Delta Smelt Summer-Fall Habitat Action 2025 Action Plan

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Photo: Suisun Marsh Salinity Control Gates that maintain salinity levels in Suisun Marsh. From California Department of Water Resources.

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In coordination with the United States Bureau of Reclamation, California Department of Fish and Wildlife, the United States Fish and Wildlife Service, the National Oceanic and Atmospheric Administration National Marine Fisheries Service, and representatives from the California State Water Contractors and Federal Water Contractors.

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Summary

The Delta Smelt Summer-Fall Habitat Action (SFHA) Plan describes intended operations for implementation for Water Year (WY) 2025. The SFHA is proposed to improve growth, survival, and recruitment of critically endangered Delta Smelt (*Hypomesus transpacificus*) by enhancing habitat and food availability through coordinated management actions. The final Water Year (WY) 2025 Sacramento Valley water year designation (40-30-30 Index based on the May 1 50% exceedance forecast) is Above Normal. However, due to the time lag for the final determination of the WY type and planning activities, this plan includes scenarios for Wet and Above Normal WY type designations where a Summer-Fall Action is anticipated to occur. As of the April 1 forecast, there was no longer any possibility of a Below Normal or drier water year type, so no scenarios for drier years are included here. The following represent the status of summer-fall operations:

- If the final WY is Above Normal, the Suisun Marsh Salinity Control Gates (SMSCG) will be operated for 60 consecutive days to maximize low salinity habitat within Suisun Marsh during the summer. If the WY is Wet, no SMSCG operations will occur.
- If the final WY is Wet or Above Normal, per the 2024 ITP, the 30-day average X2 value would be maintained $\leq$80 km for the months of September and October. However, alternative summer scenarios are being evaluated and may result in a revision to this Action Plan, and an ITP amendment.
- If the WY is Wet or Above Normal, the 100 thousand-acre feet (TAF) block of water intended for the 'One-Time Water Commitment for Delta Outflow' in 2025 is subject to spill. The water spilled from Oroville reservoir in February; therefore, no 100 TAF action will occur (Table 1).

These SFHA plans were developed by California Department of Water Resources (DWR) and discussed with California Department of Fish and Wildlife (CDFW) and the Delta Coordination Group (DCG). The DCG acknowledges variation in individual group member opinions regarding preferred operations. Monitoring and science to evaluate the effectiveness of Summer-Fall actions will accompany the actions.

Since the draft Action Plan was submitted to CDFW on May 13, DWR and U.S. Bureau of Reclamation proposed changes to SMSCG operations to start earlier to maximize low salinity habitat in summer aligning with higher prey and cooler temperatures. The proposed SMSCG change was discussed with the DCG (June 10) and is reflected in this updated Action Plan. Supporting information for the SMSCG change is provided in Appendix A.

Background

The Delta Smelt Summer-Fall Habitat Action (SFHA) is intended to improve growth, survival, and recruitment of critically endangered Delta Smelt (*Hypomesus transpacificus*) by enhancing habitat and food availability through coordinated management actions. The SFHA and investigation of summer-fall habitat conditions are included as Condition of Approval 9.1.3 of the California Department of Fish and Wildlife's (CDFW) Incidental Take Permit (ITP) issued to DWR for State Water Project operations (CDFW 2024) and are also components of U.S. Bureau of Reclamation and California Department of Water Resource's Proposed Action for coordinated long-term operation of the Central Valley Project (CVP) and State Water Project (SWP), and corresponding Biological Opinions (NMFS 2024, USFWS 2024).

Planning, recommendations for implementation, and reporting of the SFHA are typically coordinated through the Delta Coordination Group (DCG), consisting of state and federal agencies and CVP and SWP water contractors; however, deviations in planning and adaptive management of actions do occur, as in 2025, and may not include all representative stakeholders. Annually, agencies assess current water year hydrology forecasts, status of smelt populations, and operations. Qualitative and/or quantitative activities to inform decision making and develop a SFHA plan (this document) occur, which may consider what specific actions to take in Dry, Below Normal, Above Normal, and Wet years (as established by the Sacramento Valley Hydrologic Classification Index)[1]. Implementation and monitoring of actions (or no-action baseline conditions) are conducted June through October after which analysis and reporting are completed summarizing monitoring findings and assessment of action performance.

Current actions of the SFHA are aimed to provide suitable environmental and biological conditions for Delta Smelt based on current conceptual models. For example, the best available science is that Delta Smelt habitat should include low salinity (0–6 PSU), low water temperature (< 22 °C, based on temperature constructs determined by the DCG [see DCG Temperature Constructs 2023Sept 28 Draft]), turbidity of at least 12 NTU, and high food availability in open water habitats (FLaSH Synthesis; Brown et al. 2014). The SFHA is being undertaken recognizing that the highest quality habitat in the Bay-Delta includes areas with complex bathymetry, in deep channels close to shoals and shallows, and in proximity to extensive tidal or freshwater marshlands and other wetlands (Bever et al. 2016; Hammock et al. 2019). The intent of the SFHA is to provide these habitat components in the same geographic area through a range of actions to improve water quality and food supplies locally and to increase their spatial overlap in some locations. SFHA actions include the following:

1. Management of X2 during September and October (applicable in Above Normal and Wet years, undergoing evaluation of alternative actions)

[1] See: https://cdec.water.ca.gov/reportapp/javareports?name=WSIHIST

2. Suisun Marsh Salinity Control Gates (SMSCG) operations for June-October (applicable in Above Normal, Below Normal, and Dry years)
3. 100 TAF block of water for Delta Outflow (one-time use in 2025 and not applicable given spill)

Additional food subsidy studies for consideration in the Summer-Fall Action are:

4. Sacramento Deep Water Shipping Channel Food study (still undergoing feasibility studies)
5. Managed Wetlands Food subsidy study (still undergoing feasibility studies)

Additional information on each action can be found in previous DCG Guidance Documents, SFHA Monitoring and Science Plan (Appendix B), and past SFHA Seasonal Reports.

The purpose of this Action Plan is to describe planning activities and operations for the 2025 SFHA (including a no-action option). This document also serves as a deliverable for ITP Condition of Approval (COA) 9.1.3. due to CDFW. Implementation of the SFHA occurred in 2023 and 2024; it did not occur during WY 2020 to 2022 due to drought conditions, resulting in Dry (2020) and Critical (2021, 2022) water-year designations. Information has been gained from previous SFHA reporting of action years and non-action years (with baseline conditions), special studies related to actions, and previous iterations of Structured Decision Making (SDM). Because 2025 will be another action year, it provides an opportunity to evaluate efficacy of actions with contrasts to 2023 and 2024. This Action Plan describes specifically X2 (undergoing evaluation of alternative actions), SMSCG, and 100 TAF actions in Wet and Above Normal water year types, where applicable, as well as improvements to quantitative and qualitative evaluations to decision making.

2025 Hydrology and Temperature Forecast

WY 2025 follows two wetter years in 2024 and 2023 (Above Normal and Wet, respectively), which broke the last drought in 2020-2022. Above average precipitation in November and December was followed by below average precipitation in January and above average precipitation in February and March with a couple atmospheric rivers and moderate precipitation events (Figure 1; Figure 2) that resulted in an April 1 50% exceedance forecast of Wet. Despite the wet conditions during the rainy season, which may result in higher-than-average Delta outflow into summer, seasonal temperature forecasts indicate that the summer of 2025 is likely to be warmer than average (Figure 3), which could limit benefits historically expected in a wet water year for Delta Smelt habitat. A similar hot, wet summer was thought to limit the benefits of the high flows in 2017 and 2019 for Delta Smelt (FLOAT MAST 2021; Smith and Nobriga 2023).

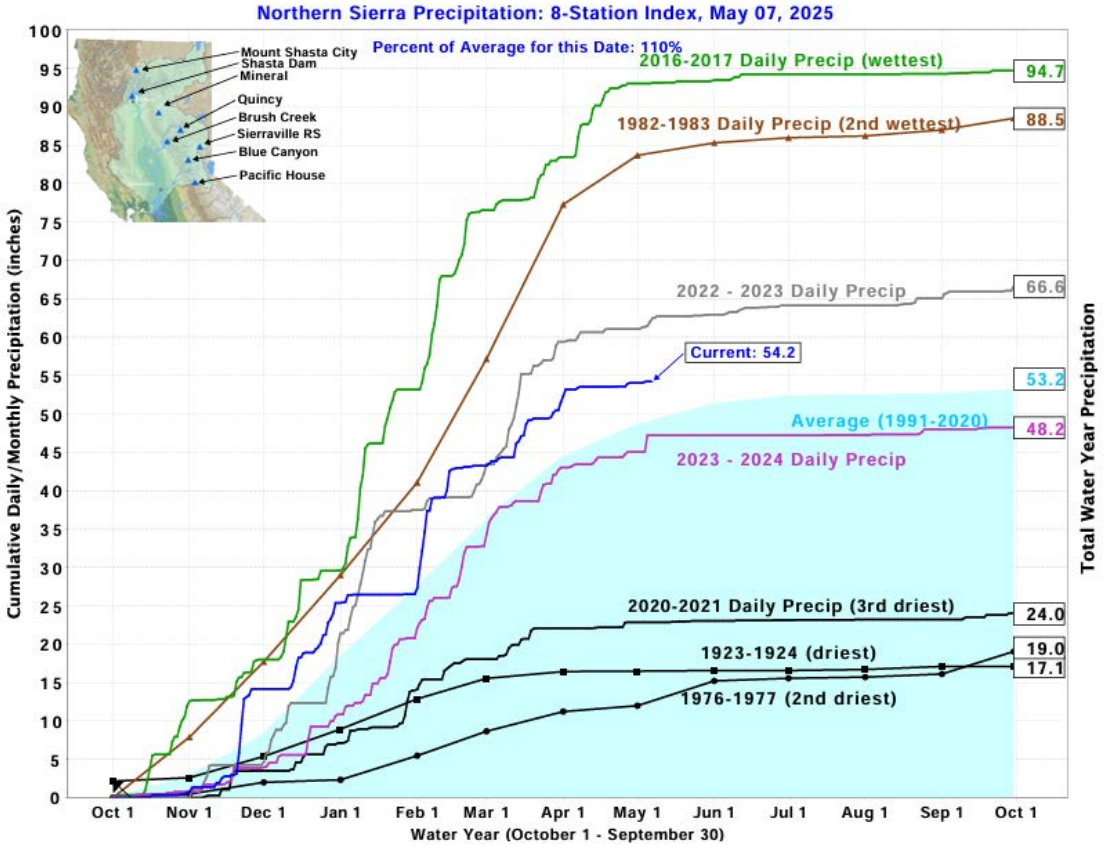


Figure 1 Northern Sierra Precipitation, 8-station index as of May 7, 2025. Graph from https://cdec.water.ca.gov/cgi-progs/products/PLOT_ESI.pdf.

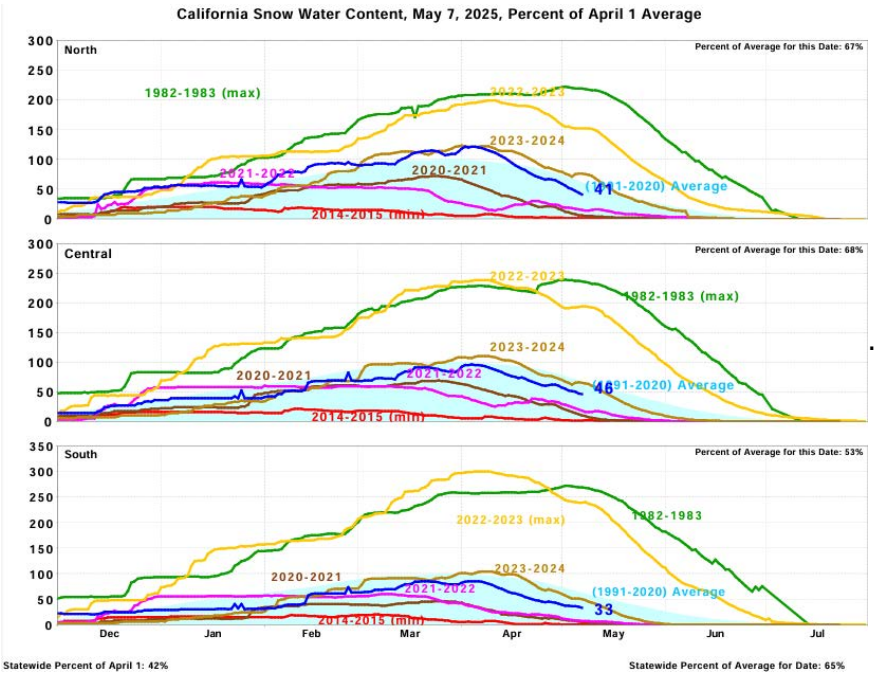


Figure 2 California Snow Water Content as of May 7, 2025; percent of April 1 average. Graph from https://cdec.water.ca.gov/reportapp/javareports?name=PLOT_SWC

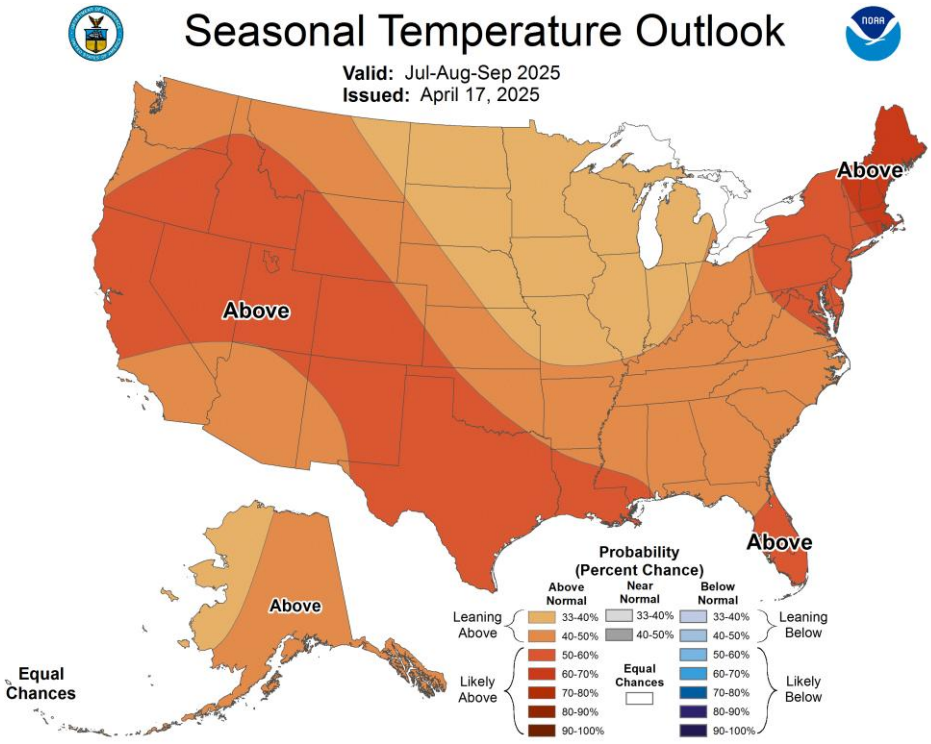


Figure 3 Seasonal temperature outlook for the United States. From NOAA's Seasonal Forecast Center https://www.cpc.ncep.noaa.gov/products/predictions/long_range/seasonal.php?lead=3

Delta Smelt Status and Distribution

In response to the continued decline in Delta Smelt coupled with few detections from ~ 2018-2021, the population has been supplemented annually through experimental releases of cultured Delta Smelt from WY 2022 to 2024. Since releases began, 315,852 cultured Delta Smelt have been released across Delta and Suisun Marsh regions. Sixteen recaptures of Delta Smelt have occurred in the summer-fall (June – Oct) since releases, including 6 in 2022 in the Lower Sacramento River, Sacramento Deepwater Ship Channel and Suisun Marsh in 2022; and 10 in 2023 in the Lower Sacramento River, Confluence, Chipps and Sherman Islands, and a few fish in Montezuma Slough and Grizzly Bay during the 2023 summer-fall action. There was only one Delta Smelt detected in the summer-fall period of 2024 in Suisun Bay. While genetic methods are not available to differentiate between offspring of experimental release fish versus wild fish, analysis from USFWS (2025) indicates all recaptures since 2022 likely have hatchery ancestry. Initial indications suggest that hatchery-origin fish generally behave similarly to wild fish (USFWS, 2025); however, large uncertainties remain.

In WY 2025, 124,946 Delta Smelt were released in the Lower Sacramento River and the Cache Slough Complex from mid November 2024 to February 2025, with a total of 80 current recaptures spread widely across the estuary (most recent catch on March 17, 2025), including the CVP fish facilities, Cache Slough Complex, lower Sacramento River, Suisun Marsh, Suisun Bay, and Sacramento Deepwater Ship Channel (see preliminary distribution data in [2]). December storms triggered the early winter pulse protection action on December 16 to reduce entrainment for adults (action in effect Dec 19, 2024 – Jan 1, 2025). In January, increased south Delta turbidity triggered Old and Middle River (OMR) management to protect adult Delta Smelt (action in effect January 15-16, 2025). Additionally, Larval and Juvenile Longfin Smelt Protection was triggered on Jan 19 (in effect Jan 20-26), which may have conferred some benefits to Delta Smelt. Wetter conditions of 2025 and the summer-fall action are anticipated to improve summer-fall abiotic and biological conditions for Delta Smelt; however, conditions have been warmer than average, which may influence the timing and distribution of spawning. Additionally, typical monitoring surveys of larvae and juveniles by the Enhanced Delta Smelt Monitoring Survey (EDSM) from April to June will not be conducted, which limits April – June monitoring data to CDFW's biweekly 20-mm Survey.

Actions, Hypotheses, and Uncertainties

Based on the March and April 2025 forecasts, we discussed hydrology scenarios that might result in Wet or Above Normal (AN) WY types. From these discussions, we developed SFHA scenarios and implementation options for different combinations of actions in each water year that aligned with the ITP. The following sections describe potential SFHA scenarios, hypotheses, and uncertainties:

Wet Water Year Type

During a Wet water year, a Fall X2 action would typically occur, per the 2024 ITP (COA 9.3.1) to decrease in upper estuary salinity and expand Delta Smelt distribution downstream, during September and October. The SMSCG action is not required in wet years, and 100 TAF of outflow will not be available in 2025 due to spillage from the winter. An evaluation of Fall X2 and summer alternatives is underway.

Fall X2

The ITP and Biological Opinion require the 30-day average of X2 to be less than or equal to 80 km for the months of September and October. Because recent modeling studies suggest less benefits of this fall X2 than a summer flow action (Smith and Nobriga 2023; Polansky et al. 2024), summer alternatives are currently being evaluated. Hypotheses and uncertainties for summer alternatives will be described in a future report.

[2] https://rosiesstuff.shinyapps.io/smeltmap/

Hypotheses:

- Decreasing X2 will maximize the area of Delta Smelt habitat with appropriate temperatures, turbidity, and salinity, which will result in higher Delta Smelt growth and survival.
- Decreasing X2 will increase biomass of calanoid copepods, specifically *Pseudodiaptomus forbesi* abundance in Suisun Bay through increased transport of freshwater species from upstream, which will result in higher Delta Smelt growth and survival.

Uncertainties:

- What, if any, habitat attributes limit Delta Smelt growth during the fall and subsequent survival?

100 TAF Block of Water

The ITP requires DWR to provide a 'One-time water commitment for Delta outflow' (ITP COA 9.1.3.2) to deploy a 100 TAF block of water to supplement Delta Outflow in WY 2025 during the summer-fall period, from June to October to improve habitat conditions for Delta Smelt. The 100 TAF shall be stored in Oroville Reservoir and is subject to spill from Oroville Reservoir if WY 2025 is wet or above normal as determined by the final 50% exceedance forecast on May 10. Given January and February storms, DWR confirmed the block of water had spilled from Oroville and the action will not be implemented. Total Lake Oroville flood control releases for the January to March period are presented in Table 1, which exceeded 100 TAF in early February.

Table 1. Oroville water releases for flood control from January through March 2025. Required base releases and extra flood control releases are presented in Acre Feet (AF).

Month	Actual Releases (Ave. CFS)	Required Releases (AF)	Extra Released for Flood Control (AF)	Total Releases (AF)
Jan	1,961	107,603	12,971	120,574
Feb	20,169	97,190	1,022,926	1,120,116
Mar	10,064	107,603	511,206	618,810

Above Normal Water Year Type

In an AN water year, Fall X2, SMSCG, and the 100 TAF outflow may occur; however, as noted above the 100 TAF water shas spilled and will not be included in the 2025 Summer-Fall Action.

Fall X2

Maintaining X2 standards would be the same as in a Wet year, which requires the 30-day average of X2 to be less than or equal to 80 km for the months of September and October. Hypothesized benefits and uncertainties are the same as a Wet year, and the adaptive management of Fall X2 is underway.

SMSCG operations

In AN years, the ITP requires 60 days of SMSCG operations between June and October. In WY 2025, gate operations will initiate in late June to maximize low salinity habitat within Suisun Marsh during the summer. Additional gate action days may be considered by DWR through an ITP amendment request. DWR believes additional gate action days, along with potential non-flow measures, could provide similar benefits of the Fall X2 action, provided Delta Smelt survival through the summer and into the early fall. Following summer-fall implementation actions, gate operations will be dictated by the Suisun Marsh Preservation agreement.

This SMSCG operation plan was revised since the initial draft of the Summer-Fall Action Plan was submitted to CDFW on May 13th. Supporting information for the proposed operational change and biological rationale is provided in Appendix A.

Hypotheses:

- Operating the SMSCGs during the summer will maximize the duration and area of Delta smelt habitat with appropriate temperatures, turbidity, and salinity, including in Suisun Marsh and Grizzly Bay. Greater, suitable habitat will result in higher Delta Smelt growth and survival.
- Operating the SMSCGs during the summer and fall will increase biomass of calanoid copepods, specifically *Pseudodiaptomus forbesi,* in Suisun Marsh through increased transport of freshwater species from upstream, which will result in higher Delta Smelt growth and survival.

Uncertainties:

- What, if any, habitat attributes limit Delta Smelt growth and survival during the summer and fall?
- Will Delta Smelt utilize habitat created in Suisun Marsh? The SMSCG action assumes that Delta Smelt will more frequently access relatively food-rich habitat in Suisun Marsh in response to the lower salinity levels. The degree to which Delta Smelt outside of Suisun Marsh will detect and respond to the action and move into the marsh is uncertain.

2025 Evaluation of Alternatives to the Summer-Fall Action

In light of recent and best available science, adaptive management practices to evaluate summer and fall actions began in January 2025. Recent evidence demonstrates that Delta Smelt survival is statistically associated with Delta outflow in the summer but not associated with fall outflow (Polanksy et al. 2024). Further, FWS analysis indicates that managing Fall X2 at 80 km is not anticipated to have visible effects on smelt survival, and higher summer outflow may better help align Delta Smelt habitat needs (June through August) such as foraging success and seasonality of prey, although the mechanisms are unknown (FWS BiOp, P. 122-135). Some analyses show some benefits of fall outflow, but these effects are not as strong as summer outflow (Smith and Nobriga 2023). Given these findings, federal and state regulatory agencies developed decision-frameworks to evaluate alternative summer-fall actions to benefit Delta Smelt.

Decision-frameworks, documentation, and outcomes for state and federal compatible evaluations of potential summer action alternatives will be available in summer-fall of 2025. In brief, frameworks included a range of Delta Smelt and other objective metrics to evaluate a suite of summer alternatives compared to Fall X2 and a no action scenario. For example, objectives such as maximizing benefits to Delta Smelt, habitat and water quality, water availability, and other ESA-listed species were evaluated using hydrodynamic and biological models. Outcomes are anticipated to result in an amendment to the 2024 ITP for a change in the Summer-Fall Action. It is also anticipated that when the Adaptive Management Steering Committee (AMSC) convenes, they may use these initial summer-fall evaluations to inform the Adaptive Management Program (ITP Attachment 4).

Monitoring and scientific investigations

Summer-Fall actions include robust science and monitoring plans (Appendix B) that occur in both action and non-action years. This includes monitoring of water quality, hydrodynamics, and collection of phytoplankton, zooplankton, benthic invertebrates, and fish. Special studies (e.g., eDNA) will also be conducted to supplement fish surveys. A description of the monitoring can be found in the SFHA Monitoring and Science Plan and project-specific workplans. CDFW and DWR will evaluate if new or enhanced monitoring elements are warranted. Science priorities are also evaluated through the DCG Science and Monitoring Work Group and vetted by the DCG, and will be discussed with the AMSC when available.

The project-specific monitoring occurs in the context of the larger Interagency Ecological Program monitoring enterprise. Data on habitat and fish response to the actions, in particular, relies heavily on data collected by existing monitoring surveys, such as the Fall Midwater Trawl, Environmental Monitoring Program, Summer Townet Survey, Yolo Bypass Fish Monitoring Program, and Enhanced Delta Smelt Monitoring. All these data sources are integrated to assess the effectiveness of the actions.

The SFHA Monitoring and Science Plan (Appendix B) is updated as needed to provide general descriptions of ongoing monitoring activities and identify topics for potential work plan modifications or directed studies. Full action study plans are also available. Where possible, each of the hypotheses and scientific uncertainties listed under each action will be statistically evaluated using data collected by the monitoring activities described in the Monitoring and Science Plan. These analyses will be reported annually to the DCG to inform future decisions. The effectiveness of the action as a whole will be synthesized and reviewed by an independent panel at regular intervals.

Coordination and communication

The DCG will continue to meet at least monthly throughout 2025. From June through October, meetings will include monthly science and monitoring updates. The DCG will contribute to the development and review of annual products including Action Plans, updated Science and Monitoring Plans, Reporting, and Independent Review panels (when applicable). The DCG anticipates using current evaluations of potential summer alternatives to Fall X2 to update and prioritize knowledge gaps and science needs for future decision-making and to consider additional models, data, and tools that could be used to inform future decision-making. The Science and Monitoring Work Group will meet as needed to provide technical support and to evaluate directed science proposals aimed at filling information gaps and reducing uncertainty.

The DCG will provide updates to different groups upon request, such as the Long-Term Operations coordination group, the Interagency Ecological Program's Science Management Team and Project Work Teams, and the Adaptive Management Sterring Committee.

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Appendices

A. Update to the WY 2025 Summer-Fall Habitat Action Plan (June 6, 2025)

B. Summer-Fall Habitat Action: 2025 Comprehensive Monitoring Plan (*provided as separate attachment*)

Appendix A

Update to the WY 2025 Summer-Fall Habitat Action Plan

June 6, 2025

California Department of Water Resources
US Bureau of Reclamation

The WY 2025 Summer-Fall Habitat Action Plan for Delta Smelt was submitted to the Delta Coordination Group (DCG) on May 13, 2025, detailing operation plans for an Above Normal Year. This report is intended to update the DCG on revisions to the Suisun Marsh Salinity Control Gate Action (SMSCG) to be implemented by DWR and USBR and provide the rationale for the change.

Current Action:

- The SMSCG will be operated for 60 consecutive days to maximize the number of days that the 3-day average salinity at Belden's Landing is ≤ 4 PSU. If the salinity does not reach 4 PSU by September 1, operations will begin on September 1 and continue until October 30.

Revised Action:

- DWR and Reclamation propose the SMSCG will be operated for 60 consecutive days starting in June.

Rationale:

- Maximize low salinity habitat within Suisun Marsh during the summer (via Belden's Landing salinity of ≤ 4 PSU, Figure 1).
- Modeled biomass, based on historical data where low salinity levels are correlated with high outflow, of zooplankton and *Pseudodiaptomus forbesi* (key smelt prey) is nearly 3-times higher in June with gate operations than without gate operations (1,856 ug/m^3 versus 381 ug/m^3, Figure 3), whereas biomass of *P. forbesi* is two orders of magnitude lower in September, though still higher with gate operations than without (13.4 ug/m^3 versus 5.5 ug/m^3).
- Summer management starting with late June SMSCG operations provides the potential to increase food supplies in Suisun Marsh, where greater habitat heterogeneity, food supplies, high turbidity and lower temperature (Figure 2), and low salinity will overlap and may better benefit the species.

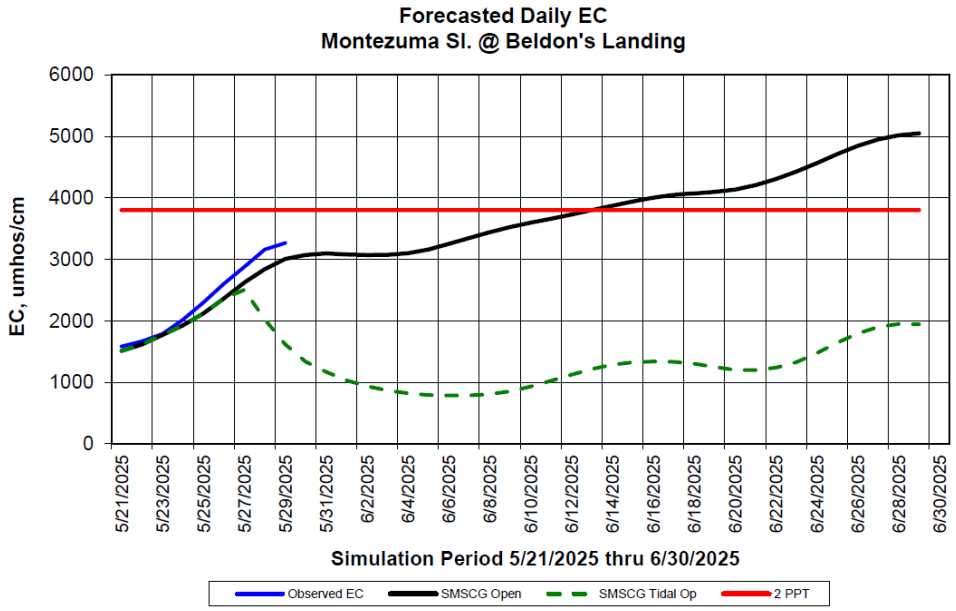


Figure 1. Electrical Conductivity (EC) modeled from DSM2 in June 2025 with and without SMSCG tidal operations. The model simulation started a little earlier than June 1 to show the general effect of a gate operation in June, the SMSCG were not operated in May.

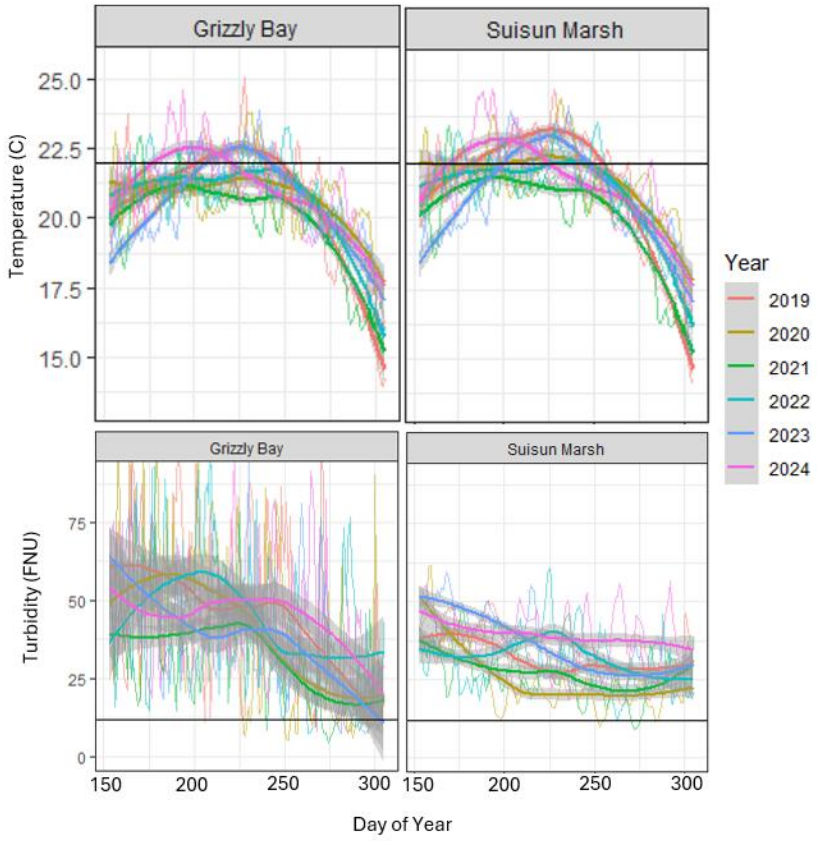


Figure 2. Daily average water temperature and turbidity in Suisun Marsh and Grizzly Bay from June through October. Black lines represent threshold for Delta Smelt (<22°C and >12 FNU).

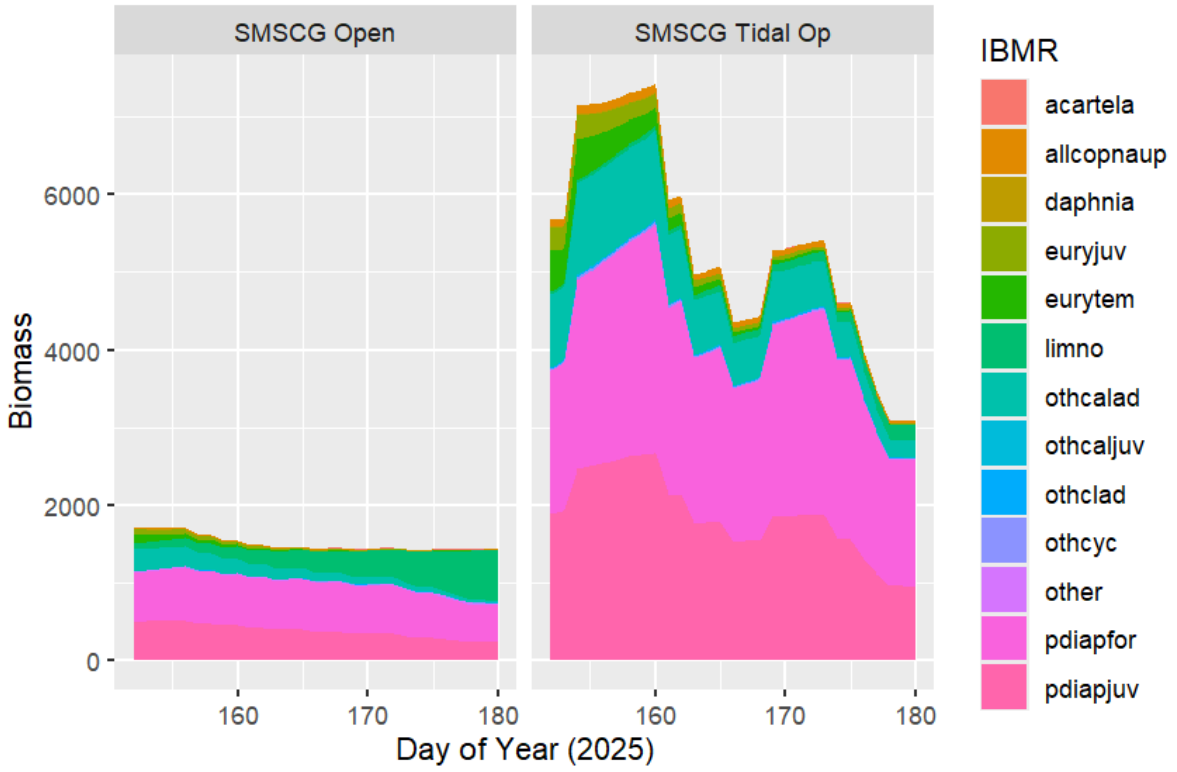


Figure 3. Predicted biomass (µg/m^3) of each major group of zooplankton taxa included in the Delta Smelt bioenergetic model (IBMR) by day of year (June) in Suisun Marsh and SMSCG scenario based on DSM2 modeling of 2025 conditions.