THE STATE of ALASKA
GOVERNOR BILL WALKER

Department of Fish and Game
DIVISIONS OF SPORT FISH & COMMERCIAL FISHERIES
Westward Region Office
351 Research Court
Kodiak, Alaska 99615-7400
Main: 907.486.1825
Fax: 907.486.1841

MEMORANDUM

TO: Jeff Regnart, Director
Division of Commercial Fisheries

Thomas Brookover, Director
Division of Sport Fish

DATE: September 28, 2015

THROUGH: Nicholas Sagalkin, Regional Supervisor
Division of Commercial Fisheries

Thomas Vania, Regional Supervisor
Division of Sport Fish

FROM: Kevin Schaberg, Regional Research Coordinator
Division of Commercial Fisheries, Region IV

Timothy McKinley, Regional Research Coordinator
Division of Sport Fish, Region II

SUBJECT: Alaska Peninsula/Aleutian Islands and Chignik Escapement Goal Recommendations

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The purpose of this memorandum is to inform you of our progress reviewing and recommending escapement goals for Area L (Chignik Management Area) and Area M (Alaska Peninsula and Aleutian Islands Management Area). The *Policy for Statewide Salmon Escapement Goals* (5 AAC 39.223) recognizes the establishment of salmon escapement goals as a joint responsibility of the Alaska Department of Fish and Game (department) and the Alaska Board of Fisheries (board) and describes the concepts, criteria, and procedures for establishing and modifying salmon escapement goals. Under the policy, the board recognizes and describes the department's responsibility for establishing and modifying biological escapement goals (BEG), sustainable escapement goals (SEG), and sustained escapement thresholds (SET).

In January 2015, an interdivisional team, including staff from the divisions of Commercial Fisheries and Sport Fish, was formed to review existing Pacific salmon *Oncorhynchus* spp. escapement goals for Area L (Chignik Management Area) and Area M (Alaska Peninsula and Aleutian Islands Management Area). 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.

Three important terms defined in the *Policy for the Management of Sustainable Salmon Fisheries* are:

- *biological escapement goal* (BEG): the escapement that provides the greatest potential for maximum sustained yield (MSY);
- *sustainable escapement goal* (SEG): a level of escapement, indicated by an index or an escapement estimate, that is known to provide for sustained yield over a 5 to 10 year period, used in situations where a BEG cannot be estimated or managed for; and
- *inriver run goal* (IRRG): a specific management objective for salmon stocks that are subject to harvest upstream of the point where escapement is estimated; the inriver run goal will be set in regulation by the board and is comprised of the SEG, BEG, or optimal escapement goal, plus specific allocations to inriver fisheries.

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. Methods used to develop BEGs included spawner-recruit analysis, and yield analysis. 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 SEGs included the percentile approach as described by Clark et al. (2014).

Following these analyses, the team estimated escapement goals for each stock, compared these estimates with the current goal, and agreed on a recommendation to keep the current goal, change the goal, or eliminate the goal. The methods used to evaluate Area L and Area M escapement goals as well as the rationale used to make subsequent recommendations are described in detail in two separate forthcoming documents. Preliminary results are summarized below.

Area L (Chignik Management Area)

The previous escapement goal review for Area L occurred in 2013 and details can be found in Sagalkin et al (2013). For the 2015 review the team added two years of data (2013 and 2014) since the last review (Table 1). Based on this new data, the team determined if enough information was present to alter existing goals or create new goals for systems that do not have goals. If new information indicated review was necessary, we determined which type of goal was most likely to be in place and conducted the analysis indicated by the data quality and type of goal. The team did not identify any systems suitable for creating new goals, and only systems with goals currently in place were further evaluated.

King Salmon

Escapement of king salmon to Chignik River in 2013 fell below the BEG. This is the only occurrence of not meeting the escapement goal since its inception in 2002. In 2014, escapement exceeded the BEG upper bound (Table 1). There was no compelling new information since the last review, and the team agreed that no further analysis was necessary in 2015.

Sockeye Salmon

Escapements to Chignik River in 2013 and 2014 met the early-run BEG and late-run SEG (Table 1). Each of these goals was reviewed in 2013 and no compelling new information was added since the last review, and the team agreed that no further analysis was necessary in 2015.

Pink and Chum Salmon

In 2015, recent escapement data (Table 1) were examined to determine if changes in the area-wide aggregate escapement goals for pink and chum salmon were justified. The team determined that these stocks warranted further review and the updated percentile method (Clark et al. 2014) was used with the most recent escapement data to see if there was a significant change in the estimates. The team recommended changing the SEG ranges to: 170,000 to 280,000 pink salmon in even years; 260,000 to 450,000 pink salmon in odd years; and 45,000 to 110,000 chum salmon.

These goals were revised mainly due to the inconsistent nature of aerial surveys throughout the management area for the aggregate goals. The analysis reviewed all historic data and applied criteria to reduce the number of systems included in the Peak Aerial Survey (PAS) indices. The number of streams included in the PAS index was reduced from 49 to eight indicator systems for pink salmon, and from 49 to six indicator systems for chum salmon. These reductions will increase the ability of the goals to indicate escapement inadequacies, and make them less sensitive to unsuccessful surveys at any of the previously included 49 systems. The selected pink salmon index streams account for a mean of 53% of the total number of fish counted in the 49 systems formerly used to index the escapement, and the selected chum salmon index streams account for a mean of 57% of the total number of fish counted in the 49 systems formerly used to index the escapement.

In summary, the final recommendation of the 2015 review team was to revise the Area L pink salmon aggregate escapement goals for both even- and odd-years, and the Area L aggregate chum salmon escapement goal. The recommended SEG range for Area L pink salmon aggregate in even years is 170,000 to 280,000 fish, and for odd years is 260,000 to 450,000 fish. The recommended SEG range for Area L chum salmon aggregate is 45,000 to 110,000 fish.

Each of these aggregate SEGs are represented and developed based on a select number of index streams that differ from previous analyses. The reason for reducing the number of index streams was to maintain a robust data set that can be more consistently monitored in the future, and

ensure that measurement of escapement is compared to the same systems identified as index streams used in the development of the escapement goal.

Coho salmon

There are no coho salmon escapement goals in Area L, as survey conditions often preclude accurate assessment. There was no compelling new information since the last review, and the team agreed that no further analysis was necessary in 2015.

Area M (Alaska Peninsula and Aleutian Islands Management Area)

The previous escapement goal review for Area M occurred in 2012 and details can be found in Sagalkin and Erickson (2013). For the 2015 review the team added the three years of data (2012 through 2014) since the last review (Table 2). Based on this new data, the team determined if enough information was present to alter existing goals or create new goals for systems that do not have goals. If new information indicated review was necessary, we determined which type of goal was most likely to be in place and conducted the analysis indicated by the data quality and type of goal. The team did not identify any systems suitable for creating new goals, and only systems with goals currently in place were further considered.

King and Chum Salmon

There is only one escapement goal in Area M for king salmon (Nelson River), and there are five aggregated district goals for chum salmon (Southeastern, South Central, Southwestern, Northwestern and Northern districts). All escapements since the last review met escapement goals, with the exception of Nelson River king salmon in 2012 and 2013 (Table 2). There was no compelling new information since the last review, and the team agreed that no further analysis was necessary in 2015.

Coho Salmon

There are two escapement goals in Area M for coho salmon (Nelson and Ilnik rivers). All escapements since the last review met SEGs in both locations. There was no compelling new information since the last review, and the team agreed that no further analysis was necessary in 2015.

Sockeye Salmon

Of the 14 current escapement goals for sockeye salmon in Area M, three (Swanson Lagoon, Meshik River, and Cinder River) were evaluated while the remaining 11 (Orzinski Lake, Thin Point Lake, Mortensens, Christianson, and Swanson lagoons, North Creek, Nelson Lake, Bear (two goals; early and late), Sandy, and Ilnik rivers; and McLees Lake) were determined to not have any compelling new information to review in 2015.

Swanson Lagoon

Recent escapement data (Table 2) were examined to determine if a change in the escapement goal was justified. Due to continued low escapements, the stock was designated as a stock of management concern in 2012.The team agreed that further analysis of the escapement goal was warranted to evaluate the impacts of the recent low escapement.

The analysis of Swanson Lagoon sockeye salmon escapement indicated a much reduced escapement goal following the percentile approach of Clark et al. (2014). However, in 2009 and again in 2014 it was observed that the lagoon was cut-off from the ocean due to shifting beach substrate. This likely had significant affect on the escapement and subsequent production in those years, and highlights the environmentally variable nature of this system. In addition, it is difficult to estimate escapement in this system using aerial surveys because of inclement weather conditions and poor visibility due to frequent algae blooms. In light of the stock of concern status, the team recommended maintaining the current SEG range of 6,000 to 16,000 fish to allow for the run to rebuild.

Meshik River

Recent escapement data (Table 2) were examined to determine if a change in the escapement goal was justified. The team determined that this stock warranted further review and examined the stock using the updated percentile method (Clarke et al. 2014) to see if there was a significant change in the estimate that would warrant a change in the escapement goal.

Using the updated percentile method, and including the tributaries (Red Bluff and Yellow Bluff creeks) to the shared Meshik River estuary, the lower and upper bounds of the escapement goal changed substantially. This suggested a need for increasing the lower bound of the escapement goal and decreasing the upper bound. The team recommended changing the Meshik River escapement goal to an SEG range of 48,000 to 86,000 sockeye salmon, and including Red Bluff and Yellow Bluff in the enumeration.

Cinder River

Recent escapement estimates for Cinder River (Table 2) were examined to determine if a change in the escapement goal was justified. The team examined whether annual escapement from Cinder River and the adjacent tributary Mud Creek were correlated and if the combined data from these two systems would better reflect current escapement trends in the event of a directed fishery. The team determined that this stock aggregate warranted further review and examined the stocks using the updated percentile method (Clarke et al. 2014) to see if there was a significant change in the estimate that would warrant a change in the escapement goal.

Mud Creek is a tributary to the Cinder River estuary and is susceptible to all harvest opportunities in that section, so inclusion is warranted if opportunities in the section are available. With the inclusion of the Mud Creek escapement, the upper bound of the range of escapement increased, suggesting the need for increasing the upper and lower bounds of the escapement goal. Because of the consistent increases to Cinder River escapement over the past decade and improved surveying effort of both drainages, the team recommended increasing the

Cinder River SEG range to 36,000 to 94,000 sockeye salmon and to include Mud Creek in the enumeration.

Pink Salmon

With a failure to reach the South Peninsula pink salmon lower escapement goal for even years since 2010 the team decided it prudent to reassess the current goal (Table 2). However the inherent relationship among the even- and odd-year goals justified a reevaluation of both goals. The analysis was an update to the 2006 Ricker spawner-recruit model, adding escapement and catch data up to brood year 2012. Both even-, odd-, and combined year datasets were analyzed within the Ricker spawner-recruit framework. However one important adaptation was employed to more accurately model the population. This was to define the total harvest estimate for South Peninsula pink salmon as that occurring from July 15 onward for more precise accounting of local stock harvest (Matt Keyse, department Area Management Biologist-Area M, Sand Point Alaska, personal communication).

This analysis marks the first time that statistically significant models for South Peninsula pink salmon even-, odd-, and combined years have been constructed. Although the even-, odd-, and combined models resulted in different estimates of S_{MSY}, the differences were not statistically different. Additionally, if the uncertainty associated with the even- and odd-year models is considered, there becomes no compelling evidence that the escapement goals for even- and odd-year South Peninsula pink salmon should be different. It is recommended that the even- and odd-year goals be aligned into an annual SEG of 1.75 to 4.0 million pink salmon.

In summary, this comprehensive review of the 24 existing salmon escapement goals in Area M resulted in 20 goals remaining unchanged; the revision of two goals (Meshik River sockeye salmon SEG range 48,000–86,000; Cinder River sockeye salmon SEG range 36,000–94,000), and consolidate an even/odd year pair into a single goal (South Peninsula pink salmon annual SEG range 1,750,000–4,000,000).

Staff are preparing two separate reports that will document these escapement goal reviews in more detail, including all current and recommended changes to escapement goals, as well as detailed descriptions of the analyses performed. These reports will be published prior to the February 2016 board meeting. In addition, an oral escapement goal report will be presented at the board meeting.

REFERENCES CITED

Clark, R. A., D. M. Eggers, A. R. Munro, S. J. Fleischman, B. G. Bue, and J. J. Hasbrouck. 2014. An evaluation of the percentile approach for establishing sustainable escapement goals in lieu of stock productivity information. Alaska Department of Fish and Game, Fishery Manuscript No. 14-06, Anchorage.

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Table 1.–Escapements, escapement goals, and recommendations for 2015 of salmon stocks in the Chignik Management Area (CMA).

Species	System	Data type [a]	Current escapement goal		Escapements			Escapement goal recommendation for 2015
			Type	Range	2012	2013	2014	
King salmon	Chignik River	WC	BEG	1,300–2,700	1,404	1,185	2,895	No change
Sockeye salmon	Chignik River							
	Early run	WC	BEG	350,000–450,000	353,441	386,782	360,381	No change
	Late run	WC	SEG	200,000–400,000[b]	358,948	369,319	291,228	No change
Pink salmon	CMA aggregate – odd years	PAS	SEG	500,000–800,000		863,991		SEG: 260,000–450,000 [c]
	CMA aggregate – even years	PAS	SEG	200,000–600,000	302,699		235,159	SEG: 170,000–280,000 [c]
Chum salmon	CMA aggregate	PAS	Lower-bound SEG	> 57,400	210,973	335,907	101,378	SEG: 45,000–110,000 [c]

[a] PAS = Peak Aerial Survey, WC= Weir Count.

[b] This lower bound does not include the inriver run goal of 50,000 fish.

[c] Recommendations include a reduction in number of streams included in annual index.

Table 2.–Escapement goals, escapements observed from 2012 through 2014, and escapement goal recommendations in 2015 for king, sockeye, coho, pink, and chum salmon stocks of Area M (Alaska Peninsula and Aleutian Islands Management Area).

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

[a] PAS = Peak Aerial Survey, WC= Weir Count.