Arctic-Yukon-Kuskokwim Region 2023 Escapement Goal Review: A Report to the Alaska Board of Fisheries

Presented by:

Zachary Liller

Division of Commercial Fisheries

&

James Savereide

Division of Sport Fish

Oral Report: RC 3 Tab 6

Written Report: RC 3 Tab 1

Presentation Objectives

- Introduce escapement goal policies and terms
- Explain the 2023 review process
- Orientation to Arctic-Yukon-Kuskokwim escapement goals
- Results and Conclusions

Escapement Goal Policies

- Policy for the Management of Sustainable Salmon Fisheries (5 AAC 39.222)

- Policy for Statewide Salmon Escapement Goals (5 AAC 39.223)

Pacific Salmon Treaty – Yukon River Salmon Agreement

- Bilateral U.S./Canada Yukon River Panel recommends escapement goals to ADF&G for Canadian origin king and fall chum salmon.

Terms

1) Biological Escapement Goal (BEG):

   - Escapement that provides the greatest potential for maximum sustained yield – expressed as a range based on productivity and data uncertainty

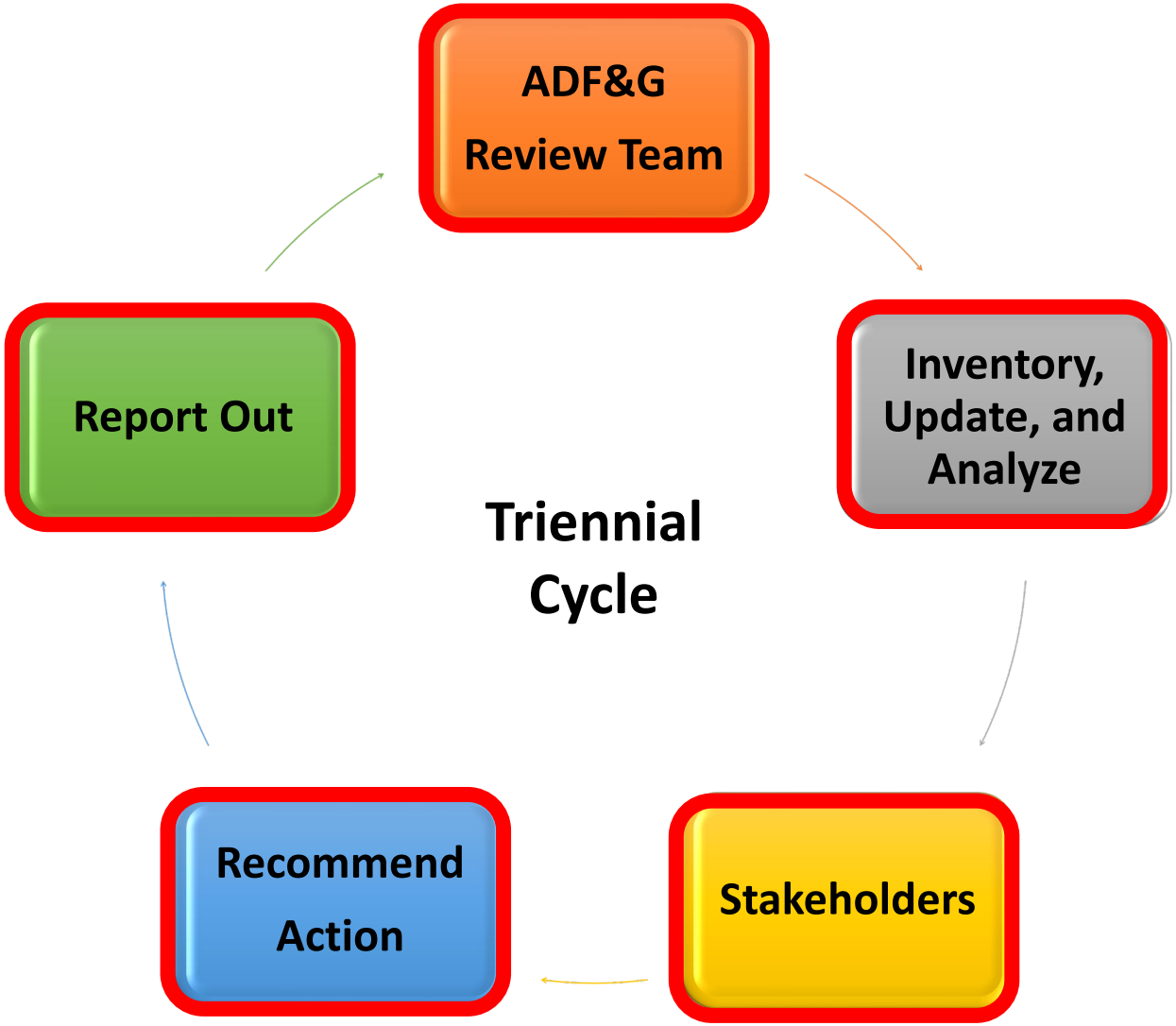
2) Sustainable Escapement Goal (SEG):

   - Escapement that is known to provide for sustained yield over a 5-to-10-year period – accounts for data uncertainty

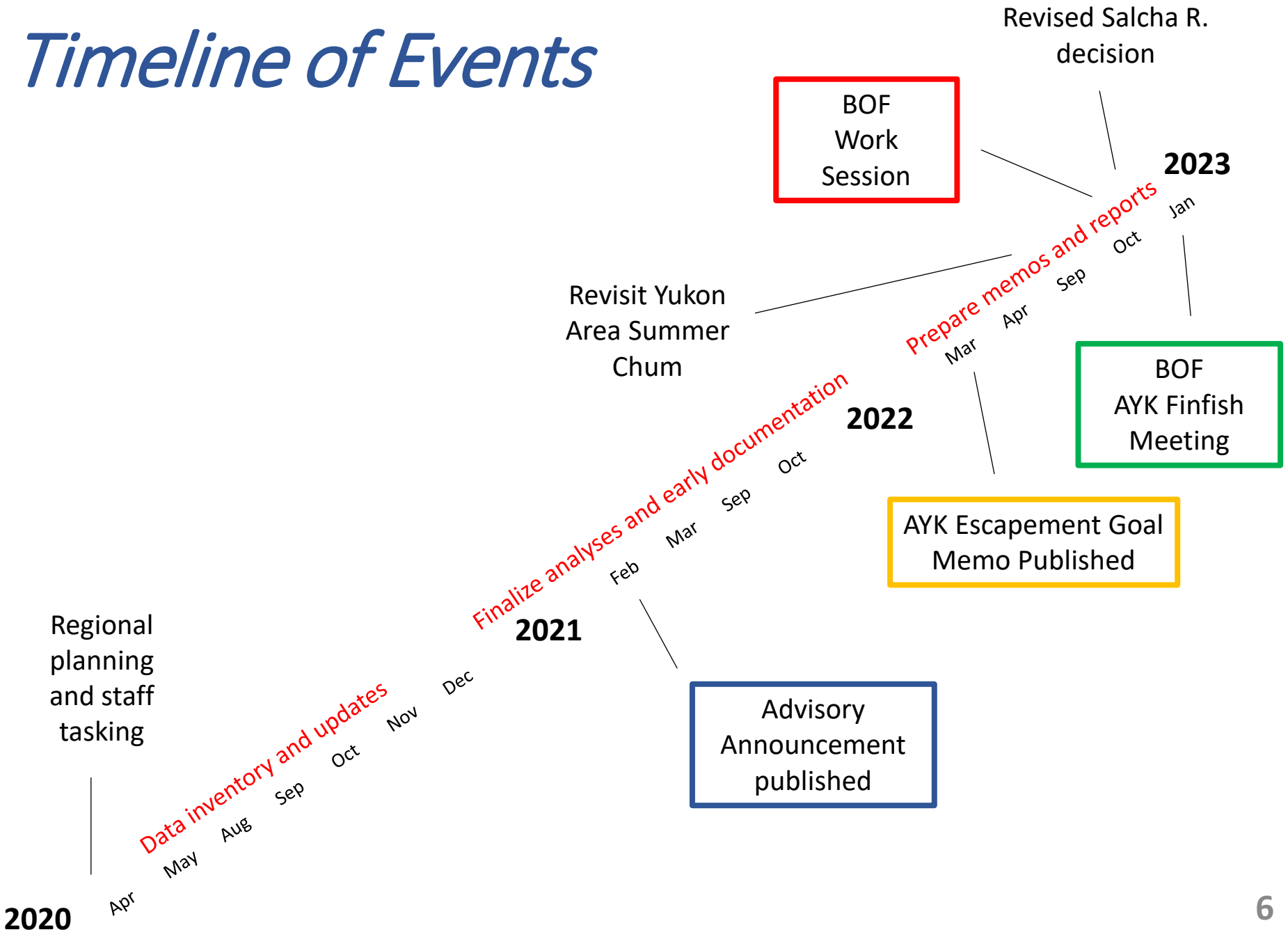
3) Optimal Escapement Goal (OEG):

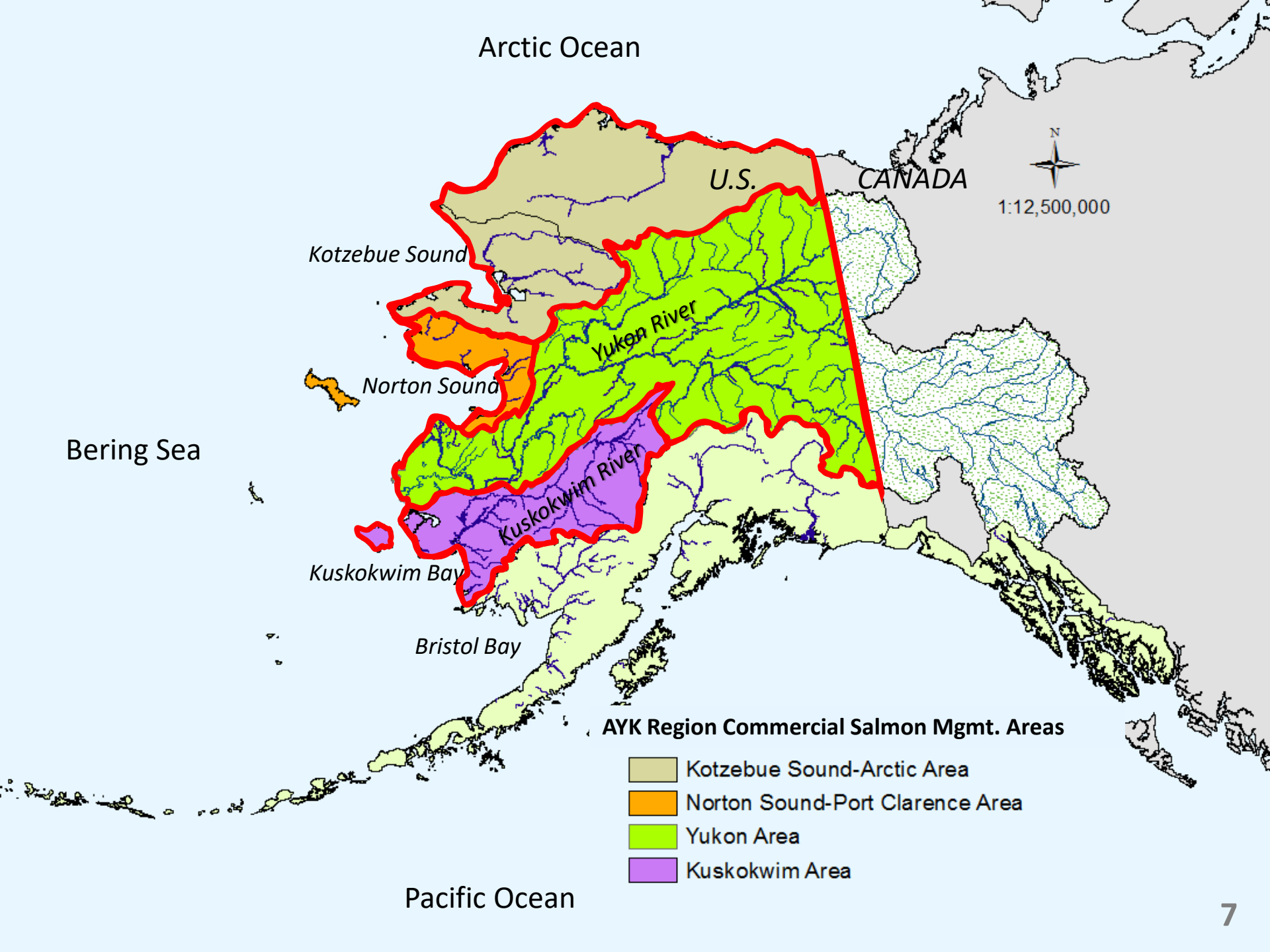
   - A specific management objective that considers biological and allocative factors and may differ from the SEG or BEG and will be adopted as a regulation by the Board

AYK Escapement Goal Review Process

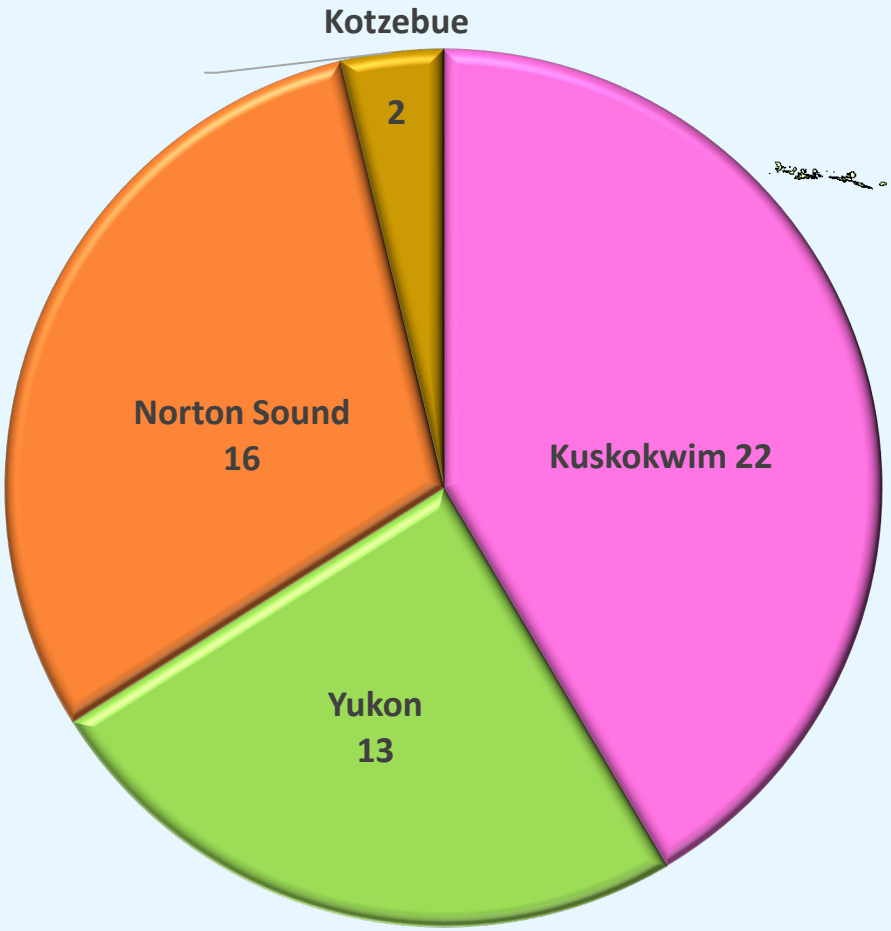


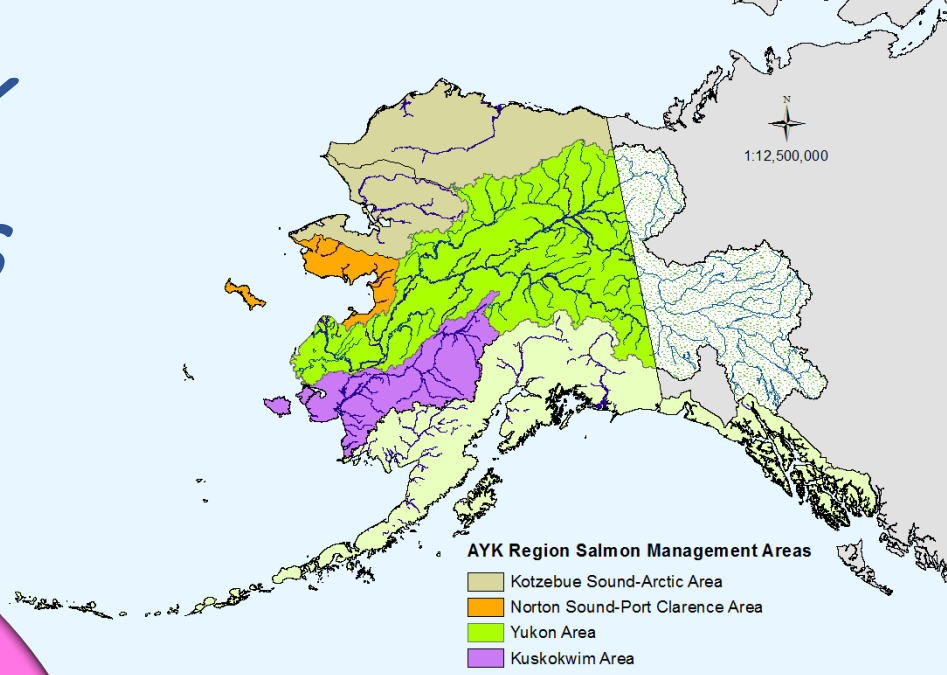
Timeline of Events



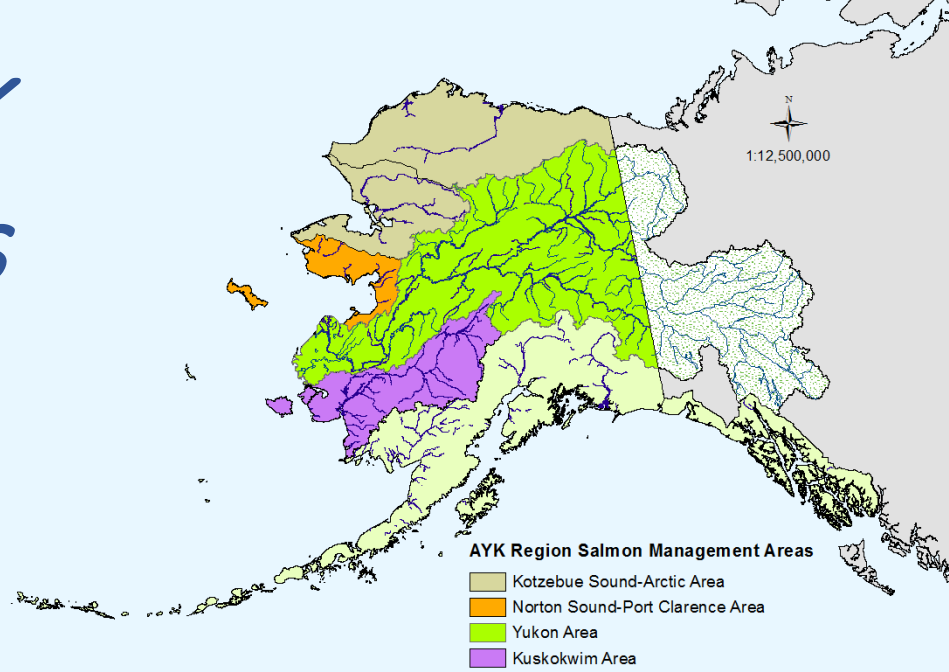

Arctic Ocean
U.S.
CANADA
N
1:12,500,000
Kotzebue Sound
Yukon River
Norton Sound
Bering Sea
Kuskokwim River
Kuskokwim Bay
Bristol Bay
AYK Region Commercial Salmon Mgmt. Areas
Kotzebue Sound-Arctic Area
Norton Sound-Port Clarence Area
Yukon Area
Kuskokwim Area
Pacific Ocean

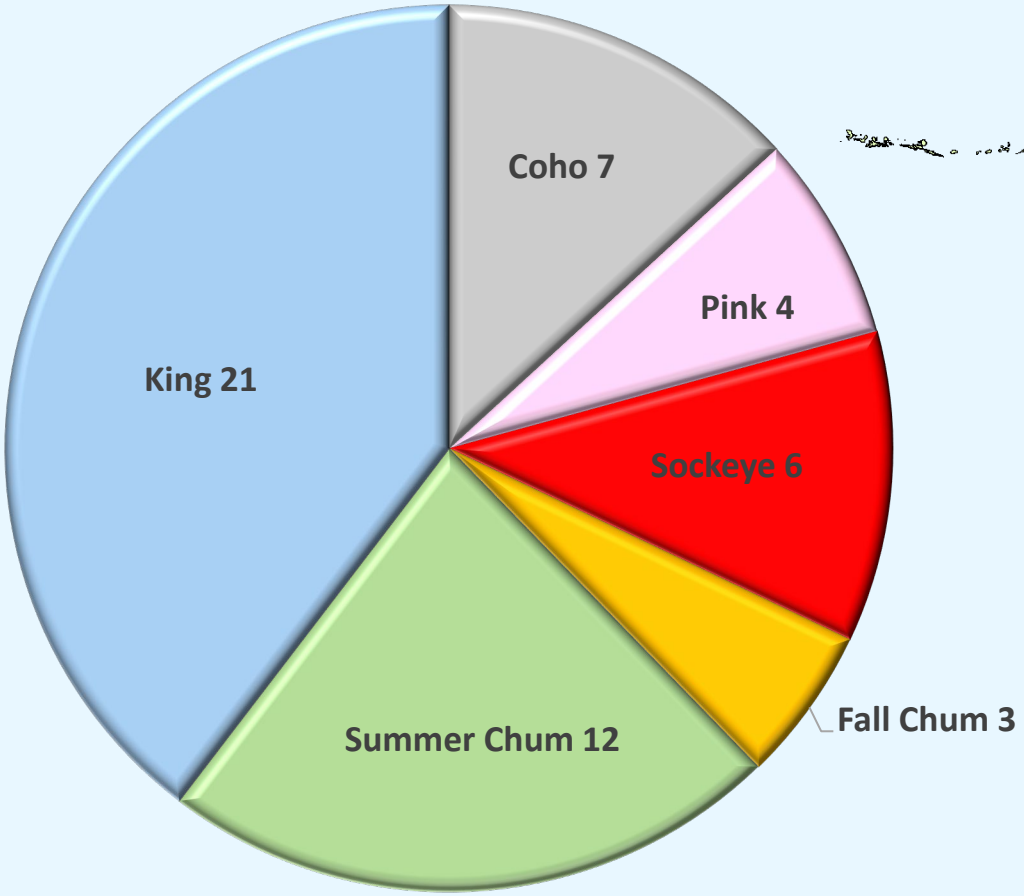
Orientation to AYK Escapement Goals



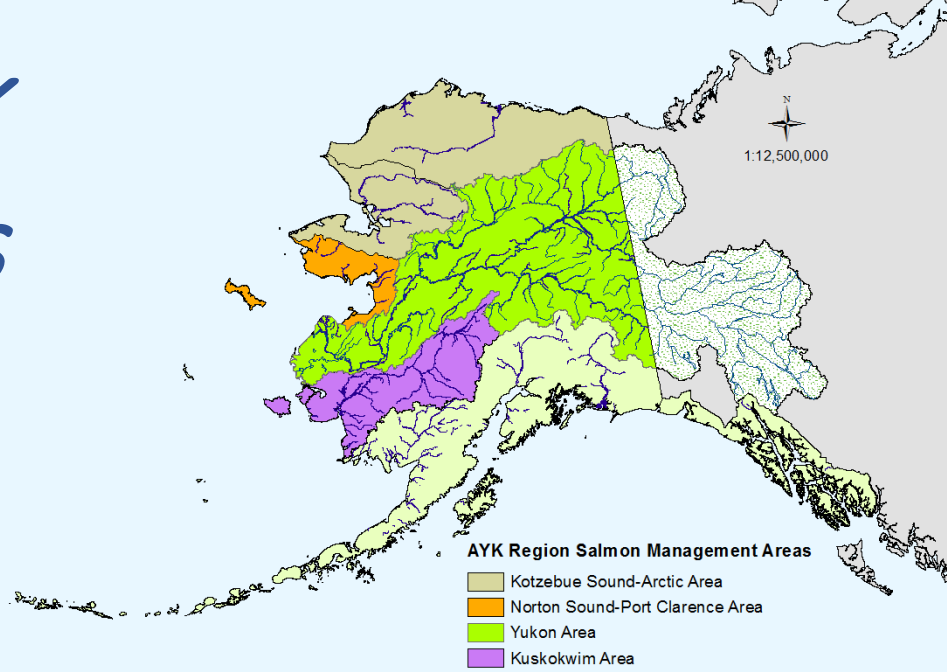


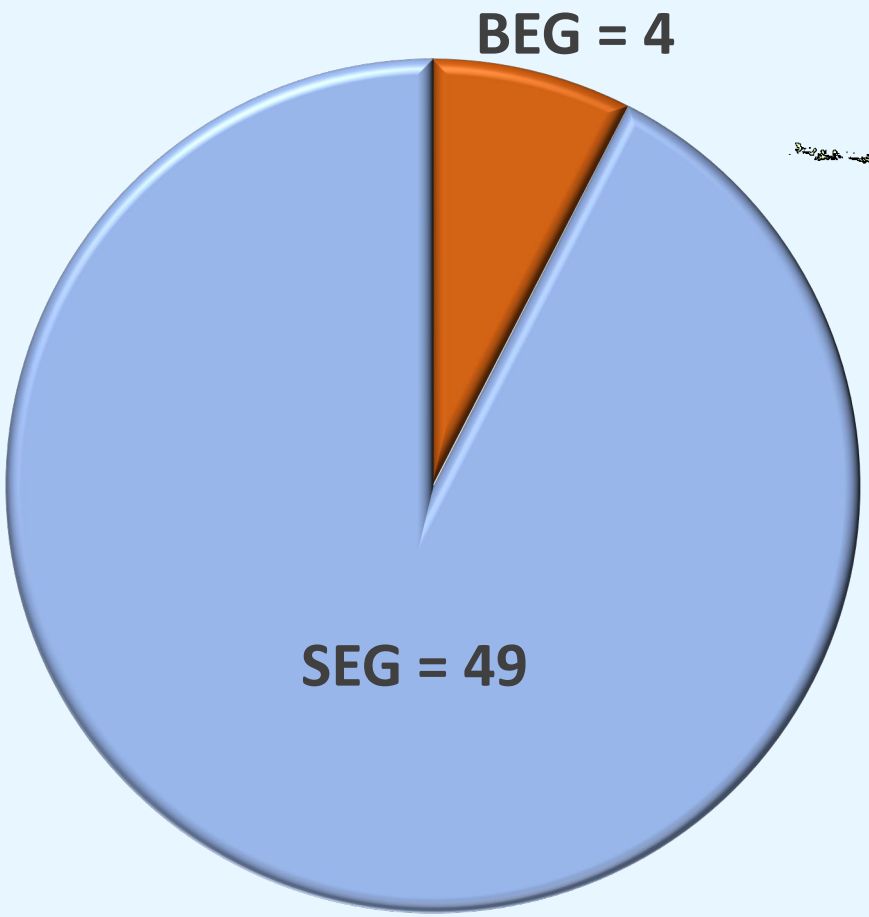
Orientation to AYK Escapement Goals





Orientation to AYK Escapement Goals

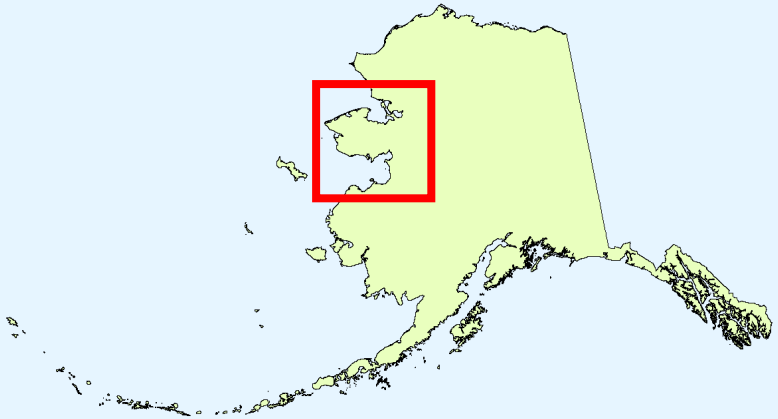




Summary of 2023 Escapement Goal Decisions for the AYK Region

- 46 of the 53 total goals be continued with no change.
- Revising one goal is warranted.
- Discontinuing six goals is warranted.
- New escapement goals are not warranted.
- Escapement goal changes have no implications on existing management plans.

Norton Sound, Arctic and Kotzebue, All Salmon

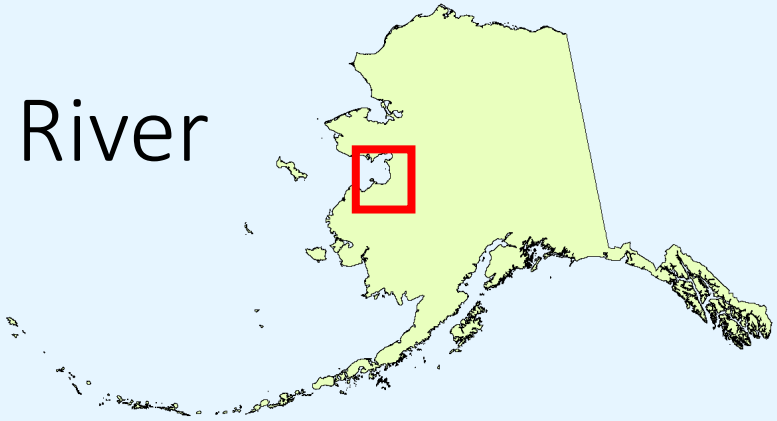


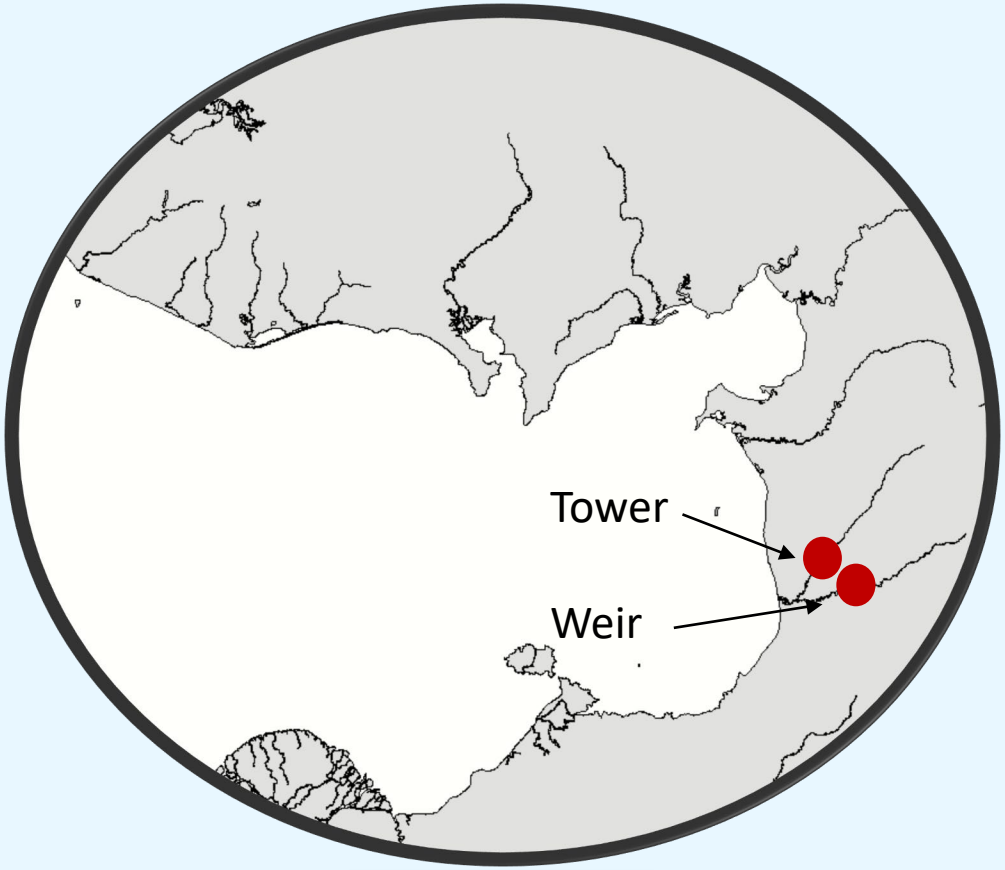
No changes to existing escapement goals

Detailed discussion pertaining to:

- Unalakleet River King Salmon
- Pilgrim River Sockeye Salmon

Norton Sound – Unalakleet River King Salmon



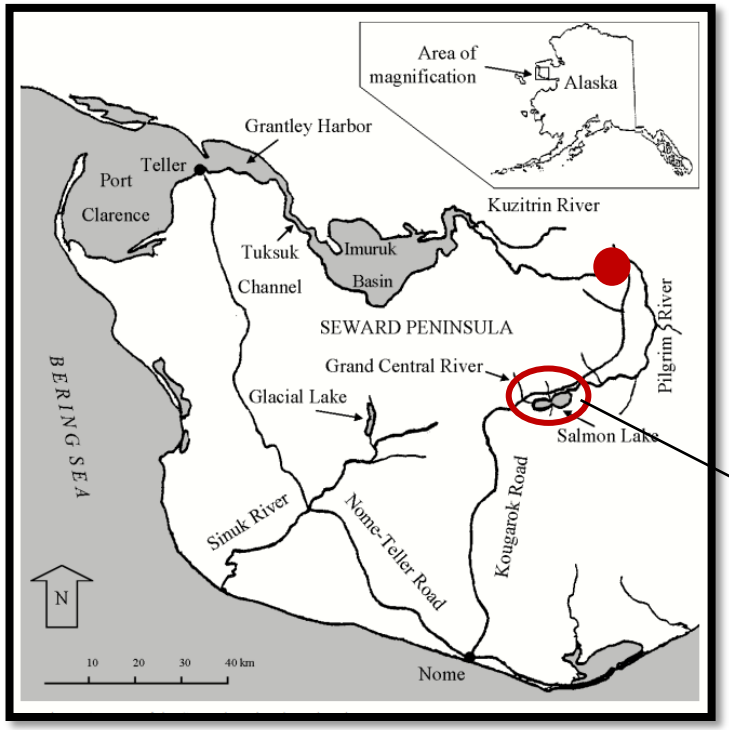


- Stock of Yield concern since 2004
- SEG established for the North River tributary.
- Additional information from Unalakleet River weir counts and drainagewide telemetry studies.
- Moving forward – develop a comprehensive escapement goal plan for Unalakleet River King salmon.

Norton Sound – Pilgrim River Sockeye Salmon

Available information to inform goals:

- *Adult escapement and harvest*
- *Limnology studies*
- *Smolt outmigration*
- *Production analyses*



- Fertilized nearly annually since 1997
- SEG of 6,800-36,000 for Salmon Lake.
- Concerns that the upper bound is too high.
- **Changes must consider fishery objectives and long-term fertilization plans.**

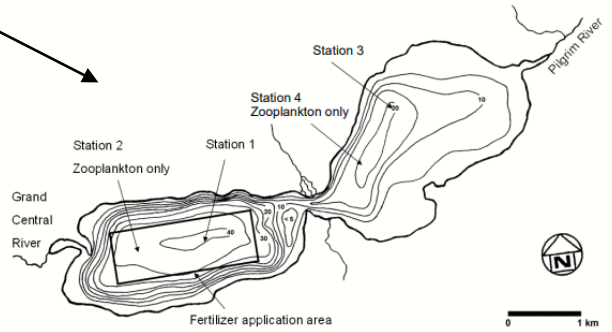
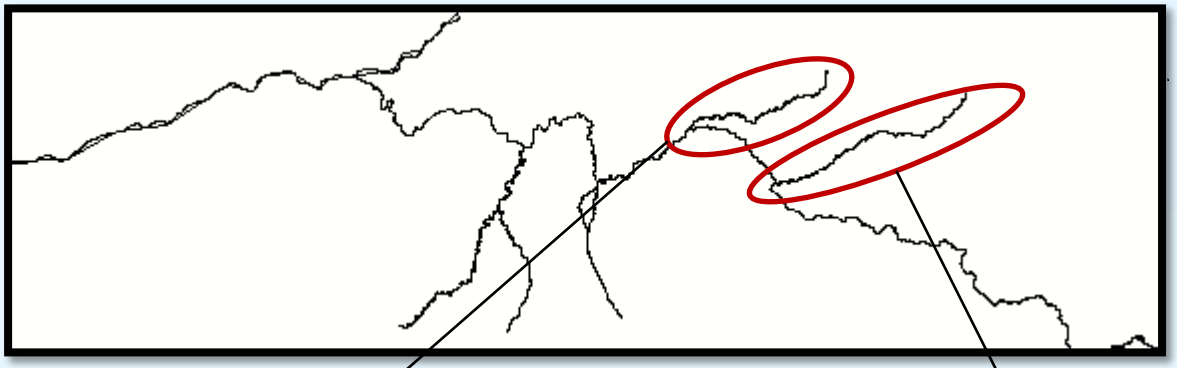
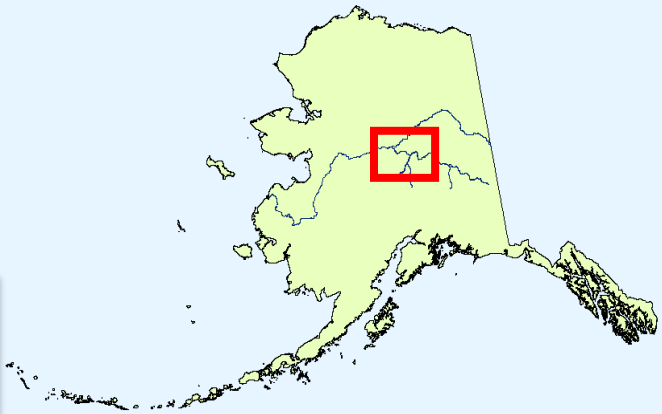


Figure 2.–Bathymetric map of Salmon Lake with limnology sampling stations and fertilizer application area.

Yukon Area- Chena and Salcha River King Salmon

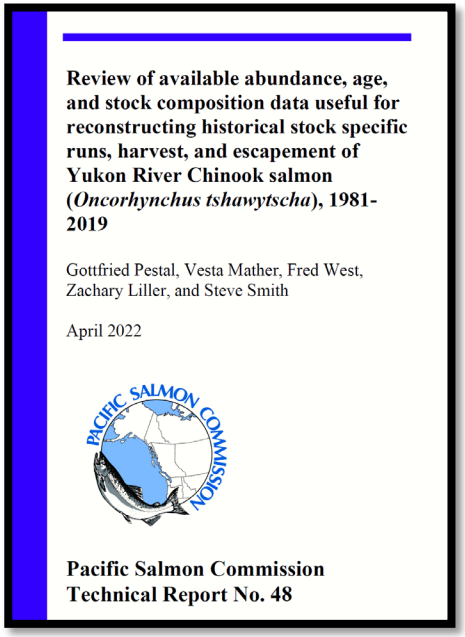




Revise the BEG for the Chena River due to a decrease in production.

- Current: 2,800 – 5,700
- Revise: 3,300 – 5,700

No change to the Salcha River BEG because the current range provides sustainable yields



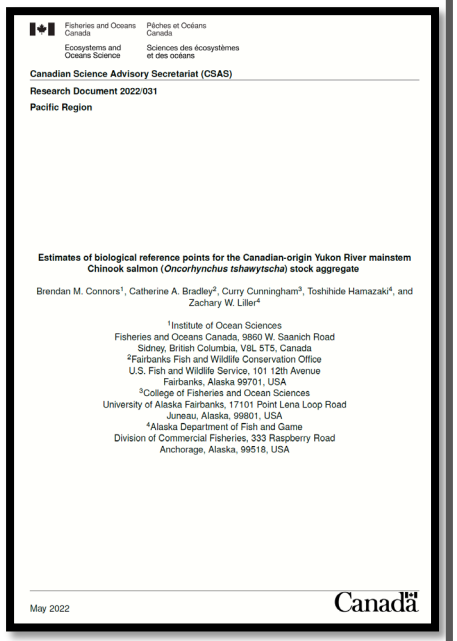
Review of available abundance, age, and stock composition data useful for reconstructing historical stock specific runs, harvest, and escapement of Yukon River Chinook salmon (*Oncorhynchus tshawytscha*), 1981-2019

Gottfried Pestal, Vesta Mather, Fred West, Zachary Liller, and Steve Smith

April 2022

PACIFIC SALMON COMMISSION

Pacific Salmon Commission Technical Report No. 48



Fisheries and Oceans Canada | Pêches et Océans Canada
Ecosystems and Oceans Science | Sciences des écosystèmes et des océans

Canadian Science Advisory Secretariat (CSAS)

Research Document 2022/031

Pacific Region

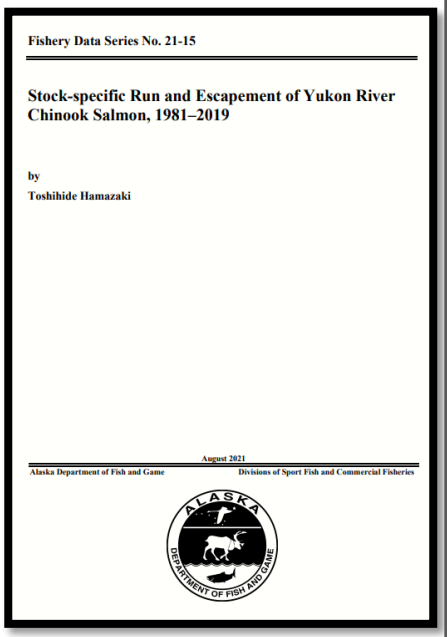
Estimates of biological reference points for the Canadian-origin Yukon River mainstem Chinook salmon (*Oncorhynchus tshawytscha*) stock aggregate

Brendan M. Connors[1], Catherine A. Bradley[2], Curry Cunningham[3], Toshihide Hamazaki[4], and Zachary W. Liller[4]

[1]Institute of Ocean Sciences
Fisheries and Oceans Canada, 9860 W. Saanich Road
Sidney, British Columbia, V8L 5T5, Canada
[2]Fairbanks Fish and Wildlife Conservation Office
U.S. Fish and Wildlife Service, 101 12th Avenue
Fairbanks, Alaska 99701, USA
[3]College of Fisheries and Ocean Sciences
University of Alaska Fairbanks, 17101 Point Lena Loop Road
Juneau, Alaska, 99801, USA
[4]Alaska Department of Fish and Game
Division of Commercial Fisheries, 333 Raspberry Road
Anchorage, Alaska, 99518, USA

May 2022

Canada



Fishery Data Series No. 21-15

Stock-specific Run and Escapement of Yukon River Chinook Salmon, 1981–2019

by

Toshihide Hamazaki

August 2021

Alaska Department of Fish and Game | **Divisions of Sport Fish and Commercial Fisheries**

ALASKA DEPARTMENT OF FISH AND GAME

Received: 5 November 2021 | Revised: 19 April 2022 | Accepted: 4 May 2022
DOI: 10.1002/eap.2709

ARTICLE

ECOLOGICAL APPLICATIONS

Chinook salmon diversity contributes to fishery stability and trade-offs with mixed-stock harvest

Brendan M. Connors[1] | **Matthew R. Siegle**[2] | **Joel Harding**[3] | **Steven Rossi**[4,5] | **Benjamin A. Staton**[6] | **Michael L. Jones**[7] | **Michael J. Bradford**[8] | **Randy Brown**[9] | **Bill Bechtol**[10] | **Beau Doherty**[4] | **Sean Cox**[4,5] | **Ben J. G. Sutherland**[2]

[1]Institute of Ocean Sciences, Fisheries and Oceans Canada, Sidney, British Columbia, Canada
[2]Pacific Biological Station, Fisheries and Oceans Canada, Nanaimo, British Columbia, Canada
[3]Fisheries and Oceans Canada, Kamloops, British Columbia, Canada
[4]Landmark Fisheries Research, Port Moody, British Columbia, Canada
[5]Simon Fraser University, Burnaby, British Columbia, Canada
[6]Columbia River Inter-Tribal Fish Commission, Portland, Oregon, USA
[7]Quantitative Fisheries Center, Michigan State University, East Lansing, Michigan, USA
[8]Fisheries and Oceans Canada, West Vancouver, British Columbia, Canada
[9]US Fish and Wildlife Service, Fairbanks, Alaska, USA
[10]Bechtol Research, Homer, Alaska, USA

Correspondence
Brendan M. Connors
Email: brendan.connors@dfo-mpo.gc.ca

Funding information
Arctic Yukon Kuskokwim Sustainable Salmon Initiative

Handling Editor: Juan C. Corley

Abstract

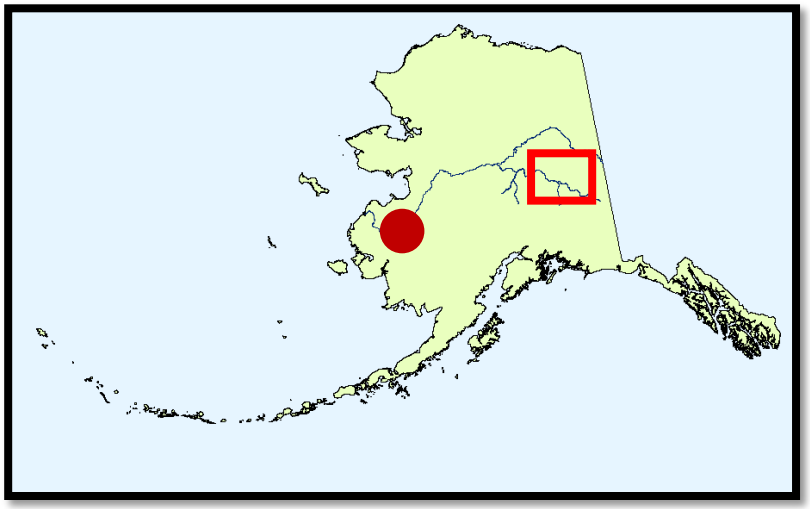
Variation among populations in life history and intrinsic population characteristics (i.e., population diversity) helps maintain resilience to environmental change and dampen interannual variability in ecosystem services. As a result, ecological variation, and the processes that generate it, is considered central to strategies for managing risks to ecosystems in an increasingly variable and uncertain world. However, characterizing population diversity is difficult, particularly in large and remote regions, which often prevents its formal consideration in management advice. We combined genetic stock identification of archived scale and tissue samples with state-space run-reconstruction models to estimate migration timing and annual return abundance for eight geographically and genetically distinct Chinook salmon populations within the Canadian portion of the Yukon River. We found that among-population variation in migration timing and return abundances resulted in aggregate return migrations that were 2.1 times longer and 1.4 times more stable than if they had composed a single homogeneous population. We then fit state-space spawner-recruitment models to the annual return abundances to characterize among-population diversity in intrinsic productivity and population size and their consequences for the fisheries they support. Productivity and carrying capacity varied among populations by approximately 2.4-fold (2.9 to 6.9 recruits per spawner) and three-fold (8800 to 27,000 spawners), respectively. This diversity implies an equilibrium trade-off between harvesting of the population aggregate and the conservation of individual populations whereby the harvest rate predicted to maximize aggregate harvests comes at the cost of overfishing ~40% of the populations but with a relatively low risk of extirpating the weakest ones. Our findings illustrate how population diversity in one of the largest salmon-producing river basins in the world contributes to fishery stability and food security in a region where salmon have high cultural and subsistence value. More generally, our work demonstrates the utility of molecular analyses of archived biological material for

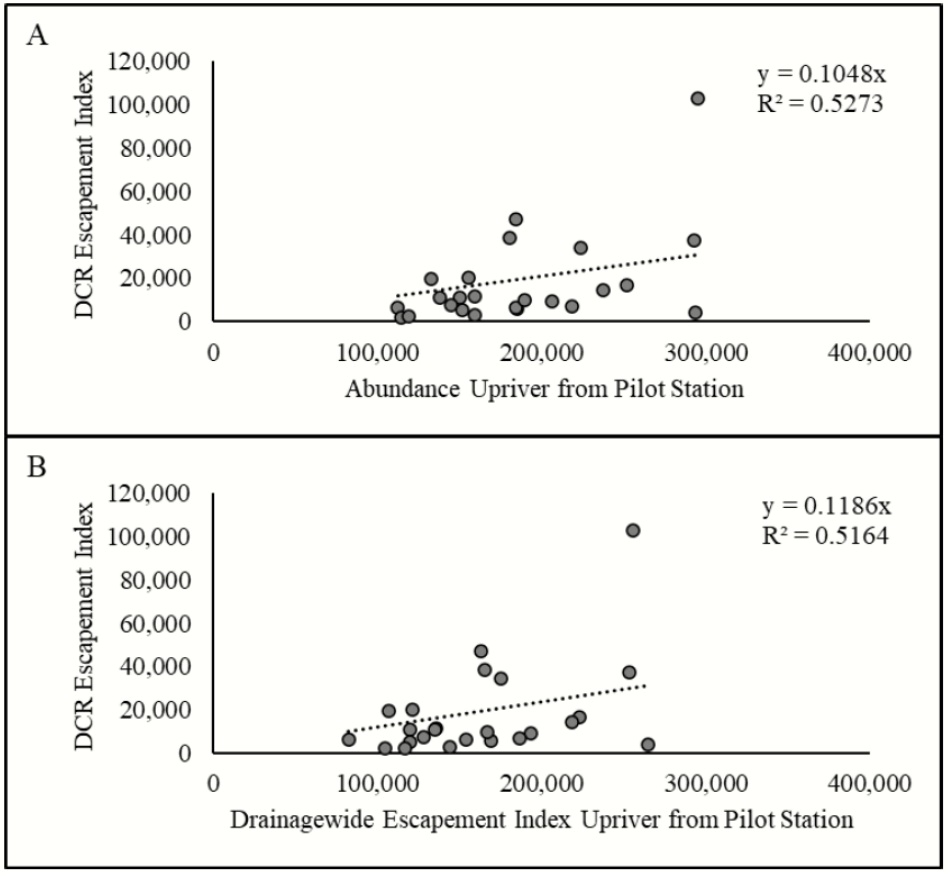
Yukon Area - King salmon modeling advances

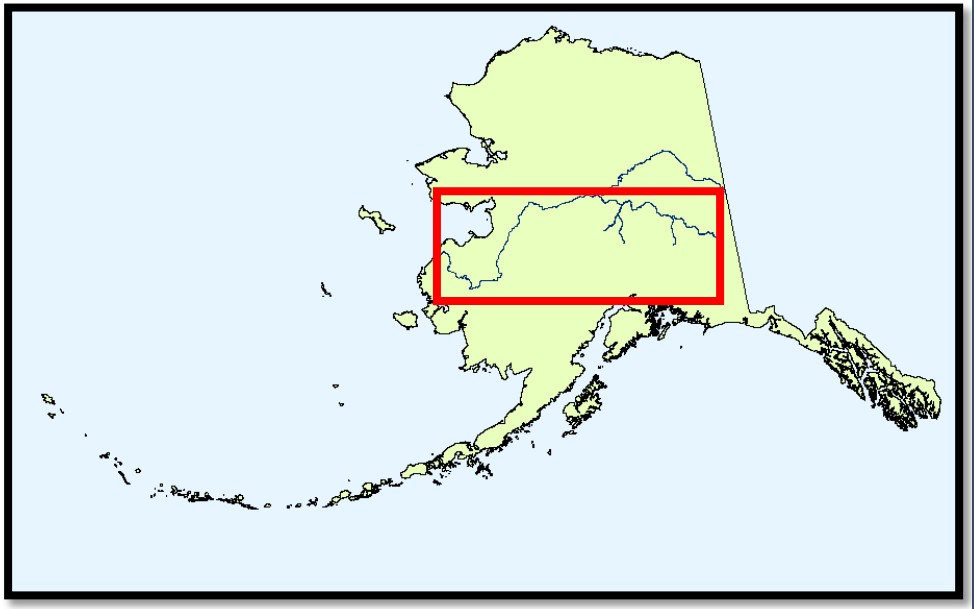
- New ability to estimate total run and escapement for all major stock components
- Insight into escapement quality and sub-stock diversity themes
- Implications for future escapement goal reviews

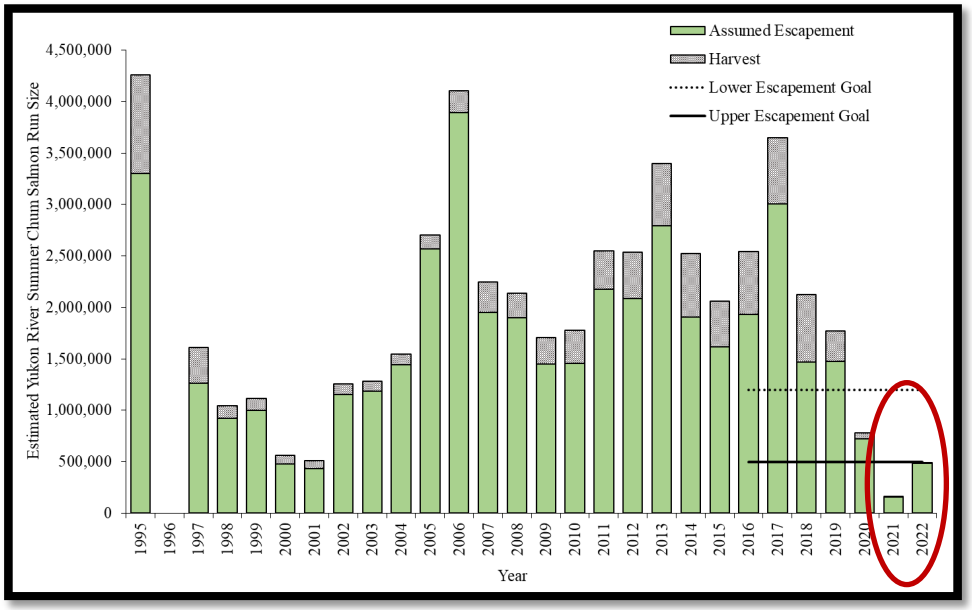
Yukon Area - Delta Clearwater River Coho Salmon

Discontinue the SEG 5,200 – 17,000 for the Delta Clearwater River because it is an unreliable index of drainagewide Yukon River escapement and not used to make management decisions.





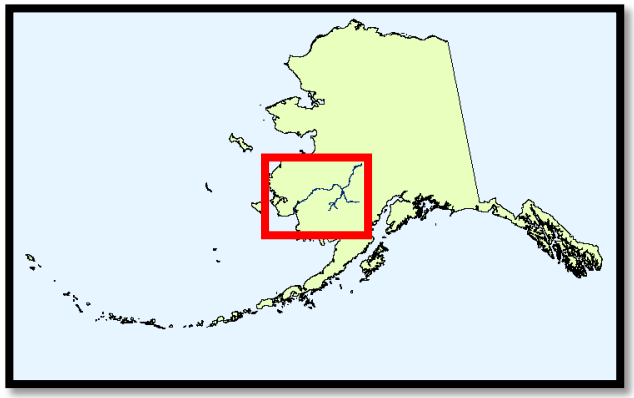




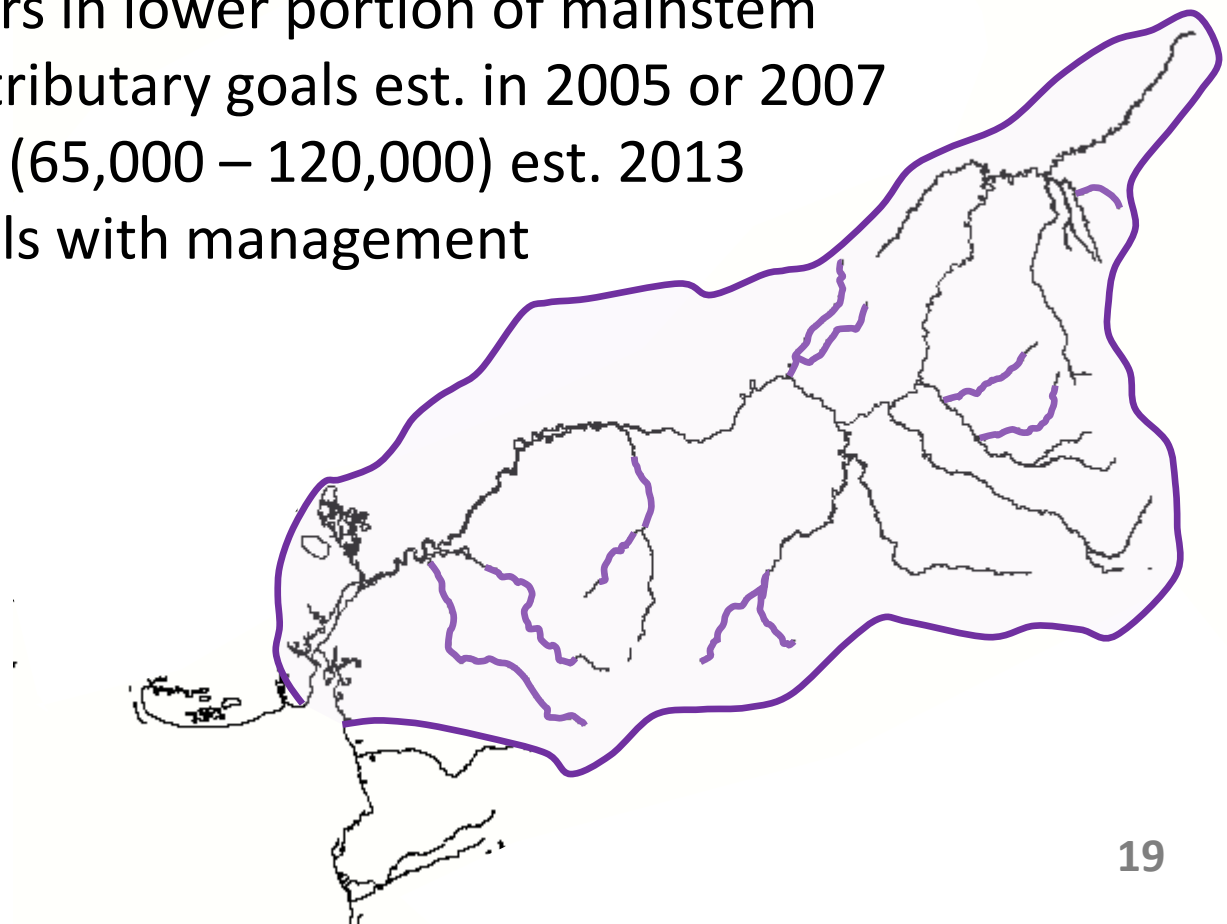
Yukon Area Summer Chum Salmon Considerations

- Complete fishery closures in 2021 and 2022
- BEG (500,000 – 1,200,000) indented to maximize yield
- Sustained yield is likely at escapements below goal range.
- Changes to the goal were not warranted.

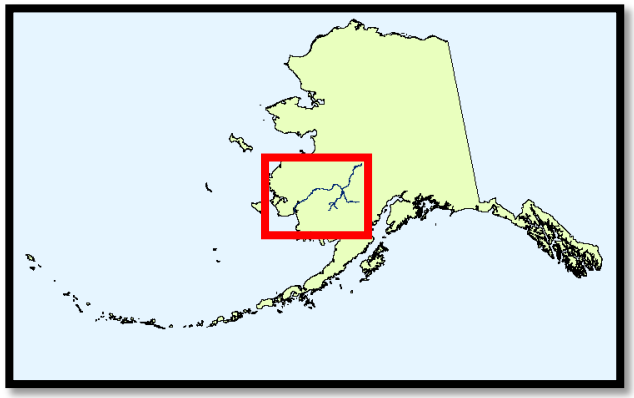
Kuskokwim Area – King Salmon



- Managed as a **single stock**
- Most harvest occurs in lower portion of mainstem
- Nine (9) separate tributary goals est. in 2005 or 2007
- Drainagewide SEG (65,000 – 120,000) est. 2013
- Desire to align goals with management

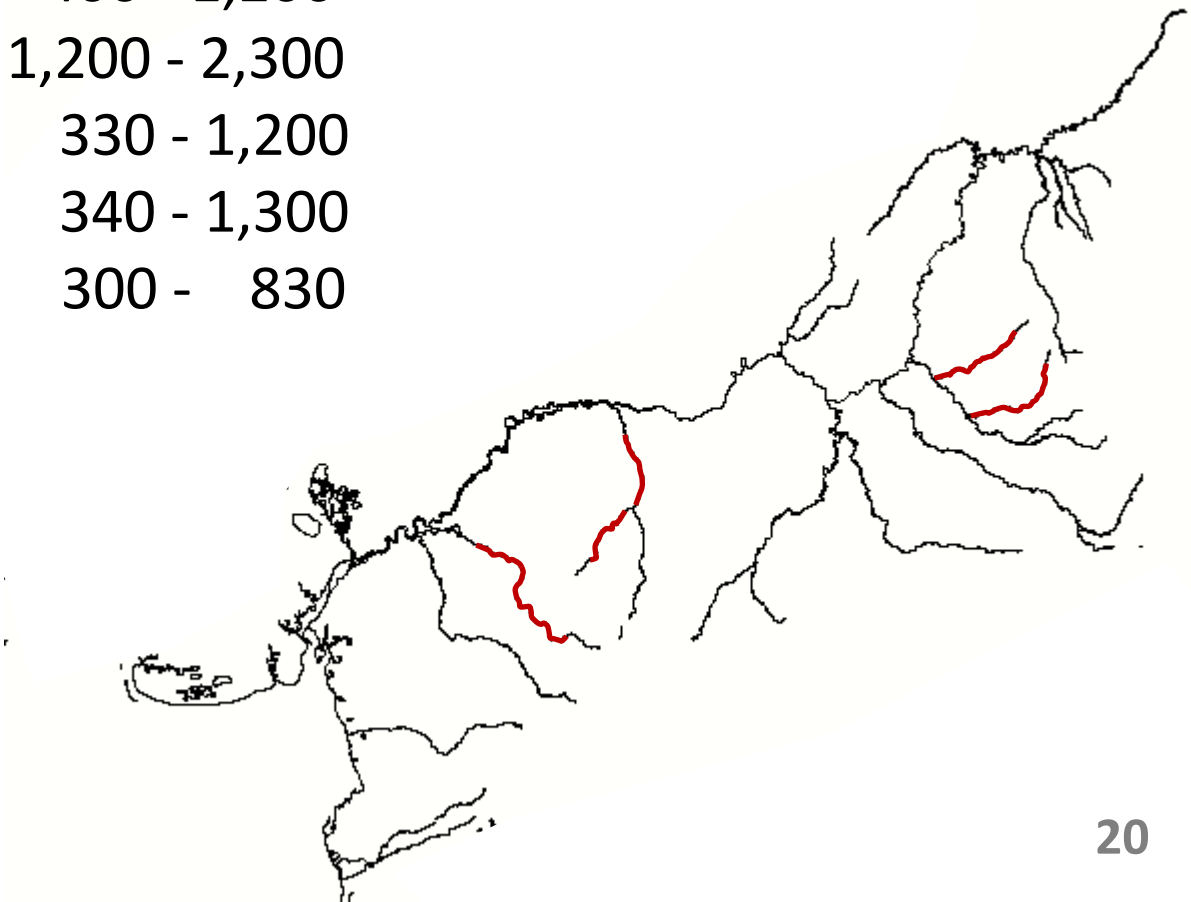


Kuskokwim Area – King Salmon

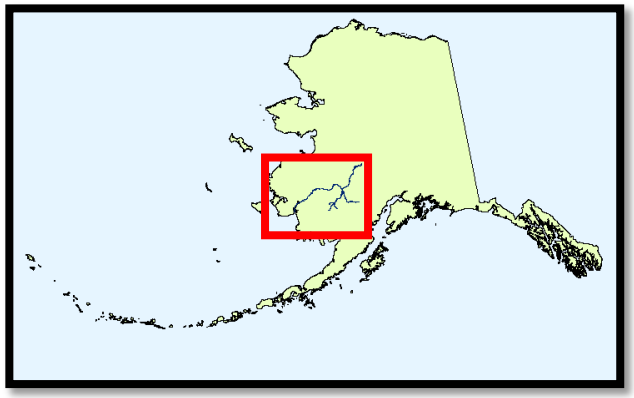


Discontinue 5 Peak Aerial SEGs:

Kisaralik R.	400 - 1,200
Aniak R.	1,200 - 2,300
Salmon R. (Aniak)	330 - 1,200
Cheeneetnuk R.	340 - 1,300
Gagarayah R.	300 - 830



Kuskokwim Area – King Salmon

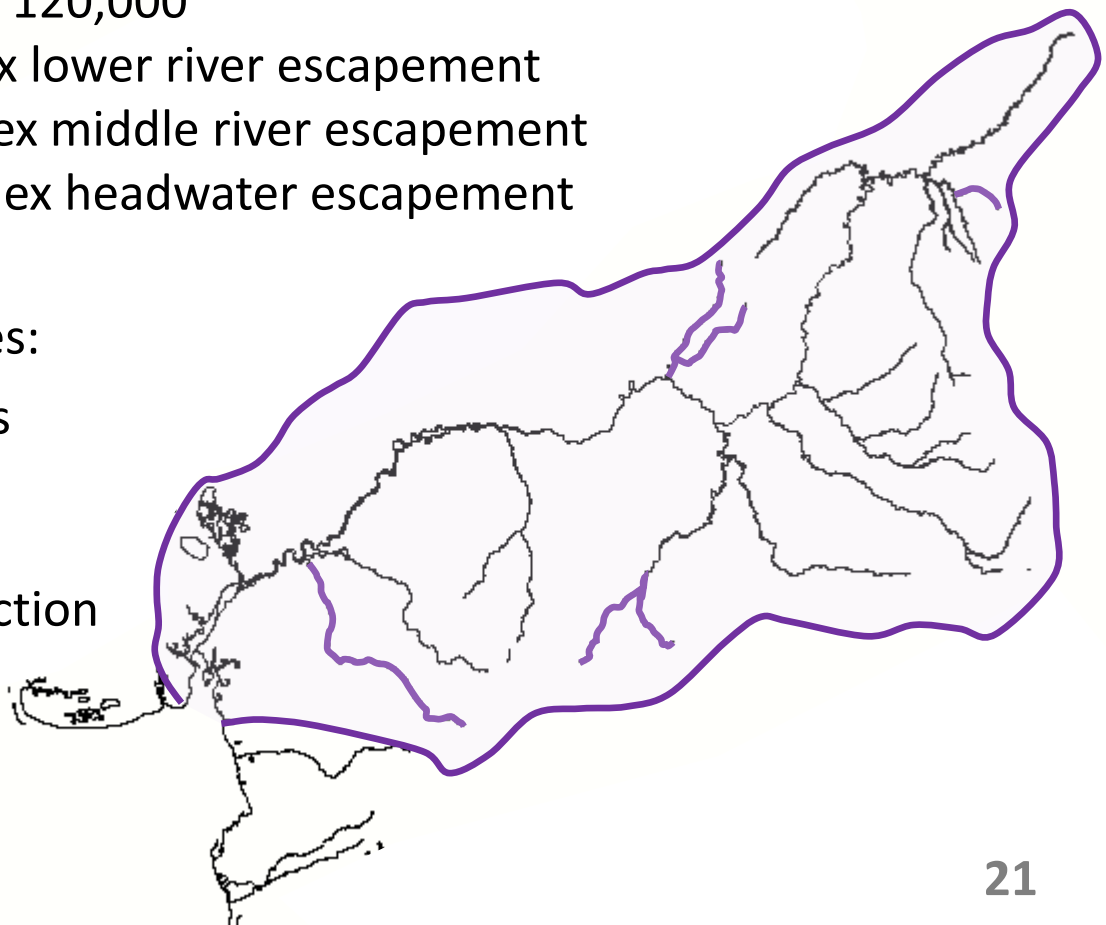


Revised escapement goal structure will include:

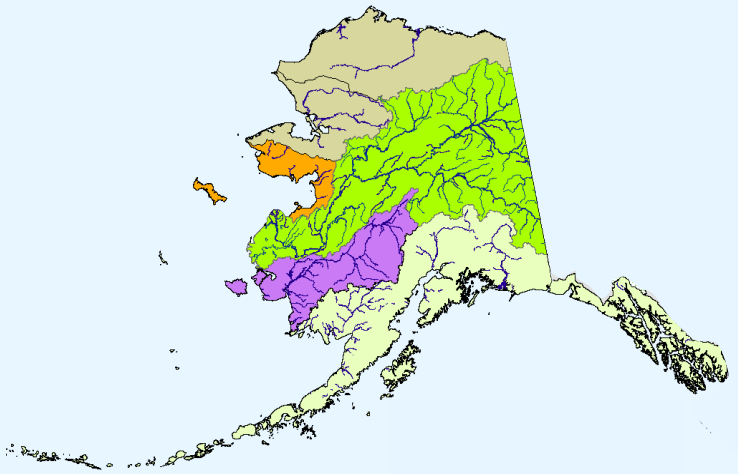
- Drainagewide goal: 65,000 – 120,000
- One weir-based goal to index lower river escapement
- Two weir-based goals to index middle river escapement
- One aerial survey goal to index headwater escapement

Annual assessment plan requires:

- Flying up to 14 aerial surveys
- Operating 3+ weirs
- Harvest monitoring
- Drainagewide run reconstruction



Summary of Decisions



Norton Sound–Port Clarence and Arctic-Kotzebue Management Area

- No changes warranted

Yukon Management Area

- Discontinue – One (1) coho salmon goal
- Revise – One (1) King salmon goal

Kuskokwim Management Area

- Discontinue – Five (5) King salmon goals

Questions?