



## MEMORANDUM

TO: Tom Taube, Acting Director, Division  
of Sport Fish

DATE: March 31, 2023

Sam Rabung, Director, Division of  
Commercial Fisheries

SUBJECT: Upper Cook Inlet Escapement  
Goal Memorandum

THRU: Jason Dye, Regional Supervisor, *JED*  
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This memorandum summarizes the Alaska Department of Fish and Game (department) review of Upper Cook Inlet (UCI) escapement goals and associated findings for escapement goals. Escapement goals in this management area have been set and evaluated at regular intervals since statehood. All UCI escapement goals were last reviewed by the department (McKinley et al. 2020) during the 2019–2020 Alaska Board of Fisheries (board) cycle. Due to changing productivity of a stock or system, escapement goals evolve over time. As a result, during the escapement goal review process, the department evaluates new methodologies and concepts and utilizes the best available data to establish or update escapement goals.

Between March 2022 and March 2023, an interdivisional salmon escapement goal review committee, including staff from the divisions of Commercial Fisheries and Sport Fish, met twice and reviewed existing salmon escapement goals in the UCI management area.

The department recognizes the importance of releasing escapement goal findings earlier in the year so the public may submit proposals relative to goals before the deadline of Monday, April 10, 2023. Thus, department staff completed their review on an accelerated timeline, and developed findings for UCI salmon escapement goals (Table 1). It is important to note that any goal changes will not take effect until the 2024 fishing season, as they are not officially adopted until after the 2023–2024 board regulatory cycle.

The review was based on the *Policy for the management of sustainable salmon fisheries* (5 AAC 39.222) and the *Policy for statewide salmon escapement goals* (5 AAC 39.223). Two important terms are used:

5 AAC 39.222(f)(3) “biological escapement goal” or “(BEG)” means the escapement that provides the greatest potential for maximum sustained yield . . .;”

and

5 AAC 39.222(f)(36) “sustainable escapement goal” or “(SEG)” means 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 . . .;”

Accordingly, the committee also determined the appropriate goal type (BEG or SEG) for each salmon stock with an existing goal. Based on the quality and quantity of available data, the committee determined the most appropriate methods to evaluate the escapement goals.

Escapement goals were evaluated for UCI stocks using a variety of methods: 1) spawner-recruit analyses, and (or) 2) the percentile approach (Clark et al. 2014). The committee developed escapement goals for each stock, compared them with the current goal if one exists, and agreed on whether to keep the current goal or change it. The methods used to evaluate the escapement goals and the rationale for subsequent findings will be described in a published report (McKinley et al. *In prep*) available prior to the February 2024 Upper Cook Inlet regulatory meeting.

### **Susitna River king salmon**

The committee findings are for no change in the SEGs for any of the four king salmon stock goals in the Susitna River drainage. The stock-recruit model used to set the initial Susitna River king salmon escapement goals for four stocks in 2020 (Deshka, Eastside, Talkeetna, and Yentna Rivers) was updated using data available through 2022. Although modeled estimates of Smsy increased for some stocks, the review team determined no changes to the current escapement goals are warranted as these goals were just developed and set in 2020, and an increase in model error (specifically process error) is responsible for most of the increase in estimates of Smsy (Table 1). If estimates of Smsy are again higher in future in-cycle reviews, the committee would be more likely to consider a change in the related escapement goals.

The estimate of Smsy for the Deshka River stock increased by approximately 1,000 fish (8%). The updated Optimum Yield Profile (OYP) suggests approximately 80% probability of achieving at least 80% of MSY with the current BEG (9,000–18,000), a change from approximately 92% and 78% probabilities at the lower and upper bounds in the 2020 analysis. However, the process error associated with this analysis is very large and has increased since the initial 2020 escapement goal analysis. Because the increase in Smsy is driven by increased process error and the OYP

probabilities associated with the existing goal continue to provide a high probability of maximum sustained yield, no change to the goal is warranted.

The estimate of Smsy for the Eastside Susitna River stock increased by approximately 1,600 fish (12%). The OYP probabilities associated with the existing SEG (13,000–25,000) in 2020 (96% and 19%) probability of achieving at least 80% of MSY at the lower and upper bound, respectively) were extremely conservative compared to other king salmon goals in Alaska, and remain so (91% and 36% probability of achieving at least 80% of MSY at the lower and upper bound, respectively) with the updated analysis. As with the results for the Deshka River stock, the process error associated with the results for this stock increased since the last board meeting and contribute to the increase in the estimate of Smsy. Because of increased process error and the OYP probabilities associated with the existing goal range continuing to be conservative, no change to the goal is warranted.

The estimates of Smsy for the Talkeetna River stock and Yentna River stock are unchanged from the estimates used in the 2020 escapement goal review to set the current SEGs (9,000–17,500 and 13,000–22,000, respectively); no change to the goal is warranted.

### **Campbell Creek king salmon**

The committee findings are for a change in the current lower bound SEG for Campbell Creek king salmon, from 380 fish to 340. Campbell Creek king salmon are assessed by a foot survey and experience a very small (unestimated) harvest via a youth fishery. Previous escapement goals for this stock were 250 fish (beginning in 1993), and a range of 50–700 fish beginning in 2001. The current lower bound SEG of 380, established in 2011, is based on the risk-based analysis (Bernard et al. 2009). The 2023 review used the 1982–2022 foot surveys (the same starting year used for the current SEG) and the percentile approach. As this stock fits the Tier 1 percentile criteria (high contrast, high measurement error, low harvest rates), the 20th percentile was used and resulted in a lower bound SEG of 340 king salmon.

### **Kenai River early- and late-run king salmon**

The committee findings are for no change in the SEGs for either of these king salmon stocks. Large fish (fish  $\geq 75$  cm mid-eye-to-fork of tail length) sustainable escapement goals (assessed by estimates of large fish produced from sonar) were adopted for the first time for both of these stocks in 2017. For the 2023 early-run reconstruction, the late-run king salmon abundance was not included as an index of early-run abundance (as done in the the 2017 model); the resultant early run estimate of Smsy is approximately 800 fish larger (24%) than the estimate in 2017. The difference in Smsy is driven by the removal of late-run king salmon abundance as an early-run index. The updated OYP suggests approximately 84% and 75% probabilities of achieving at least 80% of MSY at the lower and upper bounds of the current SEG (2,800–5,600), a change from approximate 97% and 47% probabilities at the lower and upper bounds in the 2017 analysis. Because the change in Smsy is driven by a change to the model and the updated analysis suggests the current goal continues to provide high probabilities of maximizing sustained yield, no change to the SEG is warranted. For comparison, the optimum escapement goal (OEG) for this stock is 3,900–6,600.

The late run estimate of Smsy from the 2023 analysis is similar to the 2017 estimate (17,879 vs 18,477, respectively). Also, the existing late-run SEG anticipates similar OYP probabilities as were selected in 2017. For comparison, the OEG for this stock is 15,000–30,000. The committee found that no change in the SEGs for either of the Kenai River king salmon stocks is warranted.

**Fish Creek sockeye salmon**

The current weir-based SEG (15,000–45,000) for Fish Creek was established in 2017 using the percentile approach. For this review, the committee updated the time series through 2020 and concluded there was insufficient new information to suggest the goal should be changed.

**Kasilof River sockeye salmon**

The current sonar-based BEG (140,000–320,000) for Kasilof River sockeye salmon was established in 2020. For this review, the committee updated the escapement time series and incorporated production data through 2021. The committee then examined the fit of 3 stock-recruit models (traditional Ricker, Ricker autoregressive, and Beverton-Holt) to data from brood years 1968 to 2015 (i.e., all available spawner-return data). As with the previous analysis (McKinley et al. 2020), the best fitting model was a Ricker model autoregressive with 1-year lag. There was insufficient new information to suggest the goal should be changed.

**Kenai River sockeye salmon**

The current sonar-based SEG (750,000–1,300,000) for Kenai River sockeye salmon was established in 2020 based on the traditional Ricker model (Hasbrouck et al. 2022). This review updated the escapement time series and incorporated production data through 2021. The committee then examined the fit of 3 stock-recruit models (traditional Ricker, Ricker autoregressive, and Beverton-Holt) to the data from brood years 1968 to 2015. Markov-type yield tables were also updated to include production data through 2021. The results from the stock-recruit analysis and the Markov-type yield tables were consistent with those reported previously by Hasbrouck et al. (2022). Therefore, no change to the escapement goal is warranted.

In summary, the escapement goal committee reviewed 28 salmon escapement goals for the UCI management area. The only escapement goal change is to update the Campbell Creek king salmon lower bound SEG.

A report containing details of the escapement goal analyses will be published prior to the February 2024 Upper Cook Inlet regulatory meeting. A brief oral report will be given to the board at the October 2023 Work Session. A more detailed oral report concerning escapement goals will be presented to the board in February 2024. These reports will list all current and new escapement goals for UCI, as well as a detailed description of the methods used to reach the committee's findings.

Salmon stock of concern recommendations will be finalized after the 2023 salmon season to include the most recent year's escapements. These recommendations will be formalized in a memo and presented at the board Work Session in October 2023.

## References Cited

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- McKinley, T., N. DeCovich, J. W. Erickson, T. Hamazaki, R. Begich, and T. L. Vincent. 2020. Review of salmon escapement goals in Upper Cook Inlet, Alaska, 2019. Alaska Department of Fish and Game, Fishery Manuscript No. 20-02, Anchorage.

**Table 1.-Summary of current escapement goals and committee findings for salmon stocks in Upper Cook Inlet, 2023.**

System	Current Escapement Goal			Escapement Goal findings beginning with 2024 season			
	Goal	Type	Year adopted	Range or lower bound	Type	Data	Action
<b>King Salmon</b>							
<i>Susitna River</i>							
Deshka River	9,000–18,000	BEG	2020			weir	No Change
Eastside Susitna River	13,000–25,000	SEG	2020			multiple aerial surveys <sup>a</sup>	No Change
Talkeetna River	9,000–17,500	SEG	2020			multiple aerial surveys <sup>a</sup>	No Change
Yentna River	13,000–22,000	SEG	2020			multiple aerial surveys <sup>a</sup>	No Change
	16,000-22000	OEG	2020				
Alexander Creek	1,900–3,700	SEG	2020			single aerial survey	No Change
Chulitna River	1,200–2,900	SEG	2020			single aerial survey	No Change
<i>West Cook Inlet and Knik Arm</i>							
Chuitna River	1,000–1,500	SEG	2020			single aerial survey	No Change
Theodore River	500–1,000	SEG	2020			single aerial survey	No Change
Little Susitna River weir	2,300–3,900	SEG	2017			weir	No Change

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System	Current Escapement Goal			Escapement Goal findings beginning with 2024 season			
	Goal	Type	Year adopted	Range or lower bound	Type	Data	Action
<i>West Cook Inlet and Knik Arm</i>							
Little Susitna River aerial	700–1,500	SEG	2020			single aerial survey	No Change
<i>Anchorage</i>							
Campbell	380	LB SEG	2011	<b>340</b>	LB SEG	single foot survey	Update
<i>Northern Kenai Peninsula</i>							
Crooked Creek	700–1,400	SEG	2020			weir	No Change
Kenai River - Early Run (large fish)	2,800–5,600 <sup>b</sup>	SEG	2017			sonar	No Change
	3,900–6,600 <sup>b</sup>	OEG	2017				
Kenai River - Late Run (large fish)	13,500–27,000 <sup>b</sup>	SEG	2017			sonar	No Change
	15,000–30,000	OEG	2020				
<b>Chum Salmon</b>							
Clearwater Creek	3,500–8,000	SEG	2017			peak aerial survey	No Change
<b>Coho Salmon</b>							
<i>Susitna River</i>							
Deshka River	10,200–24,100	SEG	2017			weir	No Change
<i>Knik Arm</i>							
Fish Creek (Knik)	1,200–6,000	SEG	2020			weir	No Change
Jim Creek	250–700	SEG	2020			single foot survey	No Change
Little Susitna River	9,200–17,700 <sup>c</sup>	SEG	2020			weir	No Change

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System	Current Escapement Goal			Escapement Goal findings beginnings with 2024 season			
	Goal	Type	Year adopted	Range or lower bound	Type	Data	Action
<b>Sockeye Salmon</b>							
<i>Susitna River</i>							
Chelatna Lake	20,000–45,000	SEG	2017			weir	No Change
Judd Lake	15,000–40,000	SEG	2017			weir	No Change
Larson Lake	15,000–35,000	SEG	2017			weir	No Change
<i>Cook Inlet and Knik Arm</i>							
Fish Creek	15,000–45,000	SEG	2017			weir	No Change
Packers Creek	15,000–30,000	SEG	2008			weir	No Change
<i>Northern Kenai Peninsula</i>							
Kasilof River	140,000–320,000	BEG	2020			sonar	No Change
	140,000–370,000	OEG	2011				
Kenai River	750,000–1,300,000	SEG	2020			sonar	No Change
Russian River-Early Run	22,000–42,000	BEG	2011				No Change
Russian River-Late Run	44,000–85,000	SEG	2020			weir	No Change

<sup>a</sup> Single aerial surveys of individual tributaries are combined with other historical data to estimate annual run size for three stocks of the Susitna River drainage.

<sup>b</sup> Fish 75 cm mid-eye-to-fork of tail length or longer

<sup>c</sup> Based on escapement (weir count - harvest above weir).