

## SALMON BENEFITS AD HOC GROUP MEETING

February 15, 2023, 12:00- 2:00 pm  
Zoom Virtual Meeting

### Meeting Objectives

- Finalize habitat suitability criteria for salmon, particularly for juveniles.
- Further discuss how to address productivity in the model.

### Action Items

- Technical team will assess the addition of an upper sub-optimal depth limit.
- The technical team needs to work with stakeholders to develop topographic criteria.

### Key Confirmations

The following agreements are not final and may be changed with additional analysis and discussion.

- Confirmed duration, depth, velocity, connectivity, and land cover parameters.
- Reminder for technical team and stakeholders to provide sources when speaking to specific data, models, and/or facts.

### Welcome and Introductions

Kayla Kelly-Slatten (Kelly-Slatten), Kearns & West, welcomed all attendees, reviewed the meeting agenda, and objectives.

### Review

#### *Habitat Suitability Criteria*

Group members provided the following comments/questions:

- Brian Ellrott (Ellrott), NMFS – Inquired if the leaky boards are similar to the whole boards being used by the Rice Commission. Are the leaky boards equipped for fish passage?
  - Chris Campbell (Campbell), cbec – Clarified that cbec plans to test leaky boards in a similar manner to what the Rice Commission is doing as part of their salmon practice standard.
- Bjarni Serup (Serup), CDFW – Questioned what the drainage rate is through a leaky board and how long will it take for habitat to become disconnected.

- Campbell, cbec – Noted that according to models the drawdown from absent berm overtopping to outlet board overtopping is about a day. The time until there is a disconnection depends on the depth and area of the inundated land.
- Serup, CDFW – What is the drainage rate assumption for leaky boards?
- Campbell, cbec – Clarified that the assumptions depend on the scenarios developed but variables include the leaky board orifice and height in conjunction with water depth and area.

### *Sensitivity Testing Results*

Stanford, SFEI, reviewed the sensitivity testing conducted to date.

Group members provided comments/questions on the following presentation topics:

#### Depth

- Rene Henery (Henery), Trout Unlimited – Inquired what the maximum modeled depths are; at depths greater than 6 feet there is a significant drop in fish populations. Fish don't like anything over 9+ feet of water.
  - Jesse Rowles (Rowles), cbec – Replied that in the current iteration of the model all values above 6.6 feet have been cut off. Depths of this magnitude or greater are common in the Lower Sutter.
  - Stanford, SFEI – Commented that the original thinking was that higher flow events would increase connectivity and open additional habitat for fish.
  - Henery, Trout Unlimited – Clarified that high flow scenarios do not necessarily result in better or more habitat, but it can prolong habitat occupancy and access.
  - Campbell, cbec – Elaborated on regional topography by pointing out the average 1-2 feet of elevation grade in the middle bypass (between Tisdale and Nelson Slough), but nearly 12 feet of grade in the Lower Sutter. So, in the Lower Sutter bathtub region depths will be greater and flow slower.
- Henery, Trout Unlimited – Expressed concern with the approach of using depth as a proxy for access and advocated that sensitivity testing results remain as discrete as possible.
- Serup, CDFW – Noted that while the model is oriented towards juvenile rearing there is also a large issue with connectivity for adult fish which may or may not be suitable to capture in the model as well.
- Rowles, cbec – Explained that there is flexibility in the connectivity algorithm. For example, there are minimum depths considered too shallow to increase connectivity but tweaking those depths could accommodate connectivity for different life stages.
- Henery, Trout Unlimited – Reiterated the standing hypothesis that during high flow events the Sutter Bypass is not habitat limited, but connectivity will increase. The model assumptions should reflect this hypothesis and make use of existing empirical data.
  - Stanford, SFEI – Suggested that if habitat is not limited when water levels are deep, then it makes more sense to not include a maximum depth bound because a maximum depth bound does not impact total available habitat.
  - Henery, Trout Unlimited – Noted a caveat that if the model were to remove habitat that is too deep and assumed large population, then habitat would become limiting again. Yolo Bypass data shows that for wet years there are portions of the population that does not have a strong rearing experience due to exceptionally deep water.

- Kelly-Slatten – Inquired if there is a way to add a sub-optimal criteria right above the 6.6 feet boundary.
  - Stanford, SFEI – Noted that such a criteria can easily be incorporated.
- Serup, CDFW – Highlighted that there is little data on what the upper depth limit should be if one were to be incorporated into the model. Additionally, low flow years would likely result in less habitat access, so it wouldn't matter if there was not ample habitat due to access issues. Connectivity/Access may be more important to consider than depth.
  - Henery, Trout Unlimited – Agreed with Serup, but argued that variables should be separated rather than making an assumption that the relationship between inundation and habitat or connectivity and fish presence is going to remain static after manipulating the landscape. However, building assumptions into the model limits flexibility and analysis.
- Keith Marine (Marine), Aquatic Resources Consulting Scientists – Suggested that each variable be partitioned in such a way that the corresponding change in model outputs can be described by X change in the variable. This sort of analysis would support Henery's suggestion.
  - Campbell, cbec – Agreed that this feature could be implemented in the model and would better illuminate differences between proposed management actions.
  - Serup, CDFW – Cautioned that the science is still under development when it comes to topics like suitable or preferred depths for fish on surrogate habitat, and at this point it may not make sense to drill down into certain metrics with little data.
  - Henery, Trout Unlimited – Noted that while the data on fish habitat comes from disparate systems there still seems to be consistent lessons learned from the data despite surrogate habitat being a completely different environment.
- Stanford, SFEI – Proposed that depths greater than 7 feet be considered sub-optimal.
  - Campbell, cbec – Clarified that work can be conducted later to better tease out where that depth demarcation for sub-optimal habitat should be.

#### Connectivity

- Serup, CDFW – Called into question the 0.66 feet value as it is unknown what value is acceptable as a minimum for fish passage.
  - Campbell, cbec – Clarified that the value is a product of the Central Valley Habitat Exchange Habitat Quantification Tool. Whether the value is 0.66 feet or less does not matter as the point is to demonstrate the depth at which fish are moving through a managed area. Any selected parameter for the habitat suitability process can be modified down the road, so later course correction is possible.
  - Serup, CDFW – Added that it is imperative that when the topic of connectivity comes up people do not lose sight of the fact that connectivity matters for reducing fish strandings as much as providing access to suitable habitat.
- Marine, Aquatic Resources Consulting Scientists – Pointed out that there is a relatively short window between when boards are pulled and when the water drains from X height to 0.66 feet.
  - Campbell, cbec – Agreed that the duration of inundation would be short, and possibly on the order of a day or so depending on the dimensions of the land.
  - Rowles, cbec – Clarified that the sensitivity analysis does not include leaky boards, but rather only includes an outlet weir and connectivity is lost once water levels dip below the outlet weir.

- Ellrott, NMFS – Advocated that the outlet weir remain in the model as outlet weirs are common on agricultural lands.
- Campbell, cbec – Referenced the Rice Commission’s potential practice standard of having a v-notch in a weir and a 2-inch orifice below that. The model would simulate this practice which is designed to take advantage of flood recession.
- Serup, CDFW – Noted that it is difficult to establish a baseline for duration due to variability between years.
- Stanford, SFEI – Suggested that 0.66 feet remain in baseline conditions.
- Ellrott, NMFS – Asked when does habitat become optimal again after being disconnected?
  - Stanford, SFEI – Clarified that habitat becomes suitable again after minimum criteria are met (when it floods), but there is no minimum for number of inundation days before habitat is deemed suitable.

Duration

- Serup, CDFW – Pointed out that habitat which is inundated for 14 days may get a score of 1, but if that habitat is inundated for 13 days it may get a score of 0.66. However, there is a discrepancy because a fish could enter habitat rated at a score of 1 but not reside for 14 days, in which case would that habitat be rated 0.66 for that fish?
  - Stanford, SFEI – Clarified that each parcel is rated on a daily timestep, so days 1-13 are rated 0.66, but days 14-X are rated 1.

Closing Thoughts

- Henery, Trout Unlimited – Asked why is natural land cover better than agricultural area?
  - Stanford, SFEI – Replied that it is a product of habitat complexity including depth variation, greater refuge from predators, more coverage, greater accessibility. Less challenging and more structurally complex.
  - Henery, Trout Unlimited – Noted that those assumptions seem to be an outstanding issue in themselves. There seems to be ample success and density of fish in agricultural areas, almost equivalent to what is seen in natural areas.
  - Serup, CDFW – Pushed back on the claim that there is significant density of fish on agricultural areas. The only data on this claim comes from released fish and not fish that volitionally moved into agricultural areas.
  - Henery, Trout Unlimited – Argued that it is beside the point if fish willingly swim to the agricultural areas, the point is that fish do seem to do well in these types of habitat.

Adjourn

Kelly-Slatten thanked attendees for their attendance and participation and adjourned the meeting.

Participants

Ad Hoc Group Participants	
Affiliation	Name(s)

<b>National Marine Fisheries Service (NMFS)</b>	Ally Bosworth Brian Ellrott
<b>United States Fish &amp; Wildlife Service (USFWS)</b>	Baker Holden III Jim Earley Lori Smith Matt Brown
<b>California Department of Fish &amp; Wildlife (CDFW)</b>	Bjarni Serup Mike Healey Seth Lawrence
<b>Ducks Unlimited</b>	Dan Fehringner
<b>Department of Water Resources (DWR)</b>	Jesus Esparza
<b>Aquatic Resources Consulting Scientists</b>	Keith Marine
<b>FlowWest</b>	Mark Tompkins
<b>The Urkov Group</b>	Mike Urkov
<b>Trout Unlimited</b>	Rene Henery
<b>Wild Goose Club</b>	Roger Swanson
<b>River Partners</b>	Torey Byington

<b>Program Team</b>	
<b>Affiliation</b>	<b>Name(s)</b>
<b>San Francisco Estuary Institute (SFEI)</b>	Alison Whipple Bronwen Stanford
<b>cbec</b>	Chris Campbell Jenna Duffin Jesse Rowles John Stofleth
<b>Kearns &amp; West (K&amp;W)</b>	Eric Holmes Kayla Kelly-Slatten
<b>Larsen Wurzel &amp; Associates (LWA)</b>	Eric Nagy Mark Cowan
<b>Kjeldsen Sinnock Neudeck (KSN)</b>	Holly Dawley
<b>Aquatic Resources Consulting Scientists</b>	Keith Marine
<b>Cramer Fish Sciences</b>	Steve Zeug