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of **ALASKA**
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MEMORANDUM

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DATE: September 23, 2015

SUBJECT: Arctic-Yukon-Kuskokwim Area Escapement Goal Recommendations

The purpose of this memorandum is to inform you of our progress in reviewing and recommending escapement goals for the Arctic-Yukon-Kuskokwim (AYK) Region. 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).

An interdivisional escapement goal review team (review team) was convened to review available escapement and other data and make escapement goal recommendations where appropriate.

Escapement goals recommended in this memorandum are the products of collaborative work among division staff, including several meetings of the review team, other department staff, and stakeholders from federal agencies and various non-governmental organizations. The review team coordinated and directed the work of other staff and reviewed that work in the process of making escapement goal recommendations.

Pertinent escapement goal definitions are:

5 AAC 39.222 (f)(3) “*Biological Escapement Goal (BEG)*: the escapement that provides the greatest potential for maximum sustained yield (MSY);”

5 AAC 39.222 (f)(36) “*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

5 AAC 39.222 (f)(25) “*Optimal Escapement Goal (OEG)*: a specific management objective for salmon escapement that considers biological and allocative factors and may differ from the SEG or BEG.”

Since inception of the *Policy for the Management of Sustainable Salmon Fisheries* and the *Policy for Statewide Salmon Escapement Goals* in 2000 and 2001, comprehensive escapement goal reviews have been conducted every three years for the AYK Region (ADFG 2004; Brannian et al. 2006; Molyneaux and Brannian 2006; Volk et al. 2009; Conitz et al. 2012). This review focused on stocks in which a new goal is needed, in which recent data or other evidence suggested an updated analysis might result in a substantially revised escapement goal, or which should be discontinued.

The review team compiled the most current information for each salmon stock having an existing goal, and other monitored, exploited stocks without an existing goal. For stocks with existing goals, the team decided upon a recommendation to: 1) retain the existing goal, 2) revise the goal, or 3) discontinue the goal. For stocks without an existing goal, the team decided whether or not to recommend establishing a new goal. The team decided which analytical methods were appropriate for revising a goal or establishing a new goal.

Oral and written reports concerning escapement goals and specific recommendations for numerous stocks in all areas of the AYK Region will be presented to the board in January 2016. These reports will list all existing escapement goals along with the new recommendations for all management areas of the AYK Region. The recommendations for each management area are summarized below.

Norton Sound-Port Clarence and Kotzebue Management Areas

A total of 33 escapement goals for 27 stocks exist in the Norton Sound-Port Clarence and Kotzebue management areas (Table 1). Biological escapement goals exist for 4 stocks, including Norton Sound Subdistrict 1 (Nome) chum salmon, Tubutulik River chum salmon, Kwiniuk River chum salmon, and Kotzebue (all areas) chum salmon. A total of 24 sustainable escapement goals exist for 23 stocks (one pink salmon stock has separate even and odd year

goals). Additionally, optimal escapement goals (OEG) were established by the board in 2001 for 5 chum salmon stocks that also have associated BEG or SEGs.

The review team is recommending discontinuation of the aerial survey SEG for king salmon and chum salmon on the Old Woman River, a tributary of the Unalakleet River.

Due to poor weather conditions, uncertainty of the relationship of the survey to peak spawning time, and availability of aircraft, these counts are unreliable for evaluating a goal on this system. Within the Unalakleet River drainage there is an existing tower-based goal for the North River tributary, which provides more robust data than aerial surveys can provide from the Old Woman River. Additionally, a weir project has been operational on the mainstem Unalakleet River since 2010 and has shown to provide accurate escapement information. It is the review team's long-term plan that when this weir project has sufficient years of data upon which to base escapement goals, steps will be taken to establish escapement goals for the mainstem Unalakleet River weir.

The review team is recommending discontinuation of the aerial survey SEG for king salmon for the upper Fish River/Boston Creek index area.

Due to poor weather conditions, uncertainty of the relationship of the survey to peak spawning time, and availability of aircraft, these counts are unreliable for evaluating a goal on this system. Aerial survey estimates on both Fish River and Boston Creek have not been conducted since 2004, and it has not been possible to evaluate escapements using this aerial survey estimate since then. Feasibility studies to provide better escapement enumeration estimates on the Fish River are being developed: 2014 was the first year of a tower project on the Fish River.

The review team is recommending revision of the Kwiniuk River tower goal to a lower bound SEG of >250 king salmon.

The Kwiniuk River tower is the longest-standing escapement dataset available in Norton Sound. The Kwiniuk River king stock is and has historically been relatively small. Anecdotal information provided by stakeholders indicates there is little overwintering habitat in this system and that king salmon have established themselves in this system in relatively recent human history, all of which could account for greater volatility in run size. Given this information, the review team recognizes that this stock is highly unlikely to support a directed commercial fishery and, consequently, an upper bound for a goal is not useful for management. The review team reviewed two methodologies that can be used for setting a lower bound goal as an alternative to the SEG escapement goal range: the percentile method and risk assessment method. After updating the data with most recent escapement information, both lower bound SEG methods indicated that the goal should be set at a minimum escapement of 250 king salmon.

The review team is recommending chum, pink and coho salmon Niukluk River tower goals be discontinued.

The Niukluk River tower project is no longer operational and it is no longer possible to assess tower-based goals on this system. Since this system supports important fisheries, the review team assessed all other available escapement data, which included aerial surveys, to determine if alternative escapement goals could be established at this time. Upon review, the historical aerial survey data for chum and pink salmon were not of a quality that would enable a reliable escapement goal to be established. Pink salmon have not routinely been a focus of aerial surveys in this system and historically they have not been well counted. Also, when pink salmon are abundant, it dramatically reduces the ability for chum salmon to be accurately assessed with aerial survey techniques in this system. Aerial survey data for coho salmon, however, have been of relatively good quality, consistently taken, and could be used to

establish an escapement goal. An historical aerial survey goal for coho salmon was based on the combined aerial surveys of Niukluk River and Ophir Creek, and the review team recommends a similar goal be established.

Based upon the data available, the review team recommends establishing a new Niukluk River/Ophir Creek coho salmon aerial survey goal: a SEG range of 750–1,600 fish.

All other existing escapement goals for salmon stocks in the Norton Sound-Port Clarence and Kotzebue management areas are recommended to continue without revision.

Yukon Management Area

In the Yukon Management Area, which includes the entire Yukon River drainage within Alaska, there are currently 15 established escapement goals for 6 king salmon, 2 summer chum salmon, 6 fall chum salmon, and 1 coho salmon stocks (Table 2). Eight of these goals are BEGs and 7 are SEGs. Not included in this listing are 3 goals for Canadian stocks that were established as part of the *Yukon River Salmon Agreement*. Escapement targets for these Canadian stocks (mainstem Yukon River king salmon, mainstem Yukon River fall chum salmon, and Fishing Branch River fall chum salmon) are set annually by the Yukon River Panel (JTC 2015).

For summer chum salmon, the review team recommends establishment of a new model-based, drainagewide BEG range of 500,000 to 1,200,000 fish. Development of this BEG recommendation began with estimating drainagewide escapement and spawner-recruitment parameters using a model that combined a run reconstruction and spawner-recruit analysis. Based on this analysis, the review team then examined optimal yield profiles, and selected a goal range based on probability of achieving expected yield at the selected level. The analysis showed this stock has moderate productivity, strong negative density dependence, and moderate to low harvest rate. Optimal yield profiles indicated the Yukon River summer chum salmon data contain good information about yield potential for this stock. Management considerations discussed by the review team included the need to maintain subsistence harvest opportunity during small runs, and the capacity of the commercial fishery to increase harvest during larger runs. Given these considerations, the review team selected a BEG range expected to have a moderate probability (about 70%) of producing approximately 80% or greater of maximum sustained yield (MSY) at the low end of the range and 90% of MSY at the upper end of the range.

For fall chum salmon, the review team recommends discontinuing the Sheenjek River goal and the aggregate goal for Upper Yukon River tributaries. Key assessment projects on the Sheenjek and Fishing Branch rivers have been discontinued. The Upper Yukon River tributaries goal is an aggregate goal comprising stocks in the Chandalar, Sheenjek, and Fishing Branch rivers; this goal is redundant with individual goals for each of the tributary stocks. Given the individual tributary goals, the aggregate goal has little practical application. However, the primary basis of the recommendation to discontinue is the fact that two of the three assessments have been discontinued. For the same reason, the Sheenjek River fall chum salmon goal is recommended to be discontinued, since it can no longer be assessed.

All other existing escapement goals for salmon stocks in the Yukon Management Area are recommended to continue without revision.

Kuskokwim Management Area

The Kuskokwim Management Area, which includes the Kuskokwim River and Kuskokwim Bay drainages, currently has 24 established escapement goals for 14 king salmon, 3 chum salmon, 3 coho salmon, and 4 sockeye salmon stocks (Table 3).

For Kuskokwim River chum salmon, the review team recommends that the Aniak River goal be discontinued. The Aniak River sonar project is no longer operated and is not expected to operate again in the foreseeable future. Without the sonar counts, the goal can no longer be assessed. A weir project on the Salmon River tributary of the Aniak River replaced the Aniak River sonar in 2012, but this data series is still too short to use in developing a revised or new escapement goal.

For Kuskokwim Bay king and sockeye salmon, the review team recommends revisions to three goals. These are all aerial survey based SEGs. An extensive review of aerial survey data was conducted to standardize for time and areas surveyed and for data quality. In the three cases recommended for change, the percentile goal ranges were revised substantially upwards after standardization of these data sets.

- **For Kanektok River king salmon, the review team recommends a revised SEG range of 3,900—12,000 fish, upwards from the existing SEG range of 3,500—8,000 fish.**
- **For Kanektok River sockeye salmon, the review team recommends a revised SEG range of 15,300—41,000 fish, upwards from the existing SEG range of 14,000—34,000 fish.**
- **For North Fork Goodnews River sockeye salmon, the review team recommends a revised SEG range of 9,600—18,000 fish, upwards from 5,500—19,500 fish.**

All other existing escapement goals for salmon stocks in the Kuskokwim Management Area are recommended to continue without revision.

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Table 1.—Summary of escapement goal recommendations for Norton Sound/Port Clarence and Kotzebue Management Areas for 2016.

Stock unit	Assessment method	Current goal			Escapement goal recommendation for 2016		
		Goal	Type	Year established or last revised	Action	New or revised goal	Type
<i>Norton Sound/Port Clarence Management Area</i>							
King Salmon (4 existing)							
Fish R./Boston Cr.	Aerial survey	>100	SEG	2005	Discontinue		
Kwiniuk River	Tower	300–550	SEG	2005	Revise Goal	>250	Lower Bound SEG
North River (Unalakleet R.)	Tower	1,200–2,600	SEG	2005	No change		
Old Woman R. (Unalakleet R.)	Aerial survey	550–1,100	SEG	2005	Discontinue		
Chum Salmon (10 existing)							
Nome Subdistrict 1 Aggregate	Multiple	23,000–35,000	BEG	2001	No change		
Eldorado River	Expanded aerial survey	6,000–9,200	SEG/OEG	2005	No change		
Nome River	Weir	2,900–4,300	SEG/OEG	2005	No change		
Snake River	Tower/weir	1,600–2,500	SEG/SEG	2005	No change		
Kwiniuk River	Tower	11,500–23,000	OEG	2001	No change		
Kwiniuk River	Tower	10,000–20,000	BEG	2001	No change		
Niukluk River (Fish R.)	Tower	>23,000	SEG	2010	Discontinue		
Old Woman R. (Unalakleet R.)	Aerial survey	2,400–4,800	SEG	2005	Discontinue		
Tubutulik River	Expanded aerial	8,000–16,000	BEG	2001	No change		
Tubutulik River	Expanded aerial	9,200–18,400	OEG	2001	No change		

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Table 1.–Page 2 of 3.

Stock unit	Assessment method	Current goal			Escapement goal recommendation for 2016		
		Goal	Type	Year established or last revised	Action	New or revised goal	Type
Coho Salmon (3 existing, 1 proposed)							
Kwiniuk River	Aerial survey	650–1,300	SEG	2005	No change		
Niukluk River	Tower	2,400–7,200	SEG	2010	Discontinue		
Niukluk River/Ophir Creek	Aerial Survey				Establish Goal	750–1,600	SEG
North River (Unalakleet R.)	Aerial survey	550–1,100	SEG	2005	No change		
Pink Salmon (5 existing)							
Kwiniuk River (all years)	Tower	>8,400	SEG	2005	No change		
Niukluk River (all years)	Tower	>10,500	SEG	2005	Discontinue		
Nome River (even year)	Weir	>13,000	SEG	2005	No change		
Nome River (odd year)	Weir	>3,200	SEG	2005	No change		
North River (Unalakleet. R. all years)	Tower	>25,000	SEG	2005	No change		
Sockeye Salmon (2 existing)							
Salmon Lake	Aerial survey	4,000–8,000	SEG	2005	No change		
Glacial Lake	Aerial survey	800–1,600	SEG	2005	No change		

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Table 1.–Page 3 of 3.

Stock unit	Assessment method	Current goal			Escapement goal recommendation for 2016		
		Goal	Type	Year established or last revised	Action	New or revised goal	Type
<i>Kotzebue Management Area</i>							
Chum Salmon (6 existing)							
Kotzebue (all areas)	Expanded aerial survey	196,000–421,000	BEG	2007	No change		
Noatak/Eli Rivers	Aerial survey	42,000–91,000	SEG	2007	No change		
Salmon River (Kobuk R. drainage)	Aerial survey	3,300–7,200	SEG	2007	No change		
Squirrel River (Kobuk R. drainage)	Aerial survey	4,900–10,500	SEG	2007	No change		
Tutuksuk River (Kobuk R. drainage)	Aerial survey	1,400–3,000	SEG	2007	No change		
Upper Kobuk and Selby Rivers	Aerial survey	9,700–21,000	SEG	2007	No change		

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Table 2.—Summary of escapement goal recommendations for Yukon Management Areas for 2016.

Stock unit	Assessment method	Current goal			Escapement goal recommendation for 2016		
		Goal	Type	Year established	Action	New or revised goal	Type
King salmon¹ (6 existing)							
Andreafsky River (East Fork)	Weir	2,100–4,900	SEG	2010	No change		
Andreafsky River (West Fork)	Aerial Survey	640–1,600	SEG	2005	No change		
Nulato River (forks combined)	Aerial Survey	940–1,900	SEG	2005	No change		
Anvik River	Aerial Survey	1,100–1,700	SEG	2005	No change		
Chena River	Tower/Mark-Recapture	2,800–5,700	BEG	2001	No change		
Salcha River	Tower/Mark-Recapture	3,300–6,500	BEG	2001	No change		
Chum Salmon, Summer (2 existing, 1 proposed)							
Yukon R. Drainage		No existing goal			Establish goal	500,000—1,200,000	BEG
East Fork Andreafsky River	Weir	>40,000	SEG	2010	No change		
Anvik River	Sonar	350,000–700,000	BEG	2005	No change		

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¹ The Canadian border king salmon escapement goal was established under the *Yukon River Salmon Agreement* and is reviewed annually by the Yukon River Panel. It is not included as part of this summary.

Table 2.–Page 2 of 2.

Stock unit	Assessment method	Current goal			Escapement goal recommendation for 2016		
		Goal	Type	Year established	Action	New or revised goal	Type
Chum Salmon, Fall² (6 existing)							
Yukon R. Drainage ³	Multiple ⁴	300,000–600,000	SEG	2010	No change		
Tanana River	Multiple ⁴	61,000–136,000	BEG	2001	No change		
Delta River	Foot Survey	6,000–13,000	BEG	2001	No change		
Upper Yukon R. Tributaries ⁵	Multiple ⁴	152,000–312,000	BEG	2001	Discontinue		
Chandalar River	Sonar	74,000–152,000	BEG	2001	No change		
Sheenjek River	Sonar	50,000–104,000	BEG	2001	Discontinue		
Coho Salmon (1 existing goal)							
Delta Clearwater River	Boat survey	5,200–17,000	SEG	2005	No change		

² The Canadian fall chum salmon mainstem border and Fishing Branch River escapement goals, established under the *Yukon River Salmon Agreement* and reviewed annually by the Yukon River Panel, are not included in this summary.

³ This goal includes all Alaskan and Canadian stocks.

⁴ Includes combination of any of the following methods: foot survey, aerial survey, weir, and sonar.

⁵ Includes Chandalar, Sheenjek, and Fishing Branch rivers. Per footnote 2 above, Fishing Branch River is not listed as an individual goal.

Table 3.—Summary of escapement goal recommendations for Kuskokwim Management Area salmon stocks for 2016.

Stock Unit	Assessment method	Current goal			Recommendation for 2016		
		Goal	Type	Year established	Action	New or revised goal	Type
King Salmon (14 existing)							
Kuskokwim River							
Kuskokwim R Drainage	Run reconstruction ⁶	65,00–120,000	SEG	2013	No change		
Aniak River	Aerial Survey	1,200–2,300	SEG	2005	No change		
Cheeneetnuk River	Aerial Survey	340–1,300	SEG	2005	No change		
Gagarayah River	Aerial Survey	300–830	SEG	2005	No change		
George River	Weir	1,800–3,300	SEG	2013	No change		
Holitna River	Aerial Survey	970–2,100	SEG	2005	No change		
Kisaralik River	Aerial Survey	400–1,200	SEG	2005	No change		
Kogruklu River	Weir	4,800–8,800	SEG	2013	No change		
Kwethluk River	Weir	4,100–7,500	SEG	2013	No change		
Salmon River (Pitka Fork)	Aerial Survey	470–1,600	SEG	2005	No change		
Salmon River (Aniak Drainage)	Aerial Survey	330–1,200	SEG	2005	No change		
Kuskokwim Bay							
Kanektok River	Aerial Survey	3,500–8,000	SEG	2005	Revise	3,900—12,000	SEG
Middle Fork Goodnews River	Weir	1,500–2,900	BEG	2005	No change		
North (Main) Fork Goodnews River	Aerial Survey	640–3,300	SEG	2005	No change		

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⁶ Run reconstruction is conducted postseason, and uses a model to estimate total return from harvest and escapement monitoring projects.

Table 3.–Page 2 of 2.

Stock Unit	Assessment method	Current goal			Recommendation for 2016		
		Goal	Type	Year established	Action	New or revised goal	Type
Chum Salmon (3 existing)							
Kuskokwim River							
Aniak River	Sonar	220,000–480,000	SEG	2007	Discontinue		
Kogruklu River	Weir	15,000–49,000	SEG	2005	No change		
Kuskokwim Bay							
Middle Fork Goodnews River	Weir	>12,000	SEG	2005	No change		
Coho Salmon (3 existing)							
Kuskokwim River							
Kogruklu River	Weir	13,000–28,000	SEG	2005	No change		
Kwethluk	Weir	>19,000	SEG	2010	No change		
Kuskokwim Bay							
Middle Fork Goodnews River	Weir	>12,000	SEG	2005	No change		
Sockeye Salmon (4 existing)							
Kuskokwim River							
Kogruklu River	Weir	4,400–17,000	SEG	2010	No change		
Kuskokwim Bay							
Kanektok River	Aerial Survey	14,000–34,000	SEG	2005	Revise	15,300–41,000	SEG
North (Main) Fork Goodnews River	Aerial Survey	5,500–19,500	SEG	2005	Revise	9,600–18,000	SEG
Middle Fork Goodnews River	Weir	18,000–40,000	BEG	2007	No change		