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of **ALASKA**  
GOVERNOR SEAN PARNELL

**Department of  
Fish and Game**

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
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**MEMORANDUM**


TO: Jeff Regnart, Director   
Division of Commercial Fisheries

DATE: September 19, 2012


Charles O. Swanton, Director   
Division of Sport Fish


THRU:  John Linderman, Regional Supervisor  
Division of Commercial Fisheries, Region III

SUBJECT: Artic-Yukon-  
Kuskokwim  
Escapement Goal  
Recommendations

 Don Roach, Regional Supervisor  
Division of Sport Fish, Region III

FROM: Jan Conitz, Regional Research Coordinator  
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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 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 every three years in concert 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).

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 several collaborative meetings of the review team, other department staff, and stakeholders from federal agencies and various nongovernmental organizations. The review team helped direct the work of other staff and reviewed that work in the process of making escapement goal recommendations to the directors of the divisions of Sport Fish and Commercial Fisheries.

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Two important definitions are:

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

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."

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). Therefore, analyses for this review focused on stocks for which recent data (2009–2011) might result in a substantially different escapement goal from the last review, or those goals that should be eliminated or established.

The review team compiled existing data for each salmon stock with an existing goal and other monitored, exploited stocks without an existing goal and made a determination to either: 1) retain an existing goal; 2) revise an existing goal; 3) establish a new goal; or 4) eliminate a goal. For escapement goals that were being revised or newly created, we determined the most appropriate methods to evaluate the escapement goal.

Oral and written reports (Conitz et al. *In prep*) concerning escapement goals and specific recommendations for numerous stocks in all areas of the AYK Region will be presented to the board in January 2013. This memo will list all current and recommended escapement goals for all management areas of the AYK Region. These recommendations are briefly described for each management area below. Following the January 2013 Board of Fisheries meeting, a memorandum will be prepared by the review team to include any additional recommendations generated through the board review process, and these recommendations will be sent to the division directors for final adoption.

### Kuskokwim Management Area

In the Kuskokwim Management Area, which includes the Kuskokwim River and Kuskokwim Bay drainages, there are currently 25 established escapement goals for 14 king salmon, four chum salmon, three coho salmon, and four sockeye salmon stocks (Table 1).

**The review team is recommending that a model-based drainagewide SEG of 65,000–120,000 be established for Kuskokwim River king salmon.** To develop this goal, historical (1976–2011) Kuskokwim River king salmon run size was estimated using models combining available escapement, harvest, run timing, and abundance data (Schaberg et al. 2012; Bue et al. *In prep*). From these estimates of total run size, a spawner-recruit relationship was modeled and yield profiles were constructed and used to select an escapement goal range (ADF&G *Unpublished*). This run reconstruction and spawner-recruit modeling represented new information to evaluate exploitation and escapement goals for Kuskokwim River king salmon.

The range for the drainagewide SEG was chosen to include the following attributes: 1) it corresponds to escapements that have a high probability (~80%) of achieving 80% or more of

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maximum returns; 2) escapements in this range are expected to provide yields adequate to meet subsistence needs; 3) the lower bound does not extend below the smallest observed estimate of escapement; and, 4) the lower bound is approximately equal to the level of escapement having the highest probability of achieving MSY (64,500). Currently, there is no whole-river escapement monitoring project, so total escapement will be estimated each year postseason using the run reconstruction model.

Currently there are 10 SEGs for king salmon stocks in tributaries of the Kuskokwim River. Using the total run size estimates and spawner-recruit model for all stocks combined, the existing tributary goals were re-evaluated in the context of the drainagewide goal. All of these current SEGs were developed using the percentile method (Bue and Hasbrouck *Unpublished*). Weir-based goals for the George, Tuluksak, and Kwethluk rivers were developed with a relatively short time series (10–12 years) of escapement estimates. The Tuluksak and Kwethluk river data sets were also inconsistent over a time series that coincidentally happened to capture predominately high escapement years. With the new information provided by the total run size estimation, it is apparent that the goals for the George, Kwethluk, and Tuluksak rivers are higher than necessary. The weir-based goal on the Kogrukluk River was developed using a much longer time series dating back to 1976, and encompasses a much more representative range of king salmon production in the Kuskokwim River. Although the SEG for the Kogrukluk River stock was based upon an adequate time series, it was likewise revised on the basis of the new run reconstruction model and spawner-recruit analysis (ADF&G *Unpublished*). **Therefore, the review team recommends revisions to three of the weir-based SEGs for king salmon:**

- **Kwethluk River: previous goal 6,000–11,000; recommended revised goal=4,100–7,500;**
- **George River: previous goal 3,100–7,900; recommended revised goal=1,800–3,300; and**
- **Kogrukluk River: previous goal 5,300–14,000; recommended revised goal=4,800–8,800.**

These revisions were developed by multiplying the average proportional escapement in each of these systems (escapement in tributary divided by total drainage escapement) by the upper and lower bounds of the recommended drainagewide goal.

**The review team is also recommending that the weir-based SEG for king salmon in the Tuluksak River be eliminated.** This system has been extensively altered by mining activity and supports a very small and variable escapement of king salmon. The existing SEG is 1,000–2,100 and was based on a relatively short and inconsistent data set. Measured escapements between 1991 and 2011 have ranged from 239 to 2,917 fish. The nearby Kwethluk and Kisaralik rivers support much larger escapements and likely provide an adequate index of escapement for lower Kuskokwim River king salmon stocks.

**The review team is also recommending that the aerial survey-based SEG for chum salmon in the Kanektok River (Kuskokwim Bay) be eliminated.** 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.

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

### Yukon Management Area

In the Yukon River Management Area, which includes the entire Yukon River drainage within Alaska, there are currently 16 established escapement goals for seven king salmon, two summer

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chum salmon, six fall chum salmon, and one coho salmon stocks (Table 2). Eight of these goals are BEGs and eight are SEGs. In addition, there are three goals for Canadian stocks, not listed here, 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.

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

### **Norton Sound-Port Clarence and Kotzebue Management Areas**

A total of 30 escapement goals exist in the Norton Sound-Port Clarence and Kotzebue management areas for six king salmon, 14 chum salmon, three coho salmon, five pink salmon, and two sockeye salmon stocks (Table 3). Biological escapement goals exist for three stocks, including Norton Sound Subdistrict 1 (Nome) chum salmon, Tubutulik River chum salmon, and Kotzebue (all areas) chum salmon. An optimal escapement goal (OEG) for Kwiniuk River chum salmon was established by the board in 2001. The remaining 26 goals are SEGs.

**The review team is recommending elimination of the aerial survey SEG for king salmon on the Shaktoolik 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.

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

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Table 1.—Summary of escapement goal recommendations for Kuskokwim Management Area salmon stocks for 2013.

Stock Unit	Assessment method	Most recent escapement goal			Recommendation for 2013		
		Goal	Type	Year established or last revised	Action	New or revised goal	Type
<b>King Salmon</b>							
<b>Kuskokwim River and tributaries</b>							
Kuskokwim River (entire drainage)	Run reconstruction' Aerial Survey						
Aniak River	Aerial Survey	1,200–2,300	SEG	2005	No change		
Cheeneetuk River	Aerial Survey	340–1,300	SEG	2005	No change		
Gagarayah River	Aerial Survey	300–830	SEG	2005	No change		
George River	Weir	3,100–7,900	SEG	2007	Revise goal	1,800–3,300	SEG
Holtna River	Aerial Survey	970–2,100	SEG	2005	No change		
Kisaralik River	Aerial Survey	400–1,200	SEG	2005	No change		
Kogruluk River	Weir	5,300–14,000	SEG	2005	Revise goal	4,800–8,800	SEG
Kwethluk River	Weir	6,000–11,000	SEG	2007	Revise goal	4,100–7,500	SEG
Pitka Fork Salmon River	Aerial Survey	470–1,600	SEG	2005	No change		
Salmon River (Aniak Drainage)	Aerial Survey	330–1,200	SEG	2005	No change		
Tuluksak River	Weir	1,000–2,100	SEG	2007	Eliminate goal		
<b>Kuskokwim Bay</b>							
Kanektok River	Aerial Survey	3,500–8,000	SEG	2005	No change		
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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Table 1.–Page 2 of 2.

Stock Unit	Assessment method	Most recent escapement goal			Escapement goal recommendation for 2013	
		Goal	Type	Year established or last revised	Action	New or revised goal Type
<b>Chum Salmon</b>						
<b>Kuskokwim River and tributaries</b>						
Aniak River	Sonar	220,000–480,000	SEG	2007	No change	
Kogrukluk River	Weir	15,000–49,000	SEG	2005	No change	
<b>Kuskokwim Bay</b>						
Kanektok River	Aerial Survey	>5,200	SEG	2005	Eliminate goal	
Middle Fork Goodnews River	Weir	>12,000	SEG	2005	No change	
<b>Coho Salmon</b>						
<b>Kuskokwim River and tributaries</b>						
Kogrukluk River	Weir	13,000–28,000	SEG	2005	No change	
Kwethluk	Weir	>19,000	SEG	2010	No change	
<b>Kuskokwim Bay</b>						
Middle Fork Goodnews River	Weir	>12,000	SEG	2005	No change	
<b>Sockeye Salmon</b>						
<b>Kuskokwim River and tributaries</b>						
Kogrukluk River	Weir	4,400–17,000	SEG	2010	No change	
<b>Kuskokwim Bay</b>						
Goodnews River (Main Fork)	Aerial Survey	5,500–19,500	SEG	2005	No change	
Middle Fork Goodnews River	Weir	18,000–40,000	BEG	2007	No change	
Kanektok River	Aerial Survey	14,000–34,000	SEG	2005	No change	

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

Table 2.-Summary of escapement goal recommendations for Yukon River Management Area for 2013.

Stock unit	Assessment method	Most recent escapement goal			Escapement goal recommendation for 2013		
		Goal	Type	Year established or last revised	Action	New or revised goal	Type
<b>King salmon<sup>1</sup></b>							
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		
Gisasa River	Weir	none			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		
<b>Chum Salmon (Summer)</b>							
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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Stock unit	Assessment method	Most recent escapement goal			Escapement goal recommendation for 2013		
		Goal	Type	Year established or last revised	Action	New or revised goal	Type
<b>Chum Salmon (Fall)<sup>2</sup></b>							
Yukon R Drainage <sup>3</sup>	Multiple <sup>4</sup>	300,000–600,000	SEG	2010	No change		
Tanana River	Expanded Foot Survey	61,000–136,000	BEG	2001	No change		
Delta River	Foot Survey	6,000–13,000	BEG	2001	No change		
Upper Yukon R. Tributaries <sup>5</sup>	Multiple <sup>6</sup>	152,000–312,000	BEG	2001	No change		
Chandalar River	Sonar	74,000–152,000	BEG	2001	No change		
Sheenjek River	Sonar	50,000–104,000	BEG	2001	No change		
<b>Coho Salmon</b>							
Delta Clearwater River	Boat survey	5,200–17,000	SEG	2005	No change		

<sup>1</sup> 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.

<sup>2</sup> The Canadian fall chum salmon border escapement goal and the Fishing Branch River goal, which are under the *Yukon River Salmon Agreement* and reviewed annually by the Yukon River Panel, are not included in this summary.

<sup>3</sup> This goal includes all Alaskan and Canadian stocks.

<sup>4</sup> Includes foot survey, weir, sonar, and aerial survey counts.

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

<sup>6</sup> Includes sonar, weir, and aerial survey counts.

Table 3.-Summary of escapement goal recommendations for Norton Sound/Port Clarence and Kotzebue Management Areas for 2013.

Stock unit	Assessment method	Most recent escapement goal			Escapement goal recommendation for 2013		
		Goal	Type	Year established or last revised	Action	New or revised goal	Type
<b>Norton Sound/Port Clarence Management Area</b>							
<b>King Salmon</b>							
Fish R./Boston Cr.	Aerial survey	>100	SEG	2005	No change		
Kwiniuk River	Tower	300-550	SEG	2005	No change		
Tubutulik River	Aerial survey	none			No change		
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	No change		
Shaktoolik River	Aerial survey	400-800	SEG	2005	Eliminate goal		
<b>Chum Salmon</b>							
Nome Subdistrict 1 Aggregate	Multiple	23,000-35,000	BEG	2001	No change		
Eldorado River	Expanded aerial survey	6,000-9,200	SEG	2005	No change		
Nome River	Weir	2,900-4,300	SEG	2005	No change		
Snake River	Tower/weir	1,600-2,500	SEG	2005	No change		
Kwiniuk River	Tower	11,500-23,000	OEG	2001	No change		
Niukluk River (Fish R.)	Tower	>23,000	SEG	2010	No change		
Old Woman R. (Unalakleet R.)	Aerial survey	2,400-4,800	SEG	2005	No change		
Tubutulik River	Expanded aerial survey	8,000-16,000	BEG	2001	No change		

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Stock unit	Assessment method	Most recent escapement goal			Escapement goal recommendation for 2013		
		Goal	Type	Year established or last revised	Action	New or revised goal	Type
<b>Coho Salmon</b>							
Kwiniuk River	Aerial survey	650-1,300	SEG	2005	No change		
Niukluk River	Tower	2,400-7,200	SEG	2010	No change		
North River (Unalakleet R.)	Aerial survey	550-1,100	SEG	2005	No change		
<b>Pink Salmon</b>							
Kwiniuk River (all years)	Tower	>8,400	SEG	2005	No change		
Niukluk River (all years)	Tower	>10,500	SEG	2005	No change		
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		
<b>Sockeye Salmon</b>							
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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Stock unit	Assessment method	Most recent escapement goal			Escapement goal recommendation for 2013	
		Goal	Type	Year established or last revised	Action	New or revised goal Type
<i>Kotzebue Management Area</i>						
<b>Chum Salmon</b>						
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	