THE STATE of ALASKA
GOVERNOR BILL WALKER

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

MEMORANDUM

TO: Scott Kelley, Director
Division of Commercial Fisheries

Thomas Brookover, Director
Division of Sport Fish

DATE: January 17, 2017

THRU: Nick Sagalkin, Regional Supervisor
Division of Commercial Fisheries, Region IV

Tom Vania, Regional Supervisor
Division of Sport Fish, Region II

SUBJECT: Kodiak Management Area Escapement Goal Recommendations

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

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

The purpose of this memorandum is to report our progress reviewing and recommending escapement goals for Kodiak Management Area (KMA). 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, sustainable escapement goals, and sustained escapement thresholds.

In March 2016, 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 KMA. 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* (5 AAC 39.22) 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 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, revise the goal, or eliminate the goal. The methods used to evaluate KMA escapement goals as well as the rationale used to make subsequent recommendations are described in detail in a forthcoming report. Preliminary results are summarized below.

Kodiak Management Area

The previous escapement goal review for KMA occurred in 2013 and details can be found in Sagalkin et al (2013). For the 2016 review the team added three years of data (2013–2015) 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

There are two BEG's for king salmon in the KMA located at the Ayakulik and Karluk rivers (Table 1). Both goals were revised in 2010, and six years of data was included in the analyses this cycle. The team reviewed the most recent escapement data available and fit age-structured state-space spawner recruit models (Fleischman and McKinley 2013) to data from both stocks. Based on the results of these analyses, the team recommended raising the BEG range for Ayakulik River king salmon from 4,000–7,000 fish to 4,800–8,400 fish. For Karluk River king salmon the team recommended no change to the existing goal.

Sockeye Salmon

There are 13 escapement goals for sockeye salmon in the KMA (Table 1). The team assessed all new information for each of these systems and it was determined that for Afognak, Ayakulik early-run, Ayakulik late-run, Pasagshak, and Saltery rivers, as well as Upper Station early-run and Upper Station late-run escapement goals, new information did not indicate any changes were necessary. The team reassessed the Buskin River and Malina Creek data and recommend no changes to these goals.

The Uganik Lake Lower Bound SEG (LB SEG) is recommended for removal, as the system is difficult to view from the air, and budget cuts have resulted in less survey coverage of the system over the past ten years.

Karluk River early- and late-run BEGs were reviewed and in considering the interaction between the two runs, the team recommends revising both goals, to align with the combined model. The Karluk River early-run BEG range would increase from 110,000–250,000 fish to 150,000–250,000 fish. The Karluk River late-run BEG range would increase from 170,000–380,000 fish to 200,000–450,000 fish.

Pink Salmon

There are 3 aggregate goals for KMA pink salmon, and the Kodiak Archipelago SEG is broken down with even- and odd-year specific SEGs. Both the Mainland and Kodiak Archipelago aggregate SEGs were revised in 2011. The team did not see any compelling information to initiate further review in 2016.

Chum Salmon

There are 2 aggregate LB SEG's for chum salmon in the KMA. The team reviewed both goals, and recommends removal of the LB SEG for the Mainland District and a revision of the Kodiak Archipelago LB SEG. The Mainland District LB SEG is currently an aggregate of 76 systems. Consistency of successful surveys for all systems is rare. The surveys are also not intended to identify the peak of chum salmon escapement, but are conducted ancillary to escapement surveys for pink and sockeye salmon.

The Kodiak Archipelago aggregate LB SEG is recommended to change from 151,000 to 101,000, due to the reduction of the number of systems that are included in the goal. The 17 newly selected index streams represent an average of 9% of the total number of systems previously used (up to 200) to describe the escapement of chum salmon in KMA. These 17 index systems also represent an average of 72% of the chum salmon escapement in the Kodiak Archipelago area that was previously estimated.

Coho Salmon

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There are 4 escapement goals for coho salmon in the KMA. The American, Olds, and Pasagshak rivers have LB SEGs, and the Buskin River has a BEG. The team reviewed the most recent escapement data available for KMA coho salmon stocks, and concluded that these data would not substantially affect the results of previous escapement goal analyses for the American, Olds, and Pasagshak rivers, and thus recommended no further analysis of these goals.

The team reevaluated the Buskin River coho salmon BEG and updated the spawner-recruit analysis. The additional years of information does not indicate a substantial change in stock productivity, and the team agreed that the goal should remain unchanged.

In summary, this comprehensive review of the 24 existing escapement goals in the KMA resulted in 18 goals remaining unchanged, the elimination of 2 goals (Uganik Lake sockeye salmon LB SEG; Mainland District chum salmon aggregate LB SEG), and the revision of 4 goals (Ayakulik king salmon BEG range 4,800–8,400; Karluk River early-run sockeye salmon BEG range 150,000–250,000; Karluk River late-run sockeye salmon BEG range 200,000–450,000; Kodiak Archipelago chum salmon aggregate LB SEG 101,000).

Staff are preparing a report 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. This report will be published prior to the January 2017 BOF Kodiak finfish board meeting. In addition, an oral report on escapement goals will also be presented at the same board meeting.

REFERENCES CITED

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Table 1.–Escapement goals, escapements observed from 2013 through 2015, and escapement goal recommendations in 2016 for king, sockeye, coho, pink, and chum salmon stocks of the Kodiak Management Area.

Species	System	Escapement data [a]	Current escapement goal			Escapements			Recommendation
			Type	Lower	Upper	2013	2014	2015	
King									
	Ayakulik	WC	BEG	4,000	7,000	2,354	917	2,392	Revise BEG to 4,800-8,400
	Karluk	WC	BEG	3,000	6,000	1,824	1,182	2,777	No change
Sockeye									
	Afognak	WC	BEG	20,000	50,000	42,153	36,345	38,151	No change
	Ayakulik								
	Early run	WC	SEG	140,000	280,000	214,969	210,040	218,178	No change
	Late run	WC	SEG	60,000	120,000	67,195	87,671	108,257	No change
	Buskin	WC	BEG	5,000	8,000	16,189	13,976	8,718	No change
	Frazer	WC	BEG	75,000	170,000	136,059	200,296	219,093	No change
	Karluk								
	Early run	WC	BEG	110,000	250,000	234,880	252,097	260,758	Revise BEG to 150,000-250,000
	Late run	WC	BEG	170,000	380,000	336,479	543,469	396,618	Revise BEG to 200,000-450,000
	Malina	PAS	SEG	1,000	10,000	3,800	4,900	1,000	No change
	Pasagshak	PAS	LB SEG	3,000		9,750	350	600	No change
	Saltery	WC	BEG	15,000	35,000	35,939	29,047	43,690	No change
	Uganik Lake	PAS	LB SEG	24,000		26,000	14,000	9,000	Eliminate goal
	Upper Station								
	Early run	WC	BEG	43,000	93,000	27,712	36,693	54,473	No change
	Late run	WC	BEG	120,000	265,000	125,573	181,511	132,864	No change
Coho									
	American	FS	LB SEG	400		841	1,595	530	No change
	Buskin	WC	BEG	4,700	9,600	5,959	8,413	4,341	No change
	Olds	FS	LB SEG	1,000		2,145	1,320	1,357	No change
	Pasagshak	FS	LB SEG	1,200		1,648	3,934	1,790	No change
Pink									
	Kodiak Archipelago								
	Odd year	PAS	SEG	2,000,000	5,000,000	4,450,711		5,614,531	No change
	Even year	PAS	SEG	3,000,000	7,000,000		2,733,282		No change
	Mainland District	PAS	SEG	250,000	1,000,000	620,680	254,630	754,600	No change
Chum									
	Kodiak Archipelago	PAS	LB SEG	151,000		284,799	138,489	308,376	Reduction of index streams, revise LB SEG to 101,000
	Mainland District	PAS	LB SEG	104,000		112,700	107,431	133,200	Eliminate goal

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