UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
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MEMORANDUM FOR: The File

From: Ryan J. Wulff RJW
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SUBJECT: Review of Progress for the West Coast Salmon Rebuilding Plan for Klamath River Fall-run Chinook Salmon

Section 304(e)(7) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and regulations at 50 CFR 600.310(j)(3)(iv), requires NOAA's National Marine Fisheries Service (NMFS) to periodically review the rebuilding progress of stocks being managed under rebuilding plans. This memorandum describes the analytical process used by NMFS' West Coast Region (WCR) to review the rebuilding progress for a stock of Pacific Coast salmon being managed under a rebuilding plan approved by NMFS in 2020:

- Klamath River fall-run Chinook salmon

The WCR is not recommending a determination of inadequate progress for this stock based on the results of this review; therefore, no decision memo is required. We are documenting our review in this memorandum and the attached "decision tree" document, based on NMFS Internal Guidance on Evaluating Rebuilding Progress (March 2022), for the record and to provide background for the next periodic review of this rebuilding plans.

BACKGROUND

In 2018, NMFS determined that five stocks of salmon, managed under the Pacific Fishery Management Council's (Council) Pacific Coast Salmon Fishery Management Plan (FMP) were overfished:

- Sacramento River fall-run Chinook salmon,
- Klamath River fall-run Chinook salmon,
- Queets River natural coho salmon,
- Juan de Fuca natural coho salmon, and
- Snohomish River natural coho salmon.

The Council transmitted rebuilding plans for the two overfished Chinook salmon stocks to NMFS on August 14, 2019; NMFS approved the Chinook salmon rebuilding plans on November 27, 2020 (85 FR 75920). The Council transmitted rebuilding plans for the three overfished coho

salmon stocks to NMFS on October 17, 2019; NMFS approved the coho salmon rebuilding plans on February 12, 2021 (86 FR 9301). Currently, only KRFC remains to be rebuilt.[1]

KRFC was determined to be overfished in 2018 due to a three-year geometric mean spawning escapement being below the stock's minimum stock size threshold (MSST) of spawners. Poor productivity of KRFC due to freshwater and marine environmental conditions was identified as the proximate cause of the overfished status.

The four dams of the Klamath River were removed, a restoration project that is expected to have a lasting benefit to the River and its inhabitants. Post-dam removal, over 400 miles of new habitat is now available to anadromous salmonids, roughly doubling what was available with dams in place. The states of Oregon and California are currently developing regulations to protect anadromous salmonids and prioritize escapement to utilize this new habitat, such that repopulation and recovery are effectively and expeditiously achieved. We anticipate this work will improve or alleviate several factors that contributed to the overfished status.

FMP Status Determination Criteria

The Council has established criteria based on biological reference points associated with maximum sustainable yield (MSY) exploitation rate and MSY spawning escapement. The criteria are based on the unique life history of salmon and the large variations in annual stock abundance due to numerous environmental variables. They also take into account the uncertainty and imprecision surrounding the estimates of MSY, fishery impacts, and spawner escapements. In recognition of the unique salmon life history, the criteria differ somewhat from the general guidance in the National Standard 1 (NS1) guidelines. The FMP criteria for Pacific salmon stock status determinations are listed below.

> ***Approaching Overfished—***A salmon stock is approaching overfished if the geometric mean of the two most recent postseason estimates of spawning escapement, and the current preseason forecast of spawning escapement, is below the MSST.
>
> ***Overfished—***A salmon stock is overfished when the most recent three-year geometric mean spawning escapement falls below the MSST.
>
> ***Not overfished–rebuilding—***After an overfished status determination has been triggered for a salmon stock, once the stock's three-year geometric mean spawning escapement exceeds the MSST, but remains below the spawning escapement level that is expected to produce maximum sustainable yield (S_{MSY}), the stock status improves to not overfished–rebuilding.
>
> ***Rebuilt—***When an overfished salmon stock's three-year geometric mean spawning escapement exceeds S_{MSY} it is determined to be rebuilt.

[1] In 2023, NMFS determined that Queets River spring/summer run Chinook salmon was overfished. At the November 2024 Council meeting, a rebuilding plan was adopted and will be completed and approved by October 13, 2025

***Overfishing*—**A salmon stock is considered subject to overfishing when the postseason estimate of fishing mortality (F) exceeds the maximum fishery mortality threshold (MFMT).

REBUILDING PROGRESS REVIEWS

To review the rebuilding progress of the salmon stock being managed under rebuilding plans NMFS' West Coast Region (WCR) used the following sources of information:

- NMFS' stock assessments in the Species Information System database (SIS), most recently completed in 2024,
- updated spawning escapement and exploitation rate information in the Review of 2023 Ocean Salmon Fisheries: Stock Assessment and Fishery Evaluation Document for the Pacific Coast Salmon Fishery Management Plan (SAFE document) (2024) and Preseason Report I: Stock Abundance Analysis and Environmental Assessment Part 1 for 2024 Ocean Salmon Fishery Regulations, and
- National Environmental Policy Act (NEPA) Environmental Assessment (EA) for the rebuilding plan (prepared in 2020).

The stock assessments in SIS provide time series information on salmon stock escapement (the biomass (B) value) and exploitation rate (fishing mortality (F) value).

The annual SAFE document and Preseason Reports are developed by the Council's Salmon Technical Team (STT)[2]. These documents provide the most recent values available for salmon stock escapement and exploitation rates and inform NMFS' annual stock assessments and status determinations. Preseason Report I also provides the stock forecasts for the coming fishing year. The data are developed by various co-managing agencies, including state and tribal fishery managers. Spawning escapement for most Chinook salmon stocks reflects the prior fishing year (e.g. the 2022 SAFE document includes Chinook salmon spawning escapement values from 2021).

The criteria in the NS1 guidelines [50 CFR 600.310(j)(3)(iv)] state that the Secretary may find that a stock is not making adequate rebuilding progress if either:

- The total fishing mortality rate (F) required to rebuild the stock within the rebuilding time frame ($F_{rebuild}$) or the annual catch limit (ACL) associated with $F_{rebuild}$ is exceeded, and accountability measures (AMs) are not correcting the operational issue that caused the overage, nor addressing any biological consequences to the stock or stock complex resulting from the overage when it is known; or
- The rebuilding expectations of a stock or stock complex are significantly changed due to new and unexpected information about the status of the stock.

NMFS has developed draft guidance (July 13, 2021) to assist Regional Offices in assessing adequate rebuilding process. The WCR has used this draft guidance in the development of the assessment in this document.

[2] The STT is composed of representatives from NMFS (West Coast Region and the Northwest and Southwest Fishery Science Centers), California Department of Fish and Wildlife, Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, Northwest Indian Fisheries Commission, and the U.S. Fish and Wildlife Service.

Klamath River fall-run Chinook salmon (KRFC)
KRFC was determined to be overfished in 2018 due to a three-year geometric mean spawning escapement (2015-2017) of 19,358, which is below the stock's MSST of 30,525 spawners. The Council's analysis[3] concluded that poor freshwater and marine environmental conditions lead to disease and poor productivity for KRFC, resulting in very low levels of recruitment to fisheries in 2015-2017. The Council found that KRFC would likely have met the FMP criteria for overfished status even in the absence of fishing (2015-2017).

The rebuilding plan for KRFC anticipated the stock would be rebuilt based on the three-year geometric mean spawning escapement for 2018-2020 (T_{target}). However, the Council's analysis document cautioned that the actual rebuilding period may be somewhat shorter or longer due to interannual variations in productivity.

The Council's recent SAFE document reports the KRFC three-year geometric mean spawning escapement for 2021-2023 was 30,134, which is below the stock's S_{MSY} of 40,700 spawners and below the stock's MSST of 30,525 spawners. NMFS' most recent stock assessment, completed in 2024, concluded that KRFC was still overfished.
Table 1. KRFC stock assessment series (Source; NMFS' Species Information System database).

Klamath River Fall-run Chinook Salmon	***MSST = 30,525 spawners*** S_{MSY} ***= 40,700 spawners***	***MFMT = 0.71***
Stock Assessment Year	**Three-year geometric mean spawning escapement (B)**	**Annual exploitation rate (F)**
2018	19,358 (2015-2017)	0.37 (2016)
2019	24,594 (2016-2018)	0.09 (2017)
2020	27,631 (2017-2019)	0.28 (2018)
2021	30,167 (2018-2020)	0.42 (2019)
2022	25,039 (2019-2021)	0.30 (2020)
2023	25,857 (2020-2022)	0.38 (2021)
2024	30,134 (2021-2023)	0.45 (2022)

Adequate progress criteria and recommendation

- *NS1 Criterion #1—compliance with ACLs and fishing mortality rate (F)*: KRFC does not meet NS1 Criterion #1 for inadequate rebuilding progress. See Table 1 and the attached analysis document for KRFC.
- *NS1 Criterion #2—rebuilding progress changed due to new and unexpected information*: KRFC does not meet NS1 Criterion #2 for inadequate rebuilding progress. See the attached analysis document for KRFC.
- *Other Information*: The annual escapement for KRFC has increased since the stock met the criteria as overfished and the overall exploitation rate has been well below the stock's MFMT in all years under the rebuilding plan. The three-year geometric mean escapement was lower for 2019-2021 than in the two previous periods (2017-2019 and 2018-2020)

[3] Letter from Charles A. Tracy, Executive Director Pacific Fishery Management Council, to Barry A. Thom, Regional Administrator, NMFS West Coast Region. Dated August 14, 2019, Enclosure 1: Klamath River fall Chinook Rebuilding Plan.

because the very high escapement in 2018 (52,352 spawners) is no longer included in the three-year geometric mean. The original analysis developed for the rebuilding plan for KRFC concluded that stock assessment and management error did not play a role in the overfished situation. The harvest control rule for KRFC is responsive to the annual abundance forecast for the stock by limiting the annual fishery exploitation rates based on stock abundance.

- *Recommended determination of rebuilding progress*: Because KRFC does not meet the NS1 Criteria #1 and #2 for inadequate progress, spawning escapement has improved under the rebuilding plan, the stock is not experiencing overfishing, and no new and unexpected information exists to change rebuilding expectations, the WCR does not recommend a determination that the KRFC stock is making inadequate progress toward rebuilding under the current rebuilding plan and does not propose recommending additional management measures to the Council.

Attachments

1. Adequate Progress Decision Tree: Klamath River fall-run Chinook Salmon (KRFC)

Adequate Progress Decision Tree: Klamath River fall-run Chinook Salmon (KRFC)

Background information

- Overfished basis: three-year geometric mean escapement for 2015-2017 (19,358 spawners)
- T_{target}: 2020 ($geomean_{2018\text{-}2020}$); T_{max}: 2028 ($geomean_{2026\text{-}2028}$)
- Cause of overfished: marine and freshwater habitat conditions, poor rearing conditions, high incidence of disease, warm and unproductive ocean conditions
- Rebuilding plan approved: November 27, 2020 (85 FR 75920)
- S_{MSY} = 40,700 spawners
- MSST = 30,525 spawners

Step 1: Evaluate against NS1 Criterion #1

NS1 Criterion #1 states that the Secretary may find adequate progress is not being made if "$F_{rebuild}$ or the annual catch limit (ACL) associated with $F_{rebuild}$ is exceeded, and Accountability Measures (AMs) are not correcting the operational issue that caused the overage, nor addressing any biological consequences to the stock or stock complex resulting from the overage when it is known."

Applying NS1 Criterion #1 to salmon

ACLs and other status determination criteria for salmon are based on spawning escapement (S), not catch. Three stocks in the Pacific Coast Salmon FMP have ACLs, KRFC is one of those three. We use the term S_{ACL}.

Table 1. Template for capturing information about catches, ACLs, and AMs. Klamath River fall-run Chinook salmon.

Fishing Year	Preseason Report 1, table V-5 (2024)		~~Catch/ACL~~ Esc/S_{ACL} (should be ≥ 1.0 for salmon)	If AMs were needed, describe AMs.	Describe effectiveness of AMs in correcting the operational issue that caused the overage or any biological consequences to the stock resulting from the overage when it is known.
	~~Catch~~ Escapement	S_{ACL}			
2017	19,904	7,113	2.8	N/A	N/A
2018	52,352	24,468	2.1	N/A	N/A
2019	20,022	11,314	1.8	N/A	N/A
2020	26,185	12,005	2.2	N/A	N/A
2021	29,942	15,624	1.9	N/A	N/A
2022	21,956	13,038	1.7	N/A	N/A
2023	41,623	13,805	3.0	N/A	N/A
2024[a/]	*42,932*	*14,605*	*2.9*	*N/A*	*N/A*

[a/] The 2024 escapement in Pre I, V5 is based on preseason values, specifically the current abundance forecasts and the previous year fishing regulations. This is noted in the table caption.

Table 2a. Basic template that has been used by the Office of Sustainable Fisheries for capturing information about stocks in rebuilding plans. Values are taken from SIS assessments. Klamath River fall-run Chinook salmon.

Assessment name	~~**Terminal Year in Assessment**~~ (assessment year)	**F**	**F_{MSY}**	**$F_{rebuild}$**	**F/F_{MSY}**	**$F/F_{rebuild}$**	B_{basis} 3-yr geomean escapement **B**	**B_{MSY}**	**B/B_{MSY}**	**Retrospective Adjustment (Yes/No)**	**Describe management action taken, if needed, to address overages of $F_{rebuild}$ and F_{MSY}, and effectiveness of measures in maintaining appropriate F rates.**
Review of 2017 Ocean Salmon Fisheries	2018	0.37 (2016)	0.71	N/A	0.521 (2016)	N/A	19,358 spawners (2015-2017)	40,700	0.476 (2017)	No	N/A
Review of 2018 Ocean Salmon Fisheries	2019	0.09 (2017)	0.71	N/A	0.127 (2017)	N/A	24,594 (2016-2018)	40,700	0.604 (2018)	No	N/A
Review of 2019 Ocean Salmon Fisheries	2020	0.28 (2018)	0.71	N/A	0.394 (2018)	N/A	27,631 (2017-2019)	40,700	0.679 (2019)	No	N/A
Review of 2020 Ocean Salmon Fisheries	2021	0.42 (2019)	0.71	N/A	0.592 (2019)	N/A	30,167 (2018-2020)	40,700	0.741 (2020)	No	N/A
Review of 2021 Ocean Salmon Fisheries	2022	0.30 (2020)	0.71	N/A	0.423 (2020)	N/A	25,039 (2019-2021)	40,700	0.615 (2021)	No	N/A
Review of 2022 Ocean Salmon Fisheries	2023	0.38 (2021)	0.71	N/A	0.535 (2021)	N/A	25,857 (2020-2022)	40,700	0.635 (2022)	No	N/A
Review of 2023 Ocean Salmon Fisheries	2024	0.45 (2022)	0.71	N/A	0.634 (2022)	N/A	30,134 (2021-2023)	40,700	0.740 (2023)	No	N/A

Step 2: Evaluate against NS1 Criterion #2

NS1 Criterion #2 states that the Secretary may find adequate progress is not being made if "the rebuilding expectations of a stock are significantly changed due to new and unexpected information about the status of the stock."

How T_{target} was determined

A rebuilding time model was used to assess the probability of a stock achieving rebuilt status in the years following an overfished declaration. In the model, future abundances were based on a distribution fitted to past observed abundances, accounting for lag-1 autocorrelation. The model included errors in abundance forecasts, escapement estimates, and exploitation rate implementation. Replicate simulations were performed to allow for projecting of the probability of achieving rebuilt status by year. The target time for rebuilding, T_{target}, was identified by the year in which the probability of achieving rebuilt status first met or exceeded 50 percent.

T_{target} for KRFC rebuilding was set at 2020 based on a 61 percent probability of being rebuilt. See the probability table below, excerpted from the EA for the KRFC rebuilding plan. The current rebuilding plan for KRFC is represented by Alternative I, highlighted in the table below. Year 1 used in this calculation was 2019.

KRFC ENVIRONMENTAL ASSESSMENT TABLE 4.6.A. PROJECTED REBUILDING PROBABILITIES BY YEAR FOR EACH OF THE ALTERNATIVES.

	YEAR									
	1	2	3	4	5	6	7	8	9	10
Alternative I	0.105	**0.608**	0.631	0.690	0.752	0.800	0.838	0.869	0.893	0.912
Alternative II	0.231	**0.767**	0.787	0.842	0.887	0.918	0.939	0.954	0.967	0.975
Alternative III (T_{min})	**0.592**	0.888	0.910	0.942	0.967	0.980	0.988	0.992	0.996	0.997

Source: Pacific Fishery Management Council and National Marine Fisheries Service. 2020. Environmental Assessment: Salmon Rebuilding Plan for Klamath River fall-run Chinook Salmon. Pacific Fishery Management Council, 7700 NE Ambassador Place, Suite 101, Portland, Oregon 97220-1384 and National Marine Fisheries Service, West Coast Region, 7600 Sand Point Way NE, Seattle, Washington 98115.

New and unexpected information about status of KRFC

None. The rebuilding plan uses abundance-based management to set fishery impacts (e.g, exploitation rate) and spawning escapement targets each year. KRFC did not rebuild by T_{target} (2020), as reported in the Council's Review of 2023 Ocean Salmon Fisheries (February 2024), but there is no new or unexpected information to suggest that the stock will not rebuild by T_{max} (2028). Spawning escapement for KRFC in 2028 should be reported in the Council's Review of 2028 Ocean Salmon Fisheries (February 2029). The freshwater and marine survival factors discussed in the rebuilding plan remain the primary influences on the population.

The three-year geometric mean spawning escapement that led to the overfished determination was 19,358 spawners (2015-2017). The latest observed three-year geometric mean spawning escapement was 30,134 spawners (2021-2023), a substantial improvement.

Step 3: Consider Other Factors

Evaluation Step 3 in the Rebuilding Progress Decision Tree allows managers to consider other factors that may be impacting progress in ending overfishing and rebuilding.

Other factors that may be impacting progress toward rebuilding

None identified. Council-area fisheries are already often constrained to limit impacts on KRFC.

The four dams of the Klamath River were removed, a restoration project that has a lasting benefit to the River and its inhabitants. Post-dam removal, over 400 miles of new habitat is now available to anadromous salmonids, roughly doubling what was available with dams in place. We anticipate this work will improve or alleviate several factors contributing to the overfished status.

Table 3. Template for documenting key information about rebuilding plan reviews.

Stock: Klamath River fall-run Chinook salmon			
Critical Rebuilding Plan Dates		Rebuilding Plan Start Date	Fishing year 2019 (year 1 of rebuilding)
		T_{target}	Fishing year 2020*
		T_{max}	Fishing year 2028**
Meets NS 1 Criterion #1 for inadequate progress? (*compliance with ACLs*)	No	Rationale: Escapement has been well above S_{ACL} during rebuilding. F_{MSY} has not been exceeded during rebuilding; therefore, the stock has not been experiencing overfishing.	
Meets NS 1 Criterion #2 for inadequate progress? (*rebuilding progress changed*)	No	Rationale: The rebuilding expectations of KRFC have not significantly changed due to new and unexpected information about the status of the stock. Three-year geometric mean escapement has improved substantially during rebuilding, from 19,358 spawners$_{(2015\text{-}2017)}$ when determined to be overfished to 30,134 estimated spawners$_{(2021\text{-}2023)}$.	
Other information supports a determination of inadequate progress	No	Rationale: annual escapement and three-year geometric mean escapement has increased under rebuilding and overall exploitation rate (F_{year}) has been well below MFMT in all years.	
Other Relevant Information		Analysis supporting the rebuilding plan for KRFC (see final EA) concluded that stock assessment and management error were not the main source of the overfished situation. Poor productivity of KRFC due to freshwater and marine environmental conditions was identified as the proximate cause of the overfished status. Removal of the lower 4 Klamath dams was completed in 2024 which will reopen 400+ miles of available salmon habitat. Restoration activities are underway to improve freshwater conditions.	
Recommended Determination		We do not recommend a determination that KRFC is making inadequate progress toward rebuilding. Although KRFC did not meet T_{target} (2020), there is no evidence to suggest the stock will not rebuild by T_{max} (2028).	
Recommended Management Measures for Council		N/A	

*The three-year geometric mean escapement for 2018-2020 was reported by the Council in February 2021.

**The three-year geometric mean escapement for 2026-2028 will be reported by the Council in February 2029