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DEFICIENCIES OF THE INTERIM OPERATIONS PLAN FOR THE KLAMATH PROJECT

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This paper outlines technical deficiencies of the "Interim Operations Plan" for the Bureau of Reclamation's (Reclamation) operation of the Klamath Project. The Klamath Project (Project) is a federal water project authorized in 1905 that serves over 1,200 farms comprising 230,000 acres in southern Oregon and northern California.

In 1992, after 85 years of operation, Reclamation began restricting irrigation water deliveries to the Project based on the federal Endangered Species Act (ESA). Initially, Reclamation's consultation addressed the effects of Project operations on Lost River and shortnose suckers and bald eagles. Today, bald eagles are no longer considered threatened or endangered under the ESA, but Reclamation consults on the effect to Lost River and shortnose suckers, the Southern Oregon/Northern California Coastal (SONCC) Distinct Population Segment (DPS) of coho salmon, the southern DPS of North American green sturgeon, the southern DPS of Pacific eulachon, and the southern resident DPS of killer whales.

Reclamation's current ESA compliance for operation of the Project is covered by separate biological opinions (BiOp) issued by the National Marine Fisheries Service (NMFS) in 2019 and the U.S. Fish and Wildlife Service (USFWS) in 2020. These BiOps evaluated Reclamation's proposed actions described in a biological assessment dated December 21, 2018, as modified by four separate amendments, dated February 15, 2019, March 22, 2019, October 11, 2019, and March 27, 2020.

The 2020 biological assessment, as modified, constitutes the Interim Operations Plan (IOP). The IOP was adopted to address an error in the development of a predecessor plan that had become the subject of litigation and was in effect a placeholder to allow time for completion of a new consultation with NMFS and USFWS. The IOP expires on September 30, 2022. In recent discussions, Reclamation has indicated a desire to potentially renew the IOP for some indeterminate period, possibly related to removal of four utility-owned hydroelectric dams on the Klamath River in California and Oregon.

Implementation of the IOP in 2020 and 2021 demonstrated that the assumed hydrologic outcomes of the IOP are routinely unachievable, with required river flows conflicting with required lake levels and as a result, anticipated irrigation supplies proving elusory. All indications so far are that 2022 will play out similarly, with the lake levels and river flows that diverge from the assumed hydrologic outcomes of the IOP, and irrigation supplies likely to be cut as a result. The IOP has proven effectively impossible to carry out. To simply extend it would be poor policy.[1]

1. Procedural Context of the IOP

The history surrounding the IOP helps explain why the plan does not work. The IOP is based on a hydrologic model, referred to as the Klamath Basin Planning Model (KBPM), which a technical team of hydrologists and scientists representing Reclamation, USFWS, NMFS, Klamath Basin tribes, and

[1] Legal issues associated with the IOP are not the subject of this paper.

Klamath Project water users developed between 2010 and 2012. Beyond simply being a predictive tool to evaluate different operational scenarios and the potential effects on listed species, the KBPM was intended to facilitate agreement among the parties based upon mutually acceptable hydrologic outcomes with respect to water surface levels in Upper Klamath Lake, flows in the Klamath River, and water supplies available for diversion to the Project. The KBPM formed the basis of Reclamation's 2012 biological assessment, and NMFS' and USFWS' 2013 coordinated "non-jeopardy" BiOps.[2]

This novel approach to achieving consensus over Project operations was predicated in part on the assumption that the formulaic logic of the KBPM would eventually be replaced with an operational regime governed by the Klamath Basin Restoration Agreement (KBRA), once Congress authorized the agreement. Under the terms of the KBRA, subject to certain conditions and considerations, the Project was assured a reliable supply of water from Upper Klamath Lake and the Klamath River.

The KBRA expired on its own terms in 2016 due to lack of congressional authorization. Shortly thereafter, the Hoopa Valley and Yurok Tribes filed litigation against the United States in the U.S. District Court for the Northern District of California, alleging that Reclamation had failed to reinitiate consultation after the amount of "incidental take" of coho salmon in 2014 and 2015—as measured by infection rates in juvenile Chinook salmon—exceeded the limit NMFS designated in its 2013 BiOp.

In March 2017, the U.S. District Court issued an injunction requiring that, pending completion of a new ESA consultation, Reclamation provide certain types of flows in the Klamath River downstream of Iron Gate Dam in order to mitigate the effects of *Ceratanova shasta* infection rates in coho and Chinook salmon. Reclamation operated the Project in accordance with this injunction in both 2017 and 2018, resulting in significant restrictions in the timing and quantity of water available for irrigation and national wildlife refuges.

In December 2018, Reclamation issued a new biological assessment for operation of the Project between April 2019 through September 2029. Reclamation's proposed action carried forward the formulaic rules of the KBPM with the addition of approximately 50,000 acre-feet of water designated for producing a "surface flushing flow" at Iron Gate Dam of at least 6,030 cubic feet per second (cfs) for 72 hours.

After initial informal feedback from NMFS and tribal stakeholders, in February 2019 Reclamation modified its proposed action, committing an additional 20,000 acre-feet of water for flows in the Klamath River in May and June in certain year types. Reclamation also reduced the period of the proposed action from ten years to five. The following month, Reclamation again modified its proposed action, this time deducting another 7,436 acre-feet from the supply potentially available for irrigation and refuge purposes and further committing the agency to provide $3.4 million for riparian restoration activities in the lower Klamath River over the five-year term of the proposed action. After these modifications, NMFS and USFWS issued separate non-jeopardy BiOps in March 2019.

In July 2019, the Yurok Tribe and other parties filed litigation in the U.S. District Court for the Northern District of California challenging NMFS' 2019 BiOp and Reclamation's compliance with the National Environmental Protection Act. In September 2019, the plaintiffs amended their complaint, further alleging that Reclamation and NMFS' analysis was based on erroneous technical data on available

[2] Although the biological assessment had been developed through a collaborative approach, subsequent communications and the ultimate BiOps introduced additional constraints. These included minimum flow requirements for the Klamath River identified by NMFS, which in turn led USFWS to compute "thresholds" for Upper Klamath Lake. The thresholds were not biologically-based and were not adopted to be binding operational requirements, but came to be treated as such.

coho habitat. In substance, this error resulted in an overestimation of modelled physical habitat below Iron Gate Dam under certain flow conditions, invalidating NMFS' analysis of the extent to which Reclamation's proposed flows resulted in at least 80 percent of the maximum available habitat being available for coho salmon.[3]

The plaintiffs were made aware of the flawed data by the same consultant who had provided the data to Reclamation and NMFS under contract with the federal government.

Based on this erroneous data, in November 2019 Reclamation requested a new consultation with NMFS and USFWS. In the meantime, the Yurok Tribes and other plaintiffs filed a motion with the District Court for an injunction requiring Reclamation to operate in accordance with the court's March 2017 injunction, including provision for up to 50,000 acre-feet to be available from Upper Klamath Lake for disease mitigation flows on the Klamath River. To avoid this potential outcome, Reclamation, NMFS, USFWS, the Yurok Tribe, and KWUA entered discussions on developing a temporary operating plan for the Project while consultation activities continued. These discussions ultimately led to a stipulated stay of the litigation which was to be in effect so long as Reclamation operated consistent with the IOP. The IOP essentially follows the 2018 biological assessment, as modified, but with the addition of up to 40,000 acre-feet of water in certain year types for further augmenting flows in the Klamath River in May and June. Of this total, up to 23,000 acre-feet could be realized by reduction of the supply otherwise available for irrigation and refuge use.

KWUA's stated position at the time was that the IOP was preferable to operating under the 2017 injunction, particularly given the delays in starting irrigation that occurred under the injunction. According to Tricia Hill, KWUA's president at the time, "We do not like the place it leaves us, but it's the least of a few evils, and at least creates time to do things right the next time."[4]

2. Implementation of the IOP

a. 2020

Following consultation with USFWS and NMFS and formal adoption of the IOP in March 2020, Reclamation immediately ran into issues implementing the plan. As described further below, one "boundary condition" to USFWS' non-jeopardy BiOp was that water surface elevations in Upper Klamath Lake remain above 4,142.0 feet in April and May of each year. The lake's water surface elevation surpassed 4,142.0 on the last day of March, remaining largely flat in the days after. The April 15 deadline established in the IOP for implementation of a surface flushing flow came and passed.

On April 22, 2020, Reclamation had PacifiCorp make releases from Link River Dam to support a flow of over 6,000 cfs below Iron Gate Dam for slightly more than 24 hours. Flows dropped to approximately 5,000 cfs on April 23, and to 4,500 cfs the last day of the event. These conditions did not match the assumed 6,030 cfs flow event for 72 hours specified in the IOP. Following the event, the reduction in releases at Iron Gate Dam exceeded the maximum "ramping rates" specified in the IOP.

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[3] Since 2010, NMFS has relied upon the assumption that at least 80 percent of ***maximum*** available habitat in the mainstem of the Klamath River provides for the conservation needs of coho salmon and that flows that provide at least such an amount are beneficial for maintaining physical or biological features of critical habitat and meeting the habitat needs of individual coho salmon. There is, however, no evidence that physical habitat in the mainstem Klamath River is a limiting factor for populations of the species.

[4] KWUA Press Release, "Agreement Buys Time on New Klamath Project Ops Plan" (Mar. 30, 2020).

Reclamation coordinated these modified operations with tribes and key stakeholders, attributing them to extraordinary hydrologic conditions.

In total, approximately 30,000 acre-feet of stored water was released from Upper Klamath Lake to support the flushing flow. The elevation of Upper Klamath Lake plummeted during the event, dropping more than a quarter-foot in a week. The decline continued, with Upper Klamath Lake elevations dropping to below 4,141.5 by the end of April.

As the flushing flow wound down, the Natural Resources Conservation Service (NRCS) issued an updated May 1 forecast for inflows to Upper Klamath Lake during the May through September period. Compared to the April 1 forecast, the May 1 forecast represented a 108,000 acre-foot or 48 percent reduction in the anticipated May through September inflow. Based on that forecast, Reclamation stated that it would unlikely be able to deliver the 144,000 acre-foot "locked in" irrigation supply available according to the IOP and announced just weeks earlier in Reclamation's *2020 Operations Plan*. According to Reclamation, the irrigation supply was likely to be only 80,000 acre-feet, roughly one-fifth the Project's historical annual demand.

As districts and farmers scrambled to address the reduced irrigation supply, the Yurok Tribe and Pacific Coast Federation of Fishermen's Associations filed a motion with the U.S. District Court for the Northern District of California to lift the stay of their 2019 litigation and put back in place the March 2017 injunction, requiring operation in accordance with the 2013 BiOp with the addition of the disease mitigation flows. The court scheduled a hearing for the end of May, creating the prospect for an immediate shutdown of irrigation deliveries if the motion was granted. The plaintiffs subsequently modified the motion for preliminary injunction, and ultimately the modified motion was denied.

Following NRCS' issuance of its June 1 inflow forecast, Reclamation announced that it again anticipated being able to deliver approximately 140,000 acre-feet of water to the Project during the 2020 season. At roughly the same time, in an attempt to dilute salmon disease spore concentrations in the river, Reclamation directed PacifiCorp to more than double releases out of Upper Klamath Lake, producing another pulse flow of over 1,800 cfs below Iron Gate Dam. Upper Klamath Lake dropped another quarter-foot over the course of this ten-day event, falling below 4,141.0 feet. By July 15 – a key date in terms of "boundary conditions" for USFWS' 2020 BiOp – the water surface elevation in Upper Klamath Lake had dropped another two-thirds of a foot, to 4,140.34 feet.

In late August, Reclamation informed the Yurok Tribe that it would not release the additional 7,000 acre-feet from Upper Klamath Lake included in the IOP for the tribe's "Boat Dance" ceremony, on top of the 400,000 acre-feet already committed for release to the river from March through September. The Yurok Tribe filed a new federal lawsuit over the agency's decision. Ultimately, PacifiCorp voluntarily provided the water for the ceremony from its hydroelectric reservoirs (which the company then later refilled on its own accord from Upper Klamath Lake).

Finally, to meet remaining irrigation demands within the Project and to provide limited supplies to Tule Lake and Lower Klamath National Wildlife Refuges, Reclamation made available an additional 15,000 acre-feet of water from Upper Klamath Lake. Part of this water was used to stem a major outbreak of avian botulism in Tule Lake National Wildlife Refuge, which ultimately was attributed to killing more than 60,000 ducks. The additional water initially diverted from Upper Klamath Lake was subsequently paid back by releases from Clear Lake and Gerber reservoirs during the fall and early winter period. Upper Klamath Lake ended September at an elevation of 4,138.29 feet and a seasonal low of 4,138.18 feet.

b. 2021

Last year proved even more challenging than 2020, and again exposed deficiencies of the IOP. Early in the year, Reclamation began coordinating with tribal and other key stakeholders on how to deal with the extremely dry conditions. By March, it was apparent that between existing storage levels in Upper Klamath Lake and anticipated inflows over the spring and summer, it would be physically impossible to satisfy the IOP's "requirements" with respect to lake levels and river flows, even with no irrigation diversions. By April 1, 2021, the water level in Upper Klamath Lake was at 4,140.84 feet and dropping.

On April 13, Reclamation announced that it would not produce a surface flushing flow unless Upper Klamath Lake's elevation reversed course and climbed to over 4,141.6 feet, and even then, such an event was likely to be reduced in both magnitude and duration. The lake elevation continued its decline, and no surface flushing flow was released.

For the Project, Reclamation initially announced a Project Supply of 33,000 acre-feet, in accordance with the "locked in" calculation under the IOP. Reclamation anticipated that this volume would become available after May 15. On May 13, 2021, Reclamation advised districts that the Project's main diversion, the A Canal, would remain closed for the entire year, with no deliveries for the first time in the Project's history. Notwithstanding the Project being almost entirely shut off, the lake's elevation continued to fall, dropping to 4,140.31 feet by the end of May.

In early June, Reclamation determined that even with no deliveries to the Project, the likelihood remained that Reclamation would be unable to provide the minimum flows at Iron Gate Dam and still maintain Upper Klamath Lake above a seasonal low of 4,138.0 feet, another "boundary condition" in USFWS' 2020 BiOp. Reclamation issued a temporary plan for how to adjust river flows and lake levels below the established minimums in such an event. The elevation of Upper Klamath Lake fell to 4,039.42 feet by mid-July, also violating another "boundary condition."

As a result of no deliveries to the Project, Reclamation also found itself at odds with minimum water levels required for endangered suckers in Tule Lake Sump 1A. Tule Lake Sump 1A receives water principally from return flows from the Project, has a sizable population of endangered suckers, and serves as the primary waterfowl habitat within Tule Lake National Wildlife Refuge. In early June, Reclamation, USFWS, and the Tulelake Irrigation District determined that it would likely be impossible to maintain water levels in Sump 1A and the better course was to drain the remaining water and relocate suckers into the smaller Sump 1B. Sump 1A had never been fully drained in the Project's history; in fact, this ground had not likely been dry in millions of years.

In August, after moving all the water it could from Sump 1A to Sump 1B, Tulelake Irrigation District advised Reclamation that water levels in Sump 1B could not be maintained without some source of additional water and that conditions were threatening another major outbreak of avian botulism. After coordination with PacifiCorp, USFWS, and NMFS, Reclamation approved a "borrow" of up to 15,000 acre-feet of water from PacifiCorp's reservoirs. This exchange has subsequently been repaid by forbearance of diversions of Lost River and Klamath River water that would otherwise have occurred in accordance with the IOP.

Timely precipitation in late August was the only reason Reclamation was able to provide minimum river flows downstream of Iron Gate Dam and simultaneously maintain Upper Klamath Lake above 4,138.0 feet through the end of the year.

3. Current Sufficiency of the IOP

Under Section 7 of the ESA, NMFS and USFWS are required to conduct an analysis and provide an opinion as to whether a federal agency's proposed action is likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat. Notwithstanding the issuance of a BiOp, the action agency is required to reinitiate consultation if new information reveals effects to listed species or critical habitat that were not considered in NMFS and/or USFWS' original BiOp. Reconsultation is also required if the agency's action is subsequently modified in a manner that causes effects to listed species or critical habitat that were not considered in NMFS and/or USFWS' BiOp.

For its part, USFWS was explicitly clear in its 2020 BiOp that its analysis of the impacts to Lost River and shortnose suckers from Reclamation's proposed action relied upon certain hydrologic conditions. According to USFWS' BiOp, "[c]onditions outside [the bounds to the hydrological conditions expected under this BiOp] may result in greater adverse effects than analyzed in this BiOp and exceedance of the take anticipated in the Incidental Take Statement . . . . Based on the [period of record], these conditions are extremely unlikely to occur during the term of this BiOp."

The explicit "boundary conditions" for Upper Klamath Lake water surface elevations identified by USFWS were:

1. Two consecutive years in which the surface elevation falls below 4,142.0 feet in April or May; or any year in which surface elevations fall below 4,142.0 feet in April or May when "EWA augmentation" is provided.
2. Surface elevations below levels observed in April and May of 2010 (i.e., 4,141.00 feet by April 30 and 4,141.28 feet by May 31).
3. On July 15: any year when surface elevations are less than 4,140.0 feet; more than one year when elevations fall below 4,140.5 feet; or more than two years when surface elevations fall below 4,140.8 feet.
4. More than one water year when surface elevations drop below 4,138.25 feet in September.
5. Surface elevations below 4,138.00 feet at any time.

For "boundary condition" 1, Reclamation failed to satisfy the second prong in 2020, and the first prong in 2021. Condition 2, Reclamation failed to meet in 2021. For condition 3, the first two prongs were violated in 2021 (likely setting the stage for violating the third prong in 2022). Reclamation has not yet technically violated the conditions 3 and 4, although that was largely due to timely precipitation in the late summer of 2021.

For its part, NMFS' 2019 BiOp also relied upon a "set of key assumptions that are critical to [the agency's] effects analysis on listed species and their critical habitat." According to NMFS, "[i]f new information indicates [one of these key assumptions] is invalid, Reclamation and NMFS may be required to reassess the effects of the proposed action on listed species and their critical habitat, and reinitiate consultation, if warranted."

NMFS' "key assumptions" are broader and more general than the specific lake level criteria that USFWS' identified; however, Reclamation's operation of the Project in 2020 and 2021 has also shown several of these assumptions to be flawed. NMFS' assumptions are as follows:

1. Upper Klamath Lake inflows will be within the range observed in the 1980-2018 period of record.
2. Accretions from Link River Dam to Iron Gate Dam will be consistent with accretion timing, magnitude, and volume for the period of record.
3. Upper Klamath Lake bathymetry and storage capacity is accurately modelled in the KBPM.
4. Water deliveries to the Project and off the Project will be consistent with average historical distribution patterns for the period of record.
5. Link River Dam releases, for purposes of meeting Iron Gate Dam flow targets, will not be regulated by the Upper Klamath Lake "control logic" at a greater magnitude or duration than observed in the KBPM results.

The first of these assumptions is the most critical, and in this respect, while the net annual volume of inflows in 2020 and 2021 was within the range observed between 1980 and 2018, the inflow pattern observed in 2020 and 2021 was unlike any in the period of record. Low inflows particularly in the winter and early spring in both years made it physically impossible to produce a surface flushing flow, even at flows far less than 6,030 cfs for 72 hours, without resulting in a significant drop in Upper Klamath Lake water surface elevations, including below 4,142.0 feet in April and May. This scenario of a reduced flushing flow only occurred in one year under the period of record (1992) and even then, it did not cause lake levels to fall below 4,142.0 feet in April and May. NMFS did not anticipate or analyze a scenario like 2021, where not only a flushing flow was absent, but there were also no material flows above designated minimums. In addition to violating NMFS' first "key assumption," hydrologic conditions in 2021 also violated the last one, regarding regulation of Link River Dam releases due to the Upper Klamath Lake "control logic."

Looking ahead towards the next consultation, it is also important to note that USFWS has proposed to breach dikes around Agency Lake and Barnes Ranches, thereby inundating 14,000 acres that are currently separated from Upper Klamath Lake. This action will change the storage capacity and bathymetry associated with Upper Klamath Lake, which is another "key assumption" that NMFS' 2019 BiOp depended upon.

4. Conclusion

Despite Reclamation's stated intention, the agency cannot simply "extend" the IOP, as the critical hydrologic assumptions relied upon by Reclamation, NMFS, and USFWS have proven to be invalid. NMFS and USFWS' BiOp expire on September 30, 2021, and some new form of stand-alone biological analysis will unquestionably be required.

Reclamation's previously proposed action has proven physically impossible to carry out. The modelled results of the IOP have been shown to not comport with the hydrologic reality. Any analysis by USFWS and NMFS on the effects to listed species will have to contain new or modified operations, new hydrologic assumptions, or likely both.