United States Department of the Interior

FISH AND WILDLIFE SERVICE

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In Reply Refer To:
AFWO

Technical Memorandum

TO: Alan Heck (Area Manager), Bureau of Reclamation Klamath Basin Area Office

FROM: Tanya Sommer (Field Supervisor), Dr. Nicholas A. Som (Statistician) and Nicholas J. Hetrick (FAC Program Lead), Arcata Fish and Wildlife Office

SUBJECT: Response to Request for Technical Assistance

DATE: February 2, 2023

Under the authority of the Fish and Wildlife Coordination Act (16 USC §§ 661), the Bureau of Reclamation Klamath Basin Area Office (KBAO) requested the technical assistance of the U.S. Fish and Wildlife Service's Arcata Office (AFWO) on January 10, 2023, regarding aspects of their 2023 proposal for Klamath Project Operations. Primarily, Reclamation sought technical assistance on the following:

> "*The TOP considers a river reduction flow of 16% of IGD [Iron Gate Dam] river flow releases from 13 January 2023 to 31 March 2023 to allow for a full flushing flow (i.e. peak flow of 6,030 cfs for 72 hours) in April 2023. KBAO would like the Service to analyze mortality estimates for the 2023 year class of Coho and Chinook salmon from all factors during the period from spawning to outmigration considering the actions in the TOP. Also, please provide similar mortality estimates for the 2023 year class if no IGD river flow release reductions are made and the surface flushing flow were eliminated*."

We responded affirmatively to your request and noted that the Stream Salmonid Simulator (S3) juvenile fish production model would serve as the best tool to evaluate relative risks among your proposed scenarios (Perry et al. 2019). We immediately began coordination with your staff to acquire the information necessary to run the model, specific to KBAO's proposed river flow schedules. Simultaneously, we worked to obtain additional data from other sources necessary to simulate future conditions during the 2023 water year. On January 26, 2023, your staff provided the initial Iron Gate discharge and water temperature input data, and we began finalizing items necessary for obtaining model outputs. On January 31, 2023, your staff contacted us to indicate a change in proposed hydrographs for analysis, based on their interpretation of current and forecasted seasonal hydrology. Details regarding the change in the requested analyses were then provided on February 1, 2023, as cited below:

> "*We are still planning to reach and maintain an elevation of 4142 feet on Upper Klamath Lake by April 1. Our current analysis is showing that to launch a full flushing flow of*

6,030 cfs for 72 hours followed by prescribed ramp down rates would require cuts to minimum Iron Gate Dam flows of 50% or more to remain above 4142 feet. In fact, our analysis indicates that we would need a cut of 16% just to reach 4142 feet on UKL by April 1.

Thus, we are asking you to evaluate two scenarios in terms of risk/benefits to salmonids in the Klamath River: the first is a 21% cut to IGD minimums to allow a 6,030 cfs flushing flow for a one-day duration. The second is a 16% cut to IGD minimums (that is needed to reach 4142 feet) and that would allow a 4,500 cfs flushing flow for a one-day duration."

The introduction of scenarios containing modified flushing flows precludes the standard implementation of our models. While the spore prediction submodel of S3 was constructed to simulate disease risk, including predicting the effects of flushing flows, the submodel was built with a data set having only full flushing flows (Robinson et al. 2022).

In an attempt to accommodate the modified flushing flows into our larger S3 modeling framework, we convened a panel of geomorphic and spore dynamics experts, and KBAO staff, to explore ways to simulate the impacts of modified flushing flows. This group was able to gather within 24 hours of our invitation, and a meeting was held on February 1, 2023. Over the course of this technical discussion, attendees unanimously concluded that attempting to quantify the impacts of modified flushing flows introduced more uncertainty than benefits to the overall modeling and results. That said, the group was unanimous in concluding that increased magnitude flushing flows held the greatest benefit to disease risk, and the single-day 6,030 cfs modified flushing flow would be predicted to have dramatically more benefits in reducing disease risks and associated juvenile salmonid mortality than the single-day 4,500 cfs modified flushing flow.

Without a defensible way to simulate the effects of modified flushing flows, the S3 model framework loses utility in evaluating the scenarios proposed by KBAO. However, it is still possible to compare the relative risk of mortality in the context of these scenarios. Further discharge decreases from 16% to 21% will further increase risk of redd dewatering and result in decreases in habitat availability for juvenile salmonids. However, in evaluating the scenarios and their impacts to the population of emigrating Chinook and Coho salmon, based on, recent data collections and analytic work (for example, Curtis et al. 2019), and extensive experience evaluating management alternatives for the Klamath River, we predict that the additional disease-mitigating benefits of achieving 6,030 cfs for a single-day modified flushing flow far outweigh the additional risks to juvenile salmon incurred from the 5% further decrease of IGD discharges.

Although we recognize that mitigation of disease risk under a modified flushing flow would be less than the benefits provided under a full flushing flow as described in the Management Guidance Document authored by a Tribal "Disease Technical Advisory Team" (DTAT 2017), we strongly recommend not entirely eliminating surface flushing flows, in full or modified, from the TOP.

References

Curtis, J., Poitras, T., Bond, S., and Byrd, K. 2021, Sediment mobility and river corridor assessment for a 140-kilometer segment of the main-stem Klamath River below Iron Gate Dam, California: U.S. Geological Survey Open-File Report 2020–1141, 38 p., https://doi.org/10.3133/ofr20201141.

Disease Technical Advisory Team (D. Hillemier, M. Belchick, T. Soto, C. Tucker, and S. Ledwin). 2017. Measures to Reduce Ceratonova shasta infection in Klamath River Salmonids: A Guidance Document. January 17, 2017.

Perry, R.W., Plumb, J.M., Jones, E.C., Som, N.A., Hardy, T.B., and Hetrick, N.J. 2019, Application of the Stream Salmonid Simulator (S3) to Klamath River fall Chinook salmon (Oncorhynchus tshawytscha), California—Parameterization and calibration: U.S. Geological Survey Open-File Report 2019–1107, 89 p.,https://doi.org/10.3133/ofr20191107.

Robinson, H.E., Alexander, J.D., Bartholomew, J.L., Hallett, S.L., Hetrick, N.J., Perry, R.W., Som, N.A. 2022. Using a mechanistic framework to model the density of an aquatic parasite Ceratonova shasta. PeerJ 10:e13183 https://doi.org/10.7717/peerj.13183.