Healthy Rivers and Landscapes Program for Implementation of Proposed Updates to the Bay Delta-Water Quality Control Plan

Common Responses

Submitted by:

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The State Water Resources Control Board (State Water Board) staff released the Draft Staff Report/Substitute Environmental Document in support of potential updates to the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan) in September 2023. The Draft Staff Report includes an analysis of the Healthy Rivers and Landscapes (HRL) Program as an alternate pathway for implementation of the Bay-Delta Plan updates. Members of the public submitted comments during the public comment period for the Draft Staff Report. During the three workshops hosted by the State Water Board at the end of April, the State Water Board and members of the public provided additional input on the HRL Program.

In response, the Parties to the HRL Program respectfully submit “common responses” to address comments and questions raised about the proposed HRL Program:

- Inclusion and Outreach
- HRL Program Funding
- Potential Groundwater Impacts
- Accounting of HRL Program Habitat Assets
- Upstream Temperature Protection
- Species Habitat and Abundance
- Enforcement and Accountability
- Modeling Representations of HRL Program
- HRL Program Flow Accounting

Common Response: Inclusion and Outreach

Introduction

The Healthy Rivers and Landscapes (HRL) Program is structured to provide transparency, accountability, and a collaborative approach to science and governance. The overall concept is to create a forum for Delta watershed management that is inclusive, science-based and climate responsive. The signatories (HRL Parties) to the 2022 Memorandum of Understanding Advancing a Term Sheet for the Voluntary Agreements (MOU) believe that such a forum, which currently does not exist at this scale, is critical to the successful management of the Delta watershed. The initial HRL governance proposal, which outlines how decisions about the implementation of HRL Program flows, habitat, and science are made, was developed by public water agencies, State and Federal resource agencies, and environmental non-governmental organizations (NGOs). This approach has remained the foundation for the HRL Governance Program. The HRL Parties are committed to continued public transparency, and as such have made a number of draft materials available publicly and participated in State Water Board workshops and hearings to provide additional information and opportunities for input. The HRL Program is designed to provide opportunities for transparency and public engagement throughout the term, via the release of annual and triennial reports, a collaborative Science Program, and triennial State Water Board workshops. The HRL Program is also working on a strategy for increased engagement with California Tribes.

Background

The HRL Parties began working on the HRL Program in 2017. On December 12, 2018, the Directors of the California Department of Fish and Wildlife (CDFW) and California Department of Water Resources (DWR) appeared before the State Water Board in a public meeting to present the framework proposal for the program. The State Water Board then adopted a resolution directing staff to coordinate with the California Natural Resources Agency (CNRA) on the development of the HRL Program, which was at that time referred to as the Voluntary Agreements.

The HRL Program MOU was signed in 2022. Recognizing the need for expediency in updating the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan), the HRL Parties have been working diligently to further develop the HRL Program and provide significant detail to support the State Water Board's decision-making and the public's understanding of the program. In January 2023, the State Water Board released a Draft Supplement to the 2017 Scientific Basis Report that evaluated the science behind the HRL Program. In September 2023, the State Water Board also released a Draft Staff Report (and Substitute Environmental Document), which contained materials developed by the HRL Parties as appendices, including: a Draft Strategic Plan, Draft Governance Program, Draft Science Plan, and a Draft Early Implementation Project List. This allowed an opportunity for public review and comment on these draft documents alongside other alternatives under consideration by the State Water Board.

In order to further increase transparency and provide a venue for public dialogue, the HRL Parties coordinated with the State Water Board to develop three days of public workshops on the HRL Program in April 2024. In advance of the workshops, the HRL Parties released over 500 pages of draft legal agreements and plans for public review. These materials were developed to provide more detail on how the HRL Parties propose to implement the HRL Program. Over the course of the three days, the HRL Parties provided information on numerous wide-ranging topics and heard response panels and individual comments from Tribes, NGOs, water agencies, and other interested parties. The HRL Parties remain interested in further input from the State Water Board and public to help further refine elements of the HRL Program, such as the Governance Program, Science Plan, and selection and design of habitat projects. In fact, work on these elements has continued based on input received from the April 2024 State Water Board workshops.

The HRL Parties appreciated the robust dialogue at the April 2024 State Water Board workshops and look forward to continuing the conversation. In particular, as it relates to the Governance Program, it is important to recognize the statements made by Tribes that Tribal sovereignty must be respected in order to understand Tribal water issues and Tribal water rights, and the need for Government-to-Government communication and consultation. The HRL Parties are interested in engaging with Tribal governments as well as Tribal-affiliated organizations and Tribal communities to understand how they might wish to participate in the HRL Program. Similarly, the HRL Parties are interested in hearing from environmental NGOs who wish to participate in the development of the program. In addition to systemwide efforts to increase inclusion and outreach, the HRL Parties are working with Tribes, NGOs, and other interested parties on many tributaries at the watershed level.

Following is a description of the current Governance Program, a discussion of transparency and opportunities for Tribal and public participation, and a discussion of Tribal engagement.

Governance Principles and Structure

The HRL Parties have developed a Draft Governance Program document (Link) that describes the general governance structure and principles and how decisions about flow, habitat, science, adaptive management, and watershed-wide coordination will be made through a collaborative process. This document was substantially complete in 2019, with input from participating NGOs at that time. Since then, it has been updated to invite Tribal participation into the Governance Program and has a placeholder for a voting structure to be developed as part of a Systemwide Governance Committee Charter.

The HRL Program governance principles are:

- Inclusivity and collaboration
- Transparency
- Accountability to outcomes
- Respecting rights, authorities, and obligations
- Certainty and adaptability

- Consensus-seeking
- Science-based decision making
- Efficiency

The HRL Program structure provides for governance/decision-making at both the systemwide and tributary level, as shown in **Figure 1** below. The Systemwide Governance Committee (SGC) will oversee implementation of the Science Plan, manage deployment of systemwide assets, and be responsible for preparation of reports, management of finances, and strategic planning. A charter for the SGC will be developed to describe membership in the SGC, the voting structure, and a process for adding and removing members. The HRL Program hopes to engage with Tribes and NGOs to better understand how they wish to participate in systemwide governance, and that discussion will inform development of the charter. Although Tribes and NGOs are not currently participating, it is envisioned that membership in the SGC could be open to Tribes, as well as to NGOs who support the HRL Program's goals and are willing to work towards its success (e.g., by supporting the MOU). Over the next several months, the HRL Parties will work towards finalizing the specific process for determining eligibility to become a member and a voting structure, and input on those elements is welcome.

The HRL Program needs a voting structure that allows it to operate on "day one;" therefore, the early participation of Tribes and NGOs is critical for their input on the voting structure and participation in developing eligibility for membership and voting requirements. The charter will also include a process for onboarding new members, in case Tribes or NGOs choose to engage at a later date. There may also be opportunities for interested parties to participate in a nonvoting, advisory role. In addition, the HRL Program is designed to provide opportunities for non-participating parties to review and comment, particularly via public State Water Board workshops in years 3 and 6.

Under the HRL Program, each tributary and the Delta would have a regional-specific governance group to oversee implementation and reporting for that watershed, as well as to support the SWG in decision-making. The governance structure for each tributary and the Delta is described in the respective Implementation Agreements (Exhibit B to the Draft Global Agreement to the Healthy Rivers and Landscapes Program in the Bay-Delta). Tributary governance can provide additional opportunities for involvement by Tribes and other interested parties. For example, the Mokelumne River governance group would make use of an existing partnership structure that includes representatives from a local Tribe, NGOs, and local landowners. Similarly, the American River would rely on the Sacramento Water Forum for ongoing coordination on implementation of the American River Implementation Agreement. The Sacramento Water Forum includes a diverse group of business and agricultural leaders, citizen groups, environmentalists, water managers, and local governments.

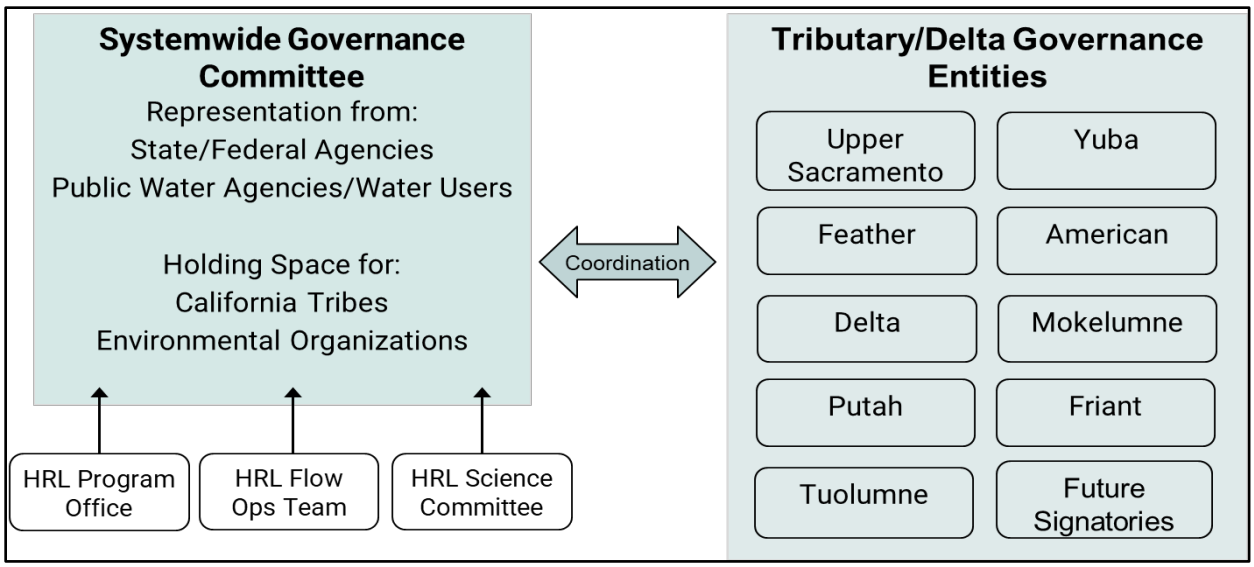


Figure 1. *The overall governance structure for the HRL Program is outlined in the Draft Governance Program and includes both systemwide governance and governance at the local watershed scale, which will be coordinated among the entities represented in the graphic above.*

The HRL Science Committee will be responsible for overseeing the Science Program to provide monitoring, research, tracking, and reporting on flow and habitat measures. Participation in the HRL Science Committee is open to non-signatories, and a public draft of a charter is in development. The Science Committee seeks collaboration with Tribal subject matter experts to incorporate Indigenous Knowledge as appropriate.

The Flow Operations Team will include water operations staff from each of the agencies with responsibility for implementing or coordinating systemwide flow measures. The group will provide input to the SWC and tributary governances on the options, feasibility, and risks of possible flow deployments and help coordinate overall operations.

The Program Office will be a neutral entity responsible for ongoing administration of the systemwide governance program that reports directly to the SWC. It may include staff such as an Executive Director and Science Manager. Primary responsibilities will include strategic planning, administrative support for the SWG, and work planning and financial administration.

Transparency and Public Participation

As described above, transparency and accountability are key governing principles of the HRL Program, which is designed to allow for sharing operations and results with the public and providing opportunities for input and dialogue during the eight-year program term (and extensions). Currently, the CNRA is hosting official information about the program on its website (Agreements to Support Healthy Rivers and Landscapes), including a compendium of program documents.

During the term of the HRL Program, an annual report describing compliance with flow and habitat measures using accounting methodology approved by the State Water Board will be prepared for

watersheds of each tributary and the Delta. The annual reports will include monitoring results, an update on the status and trends of native fish, progress on restoring habitat, and effort to seek new funding (if needed). These reports will be submitted to the State Water Board and made publicly available.

In addition, the HRL Program will prepare Triennial Synthesis Reports in years 3 and 6 that collate the preceding annual reports, synthesize the monitoring and reporting information, describe actions taken and their outcomes, and decisions made to divert from any default operations or habitat projects. The purpose is to provide a clear overview of what actions were taken, what was learned from these actions, and what subsequent actions would be supported. The Triennial Synthesis Reports will evaluate how the HRL Program-constructed habitat is supporting native fish by documenting the results of the accounting, suitability, and utilization effectiveness assessments. They will also analyze how species are responding to flow pulses in each system and identify trends. In Year 6, the HRL Program will prepare an Ecological Outcomes Report to synthesize the systemwide monitoring and research and make recommendations regarding continuance of the HRL Program. The Triennial Synthesis Reports will document the shared understanding of the Delta watershed ecosystem, building on the Scientific Basis Reports of 2017 and 2023, and will be foundational to the State Water Board's ultimate decision in years 6-8 on the continuation, modification, or cessation of the HRL Program, should it be adopted.

The State Water Board will convene informational workshops to accompany these Triennial Synthesis Reports that will provide a forum for the public to learn about the results, ask questions, and offer comments. In addition, the Science Committee is committed to using independent peer reviews to evaluate key products to increase transparency and ensure the scientific rigor of the HRL Program.

Tribal Engagement

The HRL Program is developing a long-term strategy for engagement with Tribal governments, Tribal-affiliated organizations, and Tribal communities. The HRL Parties recognize that there is significant effort needed to create a welcome and inclusive space for Tribes to support meaningful collaboration and relationship-building. Consistent with California Executive Orders B-10-11 and N-15-19, the HRL Parties respect Tribal sovereignty by acknowledging Tribes' sovereign authority over their members and territory and are committed to engaging in Government-to-Government consultation with Tribes regarding policies that may affect Tribal communities. The HRL Parties value and support Tribal consultation with meaningful collaboration to achieve common goals, including improvement of the overall ecosystem.

The State of California is also engaging with Tribal governments both regarding the Bay-Delta Plan update in general (through the State Water Board) and the HRL Program specifically. The CNRA is leading the formal process for engagement with Tribal governments on the HRL Program. CNRA, CDFW, and DWR hosted Tribal meetings in January and March 2024. The meeting in January included a Tribal Caucus to support inter-Tribal discussion and provide input and guidance to CNRA, CDFW, and DWR on future Tribal engagement. Since then, three Tribes have contacted CNRA to request Government-to-Government consultation under the CNRA's *Tribal Consultation Policy.*

At the Systemwide level, the HRL Program is developing a long-term strategy for engagement with Tribal governments, Tribal-affiliated organizations, and Tribal communities. The HRL Program intends to initiate a dialogue with these groups to help inform development of this Tribal Engagement Strategy, the intent of which will directly address common goals, including:

- Establishing a framework to integrate Indigenous Knowledge to expand knowledge and awareness of nature-based solutions, to improve inclusivity and program outcomes;
- Identifying opportunities to enhance Tribal outcomes of HRL Program implementation (e.g., Tribal water uses like cultural practices or subsistence fishing, involvement in restoration, participation in science);
- Identifying opportunities to integrate Tribal needs into projects developed under the HRL Program (e.g., identification and development of habitat restoration projects);
- Improving Tribal representation in the governance of system-wide and tributary decision making;
- Expanding the Science Committee independent peer reviewers to include Tribal subject matter expertise in areas of Indigenous Knowledge; and
- Acknowledging data sovereignty in the sharing of information, including Indigenous Knowledge, and the creation of data-sharing agreements, as requested by Tribal participants.

Indigenous Knowledge

The HRL Parties recognize the importance and value of Indigenous Knowledge as an integral component of using best available science to inform and improve the ecological outcomes of the HRL Program. In recognition of Tribal sovereignty, the HRL Parties also acknowledge Indigenous Knowledge is the intellectual and cultural property of Tribes and any reference to or application of Tribal Indigenous Knowledge would be subject to review and approval by the source Tribe.

The HRL Program will take steps to protect sensitive or confidential information shared by Tribes, and any data will be handled in alignment with the CARE (Collective benefit, Authority to control, Responsibility, and Ethics) data principles. Any habitat or flow projects based on Indigenous Knowledge would include preparation of a data-sharing agreement that defines how project results and deliverables would be used, in alignment with CARE principles.

Facilitating Tribal Participation

Tribal governments and communities' participation in the HRL Program is voluntary. Through Government-to-Government consultation, the HRL Program will learn how each Tribe wishes to participate and identify any additional support needed to facilitate active participation including funding or other mechanisms to increase Tribal capacity. The HRL Program also wishes to identify and support opportunities to compensate Tribes and Tribal representatives for their subject matter expertise to support integration of Indigenous Knowledge into the HRL Program.

Next Steps

The HRL Parties are committed to ensuring that there is transparency around development of the HRL Program and continued opportunities for public dialogue. Following are near-term actions:

- CNRA is updating its website to provide more information and a better “front door” to the HRL Program.
- CNRA will continue its official outreach to Tribes, including initiation of Government-to-Government consultation with those Tribes that have requested it.
- HRL Parties will continue development of the SGC Charter, Science Committee Charter, and Tribal Engagement Strategy, incorporating input obtained from Tribes at early Tribal meetings hosted by CNRA, during the April 2024 State Water Board workshops, and via comments received by the State Water Board on the September 2023 Draft Staff Report.
- HRL Parties will continue to develop Tribal relationships to support Tribal participation and information-sharing regarding activities specific to their tributaries.

Common Response: HRL Program Funding

Adequacy of HRL Program Funding

The Heathy Rivers and Landscapes (HRL) Program includes a Funding Plan (Exhibit G to the Draft Global Agreement to the Healthy Rivers and Landscapes Program in the Bay-Delta) that enhances the types of investments that have historically been made in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Estuary). The Funding Plan explains: (1) that significant funding for the HRL Program has already been secured; (2) that additional revenues to support the HRL Program will be generated from multiple sources, including from the Department of Water Resources (DWR), the United States Bureau of Reclamation (USBR) and other federal agencies, public water agencies, bonds and other state funding, and other sources; (3) that those revenues will support the acquisition of water and support science and habitat projects; and (4) the manner in which the revenues will be collected, directed, and disbursed.

For more than 35 years, federal, state, and local money has been used to support actions intended to protect and enhance the health of the Bay-Delta Estuary. The investments made over that period of time have been consistent and significant. The HRL Program funding plan reflects an investment by the United States and the State of California consistent with their past investments; however, those investments will be supplemented with a steady investment by public water agencies that participate in the HRL Program.

To ensure accountability, the Funding Plan discusses a financial entity to: (1) track incoming revenues and outgoing expenditures, (2) compile information and generate reports on the success of HRL Program funding, (3) compile information and generate reports on how contributed money is being spent, and (4) adopt contracting principles and maintain clear financial records.

Common Response: Potential Groundwater Impacts

Background

In September 2023, the State Water Board released a Draft Staff Report (and Substitute Environmental Document) for the Healthy Rivers and Landscapes Program (HRL Program). The Draft Staff Report discusses the potential impacts of groundwater pumping under the HRL Program, previously known as the Voluntary Agreements, on (1) surface water supplies (via stream-aquifer interactions); (2) wetlands and sensitive groundwater dependent natural communities; (3) subsidence conditions; and (4) greenhouse gas emissions.

The HRL Program's reliance on groundwater pumping is relatively small compared to the other actions the signatories (HRL Parties) to the 2022 Memorandum of Understanding Advancing a Term Sheet for the Voluntary Agreements (MOU) will undertake to make water available for flow contributions. In addition, when groundwater substitution is relied upon to make water available, the HRL Program includes enforceable tributary implementing agreements that will comply with or utilize principles similar to the United States Bureau of Reclamation (USBR)/Department of Water Resources (DWR) Draft Technical Information for Preparing Water Transfer Proposals (dated December 2019), commonly referred to as the "Water Transfer White Paper." These principles are designed to ensure no injury to other legal users of water, no unreasonable effects on fish and wildlife, and appropriate mitigation for adverse environmental impacts.

Moreover, tributary-specific actions and requirements, as summarized below, will be in place to ensure that no significant adverse environmental effects from groundwater pumping occur and that no additional mitigation is therefore necessary or appropriate.

Sacramento River Mainstem Groundwater Considerations

The Sacramento Mainstem Implementing Agreement (SMIA) (Exhibit B7 to the Draft Global Agreement to the HRL Program) proposes a maximum (20%) of the 100,000 acre-feet (AF) total flow contribution can come from groundwater pursuant to Appendix 1, Section 1.1 of the SMIA. Groundwater pumping under the SMIA will need to be approved by Sustainable Groundwater Management Act (SGMA) Groundwater Sustainability Agencies (GSAs) consistent with applicable Groundwater Sustainability Plans (GSPs) and applicable environmental review processes.

To account for water made available by the HRL Program through groundwater substitution, the Sacramento River Settlement Contractors (SRSCs) will identify and coordinate with USBR, in accordance with the Water Transfer White Paper, on the following:

a. The amount of increased pumping to provide HRL Program flow.
b. Location and characteristics of the groundwater wells used.
c. Historical groundwater pumping records for identified wells to establish a reference groundwater pumping volume that would occur absent the HRL Program.

d. A monitoring plan to assess the effects of groundwater pumping for the HRL Program and implementation of a mitigation plan.
e. Mutually agreed value for the streamflow depletion factor between the SRSC, USBR, and DWR for the HRL Program.

American River Groundwater Contributions

The North and South American River Subbasins contain the wells anticipated to make water available for HRL Program flow contributions from the American River through groundwater substitution. This contribution will occur as water providers reduce demands from the Lower American River and Folsom Reservoir, and instead shift to using groundwater in Dry and Critical water year types – leaving more water in the river or in reservoir storage.

Groundwater contributions will come from wells and conveyance facilities located in the Sacramento Regional Water Bank (Bank)[1]. The Bank is identified in both the North and South American River Basin GSPs as a project and management action that will aid in achieving groundwater sustainability. The American River region has a successful 20+ year history of providing sound conjunctive use[2] – that is, allowing the aquifer to recharge or actively putting water into the ground in wet conditions, and using stored water instead of surface water diversions in dry conditions. In turn, this use of groundwater in dry conditions allows more water to be saved in storage or remain in the Lower American River in the times when it is most needed. This conjunctive use program forms the backbone of the Bank, and the region is one of the only areas in California that has successfully stabilized and improved groundwater levels.

Well operators understand the constraints and opportunities within the system and are familiar with how much water can be pumped without creating significant impacts to the aquifer. The American River Implementing Agreement (Exhibit B1 to the Draft Global Agreement to the HRL Program) establishes a groundwater-derived contribution to HRL Program flows of 30 thousand acre-feet (TAF) during Dry and Critical water years, with the potential of an additional 10 TAF of water in Dry years. Local GSAs have preliminarily determined this contribution to be sustainable and will monitor results during the implementation of the HRL Program to ensure sustainability. In addition, the Bank includes an annual recharge of up to 65 TAF or annual recovery of up to 55 TAF, which provides a margin of safety to prevent against overdraft.

[1] For more information on the Bank, visit: https://sacwaterbank.com/

[2] California's Groundwater Live: Groundwater Levels provides 20-year groundwater level trends. This interactive dashboard shows that the American River subbasins have improved groundwater levels since the onset of conjunctive use. Visit: https://storymaps.arcgis.com/stories/b3886b33b49c4fa8adf2ae8bdd8f16c3

For the American River, a majority of wells used will have energy coming from Sacramento Municipal Utility District, which is on target to be 100% renewable by 2030[3]. In addition, all groundwater pumping will occur from electrically powered wells; diesel wells will not be used.

Feather River Groundwater Considerations

The Feather River Implementing Agreement (FRIA) (Exhibit B3 to the Draft Global Agreement to the HRL Program) proposes a maximum (20%) of the 60,000 AF total flow contribution can come from groundwater pursuant to Exhibit A (Water Transfer Agreement) of the FRIA. As discussed with the Sacramento Mainstem, groundwater pumping will need to be approved by SGMA GSAs consistent with applicable GSPs and applicable environmental review processes. The Feather River Service Area contractors (FRSAC) will identify and coordinate with DWR, in accordance with the Water Transfer White Paper, on the following:

a. The amount of increased pumping to provide HRL Program flow.
b. Location and characteristics of the groundwater wells used.
c. Historical groundwater pumping records for identified wells to establish a reference groundwater pumping volume that would occur absent the HRL Program.
d. A monitoring plan to assess the effects of groundwater pumping for the HRL Program and implementation of a mitigation plan.
e. Mutually agreed value for the streamflow depletion factor between the FRSAC, USBR, and DWR for the HRL Program.

[3] For more information on the 2030 Zero Carbon Plan and to read progress reports, visit: https://www.smud.org/Corporate/Environmental-Leadership/2030-Clean-Energy-Vision

Common Response: Accounting of HRL Program Habitat Assets

Background

According to Governor Newsom's California Salmon Strategy for a Hotter, Drier Future, over 90 percent of historic salmon spawning and rearing habitat has been lost to dams and levees; the quantity and quality of habitat currently available cannot support historic abundances of native fish populations. In acknowledgement of such, the Healthy Rivers and Landscapes (HRL) Program, previously called the Voluntary Agreements, is a comprehensive approach that integrates flow and non-flow measures, including habitat restoration, to achieve the Narrative Salmon Objective and proposed Narrative Viability Objective of the updated Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan).

The signatories (HRL Parties) to the 2022 Memorandum of Understanding Advancing a Term Sheet for the Voluntary Agreements (MOU) are committed to implementing non-flow measures such as habitat enhancement and restoration projects (as described in Appendix 2 of the MOU) to contribute towards achievement of the Narrative Salmon and Viability Objectives. The HRL Program portfolio of non-flow measures was developed based on best available science (see Common Response: Species Habitat and Abundance) to deliver the habitat acreages listed in Appendix 2 of the MOU and, together with HRL Program flow actions, would provide 25% of the habitat needed for a doubled salmon population. Implementing these non-flow measures in the form of restoration actions is a critical component of the HRL Program. A system for non-flow measure accounting and assessment will be enacted to track habitat assets developed under the program, which will provide opportunities for collaboration, oversight, and adaptation.

Non-Flow Measure Accounting Protocols

The HRL Parties intend to plan, design, and construct projects implementing non-flow measures that reflect best available science related to target species' habitat needs and life stages and will engage with CDFW early on for consultation on project design. In addition, projects implemented under the HRL Program are expected to refer to established manuals for habitat restoration project design, such as the California Salmonid Habitat Restoration Manual and National Marine Fisheries Service (NMFS) guidelines for fish passage facilities (NMFS 2023) and will apply the best available science for zooplankton production in shallow water areas for duration and water temperature conditions (e.g., as described in Corline et al. 2017).

The HRL Program Draft Strategic Plan (Appendix G1 to the State Water Board's Draft Staff Report, released in September 2023) includes quantitative and narrative design criteria for certain non-flow measures, including tributary spawning habitat, in-stream rearing habitat, and tributary floodplain rearing habitat (Draft Strategic Plan, Table 27). The Strategic Plan also discusses non-flow measures

without pre-determined design criteria (e.g., tidal wetland habitat projects, bypass floodplain rearing habitat projects); prior to implementation of such projects, they will go through a review process under the HRL Program Science Committee to ensure consistency with requirements of the HRL Program. When a habitat enhancement or restoration project is implemented as a non-flow measure under the HRL Program, non-flow measure accounting steps will be followed; these are described in the Draft Strategic Plan, Section 3.1.4, and further detailed in the Non-Flow Measure Accounting Protocol, which is Appendix F to the Draft Strategic Plan, submitted separately in March 2024.

Fish habitats are complex and dynamic mosaics, and non-flow measure accounting protocols must be both comprehensive and specific enough to ensure accountability. The tributary habitat non-flow measure accounting protocols require quantification of the area of restored and/or enhanced habitat across a project site, accomplished by assessing the extent to which science-based design criteria have been met in both the pre-project and as-built conditions. This method enables a determination of where design criteria (e.g., depth, velocity, substrate, cover) are met within the project footprint over a range of design flows and avoids "double-counting" for the same habitat at the same location across the range of design flows (e.g., a specific location that provides rearing habitat at multiple flow levels is only counted once). Similarly, this method will ensure that only suitable portions of the project area will be counted and not the entire construction footprint. The method also accounts for habitat losses in locations that might have met the design criteria before the project but may no longer do so post-construction. Results of the project-level accounting process will be provided in the annual reports prepared by the HRL Program Systemwide Governance Committee (SGC) and submitted to the State Water Board.

Individual project-level results will be aggregated for all projects in a tributary, to be compared against the amount of additional habitat acres specified in Appendix 2 of the MOU commitments to determine whether the commitments have been achieved. Non-flow measure accounting will also include the development (or revision) of habitat-flow relationships over a range of flows, reflective of those assumed in the 2023 Final Draft Scientific Basis Report Supplement (SBRS) for each tributary. Development of these new or revised relationships will form the basis of a Consistency Assessment, which will compare the availability of habitat over the range of applicable flows realized through HRL Program implementation, with the assumptions made in the SBRS. These results will be reported within the triannual synthesis reports in Year 3 and 6, submitted to the State Water Board by the SGC.

Additional Non-Flow Measure Assessments

In addition to the accounting process, the Draft Strategic Plan (Section 3.1.3) describes two additional non-flow measure assessments that will serve important roles in ensuring that implementation of the HRL Program contributes to ultimately meeting the Narrative Salmon Objective and Narrative Viability Objective.

- Habitat Suitability Assessments – The purpose of this assessment is to determine if habitat is suitable for target species and life stages. The assessment will consider habitat suitability design criteria, as well as additional factors that may affect species utilization and their ability to feed,

grow, avoid predators, and reproduce in the new or enhanced habitat. This process will allow for design criteria adaptation and will be provided in the triannual synthesis reports submitted to the State Water Board by the HRL Program Science Committee.

- Utilization and Biological Effectiveness Assessments – The objective of this assessment is to answer the question: "Did the projects achieve expected benefits?" This assessment will determine whether target species are using the new or enhanced habitat areas, are exhibiting expected near-term benefits (e.g., improved fish passage, increased growth rate) that can be attributed to the completed habitat action, and whether these measures are achieving or are likely to achieve the anticipated ecological outcomes by creating, restoring, or enhancing the habitat of one or more target species and life stages. These results will also be provided in triennial reports to the State Water Board and will be the subject of informational public workshops.

The Draft Science Plan (Appendix C to the Draft Strategic Plan) provides a comprehensive approach for evaluation of non-flow measure outcomes, including a set of hypotheses and associated monitoring for developing and conducting the assessments outlined above. These assessments, as described in Appendix 4 of the MOU, are intended to ensure non-flow measures function as intended, to benefit native fish and contribute to meeting the Narrative Salmon and Narrative Viability Objectives. Documentation of the efficacy of non-flow measures will further the collective understanding of how suitable habitat contributes to native fish viability and will inform subsequent habitat restoration actions throughout the watershed.

The non-flow measure accounting and assessment processes create opportunities for the HRL Science Committee to engage in design criteria development, review, and adaptation. The HRL Parties will collectively capitalize on opportunities to seek consensus and demonstrate accountability to desired outcomes and efficiency in the implementation and assessment of non-flow measures.

Common Response: Upstream Temperature Protection

The Healthy Rivers and Landscapes (HRL) Program is designed to balance various ecological objectives so that flow contributions from each Delta tributary are provided in a manner that will meet applicable water temperature management requirements, while also providing a significant contribution to Delta inflow. As such, no mitigation or separate temperature requirements are necessary.

In addition, signatories (HRL Parties) to the 2022 Memorandum of Understanding Advancing a Term Sheet for the Voluntary Agreements (MOU) acknowledge the importance of having clear rules and methods that address inflow/temperature if and when the State Water Board adopts the HRL Program. Summaries of tributary-specific water temperature management efforts related to the HRL Program are provided below.

Sacramento River Water Temperature Management Efforts

Pursuant to Appendix 1 of the Sacramento River Mainstem Implementing Agreement (SMIA) (Exhibit B7 to the Draft Global Agreement to the Healthy Rivers and Landscapes Program in the Bay-Delta), the Sacramento River Settlement Contractors (SRSC), in coordination with the Bureau of Reclamation's (USBR) operation of Shasta Dam, will perform a series of additional flow commitments intended for one or more of the following outcomes: (1) augment the flow regime required by the then-current Biological Opinions governing long-term operations of the Central Valley Project (CVP) on the Sacramento River mainstem during specific seasons of the year, (2) provide additional pulse flows at biologically sensitive periods, and (3) preserve cold-water pool to ensure viability of fish species during the warm summer months.

Pursuant to Section 1.3 of Appendix 1 of the SMIA, the 100,000 acre-feet (AF) flow contribution from the SRSC will require the reoperation of Shasta Reservoir, which is owned and operated by USBR. The SRSC and the Department of Water Resources (DWR) will coordinate with USBR so that reoperation of Shasta Reservoir will involve the following actions in the order presented below (see Section 2.3.2 of the Draft HRL Program Strategic Plan, Appendix G1 to the State Water Board's Draft Staff Report, released in September 2023):

1. If the water year is designated Dry, Below Normal, or Above Normal, the SRSC will implement actions to make 100,000 AF of water available as HRL Program flow contributions.
2. HRL Program governance entities (Sacramento River tributary-specific governance group and the Systemwide Governance Committee) will decide on a recommended "spring action" (i.e., a pulse flow) based on the framework in the HRL Program Strategic Plan. An evaluation of Shasta Cold Water Pool would be completed to ensure any spring action would not impact winter-run salmon cold-water temperature requirements that align with the applicable Biological Opinions and State Water Board water right requirements.

3. Recommendations by the HRL Program governance entities require approval from at least two of the following agencies: National Marine Fisheries Service (NMFS), California Department of Fish and Wildlife (CDFW), and/or the State Water Board.
4. If a spring action is not possible (for example, because of winter-run salmon cold-water temperature requirements) or needed, the HRL Program governance entities would discuss other options for the block of water made available subject to USBR approval, which could include:
    a. Making the water available instream per the fallowing schedule;
    b. Holding the water in storage in Shasta Reservoir until the fall to help meet fall flow and temperature requirements for fall-run Chinook salmon; or
    c. Carrying the water over into the next water year for a spring action, or a summer/fall action, while ensuring decision-making is clear and accounting is done through an approved methodology (subject to any additional necessary regulatory approvals still under development).

For the options listed above, if any option falls outside of the flexibility bracket (as defined in the Draft HRL Program Strategic Plan, Section 2.3.1), the Implementing Parties (parties that sign the SMIA) would seek prior approval from the State Water Board to make appropriate adjustments.

Pursuant to Section 2 (Flow Measures) of the Sacramento Draft Quantitative Flow Accounting Procedures (presented in the HRL Program Flow Accounting Protocol, which is Appendix E to the Draft Strategic Plan, submitted separately in March 2024), below are the primary quantitative procedures for: 1) measuring HRL Program flow deployment; and 2) confirming HRL Program flow contributions were made available or verified based on fallowing and groundwater substitution.

Sacramento River HRL Program flows will occur in Dry, Below Normal, and Above Normal years based on the Sacramento Valley Water Year Hydrologic Classification for a total quantity of up to 100,000 AF from the SRSC. Pursuant to the HRL Program Draft Strategic Plan, the default deployment of HRL Program flows will be during April and May of Above Normal years, assuming the deployment will not compromise temperature management on the upper Sacramento River. HRL Program flows will be provided on an irrigation schedule during Below Normal and Dry years from Shasta Reservoir, and flow deployment and operations will be coordinated between USBR and the SRSC pursuant to an MOU. Water will be made available through fallowing and groundwater substitution. The SRSC expect that all fallowed lands and groundwater wells to be used in program implementation will be identified and enrolled prior to the commencement of the HRL Program and completion of appropriate environmental documentation.

Pursuant to Section 3.1.2 of the Sacramento Draft Quantitative Flow Accounting Procedures, and as described in the SMIA, the Sacramento River governance group and the Systemwide Governance Committee will decide on a recommended spring action based on the framework in the HRL Program Strategic Plan, Section 2.3.2 (as outlined above).

HRL Program flow deployment coordination with USBR and the Sacramento River governance group will start at least one month in advance of deployment and no later than February 1. These up-to-weekly coordination meetings are intended to allow for real-time data assessment including, but not limited to, updates on the monthly Water Year classification, current storage and releases, fish survey data,

downstream demands, and any operational limitations. Prior to February 1, meetings will occur monthly, or as needed, to review fall/winter operations, ensure assets are in place for the coming year, and evaluate potential actions. Similar meetings will be occurring for the implementation of the then-current Biological Opinions governing long-term operations of the CVP).

Yuba River Water Temperature Management Efforts

In 2008, Yuba Water Agency (Yuba Water) began operating the Yuba River Development Project to meet the instream flow requirements of the Yuba Accord, resulting in a new flow regime on the lower Yuba River that was specifically designed to improve water temperatures for anadromous fish. Over the past 16 years, implementation of the Accord flow schedules has provided colder water during the summer and fall to benefit fish. Based on monitored water temperatures shown in the Yuba Accord Monitoring & Evaluation Draft Interim Report (RMT 2013), during post-Accord implementation years relative to pre-Accord years, the Accord resulted in water temperature reductions during late spring through summer, including 2 to 4°F reductions during the warmest portions of the monthly distributions.

Pursuant to Appendix 1 of the Yuba River Implementing Agreement (Exhibit B10 to the Draft Global Agreement), the proposed Yuba Water HRL Program flow contributions of 50,000 acre-feet will occur in dry, below-normal, and above-normal water year types. The three primary design objectives of Yuba Water HRL Program flow contributions are to:

1) Sustain water supply reliability to Yuba Water Member Units;
2) Maintain the occurrence of higher flow schedules of the Accord; and,
3) Preserve the cold-water pool in New Bullards Bar Reservoir, providing cold water for the lower Yuba River, all while providing a significant contribution to Delta inflow during the spring.

Meeting these three objectives ensures preservation of the beneficial water temperature regime of the lower Yuba River under the Accord. Irrigation water for Yuba Water Member Units is diverted at Daguerre Point Dam (about halfway down the lower Yuba River), with the most valuable habitat for lower Yuba River salmonids located above Daguerre Point Dam. Along with the higher flows based on the Accord flow schedules, irrigation water supply deliveries at the Daguerre Point Dam point of diversion during the months of April through November achieve the following:

- Provide flows to optimize flow-habitat relationships in the most valuable reach of the river;
- Supply the mechanism for providing cold water from New Bullards Bar Reservoir to the lower Yuba River; and,
- Limit water temperature warming in the river along the way.

Yuba Water's releases of water for irrigation deliveries in the summer and fall support much cooler river temperatures because those releases from New Bullards Bar Reservoir cold water storage provide cooler water temperatures in the most valuable habitat for lower Yuba River salmonids. Therefore, the three objectives work together to enhance water temperature conditions in the lower Yuba River.

The Yuba Water HRL Program flow contributions are designed to provide a stored-water release that would be a significant contribution to Delta inflow without diminishing the water temperature benefits of higher flow Accord schedules, irrigation deliveries, and/or cold water availability in New Bullards Bar Reservoir. After extensive study and analysis in the development of the HRL Program flow contributions,

Yuba Water determined that operating to a storage level of 600,000 AF (50,000 AF below the Yuba Accord end-of-September target of 650,000 AF) could contribute to higher Delta inflows without significant impacts to the Accord water temperature objectives. Conversely, Yuba Water determined that releasing water from storage or bypassing water during the springtime, without regard for the effects on New Bullards Bar Reservoir storage, which in turn impacts irrigation deliveries, would cause water temperatures in the lower Yuba River to be much higher than current conditions.

Yuba Water's technical analysis supporting its HRL Program flow contributions shows that water supplies are protected, Accord flow schedules are not significantly degraded, and New Bullards Bar Reservoir cold water pool is not substantially reduced during the driest years when water temperature management is most critical.

In summary, the Yuba Water HRL Program flow contributions have been designed to maintain the substantial water temperature benefits achieved with the Yuba Accord over the past 16 years, providing suitable water temperatures for anadromous fish in the lower Yuba River.

American River Water Temperature Management Efforts

Water temperature is a key limiting factor for salmonid survival in the Lower American River (LAR). Sacramento metropolitan water providers in the American River watershed (Water Providers), through their participation in the Sacramento Water Forum (Water Forum), have been collaborating with USBR to manage Folsom Reservoir and Dam to ensure adequate cold water storage and flows for fish in the LAR. This collaboration has been memorialized in a 2021 Memorandum of Understanding (MOU) between the Water Forum and USBR[1] and includes multiple important actions, including facilitation of the development and management of an adequate annual cold water pool in Folsom Reservoir.

Through its 20+ years of existence, the Water Forum has learned a great deal about the LAR and how changes in reservoir operations can impact cold water pool formation, which is critical to fall-run Chinook salmon and steelhead survival. These learnings are incorporated into the Modified Flow Management Standard[2] (MFMS), which was also included in the 2019 Biological Opinion for the Reinitiation of Consultation on the Long-Term Operations of the Central Valley Project and State Water Project (NMFS BiOp) and in the current Biological Assessment (which was prepared by Reclamation to support the 2021 Reinitiation of Consultation of the Long-Term Operation of the Central Valley Project and State Water Project).

Based on scientific studies over the years on the American River, it has been found that water temperature is equally, if not more, important than flows in improving conditions for fish[3]. The NMFS BiOp provides for an end-of-December storage target. This target puts a limit on the amount of water that can be released from storage between June and December from Folsom Reservoir, which provides a cold water pool reserve and helps to maintain water temperatures in the LAR. Cold water is built up in the reservoir from February through the end of May and is most important in the June through October

[1] Memorandum of Understanding Between the United States of American Department of the Interior, Bureau of Reclamation and Sacramento Water Forum for Coordination of Communication and Information -Sharing Activities Related to Lower American River Operations, March 29, 2021.

[2] The Lower American River Modified Flow Management Standard, Sacramento Water Forum, October 2015.

portion of the juvenile steelhead rearing season as temperatures in the river warm. During this period, flows released from Folsom's reserved cold water pool help to keep river temperatures cool and reduce physiological effects to salmonids. Gages at compliance points along the river keep track of water temperatures. These compliance points have been assigned maximum thresholds for temperature; a single degree of increase can result in adverse effects to fish, such as increased susceptibility to disease, predation, egg mortality, and/or death.

Using both observed and modeled data[3], there is evidence that if July storage is forecasted to be 500 thousand acre-feet (TAF) or lower, every 70 TAF less of water held in storage would increase maximum temperatures by 1˚F or more, see **Figure 1**. This degree of warming would put the LAR over the temperature threshold at the most sensitive compliance points during the juvenile steelhead in-river rearing period. The American River HRL Program proposed flow contributions (outlined in the American River Implementing Agreement, Exhibit B1 to the Draft Global Agreement) provide a maximum of 40 TAF of flow in Dry water years in the March through May period. This achieves the State Water Board's intention of providing spring pulse flows downstream and into the Delta without significantly compromising cold water pool formation and protection.

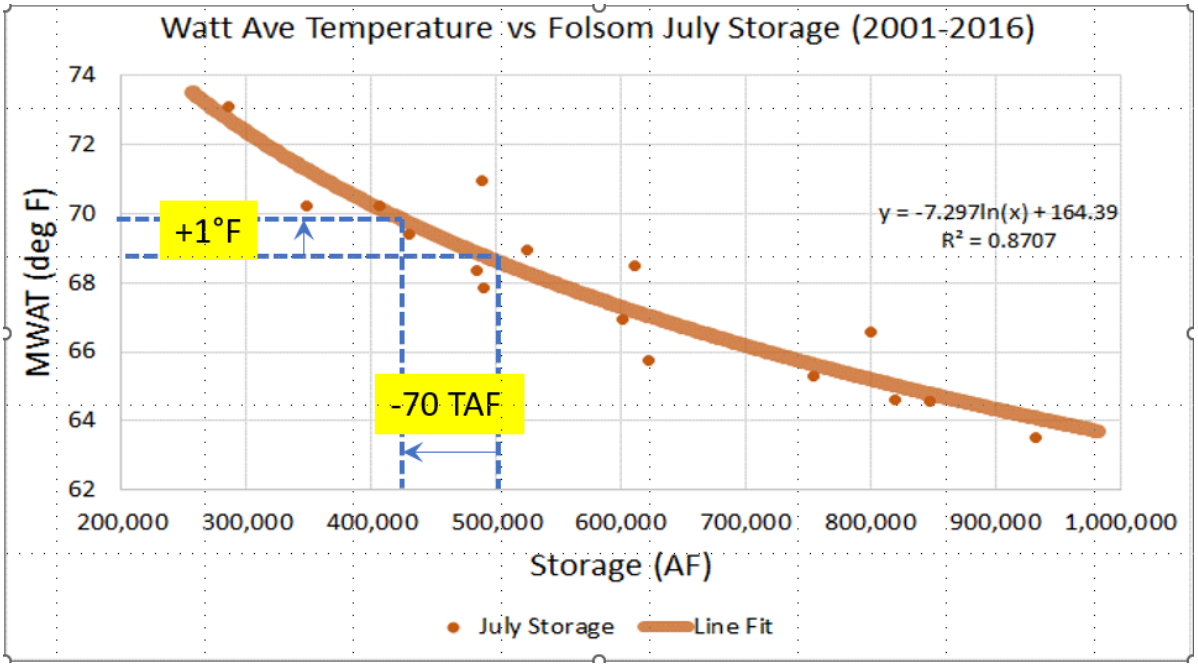


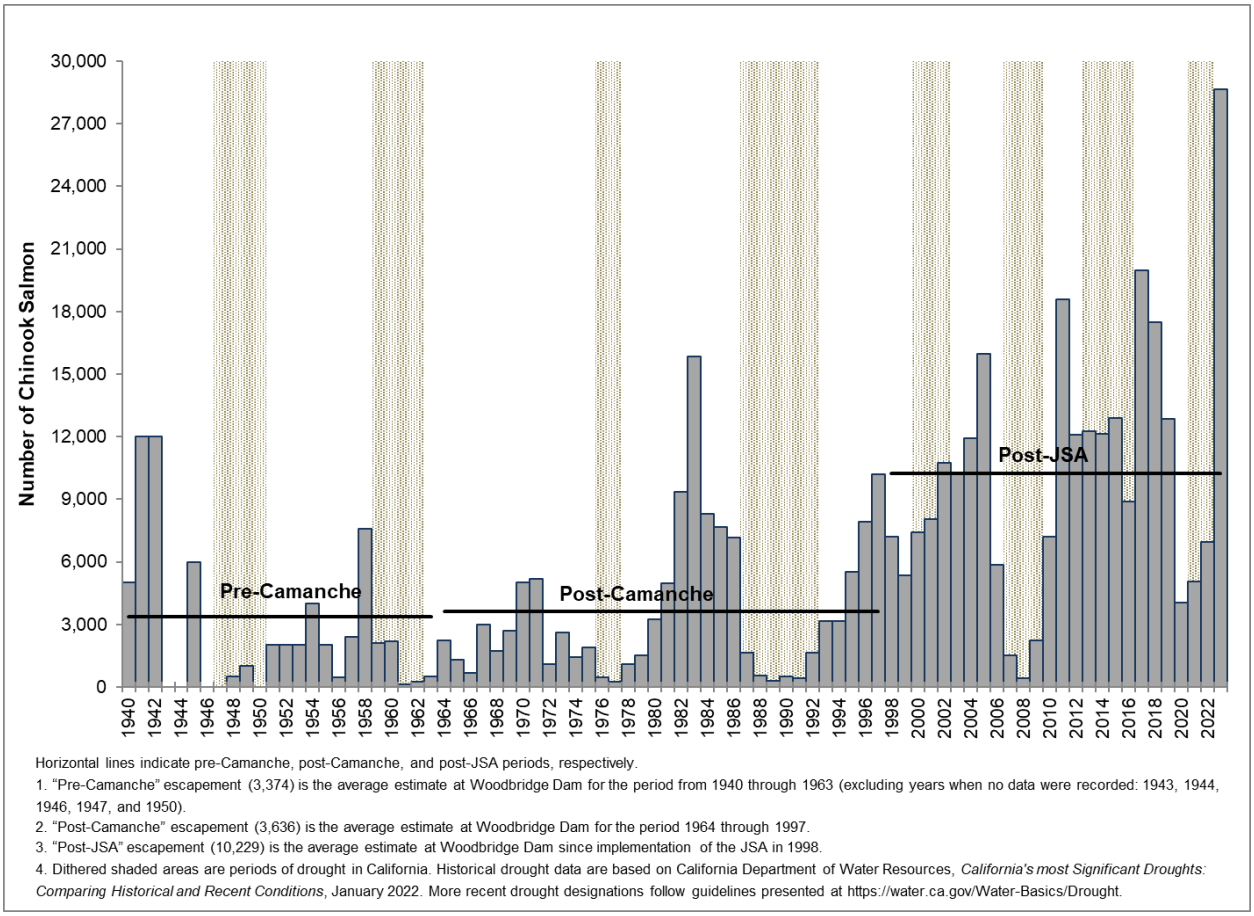
Figure 1. *Folsom Reservoir Storage Versus Lower American River Water Temperature at Watt Avenue (maximum weekly average temperature, MWAT)*[4]

[3] https://www.cwemf.org/Pubs/TempReview.pdf

[4] From presentation to the Sacramento Water Forum Plenary, chart by Craig Addley, July 2023. Full plenary available at: https://www.youtube.com/watch?v=GmjQYoDY1U0

Mokelumne River Water Temperature Management Efforts

In 1998, East Bay Municipal Utility District (EBMUD), CDFW, and the U.S. Fish and Wildlife Service (USFWS) entered a Joint Settlement Agreement (JSA) that protects and enhances conditions for the anadromous fish population and associated ecosystem in the Lower Mokelumne River, while protecting the reliable, high-quality water supply for EBMUD's 1.4 million customers. Since implementation of the JSA-required flow releases and temperature management practices, the Mokelumne River's average salmon returns to the river have more than doubled from 3,542 (1940 to 1997 average) to 10,229 (1998 to 2023 average). **Figure 2** shows the increase in returns of fall-run Chinook salmon over time, with a record of over 28,000 fish in the 2023 season.



Horizontal lines indicate pre-Camanche, post-Camanche, and post-JSA periods, respectively.

1. "Pre-Camanche" escapement (3,374) is the average estimate at Woodbridge Dam for the period from 1940 through 1963 (excluding years when no data were recorded: 1943, 1944, 1946, 1947, and 1950).
2. "Post-Camanche" escapement (3,636) is the average estimate at Woodbridge Dam for the period 1964 through 1997.
3. "Post-JSA" escapement (10,229) is the average estimate at Woodbridge Dam since implementation of the JSA in 1998.
4. Dithered shaded areas are periods of drought in California. Historical drought data are based on California Department of Water Resources, *California's most Significant Droughts: Comparing Historical and Recent Conditions*, January 2022. More recent drought designations follow guidelines presented at https://water.ca.gov/Water-Basics/Drought.

Figure 2. *Mokelumne River Fall-Run Chinook Salmon Returns*

The JSA includes a provision for cold water management to support downstream temperatures. It requires EBMUD to use its best efforts to maintain Pardee and Camanche Reservoir stratification with a minimum of 28,000 acre-feet of hypolimnetic volume (the volume of water colder than 16.4℃) in Camanche Reservoir through October, whenever Pardee Reservoir volume exceeds 100,000 acre-feet. This provision for temperature management necessitates adaptive, flexible operations of both Pardee and Camanche reservoirs.

This water temperature requirement and other water quality requirements were established to support fall-run Chinook salmon and steelhead in the Mokelumne River during the critical fall spawning and incubation period. To manage the system to achieve that volume, or a comparable adaptive approach to ensure cold water for salmon in the fall, there are multiple actions that EBMUD can take. These include: joint operation of Pardee and Camanche reservoir releases to maximize cold water transfer efficiency from Pardee to Camanche and minimize cold water losses within the system; releasing warmer surface water from the Camanche Reservoir high level outlet in place of cold water releases from the bottom of the reservoir when acceptable downstream (typically April through September) to conserve cold water for fall; and minimizing cold water diversions into the Pardee Reservoir Tower (which serves the aqueducts to the service area) to preserve cold water in Pardee for supporting the downstream cold-water pool in Camanche Reservoir.

The goal of the Mokelumne River HRL Program proposed flow contributions (outlined in the Mokelumne River Implementing Agreement, Exhibit B5 to the Draft Global Agreement) is to build on the JSA successes in the Lower Mokelumne River through a mix of flow and non-flow measures that benefit anadromous fish, increasing spring flow contributions without any significant effect on Camanche Reservoir release temperatures.

The Mokelumne River HRL Program proposed flow contributions were developed to provide biologically beneficial flow regimes below Camanche Dam based on ambient conditions when those flows are most beneficial to Mokelumne River fisheries. The Implementing Agreement contains an off-ramp for HRL Program flows so that, during very dry years, EBMUD can hold more water in Pardee and Camanche Reservoirs for temperature management. The off-ramp applies when EBMUD's March 1 median forecast of combined Pardee and Camanche Reservoir storage at the end of September is projected to be below 350 TAF. In these off-ramp years, JSA-required flows would continue to be provided. The purpose of the off-ramp is to preserve the cold water hypolimnetic volume for use to benefit fall spawning and incubation temperatures on the Lower Mokelumne River in successive JSA-defined Dry water year types (*i.e.* droughts), when carryover storage is expected to be lower than average, and the volume of cold water runoff available is lower due to drought conditions. The proposal provides that the entirety of the obligated block flow (except in off-ramp years) will be released during the designated year. The proposed Mokelumne River contributions anticipate 70 to 90 percent of full annual volume to be released in the March through May period for fry and juvenile rearing and out-migration, and 10 to 30 percent to be released in October for adult migration, spawning, and incubation.

In summary, the Mokelumne River HRL Program flow contributions have been designed to build on the substantial fishery benefits achieved with the JSA over the past 26 years, providing enhanced ecosystem conditions through a combination of flow and non-flow measures, while maintaining the ability to manage temperatures in the Lower Mokelumne River.

Feather River

The Feather River plays a critical role in maintaining the populations of Central Valley spring-run and fall-run Chinook Salmon and steelhead.

Minimum Feather River flow requirements are prescribed in the 1983 "Agreement Concerning the Operation of the Oroville Division of the State Water Project for Management of Fish and Wildlife" between CDFW and DWR (1983 Agreement). At a minimum, the releases from Oroville Reservoir must meet the monthly instream flow requirements pursuant to the 1983 Agreement. Feather River temperature requirements are also prescribed in the 1983 Agreement as well as in the 2004 Biological Opinion on the Long-Term Central Valley Project and State Water Project Operations Criteria and Plan (NMFS 2004).[5] Maintaining sufficient storage in Lake Oroville throughout the summer provides for a more efficient temperature control of reservoir releases, where the intake level from which releases are made can be selected to avoid depleting large volumes of cold water not needed for downstream temperatures, and conserve the colder water for the later summer and fall for fisheries.

Water removed from deeper in Lake Oroville will have a lower temperature, and the main intake structure at Lake Oroville allows operators to control the elevation at which water is removed from the lake. In wetter years, typically there is enough water to manage all temperature requirements. But, in drier years, inadequate storage in the early to late fall often requires State Water Project (SWP) operators to begin blending warmer water being conveyed through the main Hyatt Powerplant intakes with colder water from the low-level River Valve Outlet System (RVOS). The RVOS is at the bottom of the lake and can access the coldest part of the cold water pool. Blending operations balance the releases from Hyatt and RVOS as needed to meet the temperature requirements. Consequently, releases from the RVOS reduce power generation.

Similar to the Sacramento River, Oroville Reservoir will be used to facilitate HRL Program proposed flow contributions from Feather River water agencies, which hold diversion agreements with the State of California and will be fallowing land and taking other actions to reduce consumptive use of water in the Feather River system. The goal of the Feather River HRL Program proposed flow contributions (outlined in the Feather River Implementing Agreement, Exhibit B3 to the Draft Global Agreement) is to provide 60 TAF of water in the March to May period, facilitated through Oroville reoperations. DWR will release water to contribute environmental flows to the watershed and will recover this water during the irrigation season, with reductions in delivery through land fallowing and ground water substitution with Feather River water agencies. In addition, reservoir operators upstream of Oroville will help recover Oroville storage through reservoir reoperation, by using upstream reservoirs to capture water when not impactful to others and providing that water when needed. It is anticipated that, in a year with a flow action (Dry, Below Normal and Above Normal water year types), about 80 percent of the storage will be recovered prior to mid-September, thus limiting the impact on temperature management.

[5] The 2006 Federal Energy Regulatory Commission (FERC) Settlement Agreement, which will become effective upon issuance of the new FERC license, incorporates Feather River temperature requirements, with some minor adjustments based on the 2016 NMFS BiOp.

Tuolumne River[6]

In 1996, the Modesto and Turlock Irrigation Districts (the Districts) began operating the Don Pedro Reservoir to meet the instream flow requirements of the 1995 FERC Settlement Agreement, resulting in a new flow regime on the lower Tuolumne River, specifically designed to improve instream habitat conditions for anadromous fish. Specifically, implementing the 1995 FERC Settlement Agreement flow schedules has provided colder water during the summer to benefit steelhead.

The primary design objectives of the Tuolumne River HRL Program proposed flow contributions (outlined in the Tuolumne River Implementing Agreement, Exhibit B9 to the Draft Global Agreement) are to:

1) Provide higher flow schedules than the 1995 FERC Settlement Agreement tied specifically to lower Tuolumne River science, especially in Dry and Critical years; and
2) Preserve the cold-water pool in Don Pedro Reservoir compared to unimpaired flow proposals, providing cold water for the lower Tuolumne River, and providing a contribution to Delta inflow during the spring.

Along with the higher flows proposed by the Tuolumne River HRL Program flow contributions, irrigation water supply deliveries at infiltration galleries[7] located at river mile (RM) 26 achieve the following:

- Provide flows to prioritize flow-habitat relationships in the most valuable reach of the river;
- Supply the mechanism for providing cold water from Don Pedro Reservoir to the lower Tuolumne River and still maintain irrigation deliveries; and
- Limit water temperature warming in the river along the way.

These objectives work together to enhance water temperature conditions in the lower Tuolumne River.

The Tuolumne River water agencies recognize a need to avoid temperature degradation from implementation of the HRL Program flow commitments. The Districts will develop a plan to monitor water temperatures in Don Pedro Reservoir near the dam whenever the reservoir elevation is lower than 700 feet and at five sites in the lower Tuolumne River. Such monitoring will inform the management of cool-water storage in Don Pedro Reservoir when the reservoir is drawn down and assist in scheduling spring pulse flows with the goal of benefiting Chinook salmon and steelhead in the lower Tuolumne River. Conducting real-time temperature monitoring at the La Grange gage and at a site near the temporary fish counting weir would inform decision-making for scheduling spring and fall pulse flows that maximize benefit to aquatic resources.

The Tuolumne River Partners (TRP) would install loggers and monitor temperature at three additional sites selected through consultation with resource agencies that would enable a more thorough evaluation of the effectiveness of the actual pulse flows and management of the cool-water reservoir. Insight gained from this monitoring could be used to adapt project operations within limits set by the new license (e.g., alter the timing of future pulse flows and drought management). Specific

[6] The Tuolumne River HRL Program is part of the comprehensive HRL Program. While the individual components are not evaluated in the Phase II analysis, the flow benefits associated with the Tuolumne River HRL Program are included to provide consistency with that approach.

[7] To assist in the temperature management of the lower Tuolumne River, two infiltration galleries will be operated near RM 26, allowing the Districts to release water for irrigation at La Grange Diversion Dam into the Tuolumne River and collect it at RM 26 for conveyance into the Ceres Main Canal, thus benefiting lower Tuolumne River cold-water fisheries, while at the same time protecting water supplies.

temperatures will not be enforceable against the Tuolumne Parties pursuant to Term Sheet Section 2.2(C), but the results of the monitoring plan will be included as a metric to be measured in Term Sheet Appendix 4. (Global Agreement to the Healthy Rivers and Landscapes Program in the Bay-Delta, March 2024, Exhibit B, p. B.182)

Common Response: Species Habitat and Abundance

The Healthy Rivers and Landscapes (HRL) Program, previously known as the Voluntary Agreements (VAs), will meaningfully contribute to the existing salmon protection and proposed native fish viability narrative objectives. The HRL Program portfolio of actions is based on best available science that includes studies showing that the proposed actions benefit aquatic species and that these benefits are expected to improve species survival and abundance. The benefits and effectiveness of HRL Program actions have been demonstrated by Early Implementation Projects on multiple tributaries. (HRL Presentation, December 2023.) The HRL Program is consistent with guidance recommending greater diversity of life history strategies, supported by high quality rearing habitats under a range of flow conditions to restore lost resilience. (Yamane et al. 2018.)

Flow is often the primary focus of regulatory actions and efforts to improve species abundance. However, given the extensive anthropogenic degradation of river habitat quantity and quality over the past 170 years, the flow-only approach has limitations and may not be able to fully support species resilience and viability. The ability of physical habitat restoration to improve species abundance is well known as part of a portfolio approach that also includes flow. For example, after habitat restoration efforts started in the early 1990s, Butte Creek spring-run escapement abundance increased significantly with approximately a 2,000% increase in average abundance. (Cordoleani et al. 2023.) The Butte Creek population is now the most abundant naturally spawned spring-run Chinook salmon population in the stock complex. (Id.) For Putah Creek, implementation of the Putah Creek Accord marked a turning point in the creek's rehabilitation (Jacinto et al. 2023). Chinook salmon have returned to the system; native fish species dominate and are stable in the upper portions of Lower Putah Creek, all with a small but strategic amount of flow and habitat improvements. For the Mokelumne River, the Joint Settlement Agreement signed in 1998 provided increased flows to the Mokelumne River in all water year types. In addition, it required improvements to salmonid spawning success through habitat restoration. Since that time, East Bay Municipal Utility District (EBMUD) has added nearly 80,000 tons of spawning gravel to support salmon and steelhead and created two side channels and floodplain projects to support juvenile growth and survival. This combination of habitat and flow has resulted in an improvement to our chinook salmon escapement from an average of 3,542 (1940 to 1997 average) to 10,229 (1998 to 2023 average).

These past successes can be repeated in other tributaries as proposed in the HRL Program.

I. HRL will contribute to meeting the existing narrative salmon objective and proposed narrative native species viability objective.

Consistent with the March 2022 Memorandum of Understanding (MOU), the HRL Program is one of the pathways expected to be included in the State Water Board's Program of Implementation for the

existing narrative salmon objective and the proposed native fish viability objective.[1] The 2006 Water Quality Control Plan (Delta Plan) implements the existing narrative salmon objective through quantified Delta objectives as well as other actions that are under the responsibility of various state and federal agencies. If approved, the HRL program would be added to those actions, amongst others, that contribute to meeting the existing and proposed narrative standards.[2]

The best available science supports a conclusion that the HRL Program's contribution to the narrative objectives would be meaningful. The California Environmental Protection Agency (CalEPA) External Scientific Peer Review Program's seven independent, neutral, and objective experts agreed that the HRL Program would contribute to meeting narrative objectives. As Professor Poff explained at pp. 1-2 of his review:

> The [Scientific Basis] report correctly acknowledges, based on extensive scientific understanding, that high quality non-flow [action] (both static and dynamic) is needed to sustain fish populations. Given the degraded nature of much non-flow habitat, physical restoration combined with adequate flows can create "functional" habitat, which is justifiably expected to increase salmonid production by some amount.

As Professor Poff further explained:

> …flow alone is not sufficient. Other factors may be co-limiting fish population recovery, including habitat impairment…Implementation of the VAs is expected to enhance native fish populations. This is a reasonable expectation based on experience and ample research publications reported in the scientific literature.

The peer reviewers universally supported a portfolio approach that includes flow and non-flow actions without any suggestion that new flow was the most important action.

A. There is no hierarchy of restoration actions where flow would be the primary variable.

Multiple commenters and workshop participants suggested that a portfolio of flow and non-flow actions is not optimal because only flow actions are highly certain to provide benefits. The CalEPA peer

[1] HRL Program actions are summarized in the HRL Program Draft Strategic Plan in Tables 1 and 25. These actions include flow and physical habitat actions, as well as funding and implementation of a science and adaptive management program. The State Water Board's 2023 Final Draft Scientific Basis Report Supplement (SBRS) measured the HRL Program contribution toward meeting the narrative salmon protection objective based in the Central Valley Project Improvement Act (CVPIA) doubling goal (proposed to be met in 30 years) using the metric of whether 25% of the habitat needed for a doubled salmon population is provided over the 8-year HRL Program period. The HRL Program meets this goal.

[2] The HRL Program will not increase Harmful Algal Blooms (HABs) so mitigation is not required. (SBRS, p, 9-145 [HRL will have less than significant effect on HABs.].) While actions to improve HABs would be important, it is not currently known what actions would be effective. The State Water Board is already engaged on HABs and those efforts should further support the narrative objectives. If there is a future action that could minimize HABs, that action would likely be identified as part of the State Water Board's process.

reviewers did not agree and cautioned that while flow is important, the causative influence of new flow should not be overstated. As Dr. Carlisle explained at p. 4:

> The 2017 and Supplemental reports provide reviews and new analyses as evidence for the causative influence of flow on the populations of key species. However, the evidence is weak that any particular ecosystem stressor is the cause of population declines.

The importance of acknowledging uncertainty in decision-making extends to the quantified analyses linking species abundance to flow. The peer reviewers highlighted the importance of properly characterizing and acknowledging uncertainty, particularly as it relates to the modeled (quantified) flow analyses. Peer reviewer Dr. Carlisle at p. 8 concluded:

> I again find that anticipated biological outcomes generated from qualitative analyses of the literature appear sound and justified. In contrast, the quantitative methods, while appropriate and laudable, require more justification for some assumptions and, most importantly, a more rigorous accounting of model uncertainty.

Stating further at p. 8:

> Population estimates for Bay species were made using regression equations that predict population indices given outflow magnitudes. These equations were presented in the 2017 report and referenced again in the Supplemental Report. In presenting predictions from these models (Section 6.2.1), the Supplemental Report for the first time makes a striking declaration (Page 6-20)[3]. That the
>
> > "*…results are meant to give a general sense of the relative benefit each species may realize for a given flow scenario and they should not be interpreted as predictions of future population abundances*."
>
> I searched in vain for these phrases earlier in the Supplemental Report. It is striking that this important caveat is buried in a paragraph more than 100 pages into the document, along with the implication that it only applies to the population model estimates for the Bay species….Given the assumptions and uncertainty in all the previous quantitative analyses, surely this caveat applies to the entire Supplemental Report and should have been made clear in the introductory material. Yet, the subsequent paragraphs (Page 6-20) contain conclusions that seem to interpret results and make comparisons in violation of the caveat just mentioned. In essence, the interpretive limits of model results are unclear to me and appear to also be unclear to the report authors.

Once existing uncertainty is properly acknowledged, there is no meaningful difference between the uncertainty associated with flow actions and non-flow actions, meaning the independent value of each of the proposed HRL Program action is about the same. It is the portfolio of restoration actions across tributaries that makes HRL Program more likely to achieve benefits that meaningfully contribute to narrative objectives. Similar to how Wall Street investors spread risk to protect themselves from losses through diversification of their financial portfolio, the risk of failure is lessened when environmental investments are diversified.

[3] Reference unchanged from original but reference should be to p. 6-19.

B. The HRL program includes metrics for measuring progress toward meeting objectives.

The HRL program does not include numeric targets because the best available science cannot be used to specifically estimate exact outcomes with any expectation of accuracy. For example, as explained above, the species abundance-to-flow models cannot be interpreted to predict a specific change in abundance, rather those models can only estimate trends in species abundance in a comparative way, with an acknowledgement of significant uncertainty. Also, the originally envisioned program was shortened to an initial 8-year period, and it is unrealistic to assume that large scale changes would be observable in 6 or 8 years, particularly in species like salmon that have multiple-year life cycles. At the same time, the importance of metrics for assessing program progress is unquestioned. The CalEPA peer reviewers agree and Dr. Carlisle at p. 5 explained that:

> In summary, the hypotheses that flow and habitat restoration will provide benefits to native species is reasonable in my opinion. But it would be more transparent if this "conclusion" was characterized as a hypothesis with substantial support, that nevertheless requires testing in concert with monitoring and evaluation.

This is exactly what the HRL Program is proposing. The HRL Program Draft Science Plan (Appendix C to the Draft Strategic Plan, which was includes as Appendix G1 to the State Water Board's Draft Staff Report, released in September 2023) includes multiple hypotheses that state the expected outcome of HRL Program actions. To set into motion an adaptive management cycle, the hypotheses are accompanied by metrics which evaluate whether the intended benefits are being realized in the ecosystems and native species populations of the HRL Program tributaries and Delta. Given that the flow and non-flow actions of the HRL Program occur at varying spatial scales, and that several target species have multi-year generation times, hypotheses reflect the various spatial and temporal scales of the intended benefits. To this end, hypotheses are developed at three basic spatial and temporal "tiers" that include Local Tier, Full Tributary and Delta Tier, and Population Level Tier. The Local Tier hypotheses are more likely to be observed within the 8-year program, but the monitoring and synthesis is also considering the longer timeframes and system-wide benefits. Further detail is provided in the HRL Program Draft Science Plan.

II. HRL is providing a portfolio of physical habitat and flow actions that are expected to improve species resilience and viability.

As explained in Herbold et al. 2018 at p. 1, "the most likely way to promote salmon productivity and persistence in California is to restore habitat diversity, reconnect migratory corridors to spawning and rearing habitats, and refocus management to replenish the genetic and phenotypic diversity of these southernmost populations." The HRL program is consistent with this approach, increasing the extent and diversity of multiple habitat types across several major tributaries under a range of flow conditions.

The HRL Program portfolio approach is generally preferred by scientists over a single factor restoration approach. The portfolio effect is an ecological principle addressing how multiple life history strategies, habitat types, or species will increase a community's resiliency (Schindler et al. 2015). Improvements in

the quantity and quality of multiple habitat types under a range of flow conditions, like that proposed in the HRL Program, can support persistence of multiple life history strategies and species, generating a 'portfolio effect' that may enhance population and ecosystem resistance to perturbation, even with increased drought and flood conditions predicted by climate change models (Robinson et al. 2016; Herbold et al. 2018; Woo et al. 2019, Greene et al. 2010). Reliance on one management tool, such as flow, is less likely to result in a desired outcome, particularly given the level of uncertainty with future climate conditions. While implementation of flow actions relies on adequate precipitation falling each year, many habitat restoration sites may be available to fishes and provide ecological benefits across the full range of water years, including under drought conditions. Restoring aspects of a natural flow regime is more effective when paired with physical habitat restoration in order to achieve optimal system resiliency (Brown et al. 2022).

The portfolio approach is effective because there is a synergy between HRL Program flows and restored habitat. For example, on tributaries where floodplain or instream rearing habitat restoration is proposed, both the HRL Program restoration actions and HRL Program flows will increase the connectivity of rearing habitat with the main river channel, which has been identified as a key ecosystem stressor limiting salmonid resiliency. Freshwater flows from main river channels into floodplains will activate habitat for juvenile Chinook salmon and steelhead, increasing primary and secondary productivity and supporting increased growth rates and greater life history diversity. The HRL Program flows would also be expected to transport food resources from floodplains to downstream habitats, primarily focusing on the spring. As explained in Cordoleani *et al.* 2023 at p. 15:

> This study shows strong support for designing habitat restoration and flow management efforts that recreate ecologically functional floodplains, such as the Butte Creek floodplain and Yolo Bypass, and re-connect them to mainstem rivers to provide multi-population benefits (Pander et al. 2018; Yarnell et al. 2015, 2020). Collectively such efforts would boost abundance and amplify asynchrony among populations and lead to further reduction in the extinction risk of the CVSC stock complex, which is currently relying on core populations belonging to the same ecoregion that are likely to all be impacted by the same catastrophic climate events (Lindley et al. 2007).

This synergy between flow and non-flow actions as part of a portfolio of actions is expected to meaningfully contribute to the narrative objectives.

III. HRL actions improve species survival and abundance and meaningfully contribute to meeting narrative objectives.

The HRL Program will contribute to species abundance through investments in spawning habitat, instream rearing habitat, and floodplain and tidal marsh restoration, in addition to providing 500,000-700,000[4] acre-feet of flow.

A. HRL restoration of spawning habitat can be reasonably expected to increase species abundance.

The HRL Program is providing increased spawning habitat, which may be a factor limiting species

[4] This flow range does not include the Tuolumne River contribution.

abundance in certain tributaries. For example, as described in Blankenship et al. (2024) at p. 13, the average spawning area per Chinook salmon pair is an estimated 20 m^2 and the maximum suitable spawning area available on the lower American River has been estimated <400,000 $m^{2,}$ which suggests that current accessible habitat may be insufficient to support annual adult abundance estimates. This study used genetic techniques to determine reproductive success of female Chinook salmon spawning in-river and found evidence of density dependence, with relative recruitment success decreasing as adult spawner abundance increased. (Blankenship et al. 2024, p. 13.) In rivers where density dependent impacts may be driving spawning success in high escapement years, habitat restoration is a primary tool to alleviate pressure on existing spawning habitat. On the American River, physical improvements in spawning habitat have already been shown to be successful in increasing spawner capacity. Accounting for interannual variability, restored habitat utilization by spawners increased significantly at multiple augmentation sites relative to pre-restoration conditions and enhanced sites have been documented support up to 56% of all in-river Chinook spawning that occurs on the American River (Zeug et al. 2013, Water Forum 2024). Additionally, females spawning in newly augmented spawning habitat produced off-spring at the same rate as those in naturally occurring spawning habitat (Blankenship et al. 2024, p. 12). On the Mokelumne River, Merz et al. (2004) demonstrated that gravel augmentation improved both embryo survival success and size at emergence by improving inter-gravel water quality conditions.

B. HRL restoration of rearing habitat can be reasonably expected to increase species abundance.

Off-channel and instream rearing habitats have been constructed in participating tributaries and these habitats are being utilized by fish (Sellheim et al. 2016; Scherer et al. 2020; Wedgeworth et al. 2024). Survival, growth, and abundance can be improved by constructing more of these habitats (Sommer et al., 2001; Sellheim et al., *in revision*). As explained in Limm and Marchetti 2009 at p. 148:

> The primary result of the current study indicates that Chinook Salmon in the Sacramento River show larger otolith increments widths in off-channel habitats when compared to near-by main channel habitat suggesting faster or improved growth rates.

The growth attained in off-channel and tributary habitats can be significant, providing up to 94% of an individual's body mass in some years. (Morais *et al*., in review, pp. 32-35.) While overall utilization of off-channel and tributary habitats is likely to be higher in wet years, a portion of these habitats are used across a broad range of water year types, supporting increased life history diversity and spatial distribution of juveniles, increasing overall population resilience via the portfolio effect. (*Id.*).

C. HRL restoration of tidal marsh habitat can be reasonably expected to increase species abundance.

The shallow water in wetlands allows for greater phytoplankton production because light can penetrate to the bottom of the water column. This has been demonstrated both theoretically (Cloern 2007; Lucas et al. 2009) and empirically (Muller-Solger et al. 2002; Lopez et al. 2006; Lehman et al. 2015). Furthermore, water will remain within dead-end channels and wetland ponds longer than in river habitat, allowing for accumulation of greater phytoplankton biomass. (Downing et al. 2016; Montgomery 2017.) Longer water residence times can result in higher chlorophyll-a levels. (Stumpner et

al. 2020). For example, the tidal slough in the North Delta adjacent to wetlands have relatively high levels of phytoplankton. (Sommer et al. 2003; Lehman et al. 2010; Frantzich et al. 2018.)

As both Longfin Smelt and Delta Smelt occupy wetlands (Sommer et al. 2013, Grimaldo et al. 2017, Merz et al. 2011, Mahardja et al. 2019, Lewis et al. 2020.), the food produced by these habitats are likely to co-occur with the species. These wetland habitats provide a combination of biotic and abiotic habitat components required by the species, including water quality (turbidity, temperature, flow, salinity), prey, and physical habitat complexity. Habitat for Delta Smelt and Longfin Smelt is not well defined by the volume of low salinity habitat, making that single flow factor not a meaningful metric for measuring species benefits or effects. (Kimmerer et al. 2013, p. 13 [Variation in the volume of habitat defined by salinity is not a strong influence on abundance of many of these estuarine fish.].)

The tidal wetland phytoplankton production is expected to increase estuarine species abundance. Several conceptual models include food as an important factor driving historic Delta Smelt and Longfin Smelt abundance. (Rosenfield and Baxter 2007, Kimmerer 2004, Bennett 2005.) Several life cycle models have also found support for food availability as an important factor driving Delta Smelt and Longfin Smelt abundance. (Mac Nally et al. 2010; Rose et al. 2013; Maunder et al. 2015; Polansky et al. 2019, Kimmerer and Rose 2018). The recent multiagency Collaborative Science and Adaptive Management Program (CSAMP) work estimated that Delta Smelt abundance would increase under the recent historic regulatory export operations (Old and Middle River) if food production could be increased. (CSAMP, in review, Tables ES-2 and ES-3.)

D. HRL restoration of floodplains can be reasonably expected to increase species abundance.

Restoration of floodplains will increase species abundance through increased prey productivity, which will increase species growth and, ultimately, survival to adulthood.

The 20,000 acres of managed floodplains in the Sutter Bypass, Butte Sink, and Colusa Basin are expected to increase food availability. Salmon reared near outfalls from managed wetlands or rice fields have higher growth rates and condition factors than those reared further from sources of wetland production. (Jeffres et al. 2020; Aha et al. 2021.) Since these floodplain habitats have longer water residence times, they produce higher chlorophyll-a, zooplankton biomass, and ultimately higher salmon growth rates relative to main channel habitats. (Jeffres et al. 2008; Cordoleani et al. 2022.; Corline et al. 2017; Aha et al. 2021.) Zooplankton subsides from floodplains can also benefit fish further downstream (Sturrock et al. 2022b).

Floodplain habitat that increases prey productivity will result in larger juvenile Chinook salmon that survive better in the ocean. (Sommer et al. 2001, Satterthwaite et al. 2014.) In a system similar to the Delta, isotopic samples from fish tissue indicated that floodplain production contributed up to 50% of the diet. (Farly et al 2019.) Sommer et al. (2001) suggests that juvenile salmon that attain larger sizes by extended floodplain rearing ultimately had higher survival to adulthood. Therefore, the increases in floodplain habitat proposed by the HRL Program are expected to increase salmon growth and survival.

Answering the question of whether improved survival, through flow or habitat actions, necessarily translates into increased species abundance requires recognition that there are many factors that affect species abundance that are outside of the control of the HRL program. The current Bay-Delta water

quality control plan recognizes this and calls for NMFS to continue to manage ocean fishing. (Bay-Delta Plan, POI, p. 36.) However, there are other factors that also affect species growth and survival in the ocean, such as ocean productivity and thiamine deficiency, which may cause widespread mortality and cannot be addressed through the Delta Plan. (Lindley et al. 2009, Mantua et al. 2021.) The effects of these other stressors should be accounted for when determining program success.

IV. Conclusion

The HRL program will meaningfully contribute to the existing salmon protection and proposed native fish viability narrative objectives. The HRL portfolio of actions is based on best available science that includes studies showing that the proposed actions benefit aquatic species and that these benefits are expected to improve species survival and abundance.

Bibliography

Agreements to Support Healthy Rivers and Landscapes: Non-Flow Habitat Actions Early Implementation Project Update. State Water Resources Control Board Public Hearing for Phase 2 of the Bay-Delta Water Quality Control Plan Update. Sacramento, CA. December 1, 2023, Presentation by Todd Manley, Charlotte Biggs, Erica Bishop, Jon Munger, Max Stevenson, and Adam Robin.

Aha, N.M., Moyle, P.B., Fangue, N.A., Rypel, A.L. and Durand, J.R. 2021. Managed Wetlands Can Benefit Juvenile Chinook Salmon in a Tidal Marsh. *Estuaries and Coasts*, 44: 1440-1453.
Bennett, W. A. 2005. Critical assessment of the Delta Smelt population in the San Francisco Estuary, California. *San Francisco Estuary and Watershed Science*. Vol. 3: Issue 2.

Biggs, C., E. Bishop, T. Manley, J. Munger, A. Robin, and M. Stevenson. 2023. Agreements to Support Healthy Rivers and Landscapes: Non-Flow Habitat Actions Early Implementation Project Update. State Water Resources Control Board Public Hearing for Phase 2 of the Bay-Delta Water Quality Control Plan Update. Sacramento, CA. December 1, 2023.

Blankenship, S.M., Scherer, A., Dean, C., Sellheim, K., Sweeny, J., and Merz., J. 2024. Applying parentage methods to detect gravel augmentation effects on juvenile Chinook Salmon recruitment rates, *River Research and Applications*. Online: DOI: 10.1002/rra.4264

Brown, R.A., Sellheim, K., Anderson, J.T. and Merz, J.E., 2022. Chinook Salmon habitat evolution following river restoration, drought, and flood. *Journal of Ecohydraulics*, *9*(1), pp.107-129.

California Department of Fish and Wildlife, FMWT Midwater Trawl Survey, End of season report for 2022. February 14, 2023.

Collaborative Science and Adaptive Management Program. June 2024 Draft (Version 3.0). CSAMP, Delta Smelt Structured Decision Making-Round 1 Evaluation Report. Prepared by Compass Resource Management Ltd., Brian Crawford and Sally Rudd. (Tables ES-2 and ES-3.)

Cloern, J.E. 2007. Habitat connectivity and ecosystem productivity: implications from a simple model. *The American Naturalist*, 169(1): E21-E33.

Cordoleani, F., Holmes, E., Bell-Tilcock, M., Johnson, R.C. and Jeffres, C. 2022. Variability in foodscapes and fish growth across a habitat mosaic: Implications for management and ecosystem restoration. *Ecological Indicators*, 136: 108681.

Cordoleneani, F., Phillis, C. C., Sturrock, A. M, Willmes, M., Whitman, G., Holmes, E., Weber, P., Jeffres, C., and Johnson, R. 2023. Restoring freshwater habitat mosaics to promote resilience of vulnerable salmon populations. Ecosphere15:e4803. http://doi.org/10.1002/ecs2.4803

Corline, N.J., Sommer, T., Jeffres, C.A. and Katz, J. 2017. Zooplankton ecology and trophic resources for rearing native fish on an agricultural floodplain in the Yolo Bypass California, USA. *Wetlands Ecology and Management*: 1-13.

Downing, B.D., Bergamaschi, B.A., Kendall, C., Kraus, T.E.C., Dennis, K.J., Carter, J.A. et al. 2016. Using Continuous Underway Isotope Measurements To Map Water Residence Time in Hydrodynamically Complex Tidal Environments. *Environmental Science and Technology*, 50(24): 13387-13396.

Draft Strategic Plan for the Proposed Agreements to Support Healthy Rivers and Landscapes, 2023. [online] https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Voluntary-Watershed-Agreements/Draft_Strategic_Plan.pdf

Draft Scientific Basis Report Supplement in Support of Proposed Voluntary Agreements for the Sacramento River, Delta, and Tributaries Update to the San Francisco Bay/ Sacramento- San Joaquin Delta Water Quality Control Plan, Prepared by the State Water Resources Control Board, California Department of Water Resources, and California Department of Fish and Game, January 2023.

Farly, L., Hudon, C., Cattaneo, A. and Cabana, G. 2019. Seasonality of a Floodplain Subsidy to the Fish Community of a Large Temperate River. *Ecosystems*, 22.

Final Response to Request for Review of the Final Draft Scientific Basis Report Supplement in Support of Proposed Voluntary Agreements for the Sacramento River, Delta, and Tributaries Update to the San Francisco Bay/Sacramento-San Joaquin Delta Water Quality Control Plan (CalEPA External Peer Review), February 21, 2024, responses by Professor Poff and Dr. Carlisle.

Frantzich, J., Davis, B.E., MacWilliams, M., Bever, A. and Sommer, T. 2021. Use of a Managed Flow Pulse as Food Web Support for Estuarine Habitat. *San Francisco Estuary and Watershed Science*, 19(3): art3.

Greene CM, Hall JE, Guilbault KR, Quinn TP. Improved viability of populations with diverse life-history portfolios. Biology Letters. 2010 Jun 23;6(3):382-6.

Grimaldo, L., F. Feyrer, J. Burns, and D. Maniscalco. 2017. Sampling uncharted waters: examining rearing habitat of larval Longfin Smelt (*Spirinchus thaleichthys*) in the Upper San Francisco Estuary. Estuaries and Coasts 40:1771–1784.

Heady, W., and Merz, J. 2007. *Lower Mokelumne River Salmonid Rearing Habitat Restoration Project Summary Report*, Santa Cruz, CA.

Herbold, B., Carlson, S.M., Henery, R., Johnson, R., Mantua, N., McClure, M. et al. 2018. Managing for Salmon Resilience in California's Variable and Changing Climate. *San Francisco Estuary and Watershed Science*, 16(2).

Jacinto, E., N.A. Fangue, D.E. Cocherell, J.D. Kiernan, P.B. Moyle, and A.L. Rypel. 2023. Increasing stability of a native freshwater fish assemblage following flow rehabilitation. *Ecological Applications* 33: e2868.

Jeffres, C. A., Opperman, J. J. Moyle, P. B. 2008. Ephemeral floodplain habitats provide best growth conditions for juvenile Chinook Salmon in a California river. *Environ. Biol. Fish.* 83:449-458.

Jeffres, C.A., Holmes, E.J., Sommer, T.R. and Katz, J.V.E. 2020. Detrital food web contributes to aquatic ecosystem productivity and rapid salmon growth in a managed floodplain. *PLOS ONE*, 15(9): e0216019.

Kimmerer W. J. 2004. Open water processes of the San Francisco Estuary: from physical forcing to biological responses. *San Francisco Estuary and Watershed Science* [online serial]. Vol. 2, Issue 1.

Kimmerer, W. J., MacWilliams, M. L., Gross, E. S. 2013. Variation of fish habitat and extent of the low salinity zone with freshwater flow in the San Francisco Estuary. *San Francisco Estuary and Watershed Science*. 11:4.

Kimmerer, W. J., Rose, K. A. 2018. Individual-based modeling of Delta Smelt population dynamics in the Upper San Francisco Estuary III. Effects of entrainment mortality and changes in prey. *Transactions of the American Fisheries Society*, 147: 223-243.

Lehman, P.W., Mayr, S., Mecum, L. and Enright, C. 2010. The freshwater tidal wetland Liberty Island, CA was both a source and sink of inorganic and organic material to the San Francisco Estuary. *Aquatic Ecology*, 44(2): 359-372.

Lehman, P.W., Mayr, S., Liu, L. and Tang, A. 2015. Tidal day organic and inorganic material flux of ponds in the Liberty Island freshwater tidal wetland. *Springer Plus*, 4: 273.

Lewis, L.S., Willmes, M., Barros, A., Crain, P.K., Hobbs, J. A. 2020. Newly discovered spawning and recruitment of threatened Longfin Smelt in restored and under explored tidal wetlands. *Ecology*, 101(1), e02868.

Limm, M.P. and Marchetti, M.P., 2009. Juvenile Chinook salmon (Oncorhynchus tshawytscha) growth in off-channel and main-channel habitats on the Sacramento River, CA using otolith increment widths. Environmental biology of fishes, 85, pp.141-151.

Lindley, S. T. T., Grimes, C. B., Mohr, M. S. S., Peterson, W., Stein, J., Anderson, J. T. T., Botsford, L. W. W. 2009. What caused the Sacramento River Fall Chinook Collapse? NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-447. Pacific Management Council.

Lucas, L.V., Cloern, J.E., Thompson, J.K., Stacey, M.T. and Koseff, J.R. 2016. Bivalve grazing can shape phytoplankton communities. *Frontiers in Marine Science*, 3: 14.

Lopez, C.B., Cloern, J.E., Schraga, T.S., Little, A.J., Lucas, L.V., Thompson, J.K. et al. 2006. Ecological values

of shallow-water habitats: Implications for the restoration of disturbed ecosystems. *Ecosystems*, 9(3): 422-440.

Mac Nally, R., J.R. Thompson, W.J. Kimmerer, F. Feyrer, K.B. Newman, A. Sih, W.A. Bennett, L. Brown, E. Fleishman, S.D. Culberson, G. Castillo. 2010. An analysis of pelagic species decline in the upper San Francisco Estuary using multivariate autoregressive modeling (MAR). *Ecological Applications* 20:1417–1430.

Mahardja,, B., J. A. Hobbs, N. Ikemiyagi, A. Benjamin, A. J.Finger, 2019. Role of freshwater floodplain-tidal slough complex in the persistence of the endangered delta smelt. *PLoS ONE*, 14(1):e0208084. https://doi.org/10.1371/journal.pone.0208084

Mantua, N., R. Johnson, J. Field, S. Lindley, T. Williams, A. Todgham, N. Fangue, C. Jeffres, H. Bell, D. Cocherell, and J. Rinchard. 2021. Mechanisms, impacts, and mitigation for thiamine deficiency and early life stage mortality in California's Central Valley Chinook Salmon. North Pacific Anadromous Fish Commission, Technical Report 17:92-93.

Maunder M.N, Deriso R.B, Hanson C.H. 2015. Use of state-space population dynamics models in hypothesis testing: advantages over simple log-linear regressions for modeling survival, illustrated with application to Longfin Smelt (Spirinchus thaleichthys). Fisheries Research 164:102-111.

Merz, J.E., Hamilton, S., Bergman, D.S., Cavallo, B. 2011. Spatial perspective for delta smelt: a summary of contemporary survey data. Calif. Fish and Game 97)4) p. 164-189.

Merz, J. E., and Ochikubo Chan, L. K. 2005. Effects of gravel augmentation on macroinvertebrate assemblages in a regulated California river. River Research and Applications, 21(1):61–74.

Montgomery, J.R. 2017. Foodweb Dynamics in Shallow Tidal Sloughs of the San Francisco Estuary. University of California, Davis.

Morais, P., Sturrock, A., Phillis, C., Whitman, G., Johnson, R. In review. Droughts delay juvenile salmon downstream migration and truncate diversity in habitat use.

Muller-Solger, A.B., Jassby, A.D. and Muller-Navarra, D.C. 2002. Nutritional quality of food resources for zooplankton (*Daphnia*) in a tidal freshwater system (Sacramento-San Joaquin River Delta). *Limnology and Oceanography*, 47(5): 1468-1476.

Polansky, L. Newman, K. B. Mitchell, L. 2019. Improving inference for nonlinear state-space models of animals population dynamics given biased sequential life stage data. *Biometric Practice*. DOI:10.1111/biom. 13267

Robinson, A., Safran, S., Beagle, J., Grossinger, R. and Grenier, L. 2014. A Delta Transformed: Ecological Functions, Spatial Metrics, and Landscape Change in the Sacramento-San Joaquin Delta. In: *San Francisco Estuary Institute-Aquatic Science Center (SFEI-ASC), Prepared for the California Department of Fish and Wildlife and Ecosystem Restoration Program. A Report of SFEI-ASC's Resilient Landscapes Program*. San Francisco Estuary Institute-Aquatic Science Center Richmond, CA, p. 134.

Rose, K.A., Kimmerer, W.J., K.P., Bennett, W.A. (2013) Individual-Based Modeling of Delta Smelt

Population Dynamics in the Upper San Francisco Estuary: II. Alternative Baselines and Good versus Bad Years, *Transactions of the American Fisheries Society*, 142:5, 1260-1272.

Rosenfield, J.A. Baxter, R.D. 2007. Population Dynamics and Distribution Patterns of Longfin Smelt in the San Francisco Estuary, *Transactions of the American Fisheries Society* 136:1577-1592.

Satterthwaite WH, Carlson SM, Allen-Moran SD, Vincenzi S, Bograd SJ, Wells BK. Match-mismatch dynamics and the relationship between ocean-entry timing and relative ocean recoveries of Central Valley fall run Chinook salmon. Marine Ecology Progress Series. 2014 Sep 24;511:237-48

Scherer, A., Sweeney, J. and Sellheim, K. 2020. Evaluation of juvenile salmonid habitat use at Sailor Bar in the Lower American River. Prepared for Sacramento Water Forum, U.S. Bureau of Reclamation, and U.S. Fish and Wildlife Service. December 2020. 27pp.

Sellheim, K. L., Watry,C. B., Rook, B. Zeug, S.C. Hannon, J., Zimmerman, J., Dove, K., and Merz, J.E. 2016. Juvenile salmonid utilization of floodplain rearing habitat after gravel augmentation in a regulated river. River Research and Applications 32(4): 610-621.

Schindler, D.E., Armstrong, J.B. and Reed, T.E. 2015. The portfolio concept in ecology and evolution. *Frontiers in Ecology and the Environment*, 13(5): 257-263.

Sellheim, K., Scherer, A., Brown, R., Anderson, J., Sweeney, J., and Merz, J. *In revision*. Restored seasonally inundated habitat supports juvenile salmonid rearing and growth in two California Central Valley rivers. North American Journal of Fisheries Management.

Sommer, T.R., Nobriga, M., Harrell, W., Batham, W., Kimmerer, W. J. 2001. Floodplain rearing of juvenile chinook salmon: evidence of enhanced growth and survival. *Can. J. Fish Aquatic Sci.* 58: 325-333.

Sommer, T.R., Harrell, W.C., Nobriga, M.L. and Kurth, R. 2003. Floodplain as habitat for native fish: Lessons from California's Yolo Bypass. In: *California riparian systems: Processes and floodplain management, ecology, and restoration. 2001 Riparian Habitat and Floodplains Conference Proceedings* (ed. Faber, PM). Riparian Habitat Joint Venture Sacramento, pp. 81-87.

Sommer, T., Mejia, F. 2013. A place to call home: a synthesis of Delta Smelt habitat in the upper San Francisco Estuary. *San Francisco Estuary and Watershed Science*, 11(2).

Stumpner, E.B., Bergamaschi, B.A., Kraus, T.E.C., Parker, A.E., Wilkerson, F.P., Downing, B.D. et al. 2020. Spatial variability of phytoplankton in a shallow tidal freshwater system reveals complex controls on abundance and community structure. *Science of The Total Environment*, 700: 134392.

Sturrock, A.M., Ogaz, M., Neal, K., Corline, N.J., Peek, R., Myers, D. et al. 2022. Floodplain trophic subsidies in a modified river network: managed foodscapes of the future? *Landscape Ecology*: 37:2991-3009. https://doi.org/10.1007/s10980-022-01526-5.

U.S. Bureau of Reclamation. 2023. Long-Term Operation of the Central Valley Project and State Water Project Biological Assessment, Appendix O – Tributary Habitat Restoration. Sacramento, CA

Water Forum. 2018-2024. American River: Annual Aerial Redd Survey Long-Term Dataset. Unpublished raw data.

Water Quality Control Plan for the San Francisco Bay/ Sacramento- San Joaquin Delta Estuary. 2006. Program of Implementation.

Wedgeworth, M, Sellheim, K., Sweeney, J. and Bishop, E. 2024. Spawning and juvenile rearing habitat enhancement effectiveness monitoring for salmonids across varying flows in the Lower American River: challenges and opportunities. 58th Annual Cal-Neva AFS Conference, Redding, CA.

Woo, I., Davis, M.J., Ellings, C.S., Hodgson, S., Takekawa, J.Y., Nakai, G. et al. 2019. A Mosaic of Estuarine Habitat Types with Prey Resources from Multiple Environmental Strata Supports a Diversified Foraging Portfolio for Juvenile Chinook Salmon. *Estuaries and Coasts*, 42(7): 1938-1954.

Yamane, L., Botsford, L.W. and Kilduff, D.P. 2018. Tracking restoration of population diversity via the portfolio effect. *Journal of Applied Ecology*, 55(2): 472-481.

Common Response: Enforcement and Accountability

Introduction

The Healthy Rivers and Landscapes (HRL)[1] Program provides the State Water Board with the same enforcement tools that are available under a regulatory framework. The HRL Program supports the State Water Board's enforcement authority through participation in the HRL governance structure, through flow and non-flow measure accounting and reporting mechanisms, and through a set of agreements. As explained in the Flow Accounting common response, the process for verifying new environmental flow is reliant on well-accepted tools and methods with oversight by the United States Bureau of Reclamation (USBR) and the California Department of Water Resources (DWR) (as is done in the long-established water market), with the new HRL Program beneficiary being the environment. As explained in the Accounting of HRL Program Habitat Assets common response, the habitat accounting protocols verify that identified habitat is in fact created, following the same procedures that are used to verify habitat mitigation under existing regulatory programs. And the agreements, particularly the enforcement agreements, provide the State Water Board with the ability to ensure commitments are satisfied. As such, the HRL Program resolves the implementation challenges associated with other large-scale multi-party restoration actions and provides accountability and enforceability.

Background

The HRL Program has evolved over time to provide clear and specific commitments, transparent data-sharing, and a governance structure, over which the State Water Board will have oversight and enforcement authority.

The signatories (HRL Parties) to the 2022 Memorandum of Understanding Advancing a Term Sheet for the Voluntary Agreements (MOU) began working on the HRL Program in 2017. On December 12, 2018, the Directors of the California Department of Fish and Wildlife (CDFW) and DWR appeared before the State Water Board in a public meeting to present the framework proposal for the program. At that time, the State Water Board expressed its expectation that the HRL Program concepts could (and should) be modified and refined over time based on public input and improved understanding of the watershed. This includes incorporating the benefits of the habitat projects for which the State Water Board would otherwise lack enforceability. However, during the April 2024 public workshops, the State Water Board raised questions about the certainty and enforceability of HRL Program commitments. The HRL Program has been designed to both ensure commitments are made while also documenting and incorporating new information, including that learned through the HRL and other science programs.

As required by California Water Code section 13242, the proposed amendments to the Water Quality Control Plan for the Sacramento-San Joaquin Delta (Bay-Delta Plan) that incorporate the HRL Program include: (a) a description of the nature of actions, (b) a time schedule for the actions to be taken, and (c) a description of surveillance or monitoring/oversight to be undertaken to determine compliance. The HRL Program's core components, including the governance procedures, HRL Parties' flow contributions and non-flow measures, and State Water Board enforcement provisions, are outlined in the Draft Strategic Plan (Appendix G1 to the State Water Board's Draft Staff Report, released in September 2023),

[1] This program was previously referred to as the "Voluntary Agreements."

the Draft Governance Program (Appendix B to the Strategic Plan), the Draft Science Plan (Appendix C to the Strategic Plan), the Flow Accounting and Non-Flow Measure Accounting Protocols (Appendices E and F to the Draft Strategic Plan, submitted separately in March 2024), and the Draft Funding Plan (Exhibit G to the Global Agreement). The components and commitments included in these various plans have been memorialized in the Global Agreement (submitted to the State Water Board in March 2024), the Implementing Agreements (Exhibit B to the Global Agreement), and the Enforcement Agreements (Exhibit C to the Global Agreement) and are included in the Proposed Amendments to the Bay-Delta Plan Program of Implementation.

The approach to enforcement and accountability proposed for the HRL Program is similar to (but more detailed than) the approach the State Water Board and the Central Valley Regional Board have employed in other circumstances involving broad geographic coverage and a multitude of actions, such as the Regional Board's Irrigated Lands Regulatory Program ("ILRP") and Central Valley Salinity Alternatives for Long-Term Sustainability ("CV-SALTS") program. All three programs are based on affected parties' voluntary organization and cumulative contributions to comply with relevant water quality control plan terms.

Enforcement

The HRL Program is a settlement of HRL Parties' responsibility for two narrative objectives in the Bay-Delta Plan. The HRL Parties represent most of the major water diverters in the Sacramento River watershed, and part of the San Joaquin River watershed. The HRL Parties hold water rights and are settling their respective potential liability for Bay-Delta Plan implementation with the State Water Board. This type of approach to conflict avoidance is common, and successful examples include the Lower Yuba River Accord and the San Joaquin River Restoration Settlement. California law provides for settlement stating, "A agency may formulate and issue a decision by settlement, pursuant to an agreement of the parties, without conducting an adjudicative proceeding." (Government Code §11415.60.) The HRL Program would serve that purpose, and the State Water Board will determine whether to approve the HRL Program as part of its usual decision-making process.

Since the HRL Program would be adopted without an adjudicative proceeding necessary to establish liability and therefore enforcement authority, HRL Program enforcement would be by agreement consistent with Government Code §11415.60(c) that states, "the settlement may include sanctions the agency would otherwise lack power to implement." As described in the draft Enforcement Agreements, the HRL Parties would agree to the same level of enforcement as would have otherwise been available to the State Water Board with an adjudicative proceeding. In fact, the HRL Program removes the need for these proceedings as it relates to the Parties and therefore provides an expedited approach to implementing the updated Bay-Delta Plan.

The HRL Program includes enforcement agreements between the State Water Board and water rights holders that include the water rights holders' specific commitments to implement the Bay-Delta Plan that would be enforceable by the State Water Board pursuant to the terms of the agreements and contract law. The HRL Program includes three complementary agreements that reflect additional levels of program-level, tributary-level, and participant-level responsibility. The Global Agreement, which is a program-level agreement, describes the HRL Program, with all other agreements and guidance documents incorporated as attachments. It is anticipated that all HRL Parties would sign the Global

Agreement. The Implementation Agreements describe project-specific implementation obligations and responsibilities at the tributary level and are signed by Parties with implementation responsibilities at the tributary level. The Enforcement Agreements (proposed to be executed in part pursuant to Government Code §11415.60) describe responsibilities of each implementing entity within each watershed and the State Water Board, with both the HRL Parties and the State Water Board as signatories. Entities that are participants in the HRL Program and are covered by the settlement will be identified in the Enforcement Agreements. The State Water Board's authority to enforce is also described in the Enforcement Agreements.[2]

The Enforcement Agreements provide the State Water Board with the same enforcement mechanisms available to the State Water Board under an adjudicatory proceeding. These mechanisms include: (1) cease-and-desist orders (CDO) under Water Code §1831; and (2) water right administrative civil liability (ACL) orders under Water Code §1055, which incorporates the State Water Board's standard water-right ACL authority under Water Code §§1845 to 1848. CDOs and ACLs are standard enforcement tools that the State Water Board and the Regional Water Quality Control Boards use to enforce obligations associated with water quality control plans under the Porter-Cologne Water Quality Control Act. In Water Code §§13301 through 13303, Porter-Cologne authorizes the State Water Board and Regional Water Quality Control Boards to issue CDOs to stop violations of waste discharge requirements. In Water Code §§13323 through 13328, Porter-Cologne authorizes the boards to issue ACLs that impose civil penalties for violations of waste discharge requirements. Consistent with this approach, the Enforcement Agreements state that the State Water Board may enforce the HRL Program settlements as follows:

Pursuant to Government Code section 11415.60, the State Water Board may enforce obligation of using administrative civil liability, imposed pursuant to the procedures in Water Code sections 1050 et. seq.; a cease-and-desist order adopted pursuant to the procedures stated in Water Code Section 1825 et seq.; or both.

The enforcement mechanisms are therefore the same under both the regulatory approach and the HRL Program settlement approach, with the State Water Board's authority under the settlement approach being particularly well-defined and therefore more directly enforceable.

The circumstances under which the State Water Board would need to use its enforcement authority are expected to be rare. As explained in more detail in the Flow Accounting common response, USBR and DWR would be involved initially in ensuring that new environmental flows are made available by the tributaries and are realized as Delta outflow. Enforcement by the State Water Board would be an option if the negotiation of the details of the deployment of HRL Program flows cannot be resolved by the responsible parties and as part of the HRL Systemwide Governance Committee (SGC). As explained in the Draft HRL Strategic Plan, ongoing decision-making about the release of flows will be communicated to and coordinated by the SGC, in which State Water Board staff would be a participant. Thus, the State Water Board would have the opportunity to learn about any unresolvable implementation issues early in the process.

[2] USBR will not be signing an Enforcement Agreement. USBR will be entering into a Memorandum of Understanding with the State Water Board describing Reclamation's HRL Program obligations.

While State Water Board enforcement is available at any time, the process is such that enforcement should be a last resort. If over the course of HRL Program implementation there is an unresolvable dispute regarding the terms of a specific HRL settlement agreement, and the relevant HRL Party ultimately withdraws from the program, the State Water Board's remedy is potentially the imposition of Bay-Delta Plan implementation using regulatory mechanisms rather than HRL Program enforcement.

The HRL Program is only one component of the State Water Board's anticipated implementation of the existing Salmon Doubling objective and the proposed Native Fish Viability narrative objective. Concurrent with HRL Program implementation, the State Water Board may also allocate responsibility for Bay-Delta Plan implementation to non-HRL participants using traditional regulatory mechanisms. As further implementation of the existing Salmon Doubling objective and the proposed Native Fish Viability narrative objective, consistent with implementation of the 2006 Bay-Delta Plan, the State Water Board may also identify other actions, including non-flow and habitat actions, that should be taken by other entities who are not under the direct authority of the State Water Board. (See 2006 Bay-Delta Plan, POI, Ch. IV(B) and (C).) Each of these activities would be expected to contribute to meeting the existing and proposed narrative fish protection objectives by 2050.

Accountability

There are several governing entities that will manage implementation of the HRL Program as follows: System-wide Governance Committee, Water Source-Specific Governance Entities, the HRL Program Science Committee, the Flow Operations Team (FOT), and the Program Office. The responsibilities of each of these entities are described in the Global Agreement, section 9.1. State Water Board staff is expected to participate in or engage with each of these entities.

Regarding the implementation of flow assets, the Water-Source Specific Governing Entity on each tributary and in the Delta shall ensure implementation of flows available in the quantities and within the flexibility ranges that are identified in each Enforcement Agreement. The flow flexibility ranges in the Enforcement Agreements already account for a regulatory agency preference for outflow in the spring months and any potential implementation flexibility available for each asset, by tributary and by water-year type. The SGC would make recommendations regarding implementation of flow assets within the flexibility ranges, with final decisions made by the Water-Source Specific (tributary) entities. The State Water Board would be engaged with the deployment of flow and associated accounting through the FOT that reports to the SGC. The FOT will begin meeting each January to discuss hydrology and water operations forecasts and will meet as needed until a decision is made regarding how to deploy flow assets each year, meeting weekly thereafter throughout the flow deployment. The weekly meetings will provide opportunities to discuss flow asset deployments and accounting for the prior week and update reference conditions for the next week. See the flow accounting common response for more information. In the pre-deployment discussions, the Water-Source Specific Governing Entity has the authority to deny any proposal as it relates to their water-source because they understand the ecological conditions and operational limitations of their respective tributaries, including compliance with competing permit conditions. As long as implementation is within the identified flexibility ranges, the HRL Parties would be in compliance with the Bay-Delta Plan, because implementation would be consistent with the Enforcement Agreements.

In the Delta, CDFW would work with DWR to determine implementation of State Water Project (SWP) export cuts within the flexibility ranges described in its Enforcement Agreement, as part of the SWP's compliance with its Incidental Take Permit for Long-Term Operations. It is also anticipated that Reclamation and the Sacramento River Settlement Contractors would coordinate with the United States Fish and Wildlife Service, National Marine Fisheries Service, and the Water Board during HRL Program implementation to provide flow assets within designated flexibility ranges while also optimizing temperature protection at Shasta Reservoir and complying with the provisions of the Biological Opinions. USBR will coordinate with the HRL SGC and DWR to provide export cuts within the flexibility ranges described in the Delta Implementing Agreement (Exhibit B2 to the Draft Global Agreement) while complying with the Biological Opinions.

Funding for HRL Program implementation and water purchases is described in the HRL Program Funding common response, accounting of HRL Program flow assets is described in the Flow Accounting common response, and accounting of HRL Program non-flow measures is described in the Accounting of HRL Program Habitat Assets common response. Even though funding and accounting procedures are described and required under the Implementing Agreements, if the full list of flow assets or habitat projects are not being implemented, the State Water Board would know immediately based on their participation in the FOT and SGC.

Most HRL Program flow assets are supported by guaranteed funding and specific partners and rely on the operations and accounting of the CVP and SWP, as described in the Flow Assets common response. If the responsible HRL Parties were to not contribute their identified flow assets, the State Water Board would have the same enforcement authority they do today, as described in the Enforcement Agreements. If HRL Program flow assets that do not have a guaranteed seller do not occur, it would immediately be raised in the FOT weekly meetings and in the SGC for remedy. Any remaining issue would be reported in the annual report and the State Water Board would have an opportunity to exercise its enforcement authority. Additionally, this would be a factor weighted in the 3-year and 6-year review of HRL Program implementation, and would influence the final determination of whether the HRL Program is successful and can be extended past year-8, creating a collective incentive to ensure that all assets and actions committed to in the Implementing Agreements are in fact implemented.

Regarding the implementation of non-flow assets, the entities that have committed to implementation in the Enforcement Agreements are responsible for these actions within the time frame of the HRL Program. The accounting methods for habitat restoration are described in the Accounting of HRL Program Habitat Assets common response. Progress on habitat restoration would be reported in annual reports, including any hurdles or issues in implementation, for State Water Board review and assistance in corrective actions. If the required habitat restoration does not occur, this would be a factor weighted in the 3-year and 6-year review of HRL Program implementation, including the reasons for any incomplete projects or issues with permit streamlining as committed to in the 2022 MOU, and would influence the final determination of whether the HRL Program is successful and can be extended past Year 8.

As noted above, the State Water Board would receive an annual report from the HRL Program that describes each year's dedication of flow assets, quantified by month. Using the flow accounting methodology, the annual reports would demonstrate that new water was provided to the Delta. The annual reports would describe the status of science and monitoring activities and progress toward

completion of habitat projects. The State Water Board would also receive reports every three years that provide updates on program implementation and that also summarize the syntheses of the monitoring results and the science program to inform the success of the program. To the extent available, the annual reports would provide syntheses of monitoring results and science program activities, but realistically implementation must occur for more than a couple years to generate sufficient data to support even preliminary conclusions, which is why the year-3 and year-6 synthesis reports are important.

The year-3 and year-6 synthesis reports would apply the metrics from the Science Plan to show how monitoring and science activities are addressing conceptual models for how the system responds to restoration activities. This feed-back loop (of action followed by monitoring, synthesis, and assessment of progress in the context of hypothesis testing) is significantly more than what is currently done to assess implementation of the 2006 Bay-Delta Plan and is more than is required by law. If there are any modifications to the HRL Program that the SGC believes may improve the effectiveness of the HRL, those would be described in the three-year reports. The State Water Board would hold public informational workshops to discuss progress in HRL Program implementation as described in the three-year reports.

The final layer of accountability is the year-6 review to determine if the program should continue and whether it should continue with modifications. The Science Program will synthesize data and information produced by that program into an ecological outcomes report for the State Water Board's consideration in assessing the potential green, yellow and red-light scenarios that will be the basis for determining whether to extend, or modify, some or all of the HRL Program after Year 8.

Common Response: Modeling Representations of the HRL Program

The presentation of the Healthy Rivers and Landscapes (HRL) Program contained in the State Water Board's Draft Staff Report (DSR) raised questions about the quantities and timing of HRL Program flows and how those flows were represented in the DSR modeling. Modeling of the San Francisco Bay/Sacramento-San Joaquin Delta (Bay-Delta) system is a complex and technical topic. The intent of this common response is to address several themes that explain the results of the DSR modeling, and specifically why the presentations of modeling results do not perfectly match the descriptions of the HRL Program assets.[1]

I. Fundamental Modeling Concepts

This common response is focused on the operations modeling in the DSR. As an initial matter, there are several general concepts that must be understood as it relates to modeling operations in the Bay-Delta system, as follows:

- All operations models (e.g., SacWAM, CALSIM) commonly used in the Bay-Delta are generalized and simplified representations of a complex water system. This means that many decisions have been made regarding how to represent flow at many different locations and time scales, and all of those decisions result in a modeled system that is somewhat different than actual historic or future conditions.
- Operations models assume that facilities, demands, land use, and regulations are consistent through the model's simulation period. As these major system changes occur throughout the historical record, it is difficult to compare model results to historical information.
- Operations model results should be interpreted in a comparative manner, comparing a modeled proposed action to a modeled baseline point of comparison (baseline). Model results should not be interpreted as an absolute prediction of future conditions. These models can be used to identify general trends as compared to a baseline.
- Since operations models are based on a simplified representation of the system, different models and different model runs can have different results. These differences do not mean that the model results are incorrect or not useful. Whether a model result is useful or informative depends on how well it fits the underlying purposes of the modeling exercise.
- Since operations model results are only to identify trends, which can include direction and size of the change, care should be taken when differences are very small because small changes

[1] The assets as described in HRL Program flow assets tables (outlined in Table 1 of the Draft Strategic Plan, which was included as Appendix G1 of the DSR) were evaluated consistent with the project description as required by the California Environmental Quality Act. The differences between the project description and the modeling results are primarily the result of the selection of modeling baselines, which is an area where the State Water Board staff have discretion. The DSR acknowledged this in Chapter 9 stating, "These increases in Delta exports would not be the result of adding the proposed VAs to the Bay-Delta Plan, but instead the possible result of cumulative changes to the BiOps and ITP compared to baseline."

may be a result of the model operating to generalizations and not the actual effect of the action being evaluated.

- The selection of baseline can heavily influence the operations model results. The baseline serves as a reference point and provides perspective to all analyses.

These fundamental concepts in model result interpretation are an initial step in achieving a common understanding. Model interpretation can also be heavily influenced by how results are depicted in tables and figures, including the scale on figures and averaging periods. The action or actions being evaluated and their resulting physical changes should align with presentation and summary of results. These fundamental concepts are important for HRL Program model interpretation.

II. HRL Program Modeling Responses

Comment letters and statements received at the State Water Board's April 2024 HRL Program public workshops raised questions about the extent to which DSR modeling matches the description of HRL Program flow assets. Regardless of modeling, the HRL Program would provide new outflow. The Flow Accounting common response shows that the HRL Program would provide new flow and shows how that flow would be guaranteed as new outflow. This common response is focused on modeled representations of the HRL Program.

A. Increased outflow over baseline

Several public and agency commenters expressed concerns that the modeling showed only a small quantity of new water, either because the baseline was similar to HRL Program modeled outcomes or because it appears flow was simply moved from summer or fall to spring. Some also questioned why the total HRL Program flow asset tables did not match the absolute totals in the modeling result tables. Applying the fundamental modeling concepts described above, the reasons why the modeling of Delta outflow and associated figures do not exactly match the HRL Program outflows are as follows:

- Baselines for Comparative Purposes: As it relates to the selection of modeling representations of baseline, the largest category of change across potential baseline representations is the operation of the Central Valley Project (CVP) and the State Water Project (SWP). In the potential baseline modeling representations, diversions by all other water users is generally consistent across baselines because they generally divert at the same time and in the same quantities, with differences primarily being due to annual hydrology. CVP and SWP operations change every time their permit conditions are updated, which affects the magnitude and timing of flow. Therefore, the different baselines described here are identified in terms of the operable Biological Opinions for the CVP and SWP.
    - As agreed in the 2022 Memorandum of Understanding Advancing a Term Sheet for the Voluntary Agreements (MOU)between the HRL Program participating water users (HRL Parties) and the State of California, the baseline from which HRL Program flow assets are measured and reported includes the outflows resulting from the 2019 Biological Opinions. This baseline does not mean that the 2019 Biological Opinions would be in effect during implementation of the HRL Program; rather, it is a baseline that defines HRL Program assets for State Water Board enforcement and reporting. Since the DSR did not provide a HRL Program comparison to a 2019 Biological Opinions baseline, the

HRL Program flow asset tables would never be expected to match any of the modeling outcomes.

  - The DSR used two different baseline representations of CVP and SWP operations under two different Biological Opinions scenarios, both containing higher spring outflow, particularly in April and May, than that contained in the 2019 Biological Opinion baseline. By selecting baselines with higher spring outflow, the HRL Program outflows will appear smaller in comparison.
  - In one of the two baseline comparisons, the DSR used an older baseline representing the 2008-2009 Biological Opinions for the CVP and SWP. At the same time, the representation of the HRL Program in that comparison contained an entirely different operation of the CVP and SWP under a different set of Biological Opinions. Since the operation of the CVP and SWP were not held constant, thereby isolating the HRL Program as the only change, the results show changes in modeled flow that have nothing to do with the HRL Program. Since the operation of the CVP and SWP varied independent of HRL Program flows in the 2008-2009 Biological Opinion baseline model comparisons, the portion of the results that are due to the HRL Program cannot be determined.
  - Regardless of baseline, it would be surprising if the modeling results perfectly matched the HRL Program flow asset tables because the operations modeling is a simplified and generalized depiction of flows in the Bay-Delta system.

- Predictive Interpretation: Modeling results should not be used as absolute future predictions of the quantity of new HRL Program flows. Acre-foot to acre-foot comparisons between modeling results and the HRL Program flow asset tables are flawed because the available operations models should not be used predictively.
- Summarizing Results: The figures and tables showing DSR modeling results average together so many months, years, and water-year types that the HRL Program is nearly averaged out of the results. For example, the DSR modeling averages together the months January-June even though most of the HRL Program flow assets are provided in April and May, a pattern of flow dispersal proposed at the request of the regulatory agencies. The DSR January-June model result summary also rolls-up all water-year types into a single result. Wet years, particularly in the Sacramento River watershed, can have extremely high flows in January through June, and these Wet years will overwhelm any outflow that could be created by the CVP-SWP and/or by the tributaries.

For all of the reasons stated above, it was fully anticipated that the DSR modeling results would not specifically match the flow assets identified in the HRL Program flow asset tables, although they do provide the basis for determining any impacts that are required to be disclosed and mitigated under CEQA. It is through flow accounting protocols that the HRL Program can guarantee new flow that would not have otherwise existed in the system.

B. No increased CVP-SWP entrainment.

Since the DSR modeling of species entrainment is entirely flow based, the reasons the modeling is not reflective of the HRL Program are the same as described above. Also, most operations modeling,

including that presented in the DSR and that usually done by the U.S. Bureau of Reclamation (USBR) and the California Department of Water Resources (DWR) for permitting purposes, is generalized and cannot account for most real-time operational species protections. Therefore, actual CVP and SWP operations would be expected to be more protective than shown in the modeling.

More importantly, as further explained above and in the Flow Accounting common response, the CVP and SWP would not be diverting HRL Program flows, and they would be taking new export cuts, so the HRL Program would provide new flow as compared to what would have otherwise existed. At the same time, the CVP and SWP would be operating consistent with all then-existing applicable state and federal permits, so all entrainment of protected species would be minimized and mitigated to avoid jeopardy consistent with the Federal Endangered Species Act (ESA); and for the SWP, it would also satisfy the California Endangered Species Act (CESA) standard requiring full mitigation of the effect of take.

For all these reasons, the HRL Program is protective of species and would not result in increased entrainment of fish in the south Delta.

III. The HRL Program provides benefits in Critical water years.

The HRL Program would improve habitat conditions in all water years, including Critical water years, by creating habitat that inundates with existing flows plus Critical water year HRL Program flow assets that total approximately 155 acre-feet (low-end estimate), as shown in the following figure from the Draft Scientific Basis Report Supplement (released in 2023) for salmonid rearing habitat by water-year type.

Table 6-2. Median Percent Change between the Reference Condition and VA Scenarios for Suitable Instream Rearing Habitat by Water Year Type and Watershed

Watershed	Critical	Dry	Below Normal	Above Normal	Wet
American River	45% (21)	52% (37)	63% (44)	78% (49)	128% (51)
Feather River	4% (4)	0% (0)	-1% (-2)	2% (2)	3% (4)
Mokelumne River	0% (0)	-1% (-2)	-3% (-3)	0% (0)	NA
Sacramento River: FR	15% (14)	23% (23)	63% (49)	75% (48)	83% (50)
Sacramento River: SR	13% (23)	24% (35)	35% (49)	57% (64)	69% (61)
Yuba River	3% (7)	5% (13)	10% (24)	11% (25)	10% (20)

Note: The numbers in parentheses are median changes in suitable instream rearing habitat acreage. Results are presented for fall run in all tributaries and for spring run in the Sacramento River. Mokelumne River results are based on the Mokelumne River water year type definitions, which do not contain a "wet" category.
FR = fall run; NA = not applicable; SR = spring run

(Draft Supplemental Scientific Basis Report, p. 6-9, Table 6-2.)[2] This table shows that even in Critical water years, the HRL Program provides significant increases in available habitat. As explained in more detail in the Species Habitat and Abundance common response, improvements in the quantity and quality of multiple habitat types under a range of flow conditions, like that proposed under the HRL Program, can support persistence of multiple life history strategies and species, generating a 'portfolio effect' that may enhance population and ecosystem resistance to perturbation, even with increased

[2] Under the Mokelumne River reference condition and HRL program in all water-year types, the Mokelumne River exceeds the habitat needed to support 100 percent of the doubling goal for the juvenile population target.

drought and flood conditions predicted by climate change models. (Robinson et al. 2016; Herbold et al. 2018; Woo et al. 2019, Greene et al. 2010.) While implementation of flow actions relies on adequate precipitation falling each year, many habitat restoration sites may be available to fishes and provide ecological benefits across the full range of water years, including under drought conditions. Restoring aspects of a natural flow regime is more effective when paired with physical habitat restoration in order to achieve optimal system resiliency (Brown et al. 2022).

As further explained in the Upstream Temperature common response, proposed actions as part of USBR's and DWR's reinitiation of consultation for the long-term operation of the CVP and SWP are focused on Critical water years and improved temperature conditions downstream of Shasta Reservoir for the protection of winter-run Chinook salmon. The improved ability to manage water temperature for winter-run Chinook salmon has been a common reason for temporary urgency change petitions (TUCPs) granted by the State Water Board in the recent past. In the future, TUCPs in combination with the HRL Program, specifically the Settlement Contractors contribution, can further improve temperatures on the Sacramento River and improve the ability to manage through future droughts. The TUCPs are a form of adaptive management where USBR and DWR seek the State Water Board's input on how to best balance beneficial uses of water during critical droughts, including water supply to meet human health and safety needs. Critical droughts are unique events and hard to fully anticipate, and TUCPs are a flexible tool that can be tailored and adapted to the current state of California, working with the full state administration.

The HRL Program would add new management tools and assets to Critical water years to support species resilience.

IV. HRL Program provides benefits in Wet water years.

As illustrated above, the HRL Program would also provide benefits in Wet water years, primarily due to the natural inundation of restoration sites and the addition of HRL Program Wet water year flow assets with a proposed 123 acre-feet of permanent state water purchases and 27 acre-feet of fixed price water transfers. Since the greatest benefit of increased flows would be realized in the "in-between" water years, rather than when the system is already experiencing flooding, the HRL Program focused on drier years.

Common Response: HRL Program Flow Accounting

The HRL Program proposes a combination of flow and non-flow assets to meaningfully contribute towards the existing salmon protection narrative objective and the proposed native fish viability narrative objective. This common response addresses accounting of new HRL Program flows. Habitat accounting is discussed in a separate common response.

All HRL Program participants have a vested interest in ensuring that HRL Program flow assets (HRL Program flows) are correctly accounted for and represent new water as outflow. Incorrect accounting can affect implementation performance for the HRL Program or have unintended impacts to groundwater, surface supplies, and/or the Central Valley Project (CVP) and State Water Project (SWP) reservoirs. Therefore, all HRL participants, including the CVP and SWP operators, and the State Water Board want to ensure accounting of HRL Program flows is accurate and transparent. The Flow Accounting Procedures (Appendix E to the HRL Program Draft Strategic Plan, submitted separately in March 2024) allow for verification and ensure that action is taken to make real water available by each entity, as committed to in their respective Implementing Agreement (contained in Exhibit B to the Draft Global Agreement).

As illustrated below, new flow assets will be provided by each participating tributary upstream of the San Francisco Bay/Sacramento-San Joaquin Delta (Delta), and at the CVP and SWP export facilities through export cuts. These new flows will be in addition to flows to meet D-1641 and other regulatory requirements. This approach is illustrated in Figure 1 below.

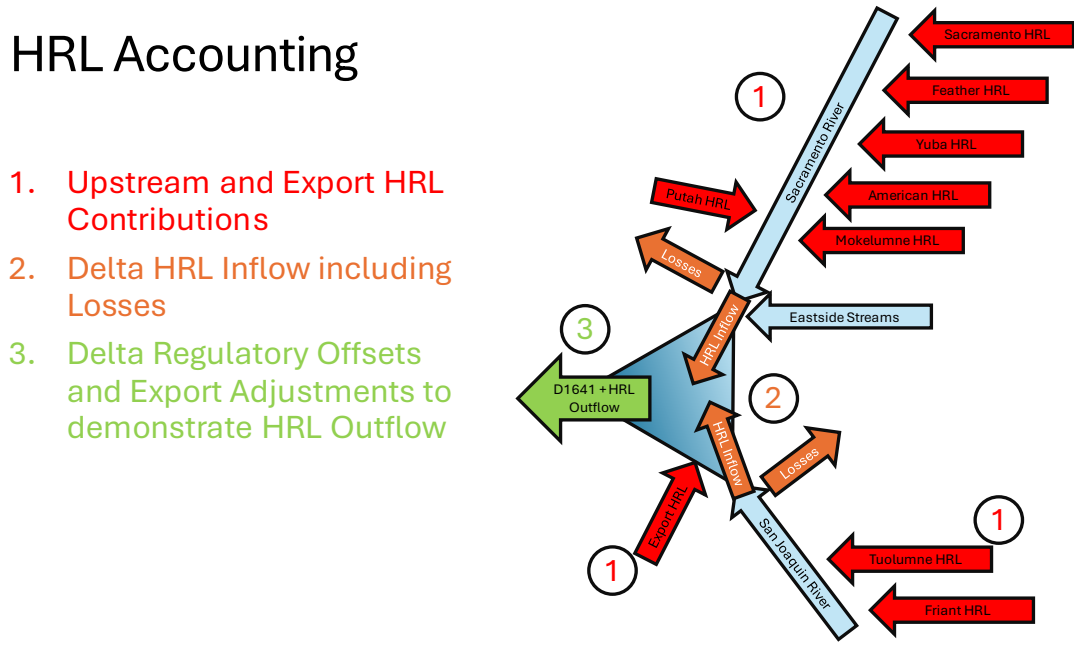


Figure 1: *HRL Program Accounting*

A key component of the Flow Accounting Procedures is the coordination among the HRL Program participants, CVP and SWP operators, and the State Water Board. The Flow Accounting Procedures allow for verification and ensure that action is implemented, and that real water is made available by each entity, as committed to in their respective Implementing Agreement. This common response addresses questions raised about implementation, accounting, and protection of HRL Program flows.

I. Summary of implementation by water source

HRL Program flows are incremental contributions to the environment by legal users of water in the Sacramento River and San Joaquin River Delta Watershed. HRL Program flows include contributions from water users on tributaries where CVP and SWP facilities exist (i.e., the Sacramento, Feather, American, and San Joaquin rivers), and from water users on the non-project tributaries, including the Yuba, Mokelumne, Putah, and Tuolumne rivers. HRL Program flows from the tributaries include releases of new environmental water that would be made available through land fallowing, reservoir reoperation, and groundwater substitution. The CVP and SWP would provide new environmental water through export reductions. The generation of HRL Program flows are unique to each tributary and the Delta, as described below.

A. Sacramento River

The Sacramento River tributary would deploy HRL Program flows by:

1. Spring Release: The U.S. Bureau of Reclamation (USBR) would release new water into the Sacramento River from Shasta Lake in the spring and summer. Sacramento River Settlement Contractors would fallow land and/or substitute groundwater in the Sacramento Valley during the irrigation season (April through September) to pay back water into Shasta Lake. The protection of cold water pool will be a consideration in years when reoperation is considered.
2. Irrigation Pattern Release: Substituting groundwater and/or fallowing agricultural land during the irrigation season without Shasta Lake reoperation to provide new flow.
3. Carryover Storage: Reoperating Shasta Lake to increase carryover storage and fallowing land/or substituting groundwater in the Sacramento Valley during the irrigation season. This action would support the cold water pool at Shasta Reservoir.

All operations generate new environmental water (total of 100 thousand acre-feet [TAF] in Above Normal and Below Normal, 102 TAF in Dry, and 2 TAF in Critical water year types1) in the Sacramento River watershed. Operations will be consistent with the Sacramento River Implementing Agreement on a flow schedule consistent with the Draft Strategic Plan (Appendix G1 to the State Water Board's Draft Staff Report, released in September 2023). (CDFW et al., 2024c and CNRA et al., 2023.) Water rights holders in the Sacramento Valley will reduce their diversions by fallowing land that otherwise would have been planted or substituting surface diversions with groundwater pumping. Land fallowing and groundwater substitution practices are described in Methods for Generating New Water section of this common

[1] Unless otherwise specified, all water types are defined using the Sacramento Valley Index

response. As such, there would be a net reduction in consumptive use of water from the Sacramento River mainstem.

B. Feather River

The Feather River tributary would deploy HRL Program flows by:

1. Spring release: DWR would release water from Oroville Reservoir consistent with the Feather River Implementing Agreement (total of 60 TAF in Above Normal, Below Normal, and Dry water year types) on a flow schedule consistent with the Draft Strategic Plan. (CDFW et al., 2024c and CNRA et al., 2023.) The Feather River Settlement Contractors would:

   a) Reduce their diversions during the irrigation season downstream of Oroville Reservoir when they would have otherwise diverted. . The Feather River Settlement diverters would either fallowing land and/or substitute groundwater (in lieu of diverting surface water). These actions by the Feather River Settlement Contractors pay back water into Oroville Reservoir to make up for the water released in spring.

   b) Reoperate reservoirs upstream of Lake Oroville to increase releases into the Feather River and that water would be stored in Lake Oroville for release of new water in the spring. The reservoirs upstream of Lake Oroville would refill consistent with a refill agreement with the SWP.

Land fallowing, groundwater substitution, and reservoir reoperation practices are described in the Methods for Generating New Water section of this common response. The total volume of new water generated through land fallowing, groundwater substitution, and/or reservoir reoperation will match the volume released from Lake Oroville in the spring. As such, there would be a net reduction in consumptive use of water for Feather River parties and Lake Oroville will recover the water it released in the spring.

C. Yuba River

The Yuba River tributary would deploy HRL Program flows by:

1. Yuba Accord Water Purchase Agreement Transfer: Yuba Water Agency (YWA) would provide all Yuba Accord Water Purchase Agreement transfer releases during April, May and June of Above Normal, Below Normal and Dry water year types that cannot be backed into Lake Oroville or exported by DWR. This water is new water to the system as it meets the Yuba Accord accounting provisions for Released Transfer Water.

2. Reoperation of New Bullards Bar Reservoir: YWA would reoperate New Bullards Bar to a target storage amount of 600 TAF on September 30 to release up to a total of 50 TAF in combination with the Yuba Accord Water Purchase Agreement transfer described above during April, May, and June of Above Normal, Below Normal, and Dry water year types. Reservoir refill accounting of New Bullards Bar Reservoir would generally be consistent with the reservoir refill accounting in Yuba Accord Water Purchase Agreement and apply to reservoir releases above 9,000 AF and which are accounted as impacts to the SWP and CVP. (CDFW et al., 2024c.)

These operations total up to 50 TAF in Above Normal, Below Normal, and Dry water year types consistent with the Yuba River Implementing Agreement and would be released on a flow schedule consistent with the Draft Strategic Plan. (CDFW et al., 2024c and CNRA et al., 2023.) Reservoir reoperation practices are described in Methods for Generating New Water section of this common response.

D. American River

The American River tributary would deploy HRL Program flows by:

1. Spring release: USBR would release water in the spring consistent with the American River Implementing Agreement (total of 10 TAF in each of three Above Normal and Below Normal years, 30 TAF in each of three Dry and Critical years, and an additional 10 TAF in each of three Dry years) on a flow schedule consistent with the Draft Strategic Plan. (CDFW et al., 2024c and CNRA et al., 2023.) The participating agencies in the American River tributary would:

   a) Replenish flows released by USBR in the spring by substituting groundwater rather than diverting surface water. USBR would account for that foregone water.

   b) Replenish flows released by USBR by reoperating reservoirs upstream of Folsom Lake to increase flows into the American River which would be stored in Folsom Reservoir.

Groundwater substitution and reservoir reoperation practices are described in Methods for Generating New Water section of this common response. The total volume of new water generated through groundwater substitution and/or reservoir reoperation will match the volume released from Folsom Lake in the spring. As such, there would be a net reduction in consumptive use of water for American River parties and USBR will account for released spring water through water replenished by the American River parties. The Flow Accounting Procedures provide a more detailed description of the HRL Program flow generation on the American River. (CDFW et al., 2024b.)

E. Mokelumne River

The Mokelumne River HRL Program flow proposal includes two components: first, an instream component, comprised of a Mokelumne River HRL Program flow contribution released from Camanche Dam; and second, a Delta contribution comprised of funding for additional water purchases in an agreed amount determined based on long-term modeling.

The Mokelumne River HRL Program flow contribution is a volume of minimum Mokelumne River flows to be released from Camanche Dam in the amount of 10 TAF, 20 TAF, and 45 TAF in Dry, Below Normal, and Above Normal Mokelumne River water year types, respectively. The Mokelumne River HRL Program flow contribution is being made available by several public water agencies on the Mokelumne River, including East Bay Municipal Utilities District (EBMUD). EBMUD owns and operates Camanche Dam and will coordinate with the other Mokelumne River HRL Parties to ensure the release of the HRL Program flow contribution on a schedule consistent with the Draft Strategic Plan (CDFW et al., 2024c and CNRA et al., 2023.). Additional details can be found in the Mokelumne Implementing Agreement.

F. Putah Creek

The Putah Creek tributary will make water available by reoperating Lake Berryessa to release new HRL Program flows in the fall, winter, and spring. Solano County Water Agency (SCWA) will release water from Lake Berryessa consistent with the Putah Creek Implementing agreement (total of 6 TAF in Above Normal, Below Normal, and Dry water years, and 7 TAF in Critical water years) on a flow schedule consistent with the Draft Strategic Plan. (CDFW et al., 2024c and CNRA et al., 2023.) Lake Berryessa will refill consistent with a refill agreement with the CVP and SWP. Reservoir reoperation practices are described in Methods for Generating New Water section of this common response. These are new flows because SCWA would not have otherwise made releases from Lake Berryessa.

G. South of Delta Export Reduction

HRL Program contributions through additional export reductions beyond those required under other regulatory requirements from the CVP and SWP would be consistent with the Delta Implementing Agreement (125 TAF in Dry and Below Normal water years, and 175 TAF in Above Normal water years) on a flow schedule consistent with the Draft Strategic Plan. (CDFW et al., 2024c and CNRA et al., 2023.)

H. San Joaquin River

The Friant Water Authority (Friant) will make water available consistent with the San Joaquin River Implementing Agreement by reducing the in-Delta recapture of San Joaquin River Restoration (SJRR) program flows to achieve a contribution of 50 TAF toward Delta outflows during February through May of Above Normal, Below Normal, and Dry water year types2 on a flow schedule consistent with the Draft Strategic Plan. (CDFW et al., 2024c and CNRA et al., 2023.) The maximum amount of reduced recapture will be up to 50% of the total SJRR flows eligible for recapture. The Flow Accounting Procedures provide a more detailed description of the HRL Program flow generation on the San Joaquin River. (CDFW et al., 2024b.)

I. Tuolumne River

The Tuolumne River tributary would deploy HRL Program flows by:

> Increased instream flow requirement, January-June: Modesto Irrigation District (MID) and Turlock Irrigation District (TID) would bypass or release water from Don Pedro Reservoir consistent with the Tuolumne River Implementing Agreement (total increase over current instream flow requirements of 138 TAF in Wet and Above Normal water years, 127 TAF in Below Normal water years, 140 TAF in Dry water years, and 86 TAF in Critical water year types[2,3]) on a flow schedule consistent with the Draft Strategic Plan (CDFW et al., 2024c and CNRA et al., 2023). The participating agencies (MID, TID, and San Francisco Public Utilities Commission) in the Tuolumne River tributary would operate Don Pedro Reservoir and reservoirs upstream of Don Pedro Reservoir to ultimately increase releases into the Tuolumne River.The participating

[2] Friant and Tuolumne water-year types are based on the San Joaquin Valley Index.
[3] In Below Normal years following a Below Normal, Dry or Critical year, Tuolumne River HRL flows would be 98 TAF. In Dry years following a Below Normal, Dry or Critical year, Tuolumne River HRL flows would be 40 TAF. In Critical years following a Below Normal, Dry or Critical year, Tuolumne River HRL flows would be 17 TAF.

agencies will make additional voluntary releases in certain agreed upon circumstances. The participating agencies will work collaboratively with DWR, USBR and other HRL Parties consistent with the 2022 MOU, Addition of Signatories (November 9, 2022).

The Flow Accounting Procedures provide a more detailed description of the HRL Program flow generation on the Tuolumne River. (CDFW et al., 2024b.)

J. Water Purchases

There are several categories of water purchases: Market Price, Permanent, and Fixed Price. Some categories of water purchases have identified buyers and sellers, and other categories will be implemented through the water market, similar to transfers that currently occur throughout the watershed. All water purchases will follow applicable guidance, regulations, and laws governing transfers. The methods for generating water for water purchases are basically the same as those being undertaken in the tributaries for the creation of new water that are described below.

II. Methods for Generating New Water

The methods for generating new water in the tributaries are described below. The same methods and processes for generating new water are well supported and documented with a long history of use as part of the current annual water transfer market. Detailed descriptions of these methods of accounting are available in the Water Transfer Guide (SWRCB 1999), Long-Term Transfers Final Environmental Impact Report/Environmental Impact Statement (EIR/EIS) (USBR and SLDMWA, 2019), and the Draft Transfers White Paper (CDWR and USBR, 2019).

A. Groundwater Substitution

New flows are generated through groundwater substitution when groundwater is pumped in lieu of diverting surface water supplies, thereby making surface water available for environmental use.

There are existing rules that protect local groundwater basins and that protect local surface water supplies. Groundwater substitution operations as part of the HRL Program must be compliant with local regulations and applicable Groundwater Sustainability Plans. (CDWR and USBR, 2019.) These rules protect against over drafting groundwater resources. Groundwater substitution will comply with or utilize principles similar to water transfers, such as minimizing the effect on surface water supplies. More details regarding groundwater substitution practices for standard water transfers are provided in the Long-Term Transfers Final EIR/EIS (USBR and SLDMWA, 2019) and the Draft Transfers White Paper. (CDWR and USBR, 2019). For more information about groundwater substitution, including streamflow depletion factors, see the Potential Groundwater Impacts common response.

B. Reservoir Reoperation

Reservoir reoperation results in the release of additional stored water from a reservoir to create new outflow. Reservoir reoperation allows the release of new water that would have otherwise not been used for downstream flow requirements, water quality standards, or captured by downstream water users. When stored water is released from a reservoir to generate a new flow, the reservoir is drawn down to levels lower than it would have been without the release of the flow. To prove that the reoperation of the reservoir creates new water, Reference Conditions (described in Flow Accounting

Procedures Section of this common response) that represent the baseline condition must be considered in addition to the proposed reoperation to demonstrate the creation of new flow. In some cases, refill agreements would be needed to avoid downstream impacts. To avoid causing impacts to other water users, refills to storage must generally occur at a time when downstream users would not have otherwise captured the water, either in downstream reservoirs, at CVP/SWP pumps, or non-project pumps. Additionally, refill cannot occur at times when the water would have been used to meet downstream flow or water quality standards. For more information regarding specific refill accounting provisions, see the Implementing Agreements.

C. Land Fallowing

Land fallowing is a reduction in agricultural production that results in a decrease in water use, thereby making new water available for outflow. The quantity of water made available through land fallowing is the difference between estimated evapotranspiration of applied water (ETAW) for agricultural production under Reference Conditions and the proposed land fallowing operation. The ETAW is the quantity of water that the crops would have consumed in the Reference Condition.

III. Flow Accounting Procedures

In real-time, the HRL Program participants would be deploying HRL Program flows based on the forecasted hydrologic conditions. Post-deployment, Flow Accounting Procedures would be used to quantify the volume of HRL Program flows deployed and tracked on individual tributaries and in the Delta each year. For HRL Program flows in each of the tributaries and the Delta, a detailed "Flow Accounting Procedure" has been developed by the HRL Program participants in coordination with CVP and SWP operators, the State Water Board, and California Department of Fish and Wildlife (CDFW) staff. The following components are included in the Flow Accounting Procedures to ensure the HRL Program flows can be transparently tracked and verified.

A. Planning

In January, the Flow Operations Team (FOT) will meet on at least a two-week interval to discuss hydrology and operations forecasts for the year. As meetings progress, FOT discussions will include water year type forecasts, Reference Conditions4, HRL Program flow volume estimates, and operations schedules to deploy HRL Program flows. The State Water Board and CDFW staff will participate in FOT meetings. Each tributary will develop an initial forecast of HRL Program flows, including detailed timing and magnitude, at least one month in advance of a HRL Program flow deployment.

[4] Reference Condition is the state of reservoirs and flows in the tributaries and in the Delta that would have existed without the HRL flows or that represent existing regulatory and other release requirements. The project operators, or CVP and SWP operators, for each system and non-project tributary operators define the Reference Condition based on the forecasted hydrology and the non-discretionary regulatory requirements for their system. Reference Condition will be the basis for quantifying the volume of HRL flows deployed. For each tributary and HRL flow, the Reference Condition is clearly defined in the respective Flow Accounting Procedure document.

B. Deployed HRL Flows

Before deploying HRL Program flows per the tributary's Implementing Agreement and the Draft Strategic Plan, reservoir operators would finalize an HRL Program flow schedule and provide it to the CVP and SWP operators. The flow schedule would indicate the location (or compliance point) at which HRL Program flows are tracked in the tributary, the Reference Condition at that compliance point, and the date range and magnitude of the HRL Program flows. Upstream reservoir operators would be obligated to adhere to the finalized schedule and would immediately notify the CVP and SWP operators of any unavoidable deviations from the schedule. Planned and actual HRL Program flow releases would be tracked daily in the tributaries and as inflow to the Delta by the CVP and SWP operators. As tributary and project operators would require increased coordination in the month leading to and during HRL Program flow deployment, FOT meeting frequency may increase to a weekly interval.

HRL Program flow volumes are determined by water year type. The water year type classification is finalized in late spring. As some tributaries commence their releases of HRL Program flows before the water year type is finalized (e.g., March), these tributaries would need to provide a finalized flow schedule for the first month of deployment (e.g., March) based on the forecasted water year type and potentially multiple forecasted HRL Program flow release schedules, subject to variations in forecasted water year type, for the following months of HRL Program flow deployment. Until the release of the HRL Program flow is complete, tributary operators would continuously coordinate with CVP and SWP operators on water year type forecasts and revisions to HRL Program flow release volume and schedule.

C. Delta Inflow

Each day, CVP and SWP operators will track planned and actual Delta inflow as they do currently. Project operators would review the HRL Program flow schedule from each tributary and calculate travel time and losses between each tributary compliance point and the Delta. After applying travel time and appropriate streamflow losses, CVP and SWP operators would track the timing and magnitude of HRL Program flows entering the Delta.

D. Inflows That Exceed Regulatory Requirements

In the Delta, CVP and SWP operators are typically operating to meet multiple regulatory requirements. Delta inflow is used to meet these regulatory requirements and support Delta exports. HRL Program participants are proposing an approach that allows the CVP and SWP operators to demonstrate that the HRL Program Delta inflows result in additional Delta outflow.

To do this, CVP and SWP operators would calculate an operational offset to Delta regulatory requirements based on the HRL Program flows entering the Delta. Delta regulatory requirements are based on flow or water quality. In the case of a flow-based regulatory requirement, project operators would increase the flow requirement by the HRL Program flow. For example, if the Delta outflow requirement is 7,100 cfs and the HRL Program flow is 1,000 cfs for a given month, project operators would apply a 1,000 cfs offset to the Delta outflow requirement and operate to a Delta outflow of 8,100 cfs. In the case of a water quality-based regulatory requirement, project operators would adjust the water quality requirement to require a fresher water quality condition. For example, if the electrical conductivity (EC) requirement for San Joaquin River at Jersey Point (Jersey Point) is 1,670 µmhos/cm and, through DSM2 or other modeling, the 1,000 cfs HRL Program flow would reduce EC by 300 µmhos/cm,

project operators would apply a 300 µmhos/cm offset to the water quality requirement and operate to an EC of 1,370 µmhos/cm at Jersey Point. CVP and SWP operators would also calculate offsets for the Old and Middle River flow requirements, if needed, based on HRL Program flows entering the Delta from the San Joaquin River.

Throughout the HRL Program operational period, CVP and SWP operators would document the existing regulations, schedule and magnitude of HRL Program flows entering the Delta, calculations for the regulatory offset, and observed data to show that existing regulations, plus the regulatory offsets, are met, thereby demonstrating new outflow.

E. Payback to CVP and SWP

As noted above, CVP and SWP operators will typically release HRL Program flows from the CVP and SWP reservoirs in advance of actions undertaken by the CVP and SWP water users on the project tributaries (Sacramento, American, and Feather rivers). As noted above, these water users take actions described in their Implementing Agreements, such as fallowing and groundwater substitution, to payback the projects.

In the case that water users on a given tributary are unable to provide a HRL Program flow, they are responsible for resolving the deficit. Neither the CVP nor the SWP have responsibility for making up or backstopping a water user's deficit on a project tributary.

F. Storage Accounting

Several categories of HRL Program flows rely on reoperating tributary reservoirs to generate the HRL Program flows. In some cases, the Implementing Agreements for these tributaries identify the storage accounting procedure. Where applicable, reservoir refill will be consistent with a refill agreement with the CVP and SWP.

G. Delta Accounting

Throughout the HRL Program flow deployment season, project operators will review prior Delta operations and verify the flow accounting in the Delta. HRL Program flows will be subtracted from their respective Delta inflow gages (e.g., Sacramento HRL Program flows will be subtracted from Sacramento River at Freeport). The calculated flow (gage flow minus HRL Program flow) will be input into DSM2 or another water quality model to demonstrate that Delta regulatory requirements were met without the HRL Program flows. This back-calculation will also allow for a verification of the total HRL Program flow volume entering the Delta. More details on this process can be found in the Delta Accounting Procedures document.

H. Transparency and Reporting

The governance, implementation procedures, and reporting are set up such that HRL Program flows can be tracked transparently and verified easily on an ongoing basis. Annual reports will demonstrate that HRL Parties are meeting their flow obligations under the HRL Program. Parties may also make information available in real time.

Relying on the forecasted information, periodic reports of the planned deployment of HRL Program flows, estimated HRL Program flows entering the Delta, and planned adjustments to Delta operations, an expected HRL Program flow contribution to Delta outflow will be provided. This will include information from CVP and SWP as well as the non-project tributaries.

HRL Parties are also committed to providing annual and triennial reports, which will summarize the annual HRL Program flows deployed along with other relevant information.

I. Water Board Enforcement

The State Water Board has an enforcement role as described in the Enforcement and Accountability common response. Further, even though operations of the CVP and SWP will assume that HRL Program flows materialize on schedule, as reported by the tributaries, the State Water Board has a role in investigating if scheduled HRL Program flows do not in fact materialize on schedule as part of an after-the-fact accounting. While there are multiple reasons why flows may not materialize that may not be an enforcement issue (e.g., unexpected runoff patterns or unexpected losses to groundwater), there may be circumstances where HRL Program flows are lost to unlawful diversion. The State Water Board has a role in protecting HRL Program flows from unlawful diversion.

IV. References

Draft Strategic Plan Appendix E – Delta Accounting Procedures, March 2024. https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Support-Healthy-Rivers-and-Landscape/FlowAccounting_StrategicPlanAppendixE_5April2024.pdf

March 2024. Draft Strategic Plan Appendix E – Flow Accounting March 2024. https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Support-Healthy-Rivers-and-Landscape/FlowAccounting_StrategicPlanAppendixE_5April2024.pdf

Global Agreement to the Healthy Rivers and Landscapes Program in the Bay-Delta. March 2024. https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Support-Healthy-Rivers-and-Landscape/20240408-HRL-Agreements-0408--2-pm.pdf

California Department of Water Resources and United States Bureau of Reclamation. December 2019. Information for Parties Preparing Proposals for Water Transfers Requiring Department of Water Resources or Bureau of Reclamation Approval.

Draft Strategic Plan for the Proposed Agreements to Support Healthy Rivers and Landscapes. September 2023. https://www.waterboards.ca.gov/waterrights/water_issues/programs/ bay_delta/docs/2023/staff-report/app-g1.pdf

State Water Resources Control Board (SWRCB). July 1999. A Guide to Water Transfers.

United States Bureau of Reclamation (USBR) and San Luis & Delta-Mendota Water Authority (SLDMWA). September 2019. Long-Term Water Transfers Final Environmental Impact Report/Environmental Impact Statement.