Department of Fish and Game

THE STATE of ALASKA
GOVERNOR MIKE DUNLEAVY

DIVISIONS OF SPORT FISH & COMMERCIAL FISHERIES
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MEMORANDUM

TO: Samuel Rabung, Director
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DATE: July 11, 2019

THRU: Bert Lewis, Regional Supervisor BL
Division of Commercial Fisheries, Region II

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SUBJECT: Nushagak River King Salmon Escapement Goal Memo

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This memo reports our progress reviewing and recommending an escapement goal for Nushagak River king salmon. During the 2018 Alaska Board of Fisheries (board) regulatory meeting the board heard testimony from Nushagak River sport and commercial fishing stakeholders regarding Proposals 41 and 42 seeking a mechanism that would pair restrictions on both the sport and commercial fisheries for the purposes of king salmon conservation. As part of this discussion, the board created a committee to review the management plan and provide recommendations to the board on a comprehensive solution. As part of this effort, the Alaska Department of Fish and Game (department) reviewed all Nushagak River king salmon data, generated a Bayesian run reconstruction, updated the stock recruit analysis, and presents an escapement goal recommendation. This recommendation incorporates corrected harvest data and uncertainty in king salmon abundance estimated by the sonar.

The *Policy for Statewide Salmon Escapement Goals* (5 AAC 39.223) recognizes the establishment of salmon escapement goals as a joint responsibility of the department and the board and describes the concepts, criteria, and procedures for establishing and modifying salmon escapement goals. Under the policy, the board recognizes the department's responsibility for establishing and modifying biological escapement goals (BEG) and sustainable escapement goals (SEG).

An escapement goal for this stock was established in 1992 and evaluated at regular intervals. Management of this stock is based on an optimal escapement goal and an inriver goal under the *Nushagak-Mulchatna King Salmon Management Plan* (5 AAC 06.361).

This 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."

For this review, the time series for Nushagak River king salmon were updated to include historical harvest and escapement data including:

- Aerial survey counts on the Nushagak, Iowithla, Klusipaw, King Salmon, Stuyahok, Koktuli, and Mulchatna rivers (1968–1980, 1990, 1995–1999)
- Bendix sonar counts (1979–1983, 1985–2004; note: 1979–1983 and 1997 were down-weighted for this analysis)
- DIDSON sonar counts (2006–2017)
- Bendix-DIDSON conversion to DIDSON equivalent counts estimated from partial side by side comparisons (2003–2005; note: no complete season-long side-by-side comparisons were conducted)
- Subsistence, sport, and commercial harvest estimates above and below the sonar site (1968–2017)
- Age composition data from commercial harvest and sonar test-fishing (1968–2017)
- Acoustic tagging study estimates of king salmon passage beyond DIDSON ensonified area (2012–2014)
- Sonar-independent capture-recapture estimates of king salmon abundance (2014–2016).

We completed an escapement goal review that included a run reconstruction and stock recruit analysis incorporating all historical harvest and escapement data. Based on the review we recommend no change to the current Nushagak king salmon SEG of 55,000–120,000 fish as indexed by the sonar (i.e. DIDSON equivalents).

The preliminary run reconstruction and stock recruit analysis results estimated an escapement range of 70,000–125,000 Nushagak River king salmon have a 90% probability of achieving 90% of MSY, which translates to 42,000–75,000 DIDSON equivalents (the number counted at the sonar). During the review it became apparent the stock recruit analysis is compromised by a lack of temporal overlap in escapement assessment methods. The biggest issues with the run reconstruction are the lack of paired Bendix and DIDSON counts for both riverbanks for multiple years, Bendix estimates not aligning well with paired aerial survey data, and aerial survey data not overlapping in time with DIDSON estimates. Furthermore, given the recent pattern of lower productivity of king salmon in

the Nushagak River and statewide, a more conservative approach of no change to the current SEG is precautious.

As part of this review, the department concluded that reestablishing annual aerial surveys is the most cost-effective and timely mechanism to reduce the uncertainty in the updated stock-recruit analysis. The department is going to conduct these surveys in 2019 and anticipates conducting them annually to reduce uncertainty associated with the stock recruit model.

The management plan will need to be amended to clarify that the differences between the SEG (55,000–120,000) and an inriver goal of 62,000–126,000 is because the inriver goal includes additional fish available for harvest above the sonar.