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## MEMORANDUM

TO: Jeff Regnart, Director  
Division of Commercial Fisheries

DATE: September 17, 2013

Charles O. Swanton, Director  
Division of Sport Fish

THRU: Steve Honnold, Regional Supervisor  
Division of Commercial Fisheries, Region IV

SUBJECT: Kodiak and Chignik  
Escapement Goal  
Memo

James Hasbrouck, Regional Supervisor  
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The purpose of this memorandum is to inform you of our progress reviewing and recommending escapement goals for the Kodiak and Chignik management areas. The *policy for the management of sustainable salmon fisheries* (SSFP; 5 AAC 39.222) directs the department to provide the Alaska Board of Fisheries (board) with a review of salmon escapement goals, to the extent practicable, concurrent with the regulatory cycle for each management area. Escapement goals were evaluated and recommended based on the SSFP and the *Policy for statewide salmon escapement goals* (5 AAC 39.223).

In April 2013, an interdivisional team, including staff from the divisions of Commercial Fisheries and Sport Fish, was formed to review existing salmon escapement goals for the Kodiak (Area K) and Chignik (Area L) management areas. This memorandum summarizes the preliminary results of the salmon escapement goal review and subsequent recommendations. The team has reached consensus on all recommendations outlined below.

Two important definitions are:

5 AAC 39.222(f)(3) “biological escapement goal” or “(BEG)” means the escapement that provides the greatest potential for maximum sustained yield . . .;” 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 review team determined the appropriate goal type for each stock with an existing goal, based on the quality and quantity of available data, and then determined the most appropriate methods to evaluate the escapement goal. If a sufficient time series of escapement and total return estimates was available and the data contained sufficient information to provide a scientifically defensible, accurate estimate of the spawning escapement with the greatest potential to produce maximum sustained yield ( $S_{msy}$ ), then the data were considered sufficient to attempt to develop a BEG. If return estimates were not available and/or the data were not sufficient to estimate  $S_{msy}$ , the data were used to establish an SEG. Methods used to develop BEGs included spawner-recruit analysis, yield analysis, and a habitat-based model (Liermann et al. 2010). Methods used to develop SEGs included the percentile approach (Bue and Hasbrouck *Unpublished*) and risk analysis (Bernard et al. 2009).

After analyzing available data for each stock, the team estimated escapement goals, compared these estimates with the current goals, and then made recommendations to establish new goals, or to maintain (no change), change, or eliminate the current goals. Preliminary results of the review are summarized below.

### **Chignik Management Area (CMA)**

The previous escapement goal review in 2010 resulted in no changes (Nemeth et al. 2010a). For the review in 2013, we added the last three years of data (2010 through 2012) to the data set for each of the six escapement goals (Table 1). If these three new years of data contained enough new information to potentially alter an existing goal, we then conducted a full analysis of the data and determined the correct goal classification and new escapement goal recommendation. The team identified no other systems or stocks suitable for adding as new goals.

#### *King, pink, and chum salmon*

The team concluded that an additional three years of data would not affect escapement goals for king, pink, or chum salmon, which were thus not reevaluated. In each of the past three years (2010–2012) goals for these species were achieved (Table 1).

#### *Sockeye salmon early- and late-runs*

The early- and late-run sockeye salmon stocks were analyzed further to determine if goal changes were warranted. The team recommended changing the current Chignik early-run sockeye salmon SEG of 350,000–400,000 to a BEG of 350,000–450,000 (Table 1). Stock-specific harvest and escapement estimates for Chignik system sockeye salmon were available

from 1922 to the present. The full data set was used in a yield analysis (Nelson et al. 2005) and in a spawner-recruit Ricker model of the early run. A more recent subset of the data (brood years 1978 to 2005) was also analyzed with a Ricker model. Similarly, the late run was analyzed using 1922 to 2005 (Dahlberg 1979) and 1978 to 2005 spawner-recruit data in a Ricker model. Yield ranges define the escapements that produced yields that are 90 to 100% of MSY (MSY was estimated from the Ricker analysis). The different data sets represented varying degrees of data quality and different levels of productivity but are considered sound and appropriate for this analysis. Euphotic volume, zooplankton biomass, and stock-interaction models were also examined for each run.

The early-run Ricker model using 1922 to 2005 spawner-recruit data indicated an  $S_{msy}$  point estimate of 408,721 and a 90% yield range of approximately 262,000 to 583,000 (contrast= 514.2;  $p$ -value < 0.00001). This model was corroborated by a yield analysis that indicated an escapement range of 350,000 to 500,000, with a mid-point of 425,000, would maximize yields. Based on these results the team recommended a range of 350,000–450,000 fish. This change is based on the results of the Ricker model but also recognizes the longevity of the current SEG which has demonstrated good yields. Furthermore, genetic analysis of stock composition from 2010 to 2013 suggests that the cutoff date (4 July) between runs is more often later than estimated historically. When available, the department will manage the sockeye salmon fishery based on inseason genetic information using the methodology of Witteveen and Botz (2004).

The team recommended no change to the late-run SEG of 200,000–400,000 to the Chignik River (Table 1) because the spawner-recruit analysis corroborated the existing goal.

In summary, the Escapement Goal Review Team recommend for department approval changing one goal. Staff are now preparing a report that will document this escapement goal review in more detail, including all current and recommended changes to escapement goals, as well as detailed descriptions of the analyses performed. This report will be published prior to the December 2013 CMA board meeting. In addition, an oral escapement goal report will be presented at the board meeting.

### **Kodiak Management Area (KMA)**

The previous escapement goal review in 2010 resulted in changes to 12 of the 23 existing goals; two of these changes split an existing goal into two goals, resulting in 25 total goals (Nemeth et al. 2010b). For the review in 2013, we added the last three years of data (2010 through 2012) to the data set for each of the 25 existing escapement goals (Table 2). If these three additional years of data contained enough new information to potentially alter an existing goal, we then conducted a full analysis of the data and determined the correct goal classification and new escapement goal recommendation. The team identified no other systems or stocks suitable for adding as new goals.

### *King, pink, and chum salmon*

For the review in 2013, the team concluded that an additional three years of recent data (2010–2012) did not provide enough information to warrant further assessment of the king, pink, or chum salmon goals, which were therefore not reevaluated.

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### *Sockeye salmon*

The team recommended no change to the early- and late-run sockeye salmon BEGs for Upper Station. For both runs, the respective spawner-recruit estimate of  $S_{msy}$  was very similar to estimates made during the 2004 and 2010 reviews. Limnological analyses also supported the current escapement goals. The team recommended no change to the Frazer Lake sockeye salmon BEG range of 75,000 to 170,000 fish (Table 1). The addition of three more years of spawner-recruit data yielded little change in the estimates of productivity. The team recommended removing the Little River Lake sockeye salmon lower-bound SEG of 3,000 sockeye salmon (Table 1). This system is a low priority to survey and the assessment may no longer adequately index or monitor trends in escapement.

### *Coho salmon*

A Bayesian spawner-recruit analysis was conducted on the Buskin River coho stock, which incorporated three additional years of data. Based on the results of the optimal yield profile from this analysis the team recommends changing the Buskin coho salmon BEG from 3,200–7,200 to 4,700–9,600 fish.

In summary, the Escapement Goal Review Team recommend for department approval changing one goal and eliminating one goal. Staff are now preparing a report that will document this escapement goal review in more detail, including all current and recommended changes to escapement goals, as well as detailed descriptions of the analyses performed. This report will be published prior to the January 2014 KMA board meeting. In addition, an oral escapement goal report will be presented at the board meeting.

### Literature Cited

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## 2013 KMA/CMA Escapement Goal Memo

Table 1.—Current escapement goals, escapements observed from 2010 through 2012, king, sockeye, coho, pink, and chum salmon stocks of the Chignik Management Area.

Species	System	Escapement data <sup>a</sup>	Current escapement goal			Escapements			Recommendation	
			Type	Lower	Point	Upper	2010	2011		2012
<i>King</i>	Chignik	WC	BEG	1,300	1,695	2,700	3,515	2,482	1,449	No change
<i>Sockeye</i>	Chignik									
	Early run	WC	SEG	350,000		400,000	432,535	488,930	353,441	Change to BEG 350,000-450,000
	Late run <sup>b</sup>	WC	SEG	200,000		400,000	311,291	264,887	358,948	No change
<i>Pink</i>	Chignik aggregate – odd years	PAS	SEG	500,000		800,000		986,248		No change
	Chignik aggregate – even years	PAS	SEG	200,000		600,000	330,570		302,699	No change
<i>Chum</i>	Chignik aggregate	PAS	Lower bound SEG	57,400			177,220	278,145	210,973	No change

<sup>a</sup> PAS = Peak Aerial Survey, WC= Weir Count.

<sup>b</sup> In addition to the SEG, there is a 50,000 inriver run goal for the late run (25,000 in August and 25,000 in September).

Table 2.—Current escapement goals, escapements observed from 2010 through 2012, king, sockeye, coho, pink, and chum salmon stocks of the Kodiak Management Area.

Species	System	Escapement data <sup>a</sup>	Current escapement goal			Escapements			Recommendation	
			Type	Lower	Point	Upper	2010	2011		2012
<i>King</i>	Ayakulik	WC	BEG	4,000	5,165	7,000	5,197	4,252	4,760	No change
	Karluk	WC	BEG	3,000	3,975	6,000	2,917	3,420	3,197	No change
<i>Sockeye</i>	Afognak	WC	BEG	20,000	39,170	50,000	52,255	49,193	41,553	No change
	Ayakulik									
	Early run	WC	SEG	140,000		280,000	201,933	177,480	213,501	No change
	Late run	WC	SEG	60,000		120,000	60,394	83,661	114,753	No change
	Buskin	WC	BEG	5,000	6,544	8,000	9,800	11,982	8,565	No change
	Frazer	WC	BEG	75,000	117,000	170,000	94,680	134,642	148,884	No change
	Karluk									
	Early run	WC	BEG	110,000	150,000	250,000	70,544	87,049	188,085	No change
	Late run	WC	BEG	170,000	267,000	380,000	277,558	230,273	314,605	No change
	Little River	PAS	LB SEG	3,000			3,200	3,900	6,300	Eliminate goal
	Malina	PAS	SEG	1,000		10,000	4,000	3,800	4,100	No change
	Pasagshak	WC or PAS	LB SEG	3,000			4,800	13402 <sup>b</sup>	4585 <sup>b</sup>	No change
	Saltery	WC or PAS	BEG	15,000	24,000	35,000	26,809	30,768	27,188	No change
	Uganik Lake	PAS	LB SEG	24,000			30,700	37,900	22,200	No change
	Upper Station									
	Early run <sup>c</sup>	WC	BEG	43,000	66,000	93,000	42,060	28,759	25,487	No change
	Late run	WC	BEG	120,000	186,000	265,000	141,139	101,893	149,325	No change
<i>Coho</i>	Buskin	WC	BEG	3,200	5,000	7,200	6,096	5,116	5,291	Increase BEG to 4,700-9,600
	American	FS	LB SEG	400			ND	1,061	427	No change
	Olds	FS	LB SEG	1,000			127	1,033	624	No change
	Pasagshak	WC	LB SEG	1,200			1,971	1,083	3,132	No change
<i>Pink</i>	Kodiak Archipelago									
	Odd year		SEG	2,000,000		5,000,000		2,506,714		No change
	Even year		SEG	3,000,000		7,000,000	3,378,483		5,111,049	No change
	Mainland District	PAS	SEG	250,000		1,000,000	265,650	273,500	413,325	No change
<i>Chum</i>	Kodiak Archipelago	PAS	LB SEG	151,000			160,290	192,400	159,825	No change
	Mainland District	PAS	LB SEG	104,000			124,500	128,700	127,850	No change

Note: ND = no data.

Chum salmon escapement estimates are different than those that appear in previous reports (e.g., Munro and Volk 2012).

<sup>a</sup> PAS = Peak Aerial Survey, WC= Weir Count, FS=Foot Survey.

<sup>b</sup> Escapement goal based on PAS; however, 2011 and 2012 data are WC.

<sup>c</sup> Upper Station early run has the only optimal escapement goal (OEG; 25,000) in the KMA, established by the board in 1999.