
1986	11,500	2000	16,700	2014	10,300
1987	10,200	2001	17,900	2015	42,600
1988	21,000	2002	18,100		
1989	31,700	2003	35,000		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using aerial/ground survey indices from 1977–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using aerial/ground survey indices from 1977–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial/ground surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix C9.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Windy Right Creek pink salmon escapement goal.

Stock:	Windy Right Creek		**Species:**	Pink Salmon
Monitoring Method:	Aerial/Ground Survey		**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)			
Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	200	23,300	9,600	Contrast = 116.5
Harvest Rate:	0.00	0.98	0.25	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	3,350	10,950	Year Adopted:	2002
Updated SEG Analysis[b]:	3,400	11,200		
% Difference:	1%	2%		
Recommendation:	Change the SEG to 3,400–11,200 fish			

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; and 2) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	200	1990	7,100	2004	12,000
1977	11,100	1991	20,700	2005	22,200
1978	300	1992	3,900	2006	17,100
1979	10,400	1993	13,600	2007	18,300
1980	3,300	1994	2,200	2008	12,500
1981	4,700	1995	11,400	2009	15,000
1982	4,700	1996	9,900	2010	6,400
1983	4,300	1997	13,900	2011	1,700
1984	3,400	1998	19,500	2012	5,800
1985	5,400	1999	5,200	2013	11,700
1986	2,500	2000	23,000	2014	5,700
1987	2,000	2001	10,300	2015	17,000
1988	1,300	2002	14,400		
1989	6,600	2003	23,300		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using aerial/ground survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using aerial/ground survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial/ground surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix C10.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Windy Left Creek pink salmon escapement goal.

Stock:	Windy Left Creek	**Species:**	Pink Salmon
Monitoring Method:	Aerial/Ground Survey	**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)		

Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	200	82,800	27,400	Contrast = 414.0
Harvest Rate:	0.00	0.98	0.25	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	3,650	29,950	Year Adopted:	2002
Updated SEG Analysis[b]:	5,400	27,100		
% Difference:	48%	-10%		

Recommendation: Change the SEG to 5,400–27,100 fish

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	200	1990	7,500	2004	23,300
1977	47,300	1991	34,500	2005	72,000
1978	1,100	1992	8,200	2006	65,200
1979	74,800	1993	25,900	2007	37,300
1980	10,900	1994	3,000	2008	64,100
1981	31,300	1995	31,600	2009	57,300
1982	4,400	1996	2,500	2010	24,200
1983	11,900	1997	64,600	2011	12,200
1984	2,500	1998	12,900	2012	11,700
1985	8,900	1999	24,000	2013	47,800
1986	2,200	2000	20,100	2014	10,100
1987	5,600	2001	61,800	2015	33,600
1988	3,400	2002	28,900		
1989	25,200	2003	82,800		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using aerial/ground survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using aerial/ground survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial/ground surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix C11.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Rocky River pink salmon escapement goal.

Stock:	Rocky River	**Species:**	Pink Salmon
Monitoring Method:	Aerial/Ground Survey	**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)		

Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	2,700	287,400	60,200	Contrast = 106.4
Harvest Rate:	0.00	0.65	0.11	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	9,350	54,250	Year Adopted:	2002
Updated SEG Analysis[b]:	11,700	54,800		
% Difference:	25%	1%		

Recommendation: Change the SEG to 11,700–54,800 fish

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	2,700	1990	18,000	2004	53,800
1977	36,700	1991	26,100	2005	198,700
1978	8,200	1992	25,400	2006	67,800
1979	85,000	1993	70,000	2007	190,000
1980	6,400	1994	17,100	2008	90,900
1981	25,000	1995	56,300	2009	173,600
1982	6,600	1996	80,100	2010	27,000
1983	16,600	1997	48,100	2011	22,700
1984	9,000	1998	165,000	2012	15,700
1985	12,100	1999	17,200	2013	75,800
1986	12,000	2000	131,600	2014	17,100
1987	4,500	2001	73,000	2015	107,900
1988	5,400	2002	112,500		
1989	10,300	2003	287,400		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using aerial/ground survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using aerial/ground survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial/ground surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix C12.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Port Dick Creek pink salmon escapement goal.

Stock:	Port Dick Creek	**Species:**	Pink Salmon
Monitoring Method:	Aerial/Ground Survey	**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)		

Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	4,500	124,400	50,400	Contrast = 27.6
Harvest Rate:	0.00	0.94	0.49	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	18,550	58,300	Year Adopted:	2002
Updated SEG Analysis[b]:	17,900	49,800		
% Difference:	-4%	-15%		

Recommendation: Change the SEG to 17,900–49,800 fish

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	12,700	1990	41,700	2004	13,300
1977	109,300	1991	54,200	2005	122,200
1978	44,900	1992	6,900	2006	51,500
1979	116,000	1993	37,000	2007	44,200
1980	56,100	1994	18,100	2008	34,200
1981	106,000	1995	6,600	2009	41,700
1982	19,900	1996	23,200	2010	41,100
1983	64,100	1997	36,900	2011	16,900
1984	44,600	1998	59,100	2012	18,100
1985	65,300	1999	8,500	2013	55,800
1986	41,600	2000	124,400	2014	48,700
1987	4,500	2001	44,700	2015	98,000
1988	12,000	2002	108,000		
1989	55,400	2003	107,700		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using aerial/ground survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using aerial/ground survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial/ground surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix C13.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Island Creek pink salmon escapement goal.

Stock:	Island Creek	**Species:**	Pink Salmon
Monitoring Method:	Aerial/Ground Survey	**No. of Years:**	39
Analysis Used:	Percentile Approach (Clark et al. 2014)		

Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	100	118,600	34,900	Contrast = 1,186.0
Harvest Rate:	0.00	0.94	0.50	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	7,200	28,300	Year Adopted:	2002
Updated SEG Analysis[b]:	9,600	32,500		
% Difference:	33%	15%		

Recommendation: Change the SEG to 9,600–32,500 fish

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976		1990	25,000	2004	33,600
1977	600	1991	24,400	2005	26,400
1978	400	1992	12,500	2006	107,700
1979	600	1993	12,100	2007	87,200
1980	2,200	1994	28,300	2008	49,700
1981	25,000	1995	10,600	2009	44,500
1982	15,000	1996	40,100	2010	69,500
1983	15,300	1997	71,100	2011	10,200
1984	35,000	1998	83,600	2012	20,100
1985	27,900	1999	8,600	2013	26,000
1986	16,600	2000	70,800	2014	50,400
1987	100	2001	81,800	2015	50,400
1988	7,200	2002	44,100		
1989	6,700	2003	118,600		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using aerial/ground survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using aerial/ground survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial/ground surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix C14.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of South Nuka Island Creek pink salmon escapement goal.

Stock:	South Nuka Island Creek		**Species:**	Pink Salmon
Monitoring Method:	Aerial/Ground Survey		**No. of Years:**	36
Analysis Used:	Percentile Approach (Clark et al. 2014)			

Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	300	41,400	10,600	Contrast = 138.0
Harvest Rate:	0.00	0.98	0.24	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	2,700	14,250	Year Adopted:	2002
Updated SEG Analysis[b]:	2,800	11,200		
% Difference:	4%	-21%		

Recommendation: Change the SEG to 2,800–11,200 fish

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 12 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976		1990	13,300	2004	6,400
1977	12,000	1991	16,400	2005	11,200
1978		1992	6,100	2006	5,100
1979	15,000	1993	34,300	2007	6,600
1980	300	1994	1,400	2008	12,300
1981	16,000	1995	6,200	2009	19,900
1982	400	1996	6,800	2010	
1983	22,200	1997	9,300	2011	
1984	600	1998	14,000	2012	1,300
1985	3,600	1999	2,400	2013	8,400
1986	7,000	2000	13,600	2014	11,000
1987	2,800	2001	20,700	2015	8,900
1988	1,200	2002	14,800		
1989	7,300	2003	41,400		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using aerial/ground survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using aerial/ground survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial/ground surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix C15.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Desire Creek pink salmon escapement goal.

Stock:	Desire Creek	**Species:**	Pink Salmon
Monitoring Method:	Aerial Survey	**No. of Years:**	37
Analysis Used:	Percentile Approach (Clark et al. 2014)		

Stock Characteristics	Minimum	Maximum	Average	Comments
Escapement Indices:	400	78,400	22,100	Contrast = 196.0
Harvest Rate:	0.00	0.96	0.38	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	1,900	20,200	Year Adopted:	2002
Updated SEG Analysis[b]:	1,500	18,000		
% Difference:	-21%	-11%		

Recommendation: Change the SEG to 1,500–18,000 fish

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	600	1990	1,000	2004	24,300
1977	800	1991	1,300	2005	46,000
1978	1,000	1992	400	2006	74,800
1979	3,000	1993	19,300	2007	11,800
1980	16,000	1994		2008	9,500
1981	5,000	1995		2009	73,900
1982	12,000	1996		2010	3,000
1983	8,500	1997	6,200	2011	600
1984	23,000	1998	6,200	2012	2,300
1985	62,500	1999	6,800	2013	56,900
1986	32,000	2000	21,100	2014	400
1987	11,000	2001	67,500	2015	46,300
1988	2,500	2002	78,400		
1989	47,000	2003	34,800		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using aerial survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using aerial survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix C16.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Bruin River pink salmon escapement goal.

Stock:	Bruin River	**Species:**	Pink Salmon
Monitoring Method:	Aerial Survey	**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)		

Stock Characteristics	Minimum	Maximum	Average	Comments
Escapement Indices:	2,900	1,598,500	196,400	Contrast = 551.2
Harvest Rate:	0.00	0.53	0.12	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	18,650	155,750	Year Adopted:	2002
Updated SEG Analysis[b]:	17,800	103,000		
% Difference:	-5%	-34%		

Recommendation: Change the SEG to 17,800–103,000 fish

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	13,500	1990	19,000	2004	66,500
1977	60,000	1991	74,900	2005	98,300
1978	33,000	1992	3,200	2006	515,100
1979	200,000	1993	86,400	2007	350,400
1980	400,000	1994	5,900	2008	150,700
1981	95,000	1995	307,300	2009	1,067,400
1982	75,000	1996	27,500	2010	40,300
1983	4,000	1997	162,700	2011	4,500
1984	110,000	1998	134,900	2012	31,800
1985	3,500	1999	2,900	2013	15,000
1986	1,200,000	2000	176,700	2014	121,600
1987	24,000	2001	18,500	2015	40,800
1988	29,000	2002	1,598,500		
1989	350,000	2003	138,700		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using aerial survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using aerial survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix C17.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Sunday Creek pink salmon escapement goal.

Stock:	Sunday Creek	**Species:**	Pink Salmon
Monitoring Method:	Aerial Survey	**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)		

Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	200	394,800	48,100	Contrast = 1,974.0
Harvest Rate:	0.00	0.60	0.12	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	4,850	28,850	Year Adopted:	2002
Updated SEG Analysis[b]:	4,400	24,900		
% Difference:	-9%	-14%		

Recommendation: Change the SEG to 4,400–24,900 fish

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	300	1990	2,800	2004	31,500
1977	9,000	1991	20,900	2005	116,200
1978	200	1992	2,900	2006	70,000
1979	12,000	1993	57,800	2007	394,800
1980	5,200	1994	3,100	2008	20,400
1981	14,200	1995	95,900	2009	106,300
1982	12,000	1996	2,800	2010	6,600
1983	4,700	1997	52,500	2011	800
1984	12,000	1998	24,000	2012	1,300
1985	11,400	1999	5,300	2013	6,100
1986	109,000	2000	39,800	2014	7,700
1987	29,700	2001	26,200	2015	60,400
1988	18,000	2002	81,900		
1989	103,000	2003	346,700		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using aerial survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using aerial survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix C18.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Brown's Peak Creek pink salmon escapement goal.

Stock:	Brown's Peak Creek		**Species:**	Pink Salmon
Monitoring Method:	Aerial Survey		**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)			
Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	900	285,000	33,100	Contrast = 316.7
Harvest Rate:	0.00	0.60	0.12	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	2,450	18,800	Year Adopted:	2002
Updated SEG Analysis[b]:	2,600	17,500		
% Difference:	6%	-7%		
Recommendation:	Change the SEG to 2,600–17,500 fish			

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; and 2) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	1,200	1990	1,000	2004	18,100
1977	13,000	1991	16,700	2005	61,000
1978	900	1992	5,000	2006	35,700
1979	15,000	1993	41,600	2007	249,400
1980	2,300	1994	1,300	2008	17,400
1981	17,700	1995	96,700	2009	63,600
1982	3,500	1996	2,400	2010	3,100
1983	1,700	1997	42,300	2011	2,000
1984	6,800	1998	7,900	2012	2,800
1985	7,000	1999	2,600	2013	4,100
1986	28,000	2000	9,800	2014	4,000
1987	40,200	2001	19,200	2015	29,100
1988	17,000	2002	27,500		
1989	120,000	2003	285,000		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using aerial survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using aerial survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from multiple aerial surveys using the area-under-the-curve (AUC) method unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

APPENDIX D: SUPPORTING INFORMATION FOR LOWER COOK INLET SOCKEYE SALMON ESCAPEMENT GOALS

Appendix D1.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of English Bay Lakes sockeye salmon escapement goal.

Stock:	English Bay Lakes		**Species:**	Sockeye Salmon
Monitoring Method:	Weir/aerial survey		**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)			

Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	2,500	20,700	10,800	Contrast = 8.3
Harvest Rate:	0.00	0.81	0.25	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	6,000	13,500	Year Adopted:	2002
Updated SEG Analysis[b]:	6,200	12,000		
% Difference:	3%	-11%		

Recommendation: No Change

Rationale for Recommendation: The committee determined there were compelling reasons not to change the SEG range for this stock. Natural production from English Bay Lakes has been enhanced through hatchery backstocking during all but 7 years since 1990. This stock is also an important subsistence resource to the residents of Port Graham subdistrict. The updated SEG analysis would have resulted in narrowing the SEG range for this stock. Narrowing the goal would make it harder to balance subsistence and commercial fishing concerns in an already complex management situation. Also, backstocking of the lake was recently curtailed and may not continue, which could result in changes to future returns. Thus, the committee recommended no change to the SEG for the English Bay Lakes sockeye salmon stock at this time.

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	6,000	1990	3,300	2004	15,000
1977	12,500	1991	7,000	2005	7,600
1978	13,500	1992	6,400	2006	16,500
1979	4,400	1993	8,900	2007	16,500
1980	12,000	1994	13,800	2008	12,000
1981	10,500	1995	20,700	2009	18,200
1982	20,000	1996	11,100	2010	12,300
1983	12,000	1997	14,400	2011	9,900
1984	11,100	1998	14,100	2012	3,400
1985	5,000	1999	14,600	2013	10,900
1986	2,800	2000	11,200	2014	7,800
1987	7,000	2001	10,500	2015	6,300
1988	2,500	2002	15,000		
1989	4,500	2003	19,800		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using weir and peak aerial survey data from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using weir and peak aerial survey data from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from the peak of multiple aerial surveys flown throughout the run (1976–1992), or from weir counts (1993–2015).

Appendix D2.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Delight Lake sockeye salmon escapement goal.

Stock:	Delight Lake	**Species:**	Sockeye Salmon
Monitoring Method:	Aerial Survey	**No. of Years:**	35
Analysis Used:	Percentile Approach (Clark et al. 2014)		

Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	800	16,300	7,800	Contrast = 19.7
Harvest Rate:	0.00	0.84	0.41	
Percentiles Used:	0.25	0.75		see rationale below
Current SEG[a]:	7,550	17,650	Year Adopted:	2011
Updated SEG Analysis[b]:	5,100	10,600		
% Difference:	-32%	-40%		

Recommendation: Change the SEG to 5,100–10,600 fish

Rationale for Recommendation: The current goal for this stock is based on weir data, which was the primary monitoring method from 1997–2014. When weir funding was cut in 2015, aerial survey became the primary monitoring method. Because the measurement error is higher for aerial survey, the committee determined it was appropriate to develop a new SEG range for this stock based on the 3-Tier Percentile Approach and using only aerial survey data. This is a Tier 1 stock based on contrast and monitoring method, but the SEG range resulting from using the 20th–60th percentiles was deemed too narrow to manage for so the committee recommended using the 25th–75th percentiles to develop the SEG range.

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976		1990		2004	11,000
1977	5,200	1991	4,100	2005	4,600
1978	5,500	1992	5,900	2006	13,300
1979		1993	5,000	2007	5,000
1980	7,300	1994	5,600	2008	11,300
1981		1995	15,800	2009	12,700
1982	13,100	1996	9,400	2010	7,100
1983	5,100	1997	6,000	2011	7,600
1984	5,400	1998	5,000	2012	7,000
1985	16,300	1999	5,900	2013	3,400
1986	8,800	2000	12,300	2014	
1987	8,100	2001	10,100	2015	3,200
1988	800	2002	12,100		
1989	4,800	2003	9,000		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using weir data from 1997–2010 (Otis et al. 2010). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using peak aerial survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from the peak of multiple aerial surveys flown throughout the run, unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix D3.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Desire Lake sockeye salmon escapement goal.

Stock:	Desire Lake		**Species:**	Sockeye Salmon
Monitoring Method:	Aerial Survey		**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)			
Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	2,800	18,600	11,100	Contrast = 6.6
Harvest Rate:	0.00	0.68	0.35	
Percentiles Used:	0.05	0.65		Tier 3
Current SEG[a]:	8,800	15,200	Year Adopted:	2002
Updated SEG Analysis[b]:	4,800	11,900		
% Difference:	-45%	-22%		
Recommendation:	Change the SEG to 4,800–11,900 fish			

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	11,000	1990	9,500	2004	10,700
1977	10,700	1991	8,200	2005	4,800
1978	10,000	1992	11,900	2006	18,600
1979	12,000	1993	11,000	2007	10,000
1980	17,000	1994	10,500	2008	10,700
1981	12,000	1995	15,800	2009	16,000
1982	18,000	1996	9,400	2010	6,300
1983	12,000	1997	14,700	2011	9,600
1984	15,000	1998	7,900	2012	8,800
1985	18,000	1999	14,600	2013	8,400
1986	10,000	2000	4,000	2014	11,500
1987	13,400	2001	5,500	2015	2,800
1988	9,000	2002	16,000		
1989	9,000	2003	8,400		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using peak aerial survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using peak aerial survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from the peak of multiple aerial surveys flown throughout the run, unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix D4.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Bear Lake sockeye salmon escapement goal.

Stock:	Bear Lake	**Species:**	Sockeye Salmon
Monitoring Method:	Weir	**No. of Years:**	37
Analysis Used:	Percentile Approach (Clark et al. 2014)		

Stock Characteristics	Minimum	Maximum	Average	Comments
Escapement Indices:	100	10,400	5,300	Contrast = 104.0
Harvest Rate:	0.00	0.96	0.55	
Percentiles Used:	0.15	0.65		Tier 2
Current SEG[a]:	700	8,300	Year Adopted:	2002
Updated SEG Analysis[b]:	500	8,200		
% Difference:	-29%	-1%		

Recommendation: No Change

Rationale for Recommendation: The committee determined there were compelling reasons not to change the SEG range for this stock. Natural production of sockeye salmon in Bear Lake has been enhanced by hatchery stocking every year since 1990. Escapement back into the lake is strictly controlled by a weir on Bear Creek operated by Cook Inlet Aquaculture Association. Fish surplus to escapement and broodstock needs are harvested at the weir for cost recovery. The committee recommended that the current goal represents an appropriate level of natural production for this stock and no change is recommended.

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	600	1990	100	2004	8,200
1977		1991	700	2005	10,300
1978		1992	1,900	2006	8,300
1979		1993	4,800	2007	8,600
1980	1,500	1994	7,300	2008	9,300
1981	700	1995	6,500	2009	10,400
1982	500	1996	6,200	2010	8,900
1983	700	1997	7,200	2011	9,600
1984	500	1998	6,200	2012	8,000
1985	1,100	1999	5,800	2013	9,000
1986	800	2000	7,800	2014	9,100
1987	300	2001	8,600	2015	9,500
1988	100	2002	8,300		
1989	100	2003	9,500		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using weir data from 1985–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using weir data from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from daily weir counts, unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix D5.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Aialik Lake sockeye salmon escapement goal.

Stock:	Aialik Lake		**Species:**	Sockeye Salmon
Monitoring Method:	Aerial Survey		**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)			

Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	500	22,400	6,500	Contrast = 49.8
Harvest Rate:	0.00	0.83	0.22	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	3,700	8,000	Year Adopted:	2002
Updated SEG Analysis[b]:	3,200	5,400		
% Difference:	-14%	-33%		

Recommendation: Change the SEG to 3,200–5,400 fish

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	8,000	1990	5,700	2004	10,100
1977	5,000	1991	3,700	2005	5,300
1978	3,000	1992	2,500	2006	4,800
1979	5,000	1993	3,000	2007	5,400
1980	6,600	1994	7,300	2008	4,200
1981	1,800	1995	2,600	2009	3,100
1982	22,400	1996	3,500	2010	5,300
1983	20,000	1997	11,400	2011	3,500
1984	22,000	1998	4,900	2012	2,100
1985	8,000	1999	3,800	2013	3,500
1986	7,600	2000	4,300	2014	500
1987	9,200	2001	5,100	2015	3,200
1988	13,000	2002	6,100		
1989	6,500	2003	5,400		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using peak aerial survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using peak aerial survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from the peak of multiple aerial surveys flown throughout the run, unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.

Appendix D6.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Mikfik Lake sockeye salmon escapement goal.

Stock:	Mikfik Lake		**Species:**	Sockeye Salmon
Monitoring Method:	Remote Video		**No. of Years:**	17
Analysis Used:	Percentile Approach (Clark et al. 2014)			
Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	400	21,000	9,900	Contrast = 52.5
Harvest Rate:	0.00	0.26	0.03	
Percentiles Used:	0.15	0.65		Tier 2
Current SEG[a]:	3,400	13,000	Year Adopted:	2014
Updated SEG Analysis[b]:	3,400	11,000		
% Difference:	0%	-15%		
Recommendation:	Change the SEG to 3,400–11,000 fish			

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 2 years of additional escapement data available for analysis, including one year with an escapement outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]
1998	9,500	2007	11,000
1999	20,000[d]	2008	10,000[d]
2000	10,400	2009	21,000
2001	3,300	2010	5,200
2002		2011	400
2003	11,000[d]	2012	3,100
2004	16,000[d]	2013	4,000
2005	6,500	2014	18,100
2006	15,000	2015	3,500

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using remote-video escapement data from 1998–2013 (Otis et al. 2013). The 15th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using remote-video escapement data from 1998–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated by reviewing video recordings of daily fish passage into Mikfik Lake throughout the run. Escapement was not surveyed or monitored during years with no escapement value.

[d] Video count was supplemented with aerial survey count to compensate for video "down-time".

Appendix D7.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Chenik Lake sockeye salmon escapement goal.

Stock:	Chenik Lake	**Species:**	Sockeye Salmon
Monitoring Method:	Remote Video	**No. of Years:**	20
Analysis Used:	Percentile Approach (Clark et al. 2014)		

Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	800	19,100	10,800	Contrast = 23.8
Harvest Rate:	0.00	0.95	0.39	
Percentiles Used:	0.15	0.65		Tier 2
Current SEG[a]:	3,500	14,000	Year Adopted:	2011
Updated SEG Analysis[b]:	2,900	13,700		
% Difference:	-17%	-2%		

Recommendation: Change the SEG to 2,900–13,700 fish

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 5 years of additional escapement data available for analysis, including years with escapements outside the current SEG range; 2) Analyses presented in Clark et al. (2014) suggest the long-term productivity of this stock may benefit from revising the SEG range, and 3) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]
1989	12,000	2003	
1990	17,000	2004	
1991	10,200	2005	12,800
1992	9,300	2006	8,500
1993	4,000	2007	17,400
1994	800	2008	10,700
1995	1,100	2009	15,300
1996	3,000	2010	17,300
1997	2,300	2011	10,300
1998		2012	16,500
1999		2013	11,300
2000		2014	17,800
2001		2015	19,100
2002			

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using remote-video and weir escapement data from 1989–1997, 2005–2010 (Otis et al. 2010). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using remote-video and weir escapement data from 1989–1997, 2005–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from daily weir counts (1989–1997, 2005–2007) and by reviewing video recordings of daily fish passage into Chenik Lake throughout the run (2008–2015). Escapement was not monitored by weir or remote video during years with no escapement value.

Appendix D8.–Escapement data (rounded to the nearest 100 fish) and stock characteristics used to update analysis of Amakdedori Creek sockeye salmon escapement goal.

Stock:	Amakdedori Creek		**Species:**	Sockeye Salmon
Monitoring Method:	Aerial Survey		**No. of Years:**	40
Analysis Used:	Percentile Approach (Clark et al. 2014)			
Stock Characteristics	**Minimum**	**Maximum**	**Average**	**Comments**
Escapement Indices:	300	11,800	2,600	Contrast = 39.3
Harvest Rate:	0.00	0.95	0.38	
Percentiles Used:	0.20	0.60		Tier 1
Current SEG[a]:	1,250	2,600	Year Adopted:	2002
Updated SEG Analysis[b]:	1,200	2,600		
% Difference:	-4%	0%		
Recommendation:	Change the SEG to 1,200–2,600 fish			

Rationale for Recommendation: The committee recommended revising the SEG for this stock using the 3-Tier Percentile Approach for the following reasons: 1) There were 14 years of additional escapement data available for analysis, including years with escapements outside the current SEG range, and 2) To be consistent and use the most current and robust methods available to set the SEGs for LCI salmon stocks sharing similar stock characteristics, unless there is a compelling reason not to**.**

Year	Escapement[c]	Year	Escapement[c]	Year	Escapement[c]
1976	1,600	1990	1,800	2004	7,200
1977	2,600	1991	1,900	2005	1,700
1978	2,600	1992	1,900	2006	300
1979	1,000	1993	2,000	2007	3,800
1980	2,600	1994	800	2008	3,200
1981	1,900	1995	2,400	2009	2,200
1982	3,200	1996	2,900	2010	1,200
1983	1,200	1997	1,500	2011	3,400
1984	1,400	1998	4,100	2012	800
1985	900	1999	8,800	2013	1,500
1986	1,900	2000	3,300	2014	4,300
1987	1,100	2001	2,700	2015	2,900
1988	400	2002	3,200		
1989	1,200	2003	11,800		

[a] The 4-tier Percentile Approach (Bue and Hasbrouck) was used to set the current SEG range using peak aerial survey indices from 1976–2001 (Otis 2001). The 25th–75th percentiles were used for this stock.

[b] The 3-tier Percentile Approach (Clark et al. 2014) was used for the updated SEG analysis using peak aerial survey indices from 1976–2015.

[c] Escapement (rounded to the nearest 100 fish) was estimated from the peak of multiple aerial surveys flown throughout the run, unless otherwise specified. Escapement was not surveyed or monitored during years with no escapement value.