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**Department of
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MEMORANDUM

TO: Forrest R. Bowers, Acting Director   **DATE:** September 28, 2018
Division of Commercial Fisheries

Thomas Brookover, Director
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THROUGH: Nicholas Sagalkin, Regional Supervisor
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Thomas Vania, Regional Supervisor
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FROM: Kevin Schaberg, Westward Region Research Supervisor   **SUBJECT:** Alaska
Division of Commercial Fisheries   Peninsula/Aleutian
Islands and Chignik
Timothy R. McKinley, Region 2 Research Coordinator   Escapement Goal
Division of Sport Fish   Recommendations

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) and sustainable escapement goals (SEG).

In January 2018, 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 and Area M. 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, or BEG, 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, yield, zooplankton biomass and euphotic volume (EV) analyses (Munro 2018). 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.

Area L (Chignik Management Area)
The previous escapement goal review for Area L occurred in 2015 (Schaberg et al. 2015a). For the 2018 review three additional years of data (2015–2017) were available (Table 2). Based on these new data, the team determined if there was enough new information to revise 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 appropriate 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 Salmon

The team determined the Chignik River king salmon goal warranted review because it had not been reviewed since 2004. The spawner-recruit analysis conducted during this review did not indicate a change was necessary to goal, and the team recommends retaining the current BEG of 1,300 to 2,700 fish (Table 1).

Sockeye Salmon
Chignik River sockeye salmon early-run BEG and late-run SEG were reviewed in 2013 and no compelling new information was added since the last review. The team agreed that no further analysis was necessary in 2018.

Pink and Chum Salmon
Recent escapement data (Table 1) were examined to determine if re-analyses of areawide aggregate escapement goals for pink and chum salmon were necessary. The team determined that these stocks did not warrant further review as they were reviewed and revised in 2015 (Schaberg et al. 2015a), and there were only three additional years of data that were within the range of past observations.

Coho Salmon
There are no coho salmon escapement goals in Area L, as survey conditions often preclude accurate assessment.

Area M (Alaska Peninsula and Aleutian Islands Management Area)
The previous escapement goal review for Area M occurred in 2015 (Schaberg et al. 2015b). For the 2018 review three additional years of data (2015–2017) were available (Table 2). Based on these new data, the team determined if there was enough new information to revise 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 appropriate 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 Salmon
The only king salmon escapement goal in Area M is for Nelson River (Table 2). The goal was last updated in 2003 (Schaberg et al. 2015b). There were several years of new escapement information since the last review, and the team agreed that further analysis was warranted in 2018. A Bayesian spawner-recruit analysis indicated that the upper bound of the BEG could be increased by 600 fish, while the lower bound should remain the same. The team recommends revising the Nelson River king salmon BEG to a range of 2,400 to 5,000 fish.

Sockeye Salmon
Of the 14 escapement goals for sockeye salmon in Area M, three (Swanson Lagoon, North Creek, and McLees Lake) were evaluated while the remaining 11 (Orzinski Lake, Thin Point Lake, Mortensens and Christianson lagoons, Nelson Lake, Bear Lake (two goals; early and late), and Sandy, Ilnik, Meshik and Cinder rivers) were determined to not have any compelling new information to review in 2018.

Swanson Lagoon
Recent escapement data (Table 2) were examined to determine if re-analysis of the escapement goal was needed. Due to continued low escapements, the stock was designated as a stock of management concern in 2012 and this designation was continued in 2015. The team agreed that further analysis of the escapement goal was warranted.

Current regulations aimed at conserving Swanson Lagoon sockeye salmon have been ineffective at increasing escapement due to environmental conditions that regularly impede salmon

migration. Swanson Lagoon aerial survey effort usually coincides with that of Christianson Lagoon which at times precluded surveys during the peak of the Swanson Lagoon run, and there have been years when algal blooms in the lagoon impede survey counting conditions (Schaberg et al. 2015). The Swanson Lagoon drainage is also annually impeded by a sand berm that builds up at the mouth of the lagoon by local wind and wave action. The berm is occasionally breached by natural processes, which allows fish passage; however, timing of the creation of a channel does not always coincide with timing of sockeye salmon migration. This occurs frequently enough to render management actions ineffective as a means of trying to increase escapement to achieve escapement goals. Current regulations only allow commercial salmon fishing by emergency order, which has been in effect since 2013 when the weekly fishing periods were rescinded by the board. This authority has not been exercised since its inception because of poor escapement into the system, which is heavily tied to the geomorphic conditions at the mouth. The review team is recommending that the escapement goal be discontinued due to the inability to use management actions to increase sockeye salmon escapement into Swanson Lagoon, and the inability to predict or control the sand berm. Without a goal in place, and with the continued presence of the sand berm, the department will continue to leave the salmon fishery closed.

North Creek
North Creek is in the Black Hills Section of the Northern District. Recent escapement data (Table 2) were examined to determine if re-analysis of the escapement goal was needed. The team determined this stock warranted further review and examined the goal using the updated percentile approach (Clark et al. 2014) to see if there was a significant change that would warrant a change in the escapement goal. The percentile approach indicated the escapement goal should be changed to reflect trends in the run, harvest, and management consistent over the last 22 years (1995–2017). Team members recommended raising the SEG to a range of 7,500 to 10,000 fish.

McLees Lake
Recent escapement estimates for McLees Lake sockeye salmon (Table 2) were examined to determine if re-analysis of the escapement goal was needed. The team assessed the goal using the updated percentile approach (Clark et al. 2014) to evaluate if the additional data would warrant changing the escapement goal.

The team recommends revising the current McLees Lake SEG range of 10,000–60,000, to a Lower Bound SEG of 10,000 fish based on the percentile method, which were corroborated with results from zooplankton biomass and EV analyses. Commercial sockeye salmon harvest has never occurred in the statistical area adjacent to McLees Lake; therefore, harvesting fish to constrain escapement below the upper end of the SEG during strong runs is not possible.

Pink Salmon
The pink salmon escapement goal in Area M was revised in 2015. Escapement data from 2015 to 2017 were evaluated for indications that this goal should be further analyzed. The review team agreed that no further analysis was necessary in 2018.

Chum Salmon
Chum salmon escapement in Area M are based on aerial. Total indexed escapement estimates

were calculated by the department using methods described in Poetter and Nichols (2014). Escapement is aggregated for each of five districts in Area M, 2 on the North side of the Alaska Peninsula and 3 on the South side.

Stock-specific harvest estimates for the 2 districts of North Alaska Peninsula chum salmon were not available. Recent escapement (Table 2) of North Alaska Peninsula chum salmon were examined to determine if re-analysis of the escapement goal was warranted, but the team agreed that no further analysis was necessary in 2018.

It was determined that peak aerial survey (PAS) counts of chum salmon would be a better metric for escapement goal evaluation on the South Alaska Peninsula. Peak aerial surveys were compiled from a database maintained by the department's Kodiak office. To standardize past and future evaluation, and reduce any inconsistencies in the data points, the escapement number used to develop the goal will be PAS that adheres to these criteria:
- Include a single flight
  - That flight will be the one with the highest count for the year (PAS)
- Include counts from within the stream itself (no fish bays, mouths, or other areas)
- Include only live fish (no carcasses)

The team ensured that the number of systems included in the evaluation and measurement of escapement goals is consistent. For this reason, we considered all the available data and evaluated the consistency of success across the years for each system. To warrant inclusion, a system must first have met the above criteria in at least 29 of the last 31 years. Most of the systems that represented the majority of the escapement in these areas met this initial validation, as they were known chum systems, and surveyed annually. This resulted in 26 index streams in the Southeastern District, 10 index streams in the Southcentral District, and 19 streams in the Southwestern District.

Peak counts of fish observed in each index system were aggregated to create a PAS index for each district. Contrast, measurement error, and harvest rates were examined to determine the proper percentile ranges that should be used to establish SEGs with the percentile approach (Clark et. al 2014). This resulted in the selection of Tier 1 percentile ranges for the Southeastern and Southcentral districts, and the selection of Tier 3 percentile ranges for the Southwestern District. The team recommends changing the chum salmon escapement goals to an SEG of 62,500–151,900 fish for the Southeastern District, an SEG of 68,900–99,200 fish for the Southcentral District, and an SEG of 86,900–159,500 fish for the Southwestern District.

These escapement goal revisions appear to be significantly lower than the current goals, however, this is because of the switch to Peak Aerial Surveys in place of the previous escapement indices, more stringent criteria for inclusion of surveys, and a reduced number of index streams in some districts.

Coho Salmon

There are two escapement goals in Area M for coho salmon (Nelson and Ilnik rivers). There was no compelling new information since the last review, and the team agreed that no further analysis was necessary in 2018.

In summary, this comprehensive review of the 23 existing salmon escapement goals in Area M resulted in 16 goals remaining unchanged; the revision of six goals (Nelson River king salmon BEG range 2,400–5,000; North Creek sockeye salmon SEG range 7,500–10,000; McLees Lake sockeye salmon LB-SEG >10,000; Southeastern District chum salmon SEG range 62,500–151,900; South Central District chum salmon SEG range 68,900–99,200; Southwestern District chum salmon SEG range 86,900–159,500), and discontinuation of one goal (Swanson Lagoon sockeye salmon SEG). There are no allocative issues or management plan implications with the recommended changes.

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 2019 board meeting. In addition, an oral escapement goal report will be presented at the board meeting.

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2018 AP/AI and Chignik Escapement Goal Recommendation Memo

Table 1. Escapements from 2015 to 2017, escapement goals, and 2018 recommendations for salmon stocks in the Chignik Management Area (CMA). Shaded cells indicate the escapement did not meet the lower end of the current escapement goal.

Species	System	Data type[a]	Current escapement goal		Escapements			Escapement goal recommendation for 2018
			Type	Range	2015	2016	2017	
King	Chignik River	WC	BEG	1,300–2,700	1,958	1,743	1,137	No Change
Sockeye	Chignik River							
	Early run	WC	BEG	350,000–450,000	534,088	418,290	453,257	No Change
	Late run	WC	SEG	200,000–400,000[b]	589,809	348,023	339,303	No Change
Pink	CMA aggregate – odd years	PAS	SEG	260,000–450,000	404,000		586,000	No Change
	CMA aggregate – even years	PAS	SEG	170,000–280,000		68,100		No Change
Chum	CMA aggregate	PAS	SEG	45,000–110,000	123,400	69,900	96,900	No Change

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

[b] This lower bound does not include the addition of the inriver run goal of 75,000 fish.

Table 2.– Escapements from 2015 to 2017, escapement goals, and 2018 recommendations for salmon stocks of Area M (Alaska Peninsula and Aleutian Islands Management Area). Shaded cells indicate the escapement did not meet the lower end of the current escapement goal.

Species	System	Data Type [a]	Current escapement goal Type	Current escapement goal Range	Escapement 2015	Escapement 2016	Escapement 2017	Escapement goal recommendation for 2018
King	Nelson River	WC/PA S	BEG	2,400–4,400	2,890	4,618	1,852	SEG: 2,400–5,000
Sockeye	Orzinski Lake	WC	SEG	15,000–20,000	26,534	21,019	20,989	No Change
	Thin Point Lake	PAS	SEG	14,000–28,000	19,900	36,400	44,300	No Change
	Mortensens Lagoon	PAS	SEG	3,200–6,400	NA	13,000	15,500	No Change
	Christianson Lagoon	PAS	SEG	25,000–50,000	6,700	111,700	290,600	No Change
	Swanson Lagoon	PAS	SEG	6,000–16,000	3,500	3,000	860	Discontinue
	North Creek	PAS	SEG	4,400–8,800	18,000	21,000	5,800	SEG: 7,500–10,000
	Nelson River	WC	BEG	97,000–219,000	257,000	300,000	381,000	No Change
	Bear Lake							
	Early	WC	SEG	176,000–293,000	304,356	293,280	570,840	No Change
	Late	WC	SEG	117,000–195,000	210,644	139,720	229,160	No Change
	Sandy River	WC	SEG	34,000–74,000	116,000	170,000	145,000	No Change
	Ilnik River	WC	SEG	40,000–60,000	26,000	124,000	238,000	No Change
	Meshik River	PAS	SEG	48,000–86,000	171,700	131,800	191,525	No Change
	Cinder River	PAS	SEG	36,000–94,000	118,000	200,500	222,600	No Change
	McLees Lake	WC/PA S	SEG	10,000–60,000	20,284	39,892	13,195	LB SEG: >10,000
Coho	Nelson River	PAS	LB-SEG	>18,000	45,000	45,000	19,000	No Change
	Ilnik River	PAS	LB- SEG	>9,000	14,000	28,000	6,000	No Change
Pink	South Peninsula all-years	PAS	SEG	1,750,000–4,000,000	7,820,800	1,038,160	5,663,637	No Change
Chum	Southeastern District	PAS	SEG	106,400–212,800	250,370	150,456	592,460	[b] SEG: 62,500–151,900
	South Central District	PAS	SEG	89,800–179,600	298,800	248,360	810,053	[b] SEG: 68,900–99,200
	Southwestern District	PAS	SEG	133,400–266,800	351,150	220,060	363,000	[b] SEG: 86,900–159,500
	Northwestern District	PAS	SEG	100,000–215,000	89,800	113,250	195,700	No Change
	Northern District	PAS	SEG	119,600–239,200	189,194	277,674	234,440	No Change

[a] PAS = Peak Aerial Survey, WC= Weir Count.
[b] The recommended goals were calculated with a reduced number of index streams. Escapement values in this table are from the prior escapement enumeration method for comparison with the current escapement goals, not the 2018 recommendations.