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WRANGELL-ST. ELIAS NATIONAL PARK AND PRESERVE RESOURCE STEWARDSHIP AND SCIENCE REPORT

Winter 2022

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Copper River Sockeye Salmon Research Projects, 2022-2025

Recent low returns of Copper River (CR) sockeye salmon have raised concerns among Federal subsistence users and others about the status and management of CR sockeye salmon stocks. Given these concerns, and recognizing the complex ecology of CR sockeye, since 2018 Wrangell-St. Elias (WRST) staff have worked with several collaborators to develop proposals for high-priority research projects that focus on these issues. Three proposals developed in collaboration with the Alaska Department of Fish and Game (ADF&G), the University of Alaska Fairbanks, Prince William Sound Science Center, and the Native Village of Eyak have been selected to receive National Park Service (NPS) funding in years 2022-2025 and are described briefly below.

1. **Apply Genetic Analysis of Copper River Sockeye Salmon Stocks to Inform In-Season Decision Making.** The overall goals of this 3-year (2022-2024) project are to (1) evaluate the use of in-season genetic analysis as a tool for estimating the stock composition of sockeye salmon harvests in Copper River fisheries, and (2) inform real-time fisheries management decisions designed to ensure long-term health and sustainability of Copper River salmon stocks and associated fisheries. In-season stock composition information will aid fishery managers in minimizing the risk of fishery management decisions to small

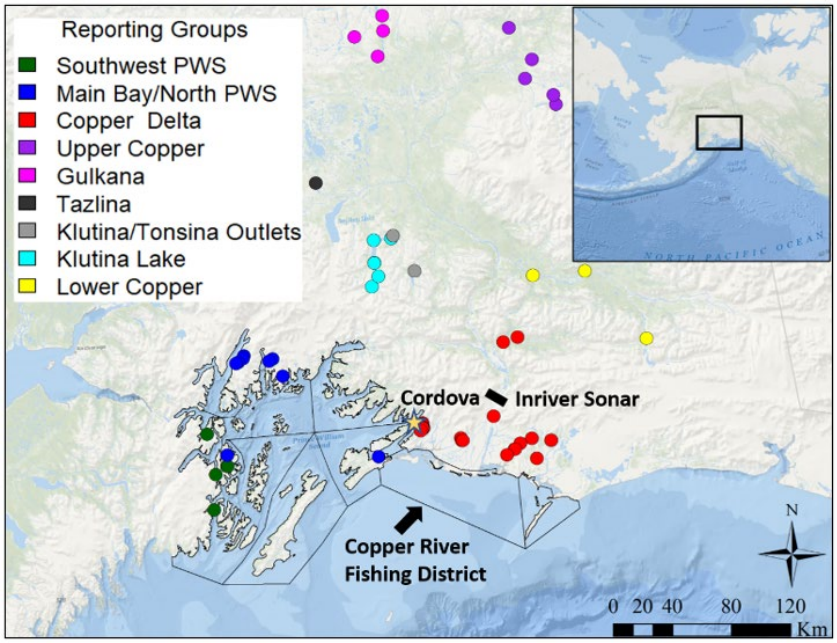

Figure 1. Prince William Sound and the Copper River watershed located in southcentral Alaska. Points indicate sockeye salmon populations in the genetic baseline and associated stock reporting groups. (Figure courtesy of Kyle Shedd and Stormy Haught, ADF&G.)

and/or sensitive stocks while maximizing sustainable harvest of abundant stocks. This research project was designed and will be implemented by ADF&G collaborators from the Gene Conservation Laboratory, Division of Commercial Fisheries, and Division of Sport Fish. The Ahtna Intertribal Resource Commission (AITRC) will contribute to project implementation by assisting ADF&G with the collection of samples from fisheries in the Chitina and Glennallen subdistricts.

Analysis and Reporting. In years 2022 through 2024, ADF&G will analyze and report the stock composition of commercial fishery harvests based on the relative abundance of sockeye salmon from nine genetic stock reporting groups (e.g., Fig. 1 and Fig. 2). Stock composition of the commercial harvest will be reported for six weekly in-season estimates and five post-season estimates. For in-season analyses, stock composition estimates will be reported to ADF&G and WRST fisheries managers approximately five days after samples are collected from the commercial harvest. Stock composition of harvests from in-river subsistence and personal use fisheries will be reported for seven genetic stock reporting groups in three monthly composition estimates during 2022-2024. Stock composition estimates will be reported to fisheries managers within seven days of sampling. ADF&G will submit interim results of the 3-year project to the Alaska Board of Fisheries (BoF) and WRST in November 2024 for discussion in relation to relevant regulatory proposals for the Prince William Sound management area during the December 2024 BoF meeting.

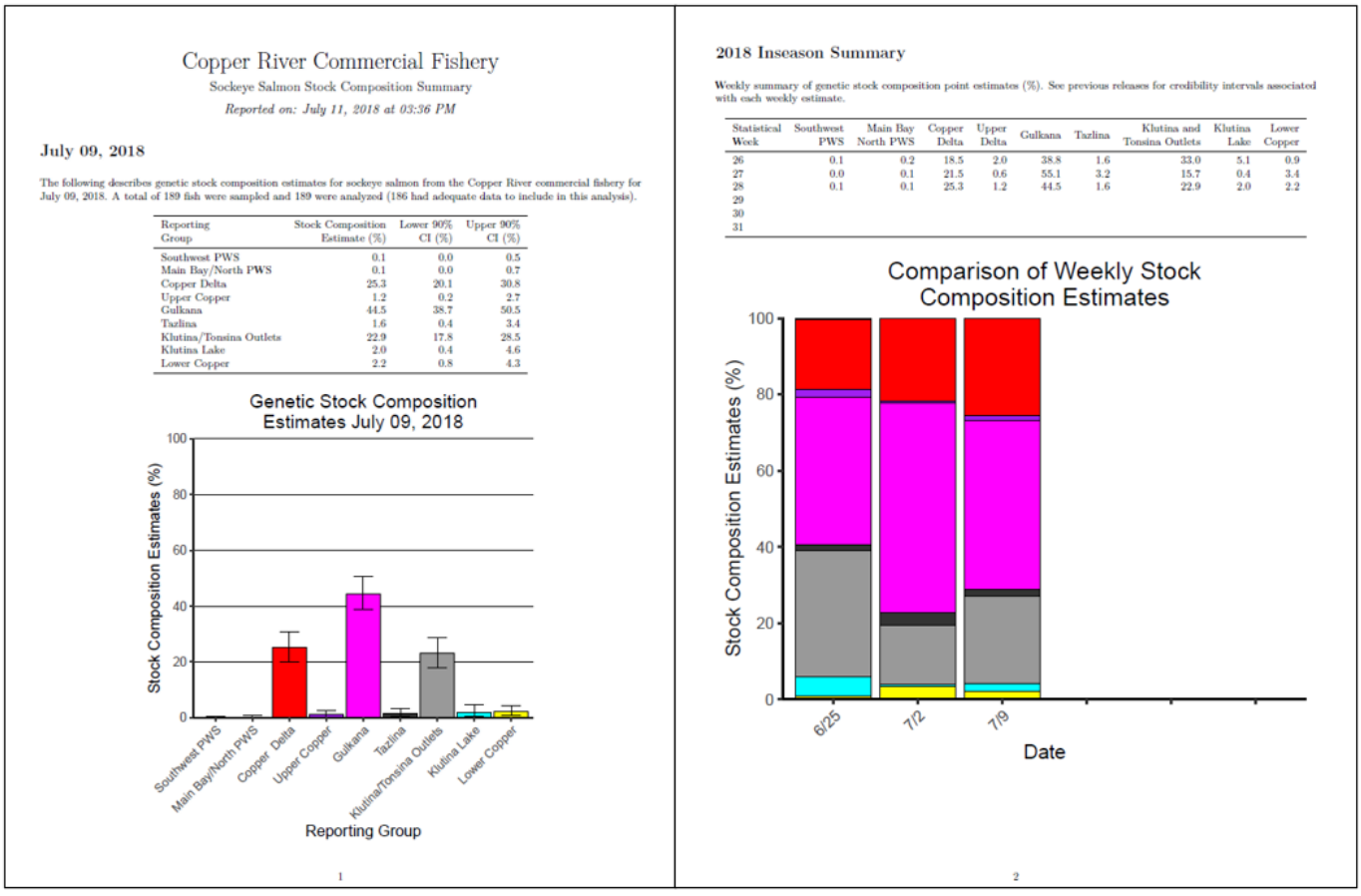

Figure 2. In-season genetic stock composition estimates as reported to ADF&G fisheries managers in 2018. On the left are the stock composition results from samples collected from the commercial harvest on 7/9/2018, while on the right are the results from three separate sampling dates to illustrate differences in stock composition over the course of the season. (Figure courtesy of Kyle Shedd and Stormy Haught, ADF&G.)

Interpretive Component. In addition to the research and management components, this project includes an interpretive component involving educational outreach to local communities and

subsistence users about the collaborative application of scientific information to inform management decision making.

2. **Examine Health Metrics of Copper River Sockeye Stocks to Inform Management Decision Making.** Building upon the stock composition project (above) and other ongoing research conducted by project collaborators, this 3-year project (2023-2025) will characterize the health and energetic status of genetically determined sockeye salmon stocks (based on genetic stock reporting groups, Fig. 1) to develop a better understanding of *escapement quality*. Aspects of escapement quality include body size and energy content (important factors that affect migratory success), sex ratio, and the appropriate distribution of spawners among different stocks in the watershed. Differential survival of CR sockeye stocks due to changes in body size, energy content, physiological quality, migration difficulty, and harvest pressure may leave some stocks more vulnerable to environmental changes than others, potentially increasing mortality risk. A better understanding of health metrics that correlate with stock-specific vulnerability and mortality risk can help fishery managers mitigate these issues by adjusting gear size, run timing closures, or harvest limits to ensure all stocks achieve sustainable escapement levels, while also providing adequate harvest opportunities. Collaborators include the University of Alaska Fairbanks (UAF), Prince William Sound Science Center (PWSSC), ADF&G, and WRST. AITRC again will contribute to project implementation by assisting ADF&G, PWSSC, and UAF with sample collection. This project also includes an interpretive component that builds upon the educational outreach associated with the stock genetics project.

3. **Describing and Modeling Factors Affecting Migratory Success of Copper River Sockeye Salmon.** This 2-year project (2022-2023) aims to develop a better understanding of how environmental changes in the Gulf of Alaska and the Copper River watershed may impact spawning migration success by sockeye salmon under future ecological scenarios. Researchers will integrate prior and ongoing radio-telemetry data on Copper River sockeye spawning migration with several long-term ADF&G data sets to develop forecasting models for sockeye that will incorporate new information from a recently available hydrological model developed by the U.S. Geological Survey. Collaborators include PWSSC, UAF, ADF&G, the Native Village of Eyak, and WRST.

Comments on State Regulatory Proposals for Management of Copper River King Salmon

In November 2021, WRST submitted comments on proposals concerning Copper River king salmon management for consideration by the BoF during their Nov-Dec 2021 regulatory meeting in Cordova. These comments expressed opposition to the ADF&G recommendation that the escapement goal for Copper River king salmon be changed from a lower bound sustainable escapement goal (SEG) of 24,000 fish to an SEG range of 21,000 to 31,000 fish and expressed support for maintaining the current SEG of 24,000 fish. Although king salmon concerns expressed in comments submitted by WRST, Ahtna Inc., and AITRC were acknowledged by the BoF during deliberation, the new SEG range of 21,000 to 31,000 fish will be implemented as recommended by ADF&G in 2022. WRST comments also addressed an inconsistency in how escapement goals for Copper River king salmon are presented in two Copper River salmon management plans. For more information, see the WRST comment letter attached at the end of this report.

Contaminated Site Management

The NPS continues to plan for implementation of cleanup activities at the Nabesna Mine Site and the Kennecott Mines and Mill Town Site pursuant to the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA). In conjunction with these planning efforts, in May 2021 Wrangell-St. Elias

established web pages for the Nabesna and Kennecott projects. Each web page provides links to a Community Involvement Plan, the project Administrative Record, and other project-related information.

- Nabesna Mine Site Environmental Investigation Project
  https://www.nps.gov/wrst/learn/management/nabesna-mine-site-environmental-investigation-project.htm

- Kennecott Mines and Mill Town Site Environmental Investigation Project
  https://www.nps.gov/wrst/learn/management/kennecott-mines-and-mill-town-site-environmental-investigation-project.htm

Strategic Planning

Park staff and collaborators from the NPS Alaska Region, the NPS Inventory and Monitoring Program, the NPS Climate Change Response Program, and the U.S. Geological Survey have initiated a project to develop a *Resource Stewardship Strategy* for the park. Preparatory work was initiated in 2020 and most of the project is to be conducted in 2021 and 2022. A Resource Stewardship Strategy is a long-range dynamic planning tool for a national park unit to set specific goals and track progress in achieving its desired natural, cultural, and subsistence resource conditions. As part of the planning portfolio, the Resource Stewardship Strategy serves as a bridge between the park unit's foundation document, other plans, and everyday management of its natural and cultural resources.

A Resource Stewardship Strategy establishes a framework and a coordinated process for:

1. Evaluating and summarizing existing information about park resources (including key issues, stressors, and threats);
2. Using science and scholarship to establish stewardship goals for park resources and values;
3. Integrating natural and cultural resource management; and
4. Determining the stewardship activities needed to achieve stewardship goals.

This framework provides a basis for informed strategic planning and sets the groundwork for preparing and implementing plans and activities to address resource management needs. Establishing this strategic approach increases management resiliency to staff turnover and guides the park unit to allocate funds and personnel to the most critical resource management needs.

During summer 2021 and continuing this fall, park staff and collaborators have been working with the NPS Climate Change Response Program to evaluate implications of alternative future climate scenarios on key park resources, including subsistence resources. The purpose of this *scenario planning* exercise is to consider the resource implications of a full range of plausible future climate conditions rather than focusing on one single scenario that is considered most likely. This type of planning approach explicitly acknowledges uncertainty and provides a foundation for adaptation.

For more information about the application of climate change scenarios to park planning, see the following link –

Link: https://escholarship.org/content/qt76p7m8rz/qt76p7m8rz.pdf

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IN REPLY REFER TO:

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Alaska Board of Fisheries
c/o Boards Support Section
Alaska Department of Fish and Game
P.O. Box 115526
Juneau, AK 99811-5526

Dear Members of the Board:

I am writing to comment on a recommendation submitted to the Alaska Board of Fisheries (board) by the Alaska Department of Fish and Game (ADF&G, or department) and on regulatory proposals for the Prince William Sound (PWS) Management Area that are to be considered by the board during its Nov-Dec 2021 meeting in Cordova. I am commenting on these because of their implications for salmon populations (stocks) that spawn in Copper River tributaries that drain portions of Wrangell-St. Elias National Park and Preserve (WRST). Consistent with the National Park Service (NPS) mission and associated management policies, the objective of my comments is to ensure the conservation of these stocks as significant natural resources that represent a vital source of energy and marine-derived nutrients to park ecosystems and are central to the traditions and subsistence practices of many rural residents who are affiliated with the park.

ADF&G recommendation that the board change the Copper River king salmon sustainable escapement goal (SEG) from 24,000 fish to 21,000-31,000 fish

I oppose this recommendation for the following reasons.

The department's review and recommendations for PWS escapement goals were outlined in an escapement goal memo dated 3/16/2020 and in a subsequent report (Joy et al. 2021b; see Attachment 1 – References Cited) published in January 2021. In these documents, the department recommended that the SEG for Copper River king salmon be changed from a lower bound SEG of 24,000 fish to an SEG range of 21,000-31,000 fish, thereby effectively reducing the lower bound SEG from 24,000 to 21,000 fish. The analyses that were performed in support of the escapement goal review and recommendation were described in a separate peer-reviewed report (Joy et al. 2021a) authored by members of the department's escapement goal review committee (committee).

The department's recommendation to change the escapement goal was based on results of models that used various data sets for Copper River king salmon for the period 1980-2018 (Joy et al. 2021a). The

committee performed two separate analyses, one based on a model that included data for the full 1980-2018 period and one based on a model that included only a subset of data for the more recent 1999-2018 period. In developing the escapement goal recommendation, a key metric of interest was the number of spawners that provide maximum sustained yield (S_{MSY}). The full 1980-2018 model, including data for years prior to 1999, estimated S_{MSY} to be 22,844 (lower than the current lower bound SEG of 24,000 fish), whereas the 1999-2018 model estimated S_{MSY} to be 26,951 (higher than the current lower bound SEG). The committee considered results of both models in developing its escapement goal recommendation, but the recommendation to reduce the lower bound SEG from 24,000 fish to 21,000 fish is likely to have been strongly influenced by results of the full 1980-2018 model that estimated S_{MSY} to be lower than the current lower bound SEG of 24,000 fish.

The choice to consider the full 1980-2018 model in addition to the 1999-2018 model was made despite the committee's observation that the 1999-2018 analysis was based on higher quality data relative to years preceding 1999, and that the 1999-2018 period coincided with an apparent decline in productivity that may be attributable to a declining trend in body size. This declining trend in size has been documented in several recent research publications that are based in part on data collected by the department (e.g., Lewis et al. 2015, Ohlberger et al. 2018, Oke et al. 2020). Relative to years prior to 1999, the 1999-2018 period also encompasses well-documented occurrences of marine heat-wave conditions that have increased in frequency, magnitude, and duration during the past two decades (Fig. 1). Such conditions are expected to intensify as climate warming increases in the decades ahead (Di Lorenzo and Mantua 2016, Joh and Di Lorenzo 2017), with uncertain implications for salmon populations that spawn in Copper River tributaries.

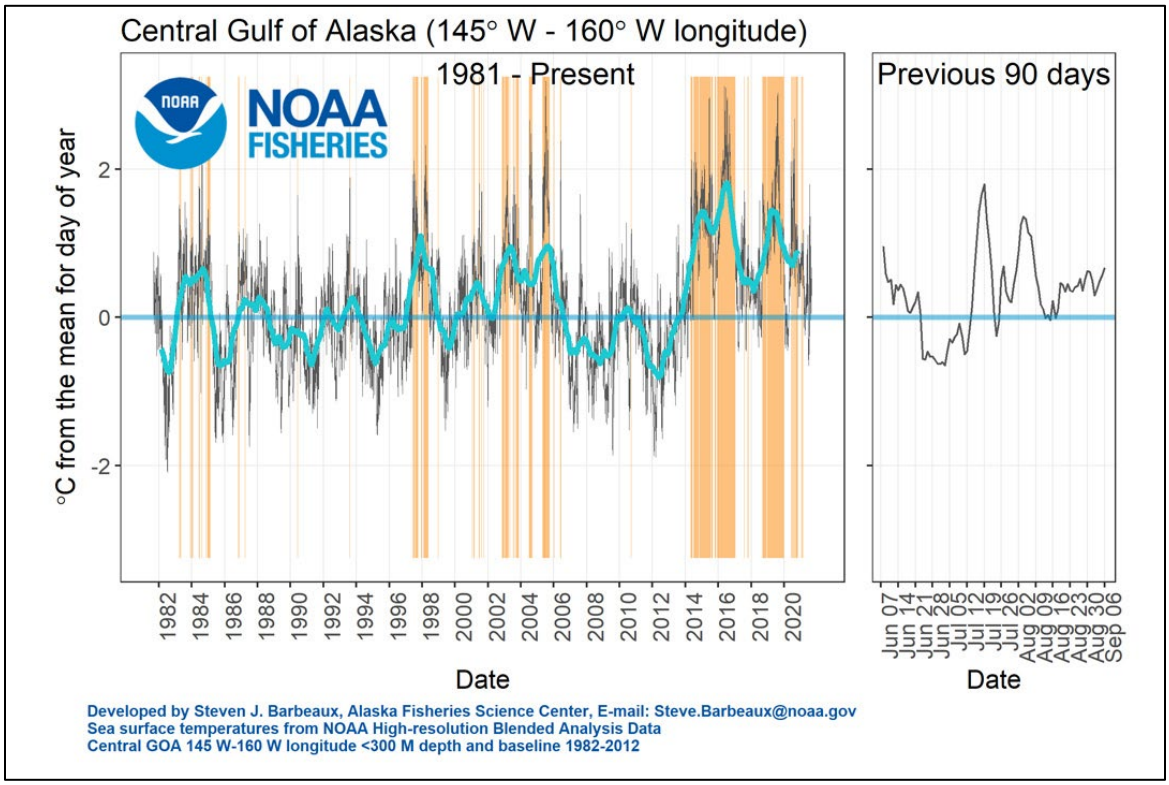

Figure 1. Sea surface temperature anomaly and marine heatwave conditions in the central Gulf of Alaska as of 9/6/2021. The graph shows satellite-derived sea surface temperature anomaly data for the central Gulf of Alaska. Here the central Gulf of Alaska is defined as the area between 145ºW and 160ºW longitude in waters less than 300 meters depth. The figure on the left shows the daily sea surface temperature anomaly (dark line), the 360-day rolling average (blue line), and time periods classified as having marine heatwave

conditions (orange shading) for January 1, 1981 through the present. The figure on the right shows the same for the previous 90 days only (*Credit: NOAA Fisheries, https://www.fisheries.noaa.gov/feature-story/central-gulf-alaska-marine-heatwave-watch, accessed 11/13/2021*.)

In considering the department's recommendation to lower the SEG for Copper River king salmon, I ask that the board consider the following facts.

1. Data collected by the department and analyzed in several recent publications indicate a declining trend in the size of Copper River king salmon, consistent with documented trends in other king salmon populations and other salmon species returning to spawn in Alaska.
2. Declining trends in salmon body size may be attributable in part to the increasing occurrence and severity of marine heatwaves that are projected to intensify in the future.
3. Declines in size are expected to result in declines in productivity, and analyses performed by the department's escapement goal review committee indicate a decline in productivity of Copper River king salmon beginning in the early 2000s.
4. The department's recommendation to lower the SEG was based in part on the full 1980-2018 model that used lower quality data from years prior to the recent decline in productivity and changes in marine conditions, may have overestimated the productivity of a king salmon population that is known to be declining in size, and therefore may have underestimated the degree to which the risk of overfishing would increase by reducing the lower bound SEG.
5. Reducing the lower bound SEG may pose greatest risks to small stocks, with potential adverse implications for overall population diversity of the Copper River king salmon population, encompassing genetic diversity as well as diversity of key life history traits (e.g., run timing) that may differ among individual spawning stocks. Recent research has found that population diversity within the Bristol Bay sockeye salmon stock complex reduces the interannual variability in overall run strength and harvest amounts due to the "portfolio effect" induced by multiple individual stocks characterized by different life history traits (Schindler et al. 2010).
6. Escapement of Copper River king salmon in 2020 was the 6th lowest since 2001 and did not meet the escapement goal. It appears that the goal may not have been met again in 2021. If this is the case, it will have been the 4th time in the past 10 years, with the lowest run since 2001 having occurred in 2016 when spawning escapement was estimated to be 12,485 salmon.

I oppose the department's recommendation to reduce the lower bound SEG for Copper River king salmon. To do so would be inconsistent with principles of precautionary conservation management, given the facts listed above, and may increase the risk of overfishing to a greater degree than is estimated by the full 1980-2018 model, especially for small stocks that are important for overall population diversity.

My opposition to the department's recommendation is consistent with concerns expressed by local stakeholders. In a 5/13/2021 letter to the department referencing PWS Proposal 5 (Establish an optimal escapement goal for Copper River king salmon), the Southcentral Alaska Subsistence Regional Advisory Council expressed support for maintaining the current lower bound SEG of 24,000 fish for Copper River king salmon due to the frequent occurrence of low escapement during the last 10 years. Likewise, in a 10/19/2021 letter to the board, the Wrangell-St. Elias National Park Subsistence Resource Commission expressed opposition to the department's recommendation to reduce the lower bound SEG for Copper River king salmon for the same reason.

<u>Proposal 5</u>: Establish an optimal escapement goal for Copper River king salmon

I support this proposal, with modification to maintain the current lower bound SEG of 24,000 fish rather than changing to an SEG range of 24,000 – 40,000 fish as proposed. For justification, see my previous comments on the department's recommended change in the Copper River king salmon SEG.

I support this proposal with further modification that the board address the long-standing lack of consistency between the king salmon escapement goals in the Copper River District Salmon Management Plan (CR District Plan, 5 AAC 24.360) and the Copper River King Salmon Management Plan (CR King Salmon Plan, 5 AAC 24.361). This inconsistency results in stakeholder uncertainty and concern about how the department is managing the commercial and subsistence fisheries in the Copper River District in coordination with Upper Copper River District fisheries to ensure conservation of Copper River salmon. The CR District Plan specifically directs the department to manage the Copper River District commercial salmon fishery to achieve an inriver goal of salmon, as measured at the sonar counter near Miles Lake. The spawning escapement component of the goal consists of the lower end of the sockeye salmon sustainable escapement goal (360,000 salmon) and ***17,500 other salmon,*** which would include king salmon and a relatively small number of coho salmon returning before sonar operations cease in late July. The CR King Salmon Plan specifically directs the department to manage the Copper River commercial and all other fisheries to achieve a sustainable escapement goal of ***24,000 or more king salmon***. The different king salmon escapement goals in these two plans appear to reflect an error in regulation.

To correct this apparent error, the spawning escapement goal of 17,500 other salmon in the CR District Plan should be revised to match *or exceed* (to account for early returning coho in addition to king salmon) the 24,000-king salmon goal of the related CR King Salmon Plan. I ask that the board generate a regulatory proposal to revise the relevant section of the CR District Plan, 5 AAC 24.360 (b) to read as follows, with revised text **underlined in bold**, and regulatory text to be deleted fully capitalized and enclosed in brackets:

> (b) The department shall manage the Copper River District commercial salmon fishery to achieve an inriver goal of salmon, as measured at the sonar counter near Miles Lake, based on the total of the following categories:
>
> Spawning escapement
>
> - lower end of sockeye salmon sustainable escapement goal
> - **24,000 king salmon** [17,500 OTHER SALMON]
> - **500 other salmon** *(or the department's best estimate for the number of coho included in sonar counts)*

This apparent regulatory error has implications that warrant its resolution through a board-generated proposal during this cycle. From correspondence with department staff, I understand that the CR King Salmon Plan is the primary guidance for king salmon management, and that the department does not consider the king salmon escapement goals in the two plans to be contradictory. But the apparent inconsistency strongly suggests to stakeholders that the total inriver goal of salmon, announced annually, is at least 6,500 too low. The continued apparent inconsistency between the two plans will result in ongoing uncertainty and concern among stakeholders regarding the department's management of Copper River sockeye and king salmon.

Resolving the apparent regulatory inconsistency will clarify for all stakeholders the department's management intent relative to king salmon escapement. This transparency in management intent also may help to address long-standing concerns expressed by local subsistence users in communities nearest the headwaters of the Copper River. Past research (Merritt and Roberson 1986, Wade et al. 2009) and Alaska Native traditional knowledge indicate that sockeye salmon stocks associated with headwater tributaries are among the earliest stocks to enter the river, with run timing similar to king salmon. Since at least 2004 (e.g., board proposal 53 in 2005) and as recently as 2021, subsistence users in headwater communities have repeatedly urged fisheries managers to allow more early run salmon to escape upstream of the

Gulkana River to increase subsistence harvest opportunities. Conservation measures that aim to ensure adequate king salmon escapement have the potential to benefit early migrating sockeye salmon stocks and local subsistence users who depend on these headwater stocks for meeting their subsistence needs.

Proposal 21: Amend the opening date of the Chitina Subdistrict personal use fishery from June 7 to June 1

I oppose this proposal for the following reasons.

Adoption of this proposal would allow fishing that would impact early migrating stocks of sockeye and king salmon, with the potential to disproportionately and adversely affect weak stocks that are important for the overall population diversity and portfolio composition of Copper River sockeye and king salmon populations. Previous studies of migratory timing of Copper River sockeye (Merritt and Roberson 1986, Wade et al. 2009) and king salmon (Gilk-Baumer et al. 2017) confirm that upper Copper River stocks typically arrive earlier than most other stocks, meaning that these stocks would be at greatest risk if the opening date of the personal use fishery was changed from June 7 to June 1. As indicated previously in my comments regarding king salmon escapement goals, since at least 2004 (e.g., board proposal 53 in 2005), subsistence users in headwater communities have repeatedly urged fisheries managers to allow more early run salmon to escape upstream of the Gulkana River to increase subsistence harvest opportunities. These urgings were expressed again in 2021, both to me and to ADF&G fisheries managers, due to increasing concerns about not having adequate harvest opportunities to ensure that subsistence needs are being met. These concerns are associated with subsistence users' perceptions that excessive harvest of sockeye and king salmon stocks destined for headwater spawning grounds occurs during early season openings of the Copper River District commercial fishery and the Upper Copper River Chitina Subdistrict personal use fishery. The delayed start of personal use fishing times in the Chitina Subdistrict is an effective means of allowing some of the earliest salmon stocks to distribute to the upper reaches without being harvested downstream, and I ask that the opening date not be changed to allow earlier fishing.

In relation to this proposal and concerns expressed by upriver subsistence users, it is important to note that WRST and ADF&G were successful in obtaining NPS funding for a 3-year research project that will use in-season genetic analyses to determine the stock composition of sockeye salmon harvested in the commercial fishery and upriver personal use and subsistence fisheries. The project "Apply Genetic Analysis of Copper River Sockeye Salmon Stocks to Inform In-Season Decision Making" will be implemented by ADF&G (Gene Conservation Laboratory, Division of Commercial Fisheries, and Division of Sport Fish) in 2022-2024. In addition to providing data for consideration by fisheries managers in-season during years 2022-2024, we anticipate that preliminary results of the 3-year study will be available for consideration by the board during the next cycle for the PWS Management Area in 2024.

Proposal 41: Repeal mandatory closed waters from the Copper River King Salmon Management Plan

I oppose this proposal for the following reasons.

The mandatory closed waters during the early season commercial fishery serve as a conservation measure to assist in managing to achieve the escapement goal for Copper River king salmon. The stocks being harvested in the area closer to the mouth of the Copper River are very likely to consist of a high composition of Copper River bound stocks. This proposal would eliminate the existing regulatory provision that assists in managing to ensure the sustainability of these stocks.

As indicated previously in my comments regarding king salmon escapement goals, escapement of Copper River king salmon in 2020 was the 6th lowest since 2001 and did not meet the escapement goal. It appears that the goal may not have been met again in 2021. If this is the case, it will have been the 4th time in the past 10 years, with the lowest run since 2001 having occurred in 2016 when spawning escapement was estimated to be 12,485 salmon. Given this context, increasing public expression of concerns for Copper River king salmon, and the fact that many of these stocks are bound for spawning locations in WRST, I do not believe it to be prudent to repeal the mandatory closed waters.

Thank you for your consideration of these comments and your support for the long-term conservation of salmon in the Copper River.

Sincerely,

Ben Bobowski, Ph.D.
Superintendent

Attachment

cc: Jeff Mow, Acting Regional Director, NPS Region 11 (Alaska)
Grant Hilderbrand, Acting Associate Regional Director for Resources, NPS Region 11 (Alaska)
Sue Detwiler, Assistant Regional Director – Subsistence, U.S. Fish and Wildlife Service – Alaska Region

Attachment 1 – References Cited

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