

Upper Sacramento Scheduling Team

Spring Management of Spawning Locations Subteam

Friday, October 29, 2021 | 11:30 a.m. – 1:00 p.m.

MEETING SUMMARY

Participants

Agency	Attendees
CDFW	Crystal Rigby, Doug Killam, Ken Kundargi
Kearns & West	Alyson Scurlock, Terra Alpaugh
NMFS	Eric Danner, Rachel Johnson, Stephen Maurano
Reclamation	Elissa Buttermore
USFWS	Kevin Niemela

Action Items

- **Doug** to draft text describing the relationship between water temperature effects on juvenile emergence timing for inclusion into the study plan.
- **Elissa** to distribute the provisional final draft of the study plan to the subteam.
- Rachel requested that **Eric** check with Nobel Hendrix to see if the updated data from this year can be modeled to see if it was an outlier year.

Key Discussion Topics with Summary of Perspectives, Outcomes, and Agreements

Meeting Objectives

1. Discuss and resolve comments on the study plan and existing and proposed tools spreadsheet

Study Plan and Existing and Proposed Tools Spreadsheet

The subteam reviewed and discussed the final feedback provided by subteam members on the study plan and existing and proposed tools spreadsheet.

Perspectives and questions shared by subteam members included:

- **Introduction/Problem Statement**
 - USFWS – Added comments about the study plan not addressing the primary question of whether the physical relationship exists. The cause and effect relationship has not been established; establishing that should be the primary purpose of the study plan. The study plan did not include much language on this. Does the group agree with edits?
 - CDFW – Are you suggesting that the relationship has not been studied yet, or that it has been studied but has not shown any results?
 - USFWS – To my knowledge, this group has not researched information in other systems of whether water temperatures elicit changes in spawn timing.

You can say there is a basis for a cause and effect relationship but cannot say a functional relationship exists between them.

- CDFW – If we keep the NMFS Biological Opinion header in the study plan, we should not alter the language; text edits can be carried over to the problem statement. Not sure if can get fish to spawn earlier, but it does appear that there is delayed spawning if water temperatures are super warm. We see this on the American River. It may not be as demonstratable on the Sacramento River currently, but it could be moving forward.
- NMFS – Agree, have not mechanistically proven the relationship. USFWS proposed to do it in a hatchery setting; this would be a useful proof of concept. Do you have a hypothesis around other co-variants impacting the patterns we see in spawn timing and nature?
- USFWS – Many things could be hypothesized. We don't know whether fish spawn later during the years they came upstream or if fish are subjected to warmer temperatures during those years. There is no way to know if they stayed in the ocean and fed longer. The best way is to try to isolate the variant you are interested in.
- NMFS – We only have correlations from the fish responding to water temperatures perspective. If the river is warm, there also might be changes in migration behavior in adults. There are a lot of behaviors that respond to temperatures. Curious as to what your alternative hypothesis would be. Support re-framing the study plan if people think other environmental co-variants explain the patterns we've seen so far.
- USFWS – There are costs to doing system-wide manipulations. Is there a threshold water temperature that elicits a response?
- Subteam members agreed to move the problem statement header up and remove all verbatim excerpts from Reclamation's Proposed Action and the NMFS Biological Opinion since the excerpts are included in the Charter. USFWS's reframing edits will be integrated into the problem statement.
- USFWS – Wonder about the word hatching vs. spawning in the hypothesis.
 - NMFS – There are pretty different conceptual models about hatch date response to spawn timing. Hatching is a degree day process. If adults are spawning later due to warmer water temperatures, their embryos will develop faster. My hypothesis is emergence dates should still be the same between babies. Get confused about how everyone thinks about that. Reality is even if we understand the concepts between the relationship of temperature, emergence, etc., we don't operate that way. I think we trick the fish. If we want to get fish to spawn sooner and give a particular water temperature, we might warm up for awhile and trigger adults to do something, but we don't keep the environmental conditions constant. Suggestion to lump the adult spawning and to not talk about the emergence date piece.
 - USFWS – Makes sense. On the American River, water temperatures don't get down to 56° F until December. Fall-run Chinook salmon has shifted much later than the rest of the runs in the system: emergence date isn't until

May or later. Hatchery fish don't mature until very late. Sacramento River water temperatures can be in the 76° F range; there is poor production on the American River due to that seasonal shift. What do we need to know about Clear Creek in the future? The Temperature Management Plan was shifted to manage to lower water temperatures in June of this year as opposed to May. Suspect we might see these things more often. Water temperatures are cooler for fall-run Chinook salmon for the incubation period. Big shifts in timing may have evolved due to the conditions being provided. If water temperatures had no effect on spawn timing, we would still be seeing spawning in October.

- CDFW – The American River is a classic example of what happens over a longer period where water temperatures are always warm. On the Sacramento River, traditionally water temperatures for winter-run Chinook salmon were cool in the upper river. The coldwater pool has only been an issue in the last decade. The problem statement says that colder springtime water temperatures trigger earlier peak spawning. Looking at actual winter-run Chinook salmon data in recent years, warmer water this year resulted in an earlier median spawn time. Curious if this trend is being manipulated by other variables. Spawn timing was earlier in 2014 for fall-run Chinook salmon. The American River was shifted later in the year over many generations of fall-run Chinook salmon. Sacramento River fish are just starting to undergo that process and are not responding the same way as fish on the American River. Could be due to hatchery fish numbers or the spatial distribution of redds. Skeptical after this year's data.
 - NMFS – Statistical modeling Nobel Hendrix used shows that April and May water temperatures are the biggest predictors for general patterns on early spawn timing. Interested in Nobel Hendrix running this year's data to see if it is an outlier. This year there was a bypass flow and rapid water temperature changes in May. There may be a long-term relationship between water temperatures and the ultimate spawn timing. Micro exposure to immediate water temperatures as fish are about to spawn might be an important covariant.
- **Water Temperature Effects on Juvenile Emergence Timing**
 - KW – Does this study plan need to address juvenile emergence timing and if so, how?
 - CDFW – Agree with the “water temperature effects spawn timing” bullets in the study plan for runs that spawn from May to early August. In general, fish later in the season will emerge later in the season; there are a few days difference in emergence due to water temperatures.
 - NMFS – Agree, but statement does not reflect that. Because spawn timing is over such a broad window, fish that spawned earlier will emerge sooner than those that spawned later in the season. Late peak spawning in warm years could delay hatching. From a population level, hatching or emergence is being delayed. Might be delaying the distribution of hatch dates, but not

delaying emergence with warm water; emergence is being accelerated with warm water.

- USFWS – If have stable water temperatures historically, then later peak spawn timing would correlate to later emergence.
 - Reclamation – Concerned about the loss of temperature management in the fall when coldwater pool resources are limited. Thinking about how our overall actions earlier in the year might delay spawning so a lot of fish are emerging just when we've lost temperature management. Suggestion to talk about the temperature effects to emergence timing.
 - NMFS – Spawn timing this year did not follow with the hypothesis from the Jennings and Hendrix 2020 paper. The spatial distribution was so compacted this year; wonder how much timing signal we're able to see when the spatial distribution is clustered so heavily upstream. May have a skewed relationship.
 - CDFW – Weren't surprised fish were spawning in upper river after the 2014/2015 drought. Had spawners downstream in those years, but no young-of-the-year survived those years. They're all heading up into the upper river. Not seeing too many downstream spawners unless it is a generation of fish that had access to cooler water.
 - NMFS – Suggestion to include bullets in the study plan describing that on a population level, if spawn timing is delayed, emergence dates will be later, but emergence dates of individuals are governed by degree days.
 - CDFW will draft text describing the relationship between water temperature effects on juvenile emergence timing for inclusion into the study plan.
- **Factors Related to Heritable Traits**
 - NMFS – Recommendation to inquire about physiology in experimental work being proposed. There are people who focus on stress-induced evolution. An independent review of the study plan would likely look for points related to heritability of run timing.
 - **Study Plan Implementation**
 - NMFS – There are a lot of outstanding questions in terms of implementation of the study plan. Would like to find a way of doing the things outlined in the study plan, but not sure who is in position of doing them in terms of funding.
 - USFWS – Recommendation to add some specificity to what the experimental design might look like instead of stating that the recommendation is an experimental design study.

Next Steps

- Reclamation will distribute the provisional final draft of the study plan based on the final feedback provided by subteam members. If subteam members do not think the study plan is sufficient, they can request a review to be done by the LTO interagency group.
- As aspects of the study plan begin to be implemented, Reclamation will provide updates through the Sacramento River Science Partnership (SRSP) or other existing venues.

Next Meeting: Future meetings will be held on an ad hoc, as needed basis. Otherwise, updates and discussion will be provided via email.