Session 26. Habitats & Fish

Date/Time: Wednesday, April 6th / 3:15 - 5:00

Moderator(s) [affiliation(s)]: Jeremy Thomas [Jacobs Engineering]

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Presentations

1. Challenges in Classifying Habitats with Model Predictions using Hard Suitability Thresholds

Presenter(s)/[affiliation(s)]: Benjamin Abban [Bureau of Reclamation]

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Collaborator(s) [affiliation(s)]: Eli Ateljevich [DWR]; Seshadri Rajagopal [ ]; Jon Shu [ ]; Blair Greimann [ ]

Permission for CWEMF to post pdf of presentation [yes/no]:

Abstract (1500 character limit)

Current approaches for classifying suitable habitat for Delta Smelt adopt hard thresholds for common parameters known to affect Smelt habitat suitability (i.e., temperature, salinity, and turbidity). Spatiotemporal trends in habitat suitability are normally determined using hydrodynamic models, which predict parameter distributions in space and time. The model predictions are compared against the hard thresholds to determine whether habitat is suitable or not. This “black and white” approach of classifying suitable habitat presents several challenges related to model prediction uncertainties and smelt tolerance of near-threshold stream conditions. Even when model prediction bias is small, there is an increased likelihood of classification errors when stream conditions hover around suitable thresholds, thereby increasing uncertainty in suitable habitat identified. We are exploring several options to address this issue, including approaches that either correct for bias or adopt a “softer” thresholding approach based on the likelihood of habitat being suitable near stream threshold conditions and quantifying uncertainties. The options are being examined for both hindcasting and forecasting efforts.

2. Floodplain Rearing Habitat Analysis of the Sacramento River, Sutter Bypass, and Yolo Bypass Associated with Sites Reservoir Feasibility Studies

Presenter(s)/[affiliation(s)]: Jeremy Thomas [Jacobs]

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Collaborator(s) [affiliation(s)]: Chad Whittington [ ]

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Abstract (1500 character limit)

Sites Reservoir is a proposed off-channel reservoir in the Sacramento Valley, capable of diverting and storing up to 1.5 million acre-feet of excess winter runoff from the Sacramento River and using it to improve water reliability in drier periods. The operations of Sites Reservoir will influence the quantity and quality of off-channel rearing habitat for juvenile salmonids. We performed hydrologic, hydraulic, and ecological modeling to determine the relationships between flows in the Sacramento River and the total area of potentially suitable habitats in the Sacramento River channel, Sutter Bypass, and Yolo Bypass, considering various hydrologic conditions and Sites Reservoir operational scenarios. Existing conditions were evaluated against potential Sites Project diversion scenarios by evaluating changes in the frequency of potential inundation events for different flows that satisfied requisite duration criteria, and changes in average monthly inundated areas that satisfied physical criteria. Depending on reservoir operations and hydrologic conditions, Sites Reservoir had variable effects on rearing habitat acreage within the study area; for some scenarios Sites improved the frequencies of floodplain rearing habitat inundation, and for some scenarios, it slightly decreased the frequencies of inundation.

3. Transport pathways and processes in the Northern Delta

Presenter(s)/[affiliation(s)]: Stephen Andrews [Resource Management Associates]

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Collaborator(s) [affiliation(s)]: Paul Stumpner [USGS]; Jon Burau [USGS]

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Abstract (1500 character limit)

The majority of freshwater flow and sediment, and a large proportion of nutrients and outmigrating juvenile fish enter the Delta from the Sacramento River. This water is transported through a series of transitional reaches – the Sacramento River, Steamboat, Sutter, Georgiana and Miner Sloughs, and the Mokelumne River – to the Central Delta and Suisun Bay. These sloughs are transitional in that they vary between more riverine character (unidirectional flow) and tidal character within a narrow range of Freeport flows. In this study, we characterize conditions in these reaches and how they change based on flow magnitude, spring-neap tidal conditions, gate operations, and potential modifications to the landscape (e.g., tidal wetland restorations). Hydrodynamic and particle tracking models are used to simulate flow and transport through the North Delta. Simple metrics such as travel time, travel distance, entrainment ratios, and tidal to net flow ratios are used to characterize conditions in the reaches. Implications for survival of outmigrating juvenile salmon are discussed, as well as what impacts of landscape and operational changes may have on them.

4. A numerical model for juvenile salmon entrainment at river junctures

Presenter(s)/[affiliation(s)]: Yong G. Lai [U.S. Bureau of Reclamation]

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Collaborator(s) [affiliation(s)]:

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Abstract (1500 character limit)

Flow features are complex at river junctures and it has been studied extensively in the past. The juvenile salmon entrainment into the side channel at river junctures, however, is less investigated; previous studies relied mostly on empirical approaches. In this talk, we present a numerical modeling approach in which a 3D flow solver is used for flows and a numerical fish track model is developed to assess the implications of the fish entrainment at junctures. First, the flow model is validated with the available experimental data, key flow structures are discussed, and the implications for fish entrainment are discussed. Next, the numerical model is used to show that the cross-sectional fish distribution upstream of a juncture is an important factor for fish entrainment efficiency. Fish entrainment efficiency curves are developed and they are compared with the field measured fish tracking data. Further, the model is used to show that the secondary flow in a river bend may have a significant impact on fish entrainment at flow junctures. Finally, a submerged vane is demonstrated to be a potential management option to locally generate secondary flows upstream of a juncture to achieve the desired fish entrainment property.