RECLAMATION

Managing Water in the West

Draft Long-Term Plan for Protecting Late Summer Adult Salmon in the Lower Klamath River

December 31, 2014

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Note to Reviewers: This version includes somewhat detailed information regarding the historical background, water supply and power generation effects, and several other aspects of past and proposed future fish protection actions that will hopefully facilitate stakeholder review of this draft plan. However, this detailed information will likely be reduced in scope or eliminated entirely in the final version. Further, there is redundant information between sections that will likely also be reduced or eliminated in the final version.

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Section 1 INTRODUCTION AND PURPOSE

1.1 Chinook Salmon Habitat

Chinook salmon are widely distributed throughout the Klamath River Basin and spawn and rear in virtually all accessible tributaries, as well as in the mainstem Klamath and Trinity Rivers. The fall run accounts for the largest proportion of returning adults since the construction of the dams, including those of the Trinity River Division (TRD), which resulted in the degradation of habitat below Lewiston Dam and the elimination of access to habitat in the upper reaches above Lewiston Dam. Efforts to protect and restore this and other fish runs have been and continue to be implemented by various programs, including the present-day Trinity River Restoration Program (TRRP).

1.2 2002 Event

Despite the continued efforts to restore and protect the various salmon and steelhead runs in the Klamath River Basin through flow releases and other habitat improvement measures, an unforeseen and unprecedented die-off occurred during a two-week period beginning in late September of 2002. A subsequent U.S. Fish and Wildlife Service report indicated that at least 34,000 adult fall Chinook salmon died from severe infections of two fish pathogens, Ichthyophthirius multifilis (Ich) and Flavobacter columnare (Columnaris).1 High fish densities due to the relatively large run size (approximately 170,000), low flows, and relatively high water temperatures were identified as contributing factors to the rapid spread of disease.2 Although a larger number of Klamath

[1] Klamath River Fish Die-off September 2002, Causative Factors of Mortality – U.S. Fish and Wildlife Service, November 2003

[2] Both diseases are infectious and the pathogens are naturally present in low concentrations during much of the year in many rivers and streams. Historically, small numbers of fish will be infected by one or both diseases during years with normal or above-normal hydrology. The free-swimming protozoan life stage of ich is opportunistic, however, and spread more rapidly among fish that are in close proximity in slow-moving water. In such instances, large numbers of protozoans attach to gill arches, inhibiting respiration, which can prove fatal.

River fall-run Chinook died, a greater proportion of the Trinity River run was lost because the die-off occurred during the peak of the Trinity run.3

1.3 Subsequent Response

Immediately following the 2002 die-off, the Department of the Interior pledged that measures would be developed and implemented to help protect future runs from an epizootic disease outbreak. In support of this commitment, the Department has undertaken flow augmentation in years when it has been determined to be necessary, because flow augmentation has been and remains the most viable management action to help protect the returning adult salmon population in late summer. This document is intended to provide the fundamental elements of a long-term plan that acknowledges this possible future need and discusses the statutory authority and policy implications associated with providing water releases from Trinity Reservoir for lower Klamath River fish protection purposes. Included are:

- an abbreviated history of the key considerations Reclamation has identified while evaluating flow augmentation measures;
- a proposed long term approach to help avoid the potential for a massive fish die-off;
- a discussion of the biological basis for flow augmentation, hydrologic factors, and non-flow alternatives; and
- a guide for future augmentation decisions and potential impacts to water deliveries and power generation.

[3] *September 2002 Klamath River Fish Kill: Final Analysis of Contributing Factors and Impacts* – California Department of Fish and Game [then], July 2004

Section 2 BACKGROUND DISCUSSION OF PREVENTATIVE ACTIONS IN PRIOR YEARS

2.1 Introduction

As discussed further in Section 3, technical experts from Reclamation, other Federal agencies, the Hoopa Valley Tribe, the Yurok Tribe, the State of California, and other entities have convened on many occasions since the 2002 die-off to analyze the various contributing factors and measures for prevention. The U.S. Fish and Wildlife Service report and subsequent studies concluded that the timing of the adult salmon return (mid-August through September) that coincides with the seasonal low flows in the lower Klamath River would be a key factor in preventing subsequent die-off events. Given the disease propagation mechanics discussed in other sections, increasing flow rates in the lower Klamath River during the return period was identified as the only potentially effective means to minimize the potential for an epizootic disease outbreak, thus the terms "preventative measure", "protective measure", and "flow augmentation" will be used interchangeably throughout this document. Similarly, flow increases presently are believed to be the only effective means of mitigating the effects of an outbreak once it becomes clear that a significant number of fish have been infected.[4]

Summarized below are the considerations and actions implemented by Reclamation from 2003-2014.

[4] *See* California Department of Fish and Game (Turek et al.) ("[F]low is the only controllable factor and tool available in the Klamath Basin . . . to manage risks against future epizootics and major adult fish kills.").

2.2 2003-2004

The Klamath River run sizes varied significantly between 2003 and 2004, with post-return estimates of approximately 192,000 adults and just under 79,000 adults, respectively. To avert another die-off, Reclamation made preventative releases from Trinity Reservoir in the late summers of both years totaling 38,000 and 36,313 acre-feet (a-f), respectively, to improve fish habitat conditions in the lower Klamath River. The majority of that combined volume was acquired through an exchange with the Metropolitan Water District of Southern California.[5] There was no substantial disease outbreak noted by Tribal, Federal and State fishery resource agencies during the return periods.

2.3 2008-2009

Predicted very dry hydrologic conditions in the Klamath River Basin in 2008 and 2009 again triggered concerns regarding adult fish health. Reclamation prepared to make augmentation releases and consulted with tribes and other Klamath and Trinity River Basin partners to develop biological and hydrologic criteria. Hydrologic conditions later improved to the extent that preventative action was ultimately unnecessary. Post-return estimates during 2008 and 2009 totaled 70,698 and 100,644, respectively.

2.4 2012

2.4.1 Run Size Projection and Request for Preventative Action

In March of 2012, the Pacific Fishery Management Council (PFMC) announced its in-river run size projection for Klamath River fall Chinook of 384,000 adults, the highest estimate by a considerable margin since recordkeeping began in 1978.[6] Abnormally dry hydrologic conditions led to very low Klamath

[5] Though MET sought return of the exchange volume in years immediately after the 2003-2004 exchange, it was not until 2009 that the exchanged volume was fully repaid, delayed primarily by Delta conveyance constraints.

[6] The highest previous run size during the period of record was 222,800 adults in 1995. The actual 2012 run size was 302,000 adults, and while 21 percent below the PFMC projection, still represents a modern-day record.

River accretion forecasts prompting concerns of a disease outbreak. Tribes, sport-fishermen groups, and other fishery advocates formally requested that Reclamation take action.

2.4.2 Fall Flow Subgroup Recommendation and Reclamation Response

In response, Reclamation collaborated with tribes, regulatory agencies, and other basin partners to develop and refine monitoring and flow augmentation criteria. A Lower Klamath River Flow Augmentation Subgroup (Subgroup) of the Flow Workgroup, (affiliated with the TRRP) was established among the partners and met on many occasions. The subgroup reviewed past analyses, researched contemporary disease propagation information, and studied hydrologic data. Ultimately, the Subgroup summarized their recommendations in a memorandum, *2012 Fall Flow Release Recommendation*, to the TMC[7] Chair dated May 31, 2012. Their primary recommendations were two-fold:

- as a *preventative measure*, they recommended that flows in the lower Klamath River be augmented to 3,200 cubic feet per second (cfs) beginning August 15, 2012, and continuing through September 21, 2012, or until river water temperatures were reduced to below 23 degrees C; and

- they recommended enhanced monitoring of fish for indicators of disease, and as an *emergency measure*, if such indicators were above a predetermined threshold as documented by the Fish Health Center, that flows in the lower Klamath River be doubled to a maximum of 6,400 cfs for a period of 7 days.

2.4.3 Development, Implementation, and Outcome

Reclamation prepared an Environmental Assessment (EA) and on August 10, 2012, signed a Finding of No Significant Impact (FONSI) for the release of up to 44,800 a-f to augment flows in the lower Klamath River for preventative purposes, along with up to 48,000 a-f for emergency purposes if monitoring indicated that this was necessary, exclusively from Trinity Reservoir. Klamath River Basin hydrologic conditions had deteriorated even over the course

[7] The Trinity Management Council is prescribed by the ROD to serve as the primary governing body for implementation of the Trinity River Restoration Program. Comprised of 8 members representing two tribes, Trinity County, the State of California, and four Federal agencies, the Trinity Management Council makes decisions by super majority, meaning that at least 7aye votes are required to pass a formal motion.

of the analysis, precluding additional releases from the Klamath River Basin, whereas Trinity Reservoir storage in mid-summer was at 107% of the 15-year average.[8]

In addition to collaborating with partners in formulating the action, Reclamation consulted with water user and power customer representatives prior to releasing the EA and again prior to executing the FONSI. Ultimately, 39,000 a-f was released for preventative purposes and no emergency releases were required. There was no substantial disease outbreak noted by tribes or fishery resource agencies during the return period. The fall Chinook return post-season estimate was 302,100 adults.

2.5 2013

2.5.1 Run Size Projection and Request for Preventative Action

In March of 2013, the PFMC announced its in-river run size projection for Klamath River fall Chinook of 272,000 adults for that year, second only in number to the 2012 projection since recordkeeping began in 1978. Further, based on the prior-year analysis of age components, fisheries experts reported that the 2013 run would have an abnormally high proportion of age four fish, which are typically larger and more accurately modeled (estimated) than younger age classes Many fishery interests suggested this as a possible indicator that the total bio-mass would be higher than typical. In May, the National Oceanic and Atmospheric Administration (NOAA) California-Nevada River Forecast Center's forecast model indicated that Klamath River flow accretions would be very low in August and September, in fact just 50% of the flow rates presented in their 2012 forecast. Tribes, sport-fishermen, other fish advocates, and fishery resource agencies again formally requested that Reclamation augment flows. Many urged that the 2012 augmentation flow rate (3,200 cfs) be again instituted for the same calendar period.

[8] Because subnormal accretion flows in the lower Klamath River are predicated by subnormal hydrology within the entire Klamath River basin, only rarely will water storage conditions in the Klamath Basin be sufficient to provide augmentation water. The only other source is the Trinity River Basin.

2.5.2 Recommendation and Reclamation Response

After again reviewing all written materials produced regarding the 2002 die-off and subsequent actions, Reclamation's Northern California Area Office (NCAO) developed two alternative augmentation regimes, to some extent mimicking past (2003-2004) augmentation protocols and designed to use less water from Trinity Reservoir as compared to the 2012 protocol.[9] The alternatives were presented to the TMC during meetings held on June 18 and June 26, 2013, where neither gained broad acceptance. After considerable discussion, a motion was introduced and seconded recommending that flows be augmented to a rate of 2,800 cfs from August 15 through September 30, complimented by a focused water temperature and fish health monitoring effort. The motion failed, thus the TMC recommendation made in 2012 was, in effect, sustained into 2013.

Through further Government-to-Government consultation and other forums, Reclamation obtained input from the Hoopa Valley Tribe, the Yurok Tribe, the U.S. Fish and Wildlife Service, NOAA Fisheries, and other basin partners. The parties discussed 2013 projected fishery conditions and reviewed the Fall Flow Subgroup's 2012 recommendations. Reclamation considered these and a variety of other factors, in addition to seeking responses from water users, power customers, and fishery interests similar to 2012 prior to making a decision on flow augmentation. Key contributing factors were the low Klamath River accretion forecast, along with the Trinity Reservoir storage level then being considerably lower than the year prior. Reclamation also considered the potential of the proposed flow augmentation depleting Trinity Reservoir storage levels to the extent that the cold water pool would be reduced, hampering efforts to meet temperature targets in the Trinity River, either in the present or following year. Taking into account this concern, together with an earlier recommendation in a study produced by Dr. Joshua

[9] One alternative would use intermittent pulse flows released from Trinity Reservoir to flush the free-swimming *Ich* life stage and induce fish migration. The other would involve a more gradual ramp rate on the ascending and descending limbs. Both would emphasize in-season monitoring and quick response adaptive management of flows.

Strange,[10] Reclamation determined that flows would be augmented to a rate of 2,800 cfs in the lower Klamath River from August 15 through September 21.

2.5.3 Implementation and Outcome

NCAO prepared an EA and on August 6, 2013, signed a FONSI for the release of up to 62,000 a-f to augment lower Klamath River flows to a rate of 2,800 cfs for preventative purposes. Citing sub-normal Klamath River Basin hydrology, the FONSI stated that augmentation would be provided exclusively from Trinity Reservoir.

Ultimately, 17,500 a-f was released for preventative purposes in 2013, and no emergency releases were required. There was no substantial disease outbreak, though it was reported by the Yurok Tribe that several fish had died from *Columnaris*. The post-season run size estimate was 165,100 adults.

2.5.4 NOAA Fisheries and U.S. Fish and Wildlife Service Recommendation

NOAA Fisheries and the U.S. Fish and Wildlife Service co-authored a memorandum dated August 12, 2013 (Joint Memorandum), which included a recommendation for monitoring fish health and conditions in the lower Klamath River, along with augmentation flow thresholds. The memorandum included an extensive assessment of historical, biological, and hydrologic factors. The key elements of their recommendation for actions to be undertaken when conditions present a risk of *Ich* spreading throughout a large number of fish are summarized below. It must be noted that the recommendations were based on hydrologic, fishery, and other conditions as specifically observed in 2013.

Preventative Flow Augmentation

- Initiate preventative flow augmentation in the lower Klamath River to a minimum of 2,800 cfs when the cumulative harvest

[10] *Summary of Scientific Evidence to Guide Special Flow Releases to Reduce the Risk of Adult Fall Chinook Salmon Mass Disease Mortality in the Lower Klamath River* by Dr. Joshua Strange, Fisheries Biologist, Yurok Tribe.

of Chinook salmon in the Yurok Tribal fishery in the estuary area meets or exceeds 7,000 fish[11].

- Initiate preventative flow augmentation by August 22 if the fish metric above is not triggered.

- Continue augmentation until September 21 unless the mean daily water temperature in the lower Klamath River is projected to be greater than or equal to 23 degrees C, in which case continue until the daily water temperature is projected to be less than 23 degrees C.

- Implement real-time flow-temperature management using existing water temperature models.

- Implement fish pathology monitoring to determine the need for a fish pathology/ mortality emergency release.

- Monitor conditions to inform need and timing of emergency flow releases based on real-time environmental conditions.

Emergency Flow Augmentation

- If diagnosis of severe *Ich* infection of gills (30 or more parasites per gill arch) in 5% or greater of a desired sample of 60 adult salmonids, confirmed by the U.S. Fish and Wildlife Service Fish Health Center or;

- Observed mortality of greater than 50 dead adult salmonids in a 20 kilometer reach in 24 hours combined with a confirmed presence of *Ich* by the U.S. Fish and Wildlife Service Fish Health Center, then:

- Immediately double pre-existing flows in the lower Klamath River for a period of 7 days.

2.6 2014

2.6.1 Run Size Projection and Requests for Preventative Action

In March of 2014, the PFMC announced its in-river run size projection for Klamath River fall Chinook of 92,800 adults. In

[11] The partners' initial reaction to utilizing the fish presence metric to trigger flow augmentation was positive, but some indicated that more time for evaluation of the concept was necessary.

May, the NOAA California-Nevada River Forecast Center announced that its forecast model indicated Klamath River flow accretions would be very low in August and September (1,800 – 1,900 cfs or lower), perhaps the lowest for the period of record. On June 20, 2014, the Hoopa Valley Tribe issued a letter to the Secretary of the Interior urging that flows be augmented to a rate of no less than 2,500 cfs beginning in August and continuing through at least September 21, 2014. The Yurok Tribe, PFMC, and other entities later formally requested that Reclamation augment flows. Conversely, Reclamation received letters from Central Valley Project (CVP) water and power users questioning the biological basis for releasing additional water and expressing concern about the impact to water supplies and power generation.

2.6.2 Recommendation and Reclamation Response

After again reviewing the information and consulting with State and Federal fish agencies, tribes, and others, Reclamation announced on July 29, 2014, that it would not provide augmentation flows on a preventative basis, but rather would implement the fish pathology/ mortality component of the emergency fall flow release recommendation as described in the 2013 Joint Memorandum. Accordingly, Reclamation coordinated discussions among fish agencies, tribes, and its own fishery and operations experts to enhance the disease monitoring, reporting, public safety notification, and communication aspects of an emergency response.

2.6.3 Worsening Conditions and Response

During the first half of August, hydrologic conditions and observed fish health both continued to worsen. It was reported that the adult return had begun much earlier than expected, and thousands of fish were stalled at the mouth of Blue Creek on the lower Klamath River mainstem. Other observations indicated fish were exhibiting lethargic behavior - in some cases to the degree that fish could be caught with bare hands. Water temperatures had risen above the 23 °C, a thermal migration barrier mark[12] and water quality was generally poor. By the end of August, the Klamath Fish Health Assessment Team reported that in their opinion, a significant fish die-off was likely imminent.

[12] A wide array of factors influence fish migration, but it is generally accepted by fishery biologists that a water temperature of approximately 23 degrees C or greater constitutes a thermal barrier to salmonid migration.

2.6.4 Implementation and Outcome

After again consulting with fish agencies, Reclamation determined that an emergency release from Trinity Reservoir was necessary to avert a potentially significant fish loss. On August 22, 2014, Reclamation announced it would increase releases from Trinity Reservoir to achieve a flow rate of approximately 2,500 cfs in the lower Klamath River. The ramp-up began the following day, August 23, and the increased release rate continued through September 14, 2014. On September 15, scientists from the Fish Health Center confirmed the presence of *Ich* parasites on nine of 24 fish taken from the lower Klamath River, six of those sampled with concentrations high enough to constitute a severe infestation in accordance with the Joint Memorandum. Reclamation consulted briefly with Federal scientists before again increasing releases from Lewiston Dam to approximately 3,400 cfs so as to achieve a doubling (from the flow rate of 2,500 cfs maintained earlier to 5,000 cfs) in the lower Klamath River. Per the criteria, the doubling was maintained for one week. Though there were documented reports of diseased fish present at several locations within the mainstem Klamath River, there was no significant die-off. Formal post-season fishery reviews are not yet available, but anecdotal reports indicated that fish health did not decline following the flow doubling. A total volume amount of 64,000 a-f was ultimately released.

Reclamation was unable to complete its evaluation of this action under NEPA as has occurred in past years, because the release was undertaken only after monitoring indicated there was an emergency need for augmenting. Reclamation instead consulted with the Council on Environmental Quality (CEQ) regarding alternative arrangements as provided for in the CEQ regulations.

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Section 3 OPTIONS CONSIDERED TO HELP PREVENT A FUTURE FISH DIE-OFF

3.1 Flow Augmentation and Non-Flow Alternatives

3.1.1 Introduction

Technical experts from Reclamation, other Federal agencies, the Hoopa Valley Tribe, the Yurok Tribe, the State of California, and others have convened on many occasions since the 2002 die-off to analyze biological, hydrologic, channel morphology, and other aspects of the die-off. The discussions and literature research included an array of flow augmentation and non-flow alternatives. Throughout the process, however, there have been no viable non-flow alternatives for fish protection identified. They did, however, develop - and refine through several iterations - measures to avert a recurrence and to better monitor fish health conditions during the return period, culminating in the 2012 TMC memorandum referenced in Subsection 2.4.2.

3.1.2 Specific Flow Augmentation Benefits

The findings in the memorandum suggest that increasing flows in the lower Klamath River during the return migration provides the following benefits:

- The transmission of the free-swimming *Ich* life stage that propagates among fish can be physically hindered by increased flow rates and velocities.
- Increased flows from the Trinity River Basin often reduce lower Klamath River temperatures in the late summer which can reduce stress and offer migration opportunity in migrating adult fish.
- Additional flows can increase the wetted cross-sectional area within the river bed, decreasing fish densities.
- Fish are sometimes cued by the flow changes and reduced water temperatures to continue their migration upstream to suitable areas of both river systems.

3.1.3 Potential Environmental Concerns Resulting from Flow Augmentation

In a variety of forums, the potentially adverse environmental effects of providing flow augmentation have also been discussed. Potential concerns have included:

- Decreases to the Trinity Reservoir cold water pool potentially compromising later efforts to comply with Trinity River temperature goals.

- Decreases to the Trinity Reservoir cold water pool potentially compromising efforts to achieve temperature objectives in the Sacramento River during the year augmentation flows are provided and potentially in succeeding years.

- Potentially exacerbating straying of Klamath River origin fish into the Trinity River.

3.2 Further Evaluation of Options to Address Potential Fish Die-off Events in Future Years

3.2.1 2013 Workshop - Non-Augmentation Options

As described in other sections, since planning for the initial augmentation releases in 2003, Reclamation has sought to refine measures for fish protection in the lower Klamath River. In addition to evaluating options internally and during consultation with tribes and fishery resource agencies, Reclamation conducted a collaborative workshop in Redding, California on December 19, 2013. The workshop was well attended by tribes, fishery resource agencies, counties, water users, power users, environmental interests, and other stakeholders.

Prior to the workshop, a paper was submitted by the Klamath Water Users Association, Redding Electric Utility, San Luis and Delta-Mendota Water Authority, Tehama-Colusa Canal Authority, and the Westlands Water District describing the need for a long-term solution and the essential components of a long-term solution. The paper is included as Appendix B.

During the workshop, various proposed measures were discussed, including non-flow alternatives. The majority of the

discussion, however, focused on refining predictive tools for enhanced real-time evaluation of fish health, more accurately estimating return populations, more accurately predicting river accretions, and determining flow augmentation efficacy.

- **Production Management**

  It was suggested at the workshop that hatcheries may be over producing, such that the habitat capacity within the lower Klamath River has been exceeded. A brief discussion of harvest and production management included statements by tribal representatives that their fishing rights are not currently being fulfilled and cannot be further compromised.

- **Passage Improvement**

  The Fall Flow Subgroup discussed passage improvements while developing recommended measures, primarily in 2012, for protection of returning adults, and the idea was again discussed at the workshop. The proposal has gained no support among fishery biologists for use as an alternative to flow augmentation. Most have indicated that since there is not a physical fish passage barrier in the lower Klamath River, this type of action is not feasible due to channel dynamics and morphology and does nothing to address temperature queuing by returning adults.

- **Early Return Period Flow Reduction**

  Another inquiry made during the workshop was whether artificially reducing lower Klamath River flows at the beginning of the return period would discourage fish from leaving the estuary and entering the river, then relying on natural flow increases later in the return period, possibly augmented by additional releases. It was explained that this is essentially what occurred naturally in 2002, causing the fish die-off, and further broad observations have shown that fish are not dissuaded from entering the river due to low flow rates.

- **Conclusion**

  None of the non-flow alternatives gained widespread acceptance among fishery experts for application in the lower Klamath River to protect returning adult salmonids. Non flow-related channel improvements in other river basins were described during the workshop, however, and partner staff indicated they will continue to monitor any published results describing their efficacy that could inform fish protection efforts in the lower Klamath River.

3.3 Recommended Approach Submitted by the Hoopa Valley Tribe

In October of 2013, the Hoopa Valley Tribe submitted a recommended fish protection approach, included as Appendix A. The approach would emphasize determining fishery needs and the available water supply, then allocating water first to the fishery and secondarily to water users.

Section 4 PROPOSED LONG TERM PROTECTION MEASURES

4.1 Criteria for Determining When Flow Augmentation is Required

As discussed in other sections of this document, Reclamation and Klamath River partners have spent considerable time developing and refining scientifically-based criteria for considering flow augmentation, culminating in the TRRP Fall Flow Subgroup recommendations developed in 2012 and the 2013 Joint Memorandum (again, the latter having been based on 2013 conditions). More work remains in that regard and Reclamation will continue collaborative efforts with partners to further refine the criteria for determining when flow augmentation is required. Any changes or refinements to the criteria will be subject to appropriate review and modification to this Plan.

Reclamation proposes to augment flows in the lower Klamath River when conditions are present, as represented by the then-current criteria, to suggest the potential for a significant fish die-off event. Recognizing that criteria will evolve, at this writing Reclamation will consider whether flow augmentation is necessary when the fall Chinook in-river run size is projected to be 170,000 or greater and flows in the lower Klamath River are forecast to be 2500 cfs or lower. Additionally, irrespective of these thresholds, Reclamation will continue to monitor conditions in the lower Klamath River and coordinate and collaborate with partners and other experts to determine whether degraded river conditions may require a response (as was the case in 2014) and to evaluate the efficacy of augmentation actions.

In general, under the current criteria, Reclamation will consider two types of responses to a potential fish-die off as described in the Joint Memorandum. The criteria presented in Section 2.5.4 are reiterated below:

Preventative Flow Augmentation – Current Criteria

- Initiate preventative flow augmentation in the lower Klamath River to a minimum of 2,500 - 2,800 cfs when the cumulative harvest of Chinook salmon in the Yurok Tribal fishery in the Estuary area meets or exceeds a total of 7,000 fish.[13]

- Initiate preventative flow augmentation by August 22 if the fish metric above is not triggered.

- Continue augmentation until September 21 unless the mean daily water temperature in the lower Klamath River is projected to be greater than or equal to 23 degrees C, in which case continue augmentation until the daily water temperature is projected to be less than 23 degrees C.

- Implement real-time flow-temperature management using existing water temperature models.

- Implement fish pathology monitoring to determine the need for a fish pathology/mortality emergency release.

- Monitor conditions to inform need and timing of emergency flow releases based on real-time environmental conditions.

Emergency Flow Augmentation – Current Criteria

- Initiate doubling of the ambient flow rate in the lower Klamath River for a period of seven days if emergency conditions exist consisting of:

    - diagnosis of severe *Ich* (30 or more parasites on a gill arch) infection of gills in 5% or greater of a desired sample of 60 adult salmonids confirmed by the U.S. Fish and Wildlife Service Fish Health Center, or;

    - observed mortality of greater than 50 dead adult salmonids in a 20 kilometer reach in 24 hours coupled with the confirmed presence of *Ich* by the U.S. Fish and Wildlife Service Fish Health Center.

As discussed in greater detail in later sections, Reclamation has determined that it shall administer as a distinct quantity its statutory obligation to release water to Humboldt County as provided for in Section 2 of the 1955 Act. Reclamation will be

[13] This threshold constitutes fulfilling the "fish presence metric" as described in further detail in the 2013 Joint Memorandum.

coordinating with Humboldt County officials concerning the release of this water, including the potential for its use for flow augmentation purposes. Reclamation includes in this plan the most current information available on the anticipated use of the water by Humboldt County, including any additional criteria concerning flow augmentation developed by Humboldt County in consultation with fishery resource agencies and tribes.

4.2 Long-Term Volumetric Requirement

As discussed in previous sections, the recommended volumetric requirements for augmentation flows in any given year have ranged widely, due primarily to temporal variations of augmentation influenced primarily by lower Klamath River accretions, and advances by biologists in suggesting a correlation between flow rates and disease propagation. Forecasted fish returns in 2012 and 2013 were the highest and second highest by a significant margin during the period of record and coincided with very low forecasted accretion flow rates. Augmentation flow volumes were 39,000 a-f and 17,500 a-f respectively, and observations were that the distribution of these volumes coincided with no significant disease or adult mortalities.

Augmentation releases made in 2014 were in accordance with the emergency criteria, wherein the seven-day doubling requirement will in most cases consume a greater water volume than implementing the preventative criteria. Had the conditions for emergency augmentation flows been met in 2012 or 2013, the volume released in either or both years would have increased significantly. Hydrologic conditions in 2014 were among the driest of record, and thus it is assumed on an empirical basis that the probability of requiring an emergency release in any given year is very low.

The average volume released for augmentation in 2003, 2004, 2012, 2013, and 2014 was 38,963 a-f. We anticipate a similar quantity will be sufficient in the majority of years where augmentation is required. However, as demonstrated by conditions experienced in 2014, the volume of release may exceed 40,000 a-f in any given year. An appropriately detailed evaluation of foreseeable augmentation needs and impacts will be included in

the appropriate NEPA document supporting actions implemented under this plan.

4.3 Annual Implementation Process

4.3.1 Annual Actions

When finalized, in addition to other measures, Reclamation will implement the actionable provisions of this plan annually as briefly outlined in the sections below:

Late March

A. PFMC releases fall Chinook ocean abundance projection and correlating estimate of adult return

March-May

A. NOAA Klamath Basin accretions forecast available

B. Reclamation determines projected lower Klamath River flow regime through September by coupling accretion forecast with prevailing Biological Opinion release requirements from Iron Gate Dam, tribal boat dance flows (Trinity River in odd years and Klamath River in even years), and Record of Decision flows from Lewiston Dam

C. Reclamation, Tribes, and Agencies assess river conditions and the applicability of the current augmentation criteria as described in earlier sections

D. In collaboration with Tribes and Agencies, Reclamation preliminarily determines if augmentation releases are necessary, and if so, to what flow rate and duration

E. Reclamation assesses present and projected hydrologic conditions and water supply allocations in the Klamath River Basin and CVP, including specifically the Trinity River Basin

F. Reclamation consults with the State Water Resources Control Board, Fish and Wildlife Service, and NOAA Fisheries

G. Reclamation determines the augmentation source, if determined necessary[14]

[14] Because subnormal accretion flows in the lower Klamath River are obviously predicated by subnormal hydrology within the entire Klamath River basin, only rarely will water storage

May-June

A. Reclamation collaborates with tribes, water and power users, regulatory agencies, etc., to gather input

B. Reclamation further refines the augmentation flow regime, if applicable, and identifies the water source(s)

C. Reclamation: 1. determines if it will release additional water from Klamath Project storage, if available, and in consideration of water temperature implications, and/or 2. coordinates with Humboldt County regarding its statutorily-directed water for augmentation, if necessary, and 3) releases additional water, if necessary, from Trinity Reservoir (with any compensation for the additional volume determined later based authorities and mechanisms described in other sections and subject to the availability of funds).

July

A. Reclamation finalizes any necessary environmental or other documentation

August-September

A. Augmentation flow regime is implemented, if required

B. Partners and other regulatory agencies gather data and provide feedback on efficacy and the potential need for releases under the emergency criteria

4.3.2 Ongoing Efforts - Enhanced Modeling and Other Predictive Tools-

Virtually all stakeholders are in agreement that improvements in predictive information will greatly benefit planning for and implementing efforts to protect returning adults. Specific areas mentioned include accretion forecasting, run size forecasting, further analyses to correlate the benefits of higher flows in preventing epizootic disease outbreaks, and continued efforts to explore non-flow alternatives.

The PFMC has indicated it is continually working to improve the fall Chinook salmon abundance and run prediction model.

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conditions in the Klamath Basin be sufficient to provide augmentation water. The only other source is the Trinity River Basin.

Discussions are ongoing with NOAA regarding improvement of the Klamath Basin accretion forecasting model.

Further, the critically dry hydrologic conditions in 2014 and the unique disease propagation and fish behavioral factors offered a significant data-gathering opportunity for fishery managers to help advance the science. Many emphasized the importance of employing the principles of adaptive management to improve fish health monitoring efforts and to advance the understanding of correlating late-summer flow conditions to maintaining good fish health.

Section 5 STATUTORY AUTHORITY

5.1 General Authorities

Reclamation's actions pursuant to this Long Term Plan are based on the Trinity River Division Authorization Act of August 12, 1955 [P.L. 84-386] Act, the Trinity River Basin Fish & Wildlife Management Act of 1984 (Act of October 24, 1984 [P.L. 98-541]; as amended by the Act of October 2, 1992 [P.L. 102-377]; Act of November 13, 1995 [P.L. 104-46]; Act of May 15, 1996 [P.L. 104-143]) (directs the Secretary to restore the fish populations impacted by the TRD facilities); the Fish and Wildlife Coordination Act [16 USC 661] and section 3406(b)(1) of the CVPIA. [15] In addition, the actions under the Long Term Plan are also consistent with Reclamation's obligation to preserve tribal trust resources.

[15] For the actions implemented in 2012, 2013, and 2014, Reclamation relied primarily on the provision in section 2 of the Trinity River Division Authorization 1955 Act that authorizes and directs the Secretary to insure "the preservation and propagation of fish and wildlife" downstream of the TRD facilities. On October 1, 2014, the U.S. District Court for the Eastern District of California found that section 2 of the 1955 Act did not provide authority for the 2013 augmentation releases. A notice is being filed regarding the appeal of this decision.

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Section 6 IDENTIFYING AND ADDRESSING EFFECTS OF AUGMENTATION RELEASES

6.1 National Environmental Policy Act Compliance Provision

As mentioned in a previous section, Reclamation prepared an EA and signed a FONSI (separately) in 2012 and 2013 when it determined that it would likely be initiating augmentation releases. In response to water user and power customer concerns regarding adverse impacts, both FONSI documents included this statement:

> *"Reclamation intends to assess any effects of the Proposed Action in future years in terms of water supply and power generation, and seeks to identify and implement mitigation opportunities, as appropriate, consistent with Reclamation authorities and available resources."*

6.2 Evaluation of Prior Effects

6.2.1 2012 Augmentation Volume Evaluation

In the 2012 FONSI, in response to concerns expressed about possible reductions in water supplies, Reclamation noted that the 2012 augmentation flows would not affect allocations for the current year and further explained that any potential for impacts to water and power users could not be determined until the end of the 2013 fill season. It stated that it would seek to identify and implement mitigation opportunities, as appropriate and consistent with Reclamation authorities and available resources. On April 23, 2013, Trinity Reservoir reached its maximum storage volume for the water year at 2,148,370 a-f, some 299,280 a-f less than the top-of-active-conservation storage capacity. Storage volumes at other CVP Reservoirs were also subnormal.

The additional 39,000 a-f released from Trinity Reservoir was routed through Trinity Powerplant and released from Lewiston

Reservoir through the spillway. That water volume thus bypassed Carr, Spring Creek, and Keswick Powerplants via export to the Sacramento River Basin. Each acre-foot otherwise diverted through the bypassed powerplants generates 1.1 Megawatt-hours (Mwh) of electrical power, thus the forgone power potentially totaled a maximum of 42,900 Mwh.

If an additional 39,000 a-f had been available in Trinity Reservoir it could have provided greater operational flexibility for the CVP. The CVP is physically and operationally complex with constantly evolving, competing demands during any time increment, thus making it difficult to project the impacts to any particular CVP user group or purpose. Any ultimate reduction in water deliveries to CVP water users as a consequence of the augmentation release is less than the augmentation release volume, the scale of which differs depending on operational conditions prior to, during, and following the additional release. And because of the complex nature of CVP reservoir and system operations, it may take a number of years for a reduced delivery to be realized.

6.2.2 2013 Augmentation Volume Evaluation

The volume of water released for augmentation in 2013 was 17,500 a-f and thus the impacts to water and power were proportionately less substantial than those of 2012. The 62,000 a-f estimate for preventative purposes as described in the EA and FONSI was developed based on the early accretion forecast. Observed flows in the lower Klamath River exceeded forecast numbers by 300 cfs or more throughout much of the augmentation period, significantly reducing the water volume necessary for augmentation. In addition, the Temporary Restraining Order granted in Federal District Court delayed the onset of augmentation flows by approximately 12 days, further reducing the augmentation volume.

The additional 17,500 a-f released from Trinity Reservoir was routed through Trinity Powerplant and released from Lewiston Reservoir through the spillway. That water volume thus bypassed Carr, Spring Creek, and Keswick Powerplants via export to the Sacramento River Basin. At 1.1 Mwh of electrical energy per a-f, the forgone power potentially totaled 19,250 Mwh.

The reduction in total CVP reservoir storage resulting from the 2013 augmentation was realized when the maximum fill level at Trinity Lake was attained in the spring of 2014. The reservoir reached elevation 2,286.74, corresponding to a storage volume of 1,311,289 a-f (54% of capacity) on April 6, 2014. Similar to the 2012 impacts discussion above, it is difficult to project impacts to any particular CVP user group or purpose, and the ultimate reduction in CVP water deliveries is smaller than the reduction in CVP reservoir storage, the scale of which differs depending on operational conditions prior to, during, and following the additional release.

6.2.3 2014 Augmentation Volume Evaluation

The volume of water initially released under the emergency criteria from August 23 through September 16, 2014, totaled approximately 22,700 a-f, while the emergency flow doubling that occurred from September 17, 2014 through September 24, 2014 (excluding ramping) totaled 41,300 a-f for a grand total of 64,000 a-f.

This volume released from Trinity Reservoir was routed through Trinity Powerplant and from Lewiston Reservoir through the spillway. That water volume thus bypassed Carr, Spring Creek, and Keswick Powerplants via export to the Sacramento River Basin. At 1.1 Mwh of electrical energy per a-f, the forgone power potentially totaled a maximum of 70,400 Mwh.

The actual impact to Trinity Reservoir storage will not be realized until the maximum refill level is attained in the summer of 2015; at such time storage conditions throughout the CVP can also be assessed.

6.2.4 Summary of Aggregate 2012-2014 Augmentation Impacts to Water Supply and Power Generation

In part because Trinity Reservoir has not refilled at any time during the entire three-year period, and due to the complex nature of CVP operations, including those involving Shasta Reservoir, the effects to the CVP water supply are cumulative over the period. There was no impact to water deliveries in 2012 as explained earlier and no discernable impact - singularly or cumulatively - in 2013. However, in 2014 the cumulative augmentation release

volume of 120,500 a-f, coupled with the extremely drought, did adversely impact CVP operations and water deliveries in 2014, as well as temperature compliance efforts in the Sacramento River and the Trinity River. The significant limitation on releases from Keswick Reservoir to conserve the cold water pool in Shasta Reservoir reduced water deliveries in general. The cumulative storage reduction of 120,500 a-f in the combined Trinity-Shasta system reduced Keswick Reservoir releases by an estimated 100,000 a-f. The cumulative storage loss also likely has reduced carryover storage in Trinity-Shasta system by an additional 20,000 a-f. The drawdown of Trinity Reservoir below 600,000 a-f in total storage incrementally contributed to the requirement to later bypass power generation at Trinity Powerplant for TRD temperature management.[16]

The irrigation component for CVP water service contractors, both north and south of the Delta, was allocated zero percent in 2014 due to the prolonged drought conditions. Under the extremely dry conditions experienced in 2014, it is unlikely that any portion of the release of an additional 100,000 a-f from Keswick Reservoir would have been available to provide water for irrigation under the CVP water service contracts. In the spring and summer of 2014, the CVP had unmet obligations for in-basin water needs in the Sacramento Valley and the Delta, and for senior priority water supplies south of the Delta. The release of any additional water at Keswick Reservoir may have been available for those purposes.

6.3 Evaluation of Future Year Impacts

6.3.1 Water Delivery and Power Generation Impacts

Reclamation has determined that water provided for in the first and second provisos of Section 2 of the 1955 Act represent separate and independent limitations on the TRD's integration with the CVP, and that proviso 2 should be administered separately and no longer subsumed in the first proviso of Section 2.[17] Humboldt

[16] The auxiliary outlet works at Trinity Dam was used extensively during August, September, and October of 2014 to reduce water temperature in the Trinity River. The intake structure for the auxiliary outlet is much deeper within the pool than the powerplant intake structure, thus withdrawing colder water from within the thermocline.

[17] See M Opinion released by the Office of the Solicitor on December 23, 2014.

County has indicated that for the long foreseeable future it will have no demand or infrastructure to withdraw water under the contract for consumptive use purposes. Humboldt County has expressed that during instances when ROD flow releases and other flows in the Trinity and Klamath Rivers are insufficient to protect fish, they may request the release of the water provided for them and for downstream users for the protection of fish and wildlife. [18]

Because this is an obligation directed by Section 2 of the 1955 Act, no compensation will be owed to other water or power users for releasing a requested volume to Humboldt County. Impacts caused by the release of augmentation flows will be addressed as described in other sections.

6.3.2 Cold Water Pool and Other Operational Impacts

CALSIM II modeling was performed to help assess potential effects of a permanent, long-term allocation of water from Trinity Reservoir during the late-summer period. As anticipated, these effects included reduced hydroelectric power production, reduced water supply, and a reduced cold water pool volume at both Shasta and Trinity reservoirs. In a presumed worst-case scenario of releasing 50,000 a-f on a long-term annual basis, less water is diverted from Trinity Reservoir into the Sacramento River basin in all water-year types, and this reduced diversion has direct annual effects to cold water pool management and to hydroelectric power production. These temperature management impacts occur in the Sacramento River Basin due in part to reduced imports of relatively colder Trinity River water and therefore may require an increase in cold water releases from Shasta Reservoir to achieve the same downstream temperatures. In addition, the increase in

[18] An August 10, 2012 letter from Barbara Evoy, Deputy Director of the Division of Water Rights, State Water Resources Control Board, explains that Reclamation may bypass and/or release water for non-consumptive cultural resource needs and to improve instream conditions for the benefit of aquatic resources without obtaining a change of place of use approval. "However, such bypass and/or release is not a beneficial use under Reclamation's permits absent approval of the amended place of use, and a decision not to divert water or failure to put water to beneficial use for a period of five years may result in reversion of the water to the public and result in partial or total revocation of the water right under Water Code § 1241." The State Board continued by advising Reclamation to file a petition to change the place of use if this is a concern. For these reasons, Reclamation has determined that it should file a petition under Water Code §§ 1701 and 1707 to add the Trinity River below Lewiston Dam and the lower Klamath River below the junction with the Trinity to the place of use for the TRD's permits.

annual releases to the Trinity River reduces overall storage in the Trinity Reservoir and therefore causes storage levels to be drafted below 1 million a-f more frequently. These lower storage periods at Trinity Reservoir result in additional bypassing of power production on the Trinity system for temperature management. Storage at Shasta Reservoir buffers the water supply impacts during normal and wetter periods, however, the impact to water deliveries is seen during a series of dry years.

6.3.3 NEPA and Endangered Species Act Compliance

Reclamation is obligated to comply with NEPA and the Endangered Species Act (ESA) when undertaking actions subject to these two statutes. Rather than undertaking single-year compliance when conditions develop that necessitate augmentation releases, in light of the recurrence of conditions in recent years and realizing the potential that conditions may require these releases in the future, Reclamation is currently evaluating the benefits of preparing a NEPA analysis on this long-term plan, which would reduce or eliminate the redundant and duplicative analysis for subsequent multi-year actions. Under this approach, Reclamation would base the analysis on a projection of the highest anticipated release volume and any subsequent-year variations in the augmentation flow regime beyond those described in the initial-year document would be addressed separately.

The reduced cold water pool volumes will require additional evaluation of effects to listed species; and these effects may be significant enough to require consultation under the ESA. The potential effects to winter-run Chinook salmon, and any additional actions that might be required to mitigate for these effects, will likely be the most significant, but spring-run Chinook and Coho may also be of concern. Again, these effects are more pronounced in periods of drought extending over several years.

6.4 Power Generation Effects

6.4.1 Reimbursability and Cost Reallocation

In addition to considering the purchase of replacement power under the authority of the 1939 Act, discussed in a later section, Reclamation has considered options to compensate power users for

the impacts caused by the augmentation releases made in 2012, 2013, and 2014. One proposal is modifying the cost allocation for the operation and maintenance component assessed to power users through the rate structure. To address foregone power generation, the CVP operation and maintenance cost allocation would be adjusted by determining the CVP production cost of the foregone power generation. These production costs would be reallocated from the CVP power purpose (reimbursable) to the fish and wildlife purpose (non-reimbursable) of the TRD within the CVP operations and maintenance cost allocation. The current power production cost at TRD facilities is approximately $21 per Mwh. There exists no authority within the cost reallocation mechanism to compensate at the replacement cost level.

6.5 Addressing Water Supply Effects

6.5.1 Sourcing

Humboldt County has expressed that during instances when ROD flow releases and other flows in the Trinity and Klamath Rivers are insufficient to protect fish, they may call for the release of water under Section 2 of the 1955 Act. Reclamation will consider whether to compensate for any releases above 50,000 a-f based on the conditions at the time any such additional release becomes necessary. Reclamation will also consider whether to compensate CVP water users for effects related to releases of project water supplies made in 2012, 2013, and 2014, as they occurred prior to the revised determination regarding the Humboldt County contract.

6.5.2 Acquiring Additional Water – Section 14 of 1939 Act

Reclamation's Office of Policy, in conjunction with the Office of the Solicitor, has examined the authorities under which Reclamation could offset impacts to water deliveries and electrical power generation caused by providing augmentation flows. These authorities would be considered for acquiring water to be used for future augmentation flows (in excess of the volume provided to Humboldt County in Section 2 of the 1955 Act) and/or to replace water released for augmentation in past years. The only viable alternative identified to date is described below.

Reclamation has determined that it may use the authority provided in Section 14 of the 1939 Act to replace CVP water allocated for augmentation flows. This authority has previously been used within Reclamation to acquire water and electrical energy, but only in very select instances. The argument centers primarily on the provisions of Section 14 of the Reclamation Project Act of 1939. Section 14 is stated below in its entirety.

> *"SEC. 14. The Secretary is hereby authorized, in connection with the construction or operation and maintenance of any project, (a) to purchase or condemn suitable lands or interests in lands for relocation of highways, roadways, railroads, telegraph, telephone, or electric transmission lines, or any other properties whatsoever, the relocation of which in the judgment of the Secretary is necessitated by said construction or operation and maintenance, and to perform any or all work involved in said relocations on said lands or interests in lands, other lands or interests in lands owned and held by the United States; (b) to enter into contracts with the owners of said properties whereby they undertake to acquire any or all property needed for said relocation, or to perform any or all work involved in said relocations; and (c) for the purpose of effecting completely said relocations, to convey or exchange Government properties acquired or improved under (a) above, with or without improvements, or other properties owned and held by the United States in connection with the construction or operation and maintenance of said project, or to grant perpetual easements therein or thereover. Grants or conveyances hereunder shall be by instruments executed by the Secretary without regard to provisions of law governing the patenting of public lands.*
>
> *The Secretary is further authorized, for the purpose of orderly and economical construction or operation and maintenance of any project, to enter into such contracts for exchange or replacement of water, water rights, or electric energy or for the adjustment of water rights, as in his judgment are necessary and in the interests of the United States and the project." (emphasis added).*

Under certain circumstances, Reclamation has used both section 14 of the 1939 Act and section 5 of the Endangered Species Act (ESA) to obtain replacement water and power.[19] For example, Reclamation has cited Section 14, together with Section 5 of the ESA, as its authority to lease water to augment flows for endangered salmon recovery in the upper Columbia River system.

The most likely north of Delta sources from which to purchase water in hydrologically challenging years are the Sacramento River Settlement Contractors (SRSC). In recent such years, the cost per acre-foot for comparatively large volumes purchased from the SRSC has been $100 to $200. Reclamation is currently exploring this option, and if it chooses to acquire water, the cost for 100,000 a-f to compensate for the cumulative 2012-2014 impacts would range from $10 million to $20 million. There may be several other sources of water in the Sacramento River Basin, but likely at a higher cost and potentially causing other adverse effects.

[19] Section 14 provides Reclamation with the authority to "enter into such contracts for exchange or replacement of water [or] water rights." 43 U.S.C. § 389. Section 5 of the ESA, in relevant part, states, "[t]he Secretary . . . shall establish and implement a program to conserve fish, wildlife, and plants, including those which are listed as endangered or threatened species . . . To carry out such a program, the Secretary . . . (2) is authorized to acquire by purchase, donation, or otherwise, lands, waters, or interests therein. . ." 16 U.S.C. § 1534.

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Appendix A – Hoopa Valley Tribe Submission

ANNUAL WATER ALLOCATION DECISION PROCESS

The process proposed in this document is designed to facilitate comprehensive administration of Reclamation/PFMC processes. By fostering inter-agency coordination in management of Klamath/Trinity fishery and water resources, flows needed to restore and protect vital trust resources can be provided while delivering surplus water to junior water users. To date, insular decision-making by water and fisheries managers has led to sharp declines in average run-size of Basin fish populations, including species listed under state and federal Endangered Species acts. Tribal fishing rights extend to these and other species, many of which are in decline.

- With respect to providing certainty to agricultural and other needs, annual allocation decisions will be made in April of each year – the same as is already done for agricultural deliveries and water year types.

- This process recognizes Klamath/Trinity in-Basin needs for fisheries as first priority, with instream flows, adequate carryover storage, and other beneficial needs fully provided, and out-of-stream diversions – to both Trinity River Division and Klamath Irrigation Project irrigators as second priority.

Figure - Schematic of annual water allocation determintation process to be Implemented through interagency (federal, state, tribal) Policy Council.

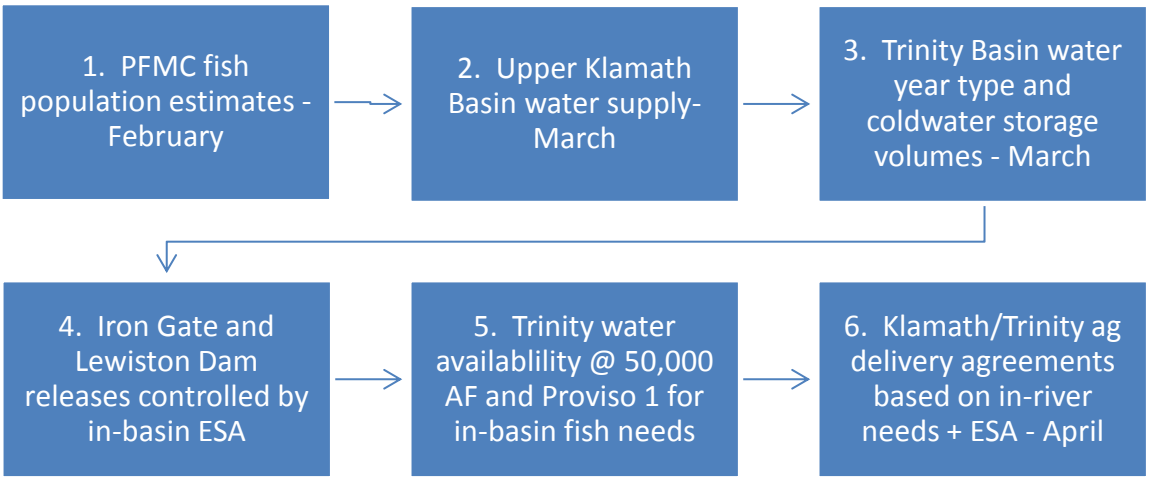

Figure 1 Schematic of annual water allocation determintation process to be Implemented through interagency (federal, state, tribal) Policy Council.

Description of Events:

1. The Pacific Fisheries Management Council predicts fall Chinook run size for each year in February. Those numbers are refined and adopted as final in April.

2. The Upper Klamath Basin water supply is established each March and finalized in April based on rainfall and inflows to Klamath Irrigation Project storage reservoirs.

3. The Trinity Basin water year is finalized in April based on predicted runoff to Trinity Reservoir.

4. Combined Klamath and Trinity water supplies, less volumes needed to meet ESA requirements, determines the amount of water available for release and diversion.

5. Managers will determine if in-basin ESA deficiencies exist, coupled with in-basin fish needs based on PFMC fish population estimates, the availability of water in excess of in-basin calls of all or parts of the 50,000 AF of "Humboldt County and downstream users" water, to determine whether water volumes above the Trinity ROD amounts are needed from the "Proviso 1" to determine the amount of water that is available for agricultural, diversion and other purposes.

6. Based on analysis of 1 through 5 above, the Secretary, in coordination with tribes, will identify the amount of surplus water that can be made available for agricultural and diversion purposes in April of each year.

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Appendix B – Water User and Power Customer White Paper

Lower Klamath River Late Summer Flow Augmentation

- Developing a Long-Term Solution –

Proposed By:

Klamath Water Users Association

Redding Electric Utility

San Luis & Delta-Mendota Water Authority

Tehama Colusa Canal Authority

Westlands Water District

Need for a Long-Term Solution:

- Necessary in order to determine the annual Trinity River hydrograph design based on annual water allotment provided by the Trinity River Restoration Record of Decision
- Necessary in order to ensure increased fall flows do not inadvertently alter other species of concern
- Necessary in order to ensure CVP and Klamath water and power contractors can successfully plan for meeting the needs of their customers throughout California, including managed wildlife
- Necessary in order to ensure CVP and Klamath water and power users are not adversely impacted or bear the increased costs incurred to provide for this voluntary, non-project action.

Essential Components of a Long-Term Solution:

- Development and implementation of non-flow measures to minimize the need for predicted flow augmentation
- Development of criteria to timely determine if a later summer flow augmentation will be needed prior to approval of Trinity River hydrograph, such as predicted run-size, precipitation forecast, etc.

- Development and implementation of a Central Monitoring System to assess fish and water quality health
- Development of triggers to clearly identify conditions which would necessitate flow augmentation
- Development and implementation of monitoring to assess impacts of flow augmentation
- Criteria for repayment of lost CVP water diversion, such as cost determination, repayment plan, etc.
- Criteria for repayment of lost CVP power production, such as cost determination, repayment plan, etc.
- Carryover plan for water if not used for preventative flows
- NEPA and ESA compliance
- Improved coordination between CVP and Klamath export operations to meet potential emergency needs