

Upper Sacramento Scheduling Team

Spring Management of Spawning Locations Subteam

Tuesday, October 12, 2021 | 11:00 a.m. – 12:30 p.m.

MEETING SUMMARY

Participants

Agency	Attendees
CDFW	Crystal Rigby, Ken Kundargi
DWR	Kevin Reece, Mike Ford
Kearns & West	Alyson Scurlock, Terra Alpaugh
NMFS	Eric Danner, Stephen Maurano
Reclamation	Elissa Buttermore, Josh Israel
SWRCB	Matt Holland
USFWS	Kevin Niemela

Action Items

- **All** to fill out the “level of effort to complete” columns (known spatial/timing constraints) in the existing and proposed tools spreadsheet.
- **All** to provide final edits on the study plan by Tuesday, October 26.
 - **All** to provide language about which studies/models should be prioritized if additional work were to be funded (refer to existing and proposed tools spreadsheet).
 - Elissa requested that **Rachel** provide feedback on the conceptual model in the study plan.
 - **Elissa** to add language providing context for the conceptual model in the study plan (e.g., significance of the bolded arrows, instructions for reading the diagram from the bottom up, two-month time window, etc.)
 - **Kevin Niemela** to draft a few sentences for the study plan about investigating the spawn timing hypothesis with active experimentation.
- **Elissa** to share recent proposal for additional years related to the technical memo for the 2016 Broodyear Winter-run Vital Rates study.

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

Meeting Objectives

1. Refine conceptual model and existing and proposed tools spreadsheet for inclusion in the study plan

Subteam Membership

Reclamation proposed the idea of adding a non-agency technical expert to the subteam meetings to provide expertise on genetics and help advance the Spring Management of Spawning Locations effort.

Perspectives and questions shared by subteam members included:

- CDFW – Suggestion to check in with the LTO interagency group to make sure there are not any concerns with adding an outside consultant to the subteam.
- Reclamation shared the 2016 Broodyear Winter-run Vital Rates Study Technical Memo referenced in the study plan and will share a recent proposal for studying additional years related to the technical memo.

Study Plan and Conceptual Model Review

Reclamation reviewed the study plan and draft conceptual model and asked for feedback from subteam members.

Perspectives and questions shared by subteam members included:

- DWR – Conceptual model looks good and captures the core items from previous conceptual models from the SAIL report related to spawning locations. In reviewing the conceptual model, it helped to keep in mind that (a) it is about spawning location and not survivability, and (b) it should be read from the bottom up.
- NMFS – The conceptual model seems to have a good balance; it is always challenging determining how simple or how inclusive to make conceptual models.
- USFWS – There are a lot of really complex interactions happening where the bottom diagram connects to the upper arrow. Fish enter the system December through June. Where the bottom diagram connects to the upper arrow could greatly influence when fish arrive to the upper river and what conditions they experience.
 - Reclamation – The factors most relevant to the actions are bolded in the conceptual model. Habitat restoration is something Reclamation can control, so it is not as likely to reduce water temperatures as much as other factors.
 - Reclamation – There are also fish in the ocean transitioning to holding adults in the river, which is covered in the NMFS Technical Memo on understanding the impacts of management drivers on salmon life stage transitions. We believe the timing of entry and conditions of holding adults affect the spatial and temporal spawning distribution.
 - DWR – The top arrow is almost a temporal line in which fish are transitioning from the holding to spawning stage. The timing at which we institute an action is going to greatly change the outcome: i.e., if we do something too early and the majority of fish are still holding versus ready to spawn; whether we properly capture that will have a big impact on the outcome.
 - Reclamation – The NMFS Technical Memo shows correlation between the temporal timing of spawning and April and May river temperatures. We could have this conceptual model be a submodel of a larger conceptual model and identify the submodel as just being one phase. We could also provide more context about the correlation between spawn timing, April and May river temperatures, and fish coming up December through June.
 - DWR – Suggestion to specify in the text of the study plan that the conceptual model is focused on a two-month time window instead of creating an additional conceptual model.
 - Reclamation will add language to the study plan that provides more context for the conceptual model.

- USFWS – Still wondering whether a functional relationship exists between cooler water temperatures and earlier peak spawning. We have found no correlation with capture timing and spawn timing from our work, so not sure if a relationship exists. If we knew early arriving fish were influenced by April and May river temperatures to spawn earlier or later, that would allow a lot more power to use river temperatures as a mechanism to manipulate spawn timing.
 - NMFS – This year in general it was earlier spawning for winter-run Chinook salmon across the board.
 - USFWS – In my opinion, spawning was pretty normal this year, which does not agree with warmer springtime water temperatures delaying peak spawning. A lot of times we will see not intuitive distributions of spawning. I want to dig into how the data was analyzed in the Jennings and Hendrix 2020 paper to see if I agree with their assessment of when peak spawn timing occurred. It is not always obvious when there is a bimodal peak. I've been doing winter-run carcass surveys for 25 years and am not convinced. Interested in investigating whether a functional relationship exists before spending too much effort examining management possibilities.
 - NMFS – Agree, really understanding the mechanism would be the obvious best approach to this.
 - KW – Will the milestones/project schedule section of the study plan answer the question if the physical relationship exists?
 - USFWS – The first order is to investigate whether or not a functional relationship of river temperatures and spawn timing or location exists. Looking at parentage-based tagging is something different in that it measures reproductive success, not spawn timing. There are more direct ways to measure spawn timing; it could be done by trying to draw correlations within the natural system or through a more scientific design in a hatchery environment.
 - Reclamation – It would be helpful to capture some type of analysis or further discussion as a future milestone.
 - USFWS – The results of an experiment, whether in a hatchery environment or river system, could preclude the need for the other modeling work that this subteam is discussing. If there is not a functional relationship, a lot of what we are discussing is not relevant.
 - Reclamation – We are planning on including the existing and proposed tools spreadsheet as a table in the study plan and are really interested in hearing what people think would make sense to do first. It might be difficult to include a lot of things from the table that are not as matured due to the deliverables and schedule.
 - All to fill out the “level of effort to complete” columns (known spatial/timing constraints) in the existing and proposed tools spreadsheet.

Existing and Proposed Tools Spreadsheet Review

The subteam reviewed and discussed the existing and proposed tools spreadsheet.

Perspectives and questions shared by subteam members included:

- KW – Are there relationships shown in the conceptual model that would need a model or experiment that is not clearly delineated in the existing and proposed tools spreadsheet?
 - NMFS – Suggestion to number each arrow in the conceptual model and determine how important we think they are and document our level of understanding of the

relationship. This could set the stage for prioritizing future work. Because of the Jennings and Hendrix 2020 paper, the focus is on how water temperatures affect the temporal distribution of spawning, not the spatial distribution.

- KW – To what extent does the Charter give space for the study plan to do this assessment?
- Reclamation – Think we want to focus more on the Action which is looking at how spawning distribution is affected by water temperatures.
- NMFS – Is it only pre-spawning water temperatures? As the winter-run Chinook salmon spawning distribution has contracted in space over time, we manage to a smaller coldwater habitat. Wondering about the impacts that prevent the distribution from ever expanding below new targets. Once the temperature management season starts, does this subteam’s focus end because it is only focused on springtime temperature management?
- Reclamation – It is springtime management, but the Charter describes looking at spatial distribution in addition to temporal distribution.
- NMFS – Evidence from the Jennings and Hendrix 2020 paper shows that pre-spawn temperatures affect the ultimate spawn timing. The focus of this subteam would be on whether we can manage to springtime water temperatures to positively affect the distribution to prevent higher TDM. Does the scope of this subteam go beyond that to trying to capture the spatial distribution of water temperatures during the spawning season as well?
- Reclamation – Water temperatures later in the spring for eggs is a different discussion. This was a very specific action to try to understand the particular observation that has been made about the temporal component of spawning. Not sure if both of those things improve productivity of a population. This was proposed as a study to be done over time to analyze what actually occurs and to do a synthesis to assess if the observations in the paper were correct or not and if not, why. If empirical observations are not conclusive, we would conduct additional lab experiments. We are aiming to have a study plan over the next 5 to 8 years that will help unravel these springtime temperature management questions. We could have used this observation to decide there is a need to manage water temperatures in the spring another way, but we wanted to study it since we didn’t understand it well.
- KW – Will the bullet points focused on items for immediate implementation provide the information this subteam needs in 5 years in terms of knowing whether you better understand the relationship and whether additional experiments or modeling is needed?
 - Reclamation – Heading in a good direction. Need to have discussion at some point to determine if earlier or later spawning is the preferred outcome. The SWFSC has some resources and biologists who provide escapement data on winter-run Chinook salmon in March to the Pacific Marine Fisheries Council, which is related to the “forecasting number of spawners” row in the existing and proposed tools spreadsheet. Can send out the Technical Memos and NMFS model if people are interested.
 - NMFS – Agree that the ultimate goal is to understand what the spatial and temporal spawning distributions will look like and to be able to forecast to a certain extent. That will provide an important piece of the puzzle especially in years where cold water resources are limited. Understanding the spatial and temporal prediction of

spawners each year would be valuable and I think this subteam has the background and knowledge to best inform how to go about doing that.

Future of the Subteam

The subteam discussed the future of the subteam.

Perspectives and questions shared by subteam members included:

- KW – A lot of things will not be implemented immediately. Could refine the conceptual model and potentially quantify the various arrows. Does this subteam want to do that soon or should that be done in the future in a different subteam?
 - Reclamation – Suggestion to finalize the study plan since it is behind schedule. Could continue to coordinate in the future but don't know enough about the action yet.
 - USFWS – If we are taking the approach that we will investigate the hypothesis opportunistically, we are on a very long timeframe to get resolution to this cause and effect hypothesis. Recommendation to take a more proactive approach to investigating hypothesis as a system-wide or confined constrained experiment with a controlled number of fish. There is a clear necessity to establish a functional relationship first; suggest prioritizing next steps or options.
 - USFWS will draft a few sentences for the study plan about investigating the spawn timing hypothesis with active experimentation.

Next Steps

- Subteam members will continue to add information to the existing and proposed tools spreadsheet and will provide final feedback on the study plan by Tuesday, October 26.

Next Meeting: Friday, October 29, 11:30 a.m.-1:00 p.m.