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SUBJECT: 2022 Bristol Bay Escapement Goal Memo

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The purpose of this memo is to report our progress reviewing and recommending escapement goals for the Bristol Bay Management Area (BBMA). 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).

Beginning in November 2020, an interdivisional salmon escapement goal committee, including staff from the divisions of Commercial Fisheries and Sport Fish, met several times to discuss salmon escapement goals in the BBMA. Escapement goals for this area have been set and evaluated at regular intervals since statehood and many of these stocks have long-term historical datasets. 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:

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

The committee determined the appropriate goal type (BEG or SEG) for each salmon stock with an existing goal and reviewed other monitored stocks that do not have escapement goals. Using available data, we determined the most appropriate methods to develop each escapement goal.

Currently, 13 escapement goals are evaluated in BBMA (Table 1). Due to the comprehensive previous analyses in Cross et al. (1997), Fair (2000), Fair et al. (2004), Baker et al. (2006 and 2009), Fair et al. (2012), Erickson et al. (2015 and 2018) the review committee focused its attention on updating and reviewing the stock-recruit analyses for sockeye and king salmon stocks.

Sockeye salmon

For this review, we updated the sockeye salmon genetic stock-specific harvest estimates from 2006 forward with the current baseline to better account for mixed-stock harvest in each district, and more accurately represent the true production of the sockeye salmon stocks in Bristol Bay. Except for the Alagnak River stock, Ricker stock-recruit models fit in a Bayesian framework were run with updated data through 2020, and for comparison, with data through 2012 (the time series of data from which the current goals were developed) to assess if the recent eight years of returns would provide additional information to modify the existing goals. The updated stock-recruit analyses from this effort were similar to the stock-recruit analyses presented to the board in 2012. Since 2012, Bristol Bay sockeye salmon runs have been very productive and several stocks (most notably Egegik, Naknek, and Wood rivers) have experienced record or near record runs and escapements. While some goals could be revised, the committee recommends no changes to the current escapement goals and will assess the returns from these large escapements over the next 3–6 years; information that will likely better inform some of the stock-recruit relationships. This pending return information may warrant revising escapement goals during the next 1 or 2 board cycles.

King salmon

The current SEG (55,000–120,000) for Nushagak River king salmon was established in 2013. For this review, a run reconstruction was developed for Nushagak River king salmon for brood years 1966–2012. As part of this run reconstruction and stock-recruit analysis the department corrected errors in harvest data used to develop the current escapement goal, and attempted to address the uncertainty in proportion of king salmon indexed by sonar that was identified by recent tagging and capture-recapture studies. The model integrated historical escapement, harvest, inriver run and age composition data to reconstruct drainage-wide historical run and escapement, as well as spawner-recruit parameter estimates from which biological reference points such as number of spawners at maximum sustained yield (S_{MSY}) are estimated. Four different time series of spawner-recruit data were analyzed, and several recommendations were made to potentially improve the run reconstruction model. Recommendations include indices of sport and commercial catch-per-unit-effort (CPUE). Due to the extensive work required to further improve the run reconstruction, the committee recommends the current escapement goal not be changed at this time. The department will continue development of a run reconstruction model and stock-recruit analyses, and present results and escapement goal recommendation prior to the next Bristol Bay board cycle.

Pink salmon

The current lower-bound SEG (165,000) for even-year Nushagak River pink salmon was established in 2013. The sonar project has only operated twice (2014 and 2018) during August (the key timeframe for pink and coho salmon passage) since the goal was established. The committee concluded updating the analysis for this stock would likely not result in a substantially different escapement goal; therefore, the committee recommends no change at this time.

Coho salmon

The current SEG (60,000–120,000) for Nushagak River coho salmon was established in 2013. The Nushagak River sonar has operated during August four times since the goal was established (2013, 2014, 2018, and 2019). The committee concluded that updating the analysis for this stock would likely not result in a substantially different escapement goal; therefore, the committee recommends no change at this time.

Chum salmon

The current lower-bound SEG (200,000) for Nushagak River chum salmon was established in 2013. The committee reviewed the recent escapements and concluded that updating the analysis for this stock would not likely result in a substantially different escapement goal; therefore, the committee recommends no change at this time.

Summary

This comprehensive review of the 13 existing salmon escapement goals in the BBMA resulted in the recommendation to maintain all existing escapement goals. Oral and written reports concerning BBMA escapement goals, the Nushagak River king salmon run reconstruction, and stock status will be presented to the board in November 2022. These reports will list current escapement goals for BBMA, detailed descriptions of the methods used to evaluate these goals, and annual escapements through 2021.

Stock of Concern recommendations for Bristol Bay salmon will be developed after the 2022 salmon season. These recommendations will be formalized in a memo and presented at the board Work Session in October 2022. A brief oral report concerning escapement goals and stock of concern recommendations will be given to the board at the Work Session.

Table 1.–Summary of current and recommended escapement goals for salmon stocks in Bristol Bay Management Area.

System	Escapement goal	Enumeration method	Goal type	Initial year	Recommendation
KING SALMON					
Nushagak River	55,000 – 120,000	Sonar	SEG	2013	No change
CHUM SALMON					
Nushagak River	200,000	Sonar	Lower-bound SEG	2013	No change
COHO SALMON					
Nushagak River	60,000 – 120,000	Sonar	SEG	2013	No change
PINK SALMON					
Nushagak River (even years only)	165,000	Sonar	Lower-bound SEG	2013	No change
SOCKEYE SALMON					
Kvichak River	2,000,000 – 10,000,000	Tower count	SEG	2010	No change
Alagnak River	210,000	Tower count	Lower-bound SEG	2019	No change
Naknek River	800,000 – 2,000,000	Tower count	SEG	2015	No change
Egegik River	800,000 – 2,000,000	Tower count	SEG	2015	No change
Ugashik River	500,000 – 1,400,000	Tower count	SEG	2015	No change
Wood River	700,000 – 1,800,000	Tower count	SEG	2015	No change
Igushik River	150,000 – 400,000	Tower count	SEG	2015	No change
Nushagak River	370,000 – 900,000	Sonar	SEG	2015	No change
	260,000	Sonar	Lower-bound OEG	2012	Not applicable
Togiak River	120,000 – 270,000	Tower count	SEG	2010	No change

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