FLOODPLAINS REIMAGINED

ADVISORY COMMITTEE MEETING SUMMARY

December 13, 2023, 1-2:30pm
Zoom Virtual Meeting

Meeting Objectives

- Gather initial feedback for Scientific Uncertainties and Data Needs
- Shared understanding of Program status

Action Items

Program Team

- Post the summary table of Scientific Uncertainties and Data Needs to the website as a standalone reference as requested by participants. [Complete]

Key Meeting Outcomes

1. Support from various participants for the Chinook Science Uncertainties and Data Needs presented by Cramer Fish Sciences and San Francisco Estuary Institute.
2. Recommendation to use the Fremont Weir Big Notch Project science and monitoring to inform uncertainties and data needs.
3. Recommendations from various participants to prioritize reducing uncertainty of assumptions around:
    a. 1:1 ratio of flow to fish;
    b. Benefits of range of depths for both Chinook salmon and birds;
    c. Distinction and comparison between benefits of land cover including managed rice fields, managed wetlands, and natural floodplains;
    d. Benefits of fish food production and delivery;
    e. Benefits of floodplains in relation to increased Chinook survival as indicated by otolith science;
    f. Effects of increased introduction of hatchery fall-run Chinook into the Sacramento River system.

Welcome and Introductions

Julie Leimbach (Leimbach), Kearns & West, welcomed all attendees. All attendees are listed in the table at the end of the document.

Leimbach reviewed the meeting agenda and objectives.

Holly Dawley (Dawley), KSN, provided some context for the current stage of the Floodplains Reimagined program. The Program Team will:

- Prioritize Program activities to maximize currently secured funding.
- Collaborate and coordinate with other related efforts in the Central Valley.
- Continue to engage technical experts in both Ad Hoc Group meetings and Technical Assistance projects.
- Seek additional funding.

Dawley also recognized a number of Steering Committee members who have worked with the Technical Team to contribute to science sharing for the Program.

Chinook Salmon Science Uncertainties and Data Needs

Introduction

Steve Zeug, Cramer Fish Sciences, presented the Chinook Salmon Science Uncertainties and Data Needs. Zeug is a Science Operations Manager and Senior Scientist with extensive floodplains-related work in both California and Texas. Zeug's presentation was a combined effort with Steering Committee members Carson Jeffres, UC Davis; Bjarni Serup, CDFW; and Brian Ellrott, NMFS.

Zeug stated that the purpose of the presentation was to provide a general description of scientific uncertainty concerning juvenile salmon benefits within Central Valley flood bypasses.

The purpose of this presentation is to develop a shared understanding of Chinook salmon science uncertainties to be documented in the Phase I Report and inform future science. The Facilitator invited participants to provide input and clarifications on the concepts presented. The Technical Team will consider input for the Phase I Technical Memorandum on Chinook Salmon Science Uncertainties and Data Needs.

Science Uncertainties

Zeug outlined the rationale for addressing scientific uncertainty, sources, and factors affecting uncertainty.

Rationale for reducing scientific uncertainty:

- Transparency around uncertainties translates to a better chance of making positive decisions for target species and stakeholders.
- Minimization of risk from poor or uninformed decisions that are misaligned with stakeholder interests.

Sources of uncertainty:

- Model uncertainty – in the hydrodynamic or biological models such as the Salmon Benefits Model and the Habitat Suitability Approach
    - Key questions:
        - Are all the correct functions represented in those models?
- Overall structural uncertainty – in all the models

    - Key questions
        - Are we representing the connections between these models and components correctly?
        - Are our models useful enough to help make decisions?

Factors affecting uncertainties around potential salmon benefits in the flood bypasses:

- Some data on juvenile salmon growth on floodplain landscapes suggest potential benefits for salmon populations.
- Scientific understanding is increasing but key information remains incomplete.
- Some data show that salmon use of and growth on floodplain landscapes suggest potential benefits.
- Most available data on salmon floodplain use and survival is still noisy or equivocal.
- Models use the best available scientific data with several assumptions that may or may not be correct to evaluate scenarios for Floodplains Reimagined Phase I.

Benefits

Benefits to juvenile salmon are expected to accrue in the following ways:

- River channels
    - Some fish will migrate down the main channel
    - Some fish will enter the flood bypasses
    - More river connections will increase the number of fish accessing habitat within the bypass
- Bypass
    - Fish grow rapidly in the bypass when food is more abundant and temperatures are warmer than the river channel
    - Increased suitability in space and time results in more capacity
- Delta
    - Larger fish are stronger swimmers and can escape gape-limited predators, better resulting in higher survival through the Delta
- Ocean
    - Larger fish may experience higher survival rates and population sizes in the ocean

Needs Summary

Zeug provided a summary of needs pertaining to two of the biological models employed by Floodplains Reimagined:

- Salmon Benefits Model
    - Evaluate in-river lateral fish distribution and behavior, and relative entrainment rates at flood basin weir locations. Consideration of differing channel geometries, river reaches, and adjacent habitat types.
    - Evaluate juvenile salmon movements and residence times in flood basins.
    - Evaluate relative rearing survival rates of fry, parr, and pre-smolt life stages in flood basins, including conveyances and outlet, and the river channel.

    - Reconcile caged fish growth study rates with free-swimming growth and survival.
    - Determine if larger size translates to higher survival in Delta and/or ocean (population-level effect).
- Habitat Suitability Approach
    - Use and/or preferences for depth and cover type within floodplain environments.
    - Connectivity and conveyance features and how they affect access, movement, and survival.
    - Evaluate managed field operations – fish access/egress passage.

Questions and Comments

The participants recommended reducing scientific uncertainty around the following assumptions:

1. 1:1 ratio of flow to fish;
2. Benefits of range of depths for both Chinook salmon and birds;
3. Distinction and comparison between benefits of land cover including managed rice fields, managed wetlands, and natural floodplains;
4. Benefits of fish food production and delivery;
5. Benefits of floodplains in relation to increased Chinook survival as indicated by otolith science;
6. Effects of increased introduction of hatchery fall-run Chinook into the Sacramento River system.

The participants discussed the following questions, comments, and recommendations:

1:1 Ratio of Flow to Fish Assumptions

- Clarification of the assumption of 1:1 ratio of flow to fish movement over a weir. [Paul Buttner, California Rice Commission]
    - The ratio is based on flow proportion, and the relationship is from tagged fish. The y-axis of the chart [see Appendix] represents the proportion of flow, and the x-axis is the proportion of fish entrained in that tributary. If 15 percent of water on any given day is flowing into the bypass, then 15 percent of fish are also flowing into the bypass. [Zeug, Cramer Fish Sciences]
    - Another way to think about it is, the more flow we have into the bypass, the more connectivity we have, and therefore more functionality and fish passage. [Bjarni Serup, CDFW]
    - There may be variation of fish entrainment in proportion to flow; there may be higher entrainment and uniformity at high flows; there may be lower entrainment and less uniformity at lower flows. Similar to dispersion of flakes in a snow globe for example, the fish can be evenly spread in the flow and later unevenly dispersed. [Keith Marine, Aquatic Resources Consulting Scientists]
    - The flow to fish ratio is one example where the bypass behaves differently from the floodplain. We'll probably see more of that, differences between ecology and inundation. [Serup, CDFW]

- The flow-fish relationship is relatively certain. The uncertainty is around the number of fish in different flow conditions.
    - It's a fair assumption that when we have enough flow to go through the notches, there's probably fish present in those conditions. The number of fish is the unknown variable.
    - Recommendation to study timing and fish density in relation to flow at the Tisdale Weir starting August/September through June. [Serup, CDFW]
    - Clarification of uncertainty around flow triggers to initiate fish movement ont the floodplain [Getz, Ducks Unlimited]
        - Lower flow conditions might not be the conditions that move fish. Even if salmon are not accessing the floodplain during lower flows, other species could. [Zeug, Cramer Fish Sciences]
        - Clarification that changes in hydrology trigger fish movement.
        - Uncertainty around effects of higher flows on fish movement. Higher flows make it unsafe to sample and remove traps.

Benefits of range of depths for both Chinook salmon and birds

- Recommendation to develop more information on depth variation and potential benefits for birds. [Virginia Getz, Ducks Unlimited]

Benefits of different cover types

- Recommendation to distinguish and compare between benefits of land cover including managed rice fields, managed wetlands, and natural floodplains;
- Recommendation for investment in reducing uncertainty around the difference in productivity of cover types between rice and managed wetlands. [Buttner, California Rice Commission]

Benefits of fish food production and delivery

- We have the ability to produce lots of food to subsidize the Sacramento River, and we monitored tagged fish there. We may have up to 80 percent of the fish still in the river; how do we know how much food to produce? [Bair, Program Team]
    - Even in the wettest years, we're not getting 50 percent of fish on the floodplain. Coming up with best practices and where and when is a fruitful effort for testing that hypothesis. [Zeug, Cramer Fish Sciences]
    - Suggest creating a conceptual model. Creating more variables can seem tedious. [Serup, CDFW]

Benefits of floodplains in relation to increased Chinook survival as indicated by otolith science

- New studies on otoliths point to higher survival rates of fish. [Lewis Bair, Program Team]
- The otolith data is promising but there are still questions that need resolving. Recommendation for a study framed around the size of juvenile salmon is the factor creating the benefit, we'd need to do a study framed around that. [Zeug, Cramer Fish Sciences]

Effects of increased introduction of hatchery fall-run Chinook into the Sacramento River system

- The Bridge Group has requested that fall-run Chinook hatchery fish be introduced into the Sacramento River floodplain in order to increase juvenile production. What uncertainty is related to this potential introduction of hatchery fish. Will the change in runs change fish behavior, fish densities, and fish location. [Brown, USFWS]
    - Recommendation for studies with clear objectives and hypotheses. We don't know about fish distribution into the bypass nor capacity or routing. [Zeug, Cramer Fish Sciences]

Prioritization & Sensitivity Analysis

- Suggestion to prioritize and sequence. With prioritization, we could conduct a sensitivity analysis to determine which parameters have the greatest effect on the model. [Matt Brown, USFWS]
    - The Salmon Benefits model ran a sensitivity analysis; no single variable surfaced as the sensitive variable. [Zeug, Cramer Fish Sciences]
- Recommendation to prioritize investment in reducing uncertainty based on potential preliminary concepts being explored in Floodplains Reimagined. [Zeug, Cramer Fish Sciences]
    - On the Sacramento River, sensitivity analysis can be very nuanced: fish at the appropriate life stage, at the specific access points, at the right time. We've assumed the pattern of movement is similar every year and doesn't vary. Some fish could be moving down when one of these bypass discharge events happens. Last year, the Sacramento River operations management was disorganized, and what was occurring downstream of the Basins was not communicated hydrologically to the Upper Sacramento River. The operations move and export nutrients. The 1:1 flow ratio assumption and timing, i.e., the same time every year, is going to be so sensitive because it's a very generalized assumption based on nature and how we have to manage the system hydrologically. [Keith Marine, Aquatic Resources Consulting Scientists]
- Recommendation to use the Fremont Weir and Big Notch as a foundation. [Serup, CDFW]
- Recommendation to investigate the limiting factors and to not assume that the bypass is habitat-limited for juvenile rearing.
- Some participants agreed that fish size and timing are both worth examining for relationship with juvenile rearing survival factors. Coordination and timing are especially tricky during drier years when the water warms up earlier in the year. [Carson Jeffres, UC Davis; Zeug, Cramer Fish Sciences; Serup, CDFW]

Key Outcomes

Advisory Committee members from various fish agencies expressed support for the Chinook Science Uncertainties and Data Needs. Recommendations for reducing uncertainties are listed in the Key Meeting Outcomes section of the beginning of this document.

The participants flagged topics for the Ad-Hoc Group in 2024 to address reducing scientific uncertainty. [Leimbach, Kearns & West]

Program Update

Dawley provided an update on the Floodplains Reimagined program and timeline and shared the following details:

- The State grant funding concludes after February 2024.
- The Program Team is working to compile the deliverables for the State and will determine what is needed from the Steering Committee to complete those items.
    - Steering Committee meeting schedule for 2024 is currently TBD.
- The Technical Memorandums have been compiled.

Dawley expressed appreciation to the Advisory Committee for the previous two years' worth of scientific collaboration.

Closing Remarks and Adjourn

Leimbach reviewed the action items, thanked participants for their participation, and adjourned the meeting.

Participants

Advisory Committee Members	
Affiliation	**Name(s)**
Bird Haven Ranch	Andy Atkinson
California Department of Fish & Wildlife (CDFW)	Bjarni Serup Briana Seapy Derrick Alcott Duane Linander Elaine Jeu Erica Meyers Kristal Davis-Fadke Luke Matthews Michelle Forsha Mike Healey
California Rice Commission	Paul Buttner
Central Valley Flood Protection Board (CVFPB)	Jane Dolan
Department of Water Resources (DWR)	Jesus Esparza Lori Price
Ducks Unlimited	Virginia Getz
FlowWest	Mark Tompkins

Foraker Properties	Erik Foraker
National Marine Fisheries Service (NMFS)	Ellen McBride
Northern California Water Association (NCWA)	Todd Manley
Reclamation District 1500	Jon Scott
United States Fish & Wildlife Service (USFWS)	Andy Trent Erin Strange Jim Earley Matt Brown Michael D'Errico Tricia Bratcher
University of California (UC), Davis	Carson Jeffres
Wild Goose Club	Roger Swanson

Program Team **Affiliation**	**Name(s)**
Aquatic Resources Consulting Scientists	Keith Marine
cbec	Chris Campbell Scott Wright
Cramer Fish Sciences	Steve Zeug
Kearns & West (K&W)	Julie Leimbach Bethany Taylor
Kjeldsen Sinnock Neudeck (KSN)	Holly Dawley Claire Darnall
Larsen Wurzel & Associates (LWA)	Eric Nagy Mark Cowen
Point Blue	Kristy Dybala
Reclamation District (RD) 108	Lewis Bair

Appendix

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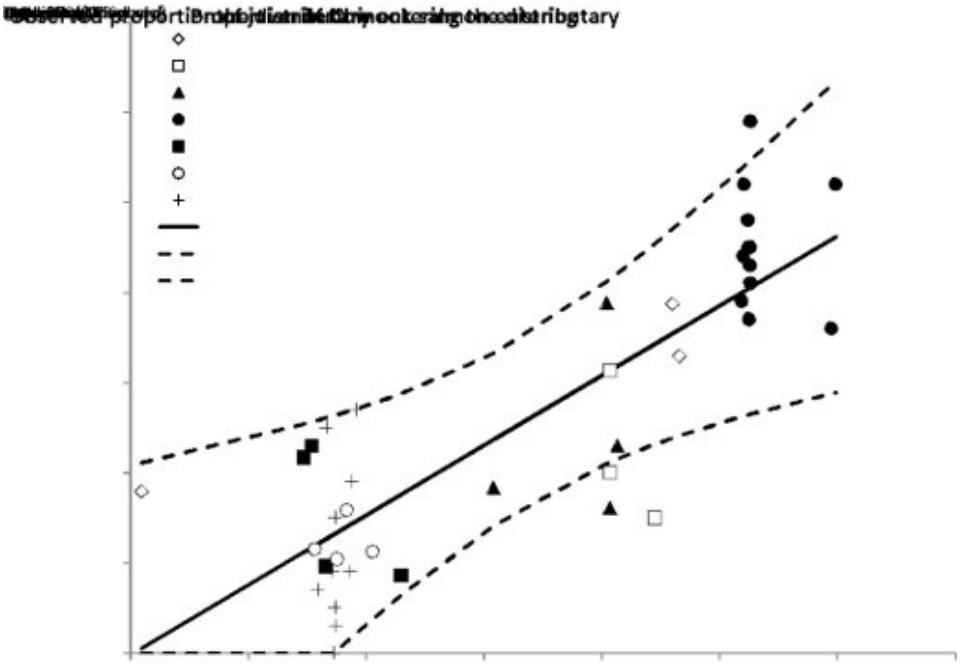

Figure 1. Representation of fish movement over a weir in direct proportion to flow (1:1)