

LONG-TERM OPERATIONS OF THE CALIFORNIA STATE WATER PROJECT

ADDENDUM TO THE FINAL ENVIRONMENTAL IMPACT REPORT (SCH No. 2023060467) TO MODIFY CONDITIONS OF APPROVAL 9.1.3, DELTA SMELT SUMMER-FALL HABITAT ACTION AND 9.1.4, DELTA SMELT SUPPLEMENTATION UNDER INCIDENTAL TAKE PERMIT No. 2081-2023-054-00

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Acronyms and Abbreviations

Term	Definition
°C	degrees Celsius
µg/L	micrograms per liter
BiOp	biological opinion
CASS SC	Culture and Supplementation of Smelt Steering Committee
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
cHAB	cyanobacteria harmful algal bloom
COA	Condition of Approval
CVP	Central Valley Project
DCG	Delta Coordination Group
Delta	Sacramento–San Joaquin Delta
dph	days post-hatch
DSM2	Delta Simulation Model II
DSSEEP	Delta Smelt Survival Evaluation and Enhancement Plan
DWR	California Department of Water Resources
EDSM	Enhanced Delta Smelt Monitoring Program
EIR	environmental impact report
FEIR	final environmental impact report
ITP	incidental take permit
kg	kilogram
km	kilometer
mm	millimeter
OMR	Old and Middle River
psu	practical salinity unit
Reclamation	U.S. Bureau of Reclamation
SMSCG	Suisun Marsh Salinity Control Gates
SMWG	Science and Monitoring Work Group
Summer-Fall Action	Delta Smelt Summer-Fall Habitat Action
SWP	State Water Project
USFWS	U.S. Fish and Wildlife Service
WY	water year

1.1 Introduction

The California Department of Water Resources (DWR) is submitting a Major Amendment Request to the California Department of Fish and Wildlife (CDFW) for its incidental take permit (ITP) for the Long-Term Operations of the California State Water Project (SWP) (California Department of Fish and Wildlife 2024; Permit No. 2081-2023-054-00). The ITP, referred to hereafter as the 2024 LTO ITP, was issued in 2024 and provides incidental take coverage for the effects of SWP operations on five fish species listed under the California Endangered Species Act (CESA)—Longfin Smelt (*Spirinchus thaleichthys*), Delta Smelt (*Hypomeus transpacificus*), winter-run Chinook Salmon (*Oncorhynchus tshawytscha*), spring-run Chinook Salmon (*O. tshawytscha*), and White Sturgeon (*Acipenser transmontanus*) in: (1) the Sacramento River from its confluence with the Feather River downstream to the legal Sacramento–San Joaquin Delta (Delta) boundary at the I Street Bridge in the city of Sacramento; (2) the Delta (i.e., upstream to Vernalis and downstream to Chipps Island); and (3) Suisun Marsh and Bay (see Figure 1-1). Collectively, these species are referred to as covered species. This request is DWR’s third request for an amendment to ITP 2081-2023-054-00.

This Environmental Impact Report (EIR) Addendum provides California Environmental Quality Act (CEQA) coverage for DWR’s request for a Major Amendment (Amendment 3) to the 2024 LTO ITP, in which DWR requests to modify Conditions of Approval (COA) 9.1.3, *Delta Smelt Summer-Fall Habitat Action* (Summer-Fall Action) and 9.1.4, *Delta Smelt Supplementation*.

DWR has been operating to applicable COAs identified in the 2024 LTO ITP and subsequent amendments (California Department of Fish and Wildlife 2025a, 2025b) since November 1, 2024, and DWR has been planning and implementing the conditions that are required to be met over the life of the permit.

The Summer-Fall Habitat Action, as described in the U.S. Bureau of Reclamation’s (Reclamation) 2024 Proposed Action, 2024 U.S. Fish and Wildlife Service (USFWS) Biological Opinion (BiOp), and the 2024 LTO ITP, includes a flow action, known as Fall X2, which sets a requirement for the location of the 2-practical salinity unit (psu) isohaline, and a toolbox of additional actions, including operation of the Suisun Marsh Salinity Control Gates (SMSCG), to maintain appropriate low-salinity habitat for Delta Smelt in Suisun Marsh and Suisun Bay. The purpose of the Fall X2 action is to move the low-salinity zone (0.5–6 psu) into Suisun Bay where Delta Smelt historically and primarily reared during the summer and fall months of wetter year types. The Fall X2 action is implemented during September and October of Wet and Above Normal water years and is achieved through a combination of SWP and Central Valley Project (CVP) reservoir releases and export reductions. The Fall X2 action was initially required in the 2008 USFWS BiOp as an adaptive management measure.

In 2025, DWR submitted an ITP amendment application to CDFW to remove the Fall X2 action for the 2025 water year. CDFW amended the Summer-Fall Habitat Action (COA 9.1.3), to allow DWR to operate to D-1641 rather than meeting the requirement to meet a monthly average X2 of ≤ 80 kilometers (km) for one year and issued alternative mitigation for COA 9.1.3: (1) 10 additional days of SMSCG operations to extend the period of lower-salinity rearing habitat in Suisun Marsh for Delta Smelt beyond the existing 60-day requirement, and (2) a new three-year food and habitat

enhancement program (COA 9.1.3.3) to implement summer actions in 2026–2028, intended to supplement food and habitat quality that may increase the localized benefits of a SMSCG action for Delta Smelt.

1.1.1 Background of the Fall X2 Action

The Fall X2 action was a new requirement in the 2008 USFWS *Biological Opinion on the Long-term Operation of the Central Valley Project and State Water Project*, also referred to as the 2008 USFWS BiOp (U.S. Fish and Wildlife Service 2008). CDFW issued a consistency determination on the 2008 BiOp for Delta Smelt. USFWS (2024:133) stated that the “Fall X2 action was originally in the Service’s 2008 Biological Opinion as a Reasonable and Prudent Alternative (Service 2008) and was motivated by concerns about proposed ‘flatlining’ of habitat suitability in the autumn (Feyrer et al. 2011, p. 124 and their Fig. 5).” To address scientific uncertainty, the 2008 USFWS BiOp developed a robust science and monitoring plan to better understand how Delta Smelt would respond to the Fall X2 action. The science and monitoring plan was designed to be carried out in an adaptive management framework, stating “and will adjust the Action if/when circumstances and improved scientific understanding warrant.” The Fall X2 action was required as a stand-alone Reasonable and Prudent Alternative (RPA Component 4) with the stated objective to understand how Delta Smelt respond to increased habitat area in the fall of Above Normal and Wet years. USFWS (2008:369) stated that managing X2 through increasing Delta outflow during fall when the preceding water year was wetter than normal was to help return ecological conditions of the estuary to that which occurred in the late 1990s, when wild smelt populations were much larger. Additionally, the action was intended to increase areas of habitat and promote the distribution of Delta Smelt away from the risks of possible future entrainment, contaminants, and predation (U.S. Fish and Wildlife Service 2008:373).

1.1.2 New Scientific Understanding of the Delta Smelt Life Cycle

In 2012, USFWS initiated the development of several life cycle modeling efforts to better understand the factors that affect Delta Smelt population growth rates, consistent with an adaptive management approach. These efforts led to two published life cycle models (Polansky et al. 2021; Smith et al. 2021). The first of these models has been repeatedly explored using alternative versions to test the robustness of its predictor variables (Polansky et al. 2023, 2024). The results of these life cycle model variations support the hypothesis that Delta outflow in the summer, rather than fall, is the better predictor of Delta Smelt survival. These analyses demonstrated that summer outflow had the strongest positive effect on Delta Smelt survival and probability of positive population growth with the least uncertainty out of any of the covariates analyzed (i.e., spring food, fall Secchi depth) (Polansky et al. 2024). While Polansky et al. (2024) did not propose a mechanism for this relationship, Smith and Nobriga (2023) demonstrated that more favorable downstream habitat frequently becomes unavailable by midsummer; therefore, summer flows may increase alignment of high turbidity, low temperature habitat, while also increasing food subsidies, which in turn may support Delta Smelt growth and survival (Smith and Nobriga 2023). Similar effects may happen if flows are high enough in the fall, but the response of Delta Smelt lessens because water temperatures cool into more appropriate ranges and the prey subsidy is reduced as prey populations seasonally senesce. This newer information means the species benefits originally hypothesized for the Fall X2 action are unlikely to translate to improved Delta Smelt population

growth rate. A modified Fall X2 action was incorporated into the Summer-Fall Action in the 2019 BiOp and 2020 LTO ITP, and again in the 2024 BiOp and 2024 LTO ITP, adding to the SMSCG operation and other tools acknowledging the advancements in the Delta Smelt Life Cycle Model and potential benefits of summer habitat.

Through the collective advancements in science and 2024 USFWS BiOp determinations that “the Fall X2 action is not anticipated to have observable effects on Delta Smelt survival,” (U.S. Fish and Wildlife Service 2024:135) adaptive management of Fall X2 occurred with recent removal of the action as a federal Endangered Species Act requirement (2025 Record of Decision for the LTO of the CVP and SWP). Adaptive management of Fall X2 also occurred in Amendment 1 to the 2024 ITP (California Department of Fish and Wildlife 2025a), which allowed DWR to suspend the Fall X2 action under COA 9.1.3 in water year (WY) 2025, noting that “Salinity in Suisun Marsh can be managed through operation of SMSCG.” In addition to Fall X2, DWR and Reclamation have undertaken actions to address habitat for Delta Smelt including in the fall: 8,000 acres of intertidal and associated subtidal habitat have been restored to meet the intent of the 2008 USFWS BiOp (i.e., “to provide benefits to delta smelt habitat to supplement the benefits resulting from the flow actions [OMR and Fall X2]” [U.S. Fish and Wildlife Service 2008:284]) and additional SMSCG operations to increase suitable habitat extent for Delta Smelt in Suisun Marsh (Sommer et al. 2020; Beakes et al. 2021).

DWR has invested in an adaptive management framework, annually evaluating the effect of Summer-Fall Habitat Actions consistent with the ITP Adaptive Management Program (California Department of Fish and Wildlife 2024:Attachment 4). DWR, in collaboration with other agencies, has also participated in structured decision-making efforts, independent reviews (Delta Stewardship Council 2024; National Academies of Science, Engineering, and Medicine 2025), and a robust synthesis effort integrating analyses of monitoring data, Delta Smelt life cycle modeling, and seasonal report information (Delta Coordination Group Science and Monitoring Work Group 2026). Collectively, these activities have led to the major amendment request to permanently off-ramp Fall X2.

1.1.3 Wild and Hatchery-Origin Delta Smelt Trends

Alongside management of summer-fall habitat, the historical population of Delta Smelt continued to decline with near-zero detections in long-term monitoring surveys. Experimental releases of hatchery Delta Smelt began in WY 2022 to safeguard the species from extinction. Releases of hatchery Delta Smelt have continued annually under the recent initiation of the Delta Smelt Supplementation Program; however, despite logistical successes in releasing large numbers of fish, the contemporary population has not seen evidence of positive growth, and post-release survival is extremely low, relative to historical wild Delta Smelt population metrics. Additionally, monitoring survey data indicates that recruitment and survival of natural-origin larvae and juveniles (i.e., offspring of released smelt) into summer-fall is similarly low.

DWR has prepared this Addendum for the proposed changes to COAs 9.1.3 and 9.1.4 of the 2024 LTO ITP to comply with CEQA (Public Resources Code, § 21000 et seq.), augmenting the 2024 Final Environmental Impact Report (FEIR). As described in this Addendum, the proposed revisions to the 2024 LTO ITP do not require revisions to the conclusions or findings presented in the 2024 FEIR because no new or substantially more intense or severe significant environmental impacts or potentially significant environmental impacts would occur.

1.2 Proposed Project Description Updates

DWR is requesting a major amendment of the 2024 LTO ITP (ITP No. 2081-2023-054-00; California Department of Fish and Wildlife 2024).

1.2.1 Existing Conditions of Approval Proposed for Amendment

The proposed amendment includes revisions to 2024 LTO ITP COA 9.1.3, *Delta Smelt Summer-Fall Habitat Action*, and COA 9.1.4, *Delta Smelt Supplementation*. COAs as they are currently described in the 2024 ITP's second amendment (California Department of Fish and Wildlife 2025b:102–104) are shown below.

1.2.1.1 Condition 9.1.3, Delta Smelt Summer-Fall Habitat Action

The Delta Smelt Summer-Fall Habitat Action (Summer-Fall Habitat Action) is intended to benefit Delta Smelt food supply and habitat, thereby contributing to the recruitment, growth, and survival of Delta Smelt. The FLaSH conceptual model states that Delta Smelt habitat should include low-salinity conditions of 0 to 6 parts per thousand (ppt), turbidity of approximately 12 NTU, temperatures below 25°C (77°F), food availability, and littoral or open water physical habitats (Brown et al. 2014). The highest-quality habitat in Suisun Marsh and Grizzly Bay 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. The Summer-Fall Habitat Action will provide the aforementioned habitat components in the Suisun Marsh and Grizzly Bay through a range of actions by water year type to improve water quality and food supplies.

Each year DWR shall develop a plan in collaboration with Reclamation, and subject to written approval by CDFW, to operate the SWP to achieve operational requirements described in the bullets below in this Condition of Approval, and implement additional actions, as available, including monitoring, science, and food enhancement actions to enhance Delta Smelt habitat (Summer-Fall Action Plan). As an outcome of this annual planning and implementation process, reports documenting Summer-Fall Habitat Action operations and results from monitoring and scientific investigations shall be used as part of the Adaptive Management Program (Attachment 4 of the ITP) to better understand Delta Smelt habitat during the summer-fall time period and investigate the way in which SWP and CVP operations interact with the full range of components of Delta Smelt habitat. DWR shall submit drafts of all reports documenting Summer-Fall Habitat Action operations and results to CDFW for review, incorporate CDFW input, and send final draft reports to CDFW for approval prior to finalization.

DWR shall submit a final draft Summer-Fall Action Plan to CDFW by May 15 in each year a Summer Fall Habitat Action is required for written approval prior to implementation of this Condition of Approval. The Summer-Fall Action Plan shall describe the planned implementation of the actions required in this Condition of Approval and the expected hydrologic and biological benefits. The Summer-Fall Habitat Action shall be implemented between June 1 and September 30 of each water year and through October 31 of the following water year.

DWR shall include in the Summer-Fall Action Plan and adhere to the following minimum requirements:

- Improve Fall Low-Salinity Habitat (Fall X2): To increase the amount of low-salinity zone habitat for Delta Smelt in Wet and Above Normal hydrologic year types, DWR shall, in

coordination with Reclamation, maintain a 30-day average $X2 \leq 80$ km from September 1 through October 31.

- Operate Suisun Marsh Salinity Control Gates: To address effects on habitat for juvenile Delta Smelt and increase habitat and food access for Delta Smelt in summer and fall (June through October) in Suisun Marsh and Grizzly Bay during Above Normal and Below Normal water years, and Dry water years following Wet or Above Normal water years, DWR shall operate SMSCG for 60 days, to maximize the number of days that Belden's Landing 3-day average salinity is equal to, or less than, 4 psu, to maximize the spatial and temporal extent of Delta Smelt low salinity zone habitat in Suisun Marsh and Grizzly Bay. Operation of the SMSCG shall occur between June 1 and October 31 in years which operation of the SMSCG is required. In Dry years following Below Normal years, DWR shall operate SMSCG for 30 days to maximize the number of days Belden's Landing 3-day salinity is equal to, or less than 6 psu to maximize the spatial and temporal extent of Delta Smelt low salinity zone habitat in Suisun Marsh and Grizzly Bay. DWR shall implement SMSCG operations consistent with the CDFW-approved Summer-Fall Action Plan in each year in which an action is required.

DWR shall implement a modified Summer-Fall Action for water year 2025 that adheres to the following minimum requirements:

- DWR shall operate to meet the requirements of D-1641 in September 2025 and October 2025 and is not required to meet a monthly average $X2$ of ≤ 80 km during this time.
- DWR shall operate the SMSCG for 60 days as required for an Above Normal water year type. In addition, DWR shall extend the required SMSCG operations for three (3) consecutive days starting from August 23, 2025, and operate the SMSCG on a daily basis starting from September 5, 2025, for an additional seven (7) consecutive days to expand the spatial extent of Delta Smelt low salinity zone habitat in Suisun Marsh.

1.2.1.2 Condition 9.1.4, Delta Smelt Supplementation Program

A DS Supplementation Program is intended to work in conjunction with water management strategies, habitat restoration, and food web productivity enhancements, to support the persistence of Delta Smelt in the wild. DWR shall, in coordination with Reclamation, support the development, refinement and implementation of a Delta Smelt Supplementation Strategy which shall establish the framework, objectives, and timelines for the DS Supplementation Program to bolster the current population of Delta Smelt and increase the likelihood of achieving a self-sustaining status. DWR shall fund DS Supplementation Program CDFW staff according to Condition of Approval 9.1.4.1.

DWR shall, in coordination with Reclamation, work through the Culture and Supplementation of Smelt Steering Committee (CASS SC), to continue to collaborate with CDFW and USFWS on the development of the DS Supplementation Program and the Delta Smelt Supplementation Strategy. The CASS group was created in 2019 and is comprised of participants from Reclamation, DWR, CDFW, and USFWS. This body provides oversight in advancing science-based management activities to secure and stabilize the Delta Smelt population through a coordinated propagation and supplementation program. The CASS SC shall continue to provide guidance to its three working groups: 1) Captive Propagation Working Group, 2) Research Working Group, and 3) Regulatory Working Group.

An update to the Delta Smelt Supplementation Strategy is expected to be approved by CDFW and USFWS in 2025. Permittee shall, in coordination with Reclamation, CDFW, and USFWS, and subject to necessary state and federal permitting, support implementation of the DS Supplementation Program through a collective management structure consistent with the updated Delta Smelt Supplementation Strategy and the AMP (Attachment 4 of the 2024 LTO

ITP). DS Supplementation Program governance will consist of the CASS SC and collaborative technical teams charged with implementation of all aspects of supplementation (Captive Propagation Working Group, Research Working Group, and Regulatory Working Group).

DWR shall, in coordination with Reclamation, ensure production ramps up to a minimum of 125,000 fish by water year 2024, a minimum of 150,000 fish by water year 2025, a minimum of 250,000 fish by water year 2029, and a minimum of 500,000 fish by water year 2034 that are at least 200 days post-hatch (dph) or equivalent as informed by CDFW and USFWS. In the event that current Delta Smelt production estimates indicate a risk that minimum production will not be met in the subsequent year for reasons outside Permittee's control, Permittee shall meet and confer with CDFW to develop a plan to maximize production for supplementation. USFWS and CDFW, in coordination with Reclamation and DWR, will update the Supplementation Strategy to incorporate new findings from the program and update performance metrics used to guide production targets and methods development.

A process to evaluate production targets to support supplementation will be developed and implemented no less than annually via the CASS SC. Outcomes of the review may include but are not limited to revisions of annual production numbers, timeline, release methods, monitoring, and genetic management strategies. These findings will be incorporated into the Delta Smelt Supplementation Strategy and will serve as guidance for the program.

The Delta Smelt Supplementation Strategy will also evaluate and address any need for additional facilities and infrastructure improvements to existing facilities and evaluate the benefit of new approaches to maintaining the refugial population of Delta Smelt while also supporting the updated Delta Smelt Supplementation Strategy and DS Supplementation Program. Permittee shall, in coordination with Reclamation, collaborate with CDFW and USFWS on the development of additional facility needs, their construction and operation, to meet a production capability of 500,000 Delta Smelt that are at least 200 days post-hatch, within 10 years of the effective date of this ITP. Such facilities and infrastructure improvements are not Covered Activities of this ITP and could require separate processes for compliance under CESA and CEQA for their construction and eventual operation.

To support CDFW's role in the DS Supplementation Program, Permittee shall fund a full-time biologist position (Condition of Approval 9.1.4.1).

1.2.2 Proposed Modifications to Conditions of Approval 9.1.3 and 9.1.4

Beyond the proposed modifications to COAs 9.1.3 and 9.1.4 described below, there are no changes to SWP facilities or other operations proposed.

1.2.2.1 Condition 9.1.3, Delta Smelt Summer-Fall Habitat Action

Proposed modifications of COA 9.1.3 include permanent removal of the September and October Fall X2 requirement (80 km) as described in the 2024 LTO ITP, instead operating to State Water Resources Control Board D-1641 for September and October, consistent with the limited term amendment (California Department of Fish and Wildlife 2025a). DWR proposes an alternative action to address SWP impacts by flooding approximately 315 acres of wetlands during the summer and fall of Wet and Above Normal water years to provide food subsidies in Suisun Marsh, where juvenile Delta Smelt have been abundant historically. Changes to the food action region may be proposed by DWR, in coordination with CDFW, if monitoring data of Delta Smelt suggest a food action may have benefits outside the Suisun Marsh region. This alternative action is estimated to provide a biomass

of zooplankton equal to the SWP's proportional share of the biomass of Delta Smelt's main diet taxon, *Pseudodiaptomus forbesi*, transported during a Fall X2 action. The zooplankton production will occur on DWR's own land or through contracts with willing landowners. Monitoring during the action will include chlorophyll concentration, zooplankton abundance, dissolved oxygen, temperature, pH, and potentially presence of fish at the outlet of the wetland while draining. From these data, DWR will calculate total zooplankton produced and any potential negative impacts on water quality in surrounding channels.

Justification for Proposed Modification to Condition 9.1.3

Monitoring data indicate that hatchery Delta Smelt represent the majority, if not the entire, population of Delta Smelt in the wild (U.S. Fish and Wildlife Service 2025). In recent years, daily average temperatures in many regions of the estuary frequently exceed levels that impair smelt growth (warmer than 22 degrees Celsius [°C]; Lewis et al. 2021; Smith and Nobriga 2023). Summer water temperature and extreme heat events are the likely driver affecting Delta Smelt survival (Mahardja et al. 2025; Pien et al. 2025) and reduce intended benefits of freshwater flow (Interagency Ecological Program Management, Analysis, and Synthesis Team et al. 2015; Flow Alteration Management Analysis and Synthesis Team 2021; Schultz et al. 2019). Under COA 9.1.3, DWR conducts SMSCG operations as component of the Summer-Fall Action to provide increased habitat in Suisun Marsh where suitable water temperatures may exist, and the greater habitat heterogeneity and extensive tidal wetlands in Suisun Marsh may provide thermal refugia in microhabitats not detected by continuous sondes (Enright et al. 2013; see also Gustine et al. 2023). COA 9.1.3 requires that the SMSCG be operated for a set number of days between June and October, but does not specify which days during the time period operations are required. Therefore, different operational schedules can be explored to optimize the spatial or temporal extent of suitable lower-salinity conditions for Delta Smelt habitat. As discussed in more detail below in the "Growth and Health Effects" and "Survival Effects" subsections of Section 2.2.2.2, "Delta Smelt," there is little evidence of positive biotic responses (growth, health, and survival) from lower X2 in the fall as would occur with the Fall X2 action.

Recent analysis indicates that survival within the historical Delta Smelt population is significantly correlated with summer outflow in June through August, whereas fall outflow in September and October is not consistently supported as a predictor of survival (Polansky et al. 2024). Thus, the statistical life cycle model best explaining historical Delta Smelt population growth includes summer outflow but not fall outflow (Polansky et al. 2024). USFWS summarized the previously published life cycle model, summer and fall flow results (Polansky et al. 2021, 2023, 2024), for the analysis of the Proposed Action in their LTO BiOp, concluding that the Fall X2 component of the Summer-Fall Action is not supported as being likely to result in a detectable change in Delta Smelt survival based on the life cycle modeling (U.S. Fish and Wildlife Service 2024:133). Consistent with USFWS findings, Mahardja et al. (2026) used individual-based modeling that demonstrated the Delta Smelt population growth rate was only 0.032 higher with the Fall X2 action compared to without, with overlapping 95 percent credible intervals (see Figure 2-12 in the "Survival Effects" section of Section 2.2.2.2, "Delta Smelt"). The Delta Coordination Group's (DCG) Science and Monitoring Work Group (SMWG) recently completed a synthesis of all available information on monitoring and modeling of the effectiveness of Fall X2 actions, and found empirical support for the models used by Polansky et al. (2024) and Mahardja et al. (2026), finding that higher outflow and/or lower X2 in summer had greater benefits for Delta Smelt food supply, growth, and survival than outflow in fall (Delta Coordination Group Science and Monitoring Work Group 2026).

Since supplementation efforts of Delta Smelt began in December 2021, survival of hatchery adult Delta Smelt following release has been quite low (<9 percent, see discussion below in the “Current Delta Smelt Spatial Distribution and Population Status” subsection of Section 2.2.2.2, “Delta Smelt.” With limited adult survival and low to zero larval detections (Mussman et al. 2026), weight of evidence suggests that hatchery-supplemented Delta Smelt are not completing their life cycle at a level where population growth is realistic, and therefore, few juvenile Delta Smelt are anticipated to be present during the summer-fall period (see “Current Delta Smelt Spatial Distribution and Population Status” section of Section 2.2.2.2, “Delta Smelt”). For example, from 2021 through 2025, only one to nine wild-origin individuals greater than 20 millimeters (mm) have been detected during summer-fall; therefore, the proposed modification to permanently remove the requirement to implement X2 at or below 80 km in September and October is not anticipated to have effects on Delta Smelt survival, and is consistent with best management practices in an adaptive management approach.

Given that scientific evidence supports summer outflow and habitat being a stronger factor than fall outflow at potentially influencing the historical Delta Smelt survival and population growth (Polansky et al. 2024; Delta Coordination Group Science and Monitoring Work Group 2026) suggested by increased food subsidies, higher turbidity, and potentially lower temperature (Smith and Nobriga 2023; Delta Coordination Group Science and Monitoring Work Group 2026), DWR proposes to subsize food in the summer-fall period to benefit hatchery-supplemented Delta Smelt that may be present in the Suisun Marsh region. DWR does not propose summer outflow actions in this amendment because there has not been significant decline in summer outflow attributed to the SWP. On the contrary, Hutton et al. (2017a) found that outflow during July–August has increased over the past 50 years, and Hutton et al. (2017b) attributed that increase to water project operations (CVP and SWP combined). While there is expected to be a small decrease in summer flow caused by the proposed major amendment, this change is less than 2 percent of the total flow (see Section 2.2.2.1 *Quantitative Hydrological Scenarios*). Furthermore, the outflow required to reach positive smelt effects (e.g., population growth or minimum abundance for hatchery broodstock collection targets) would be a significant portion of annual water supply (Mahardja et al. 2026; Healy et al. 2025), but with a reduced SWP-only outflow action (i.e., without CVP proportional share), positive Delta Smelt effects are not anticipated. Additionally, there is high uncertainty in modeling approaches as they may not accurately reflect the status and responses of the contemporary smelt population, and therefore any realized benefits to Delta Smelt from SWP share of summer X2 action are unlikely.

There are several potential mechanisms behind the summer flow-survival relationship for Delta Smelt, but both the DCG SMWG (2026) and Smith and Nobriga (2023) found evidence that high food availability in June and July may be an important part of the mechanism, and is consistent with Hammock et al. (2022) and McCormick et al. (2025), who found increased food availability result in improved smelt condition. Therefore, DWR has committed to increase food availability in the Suisun region as part of this Proposed Major Amendment. As described in Attachment 1, *Zooplankton Transport Estimates for State Water Project Incidental Take Permit Summer-Fall Habitat Requirements* CDFW analyzed the biomass of the important Delta Smelt food item *Pseudodiaptomus forbesi* that is transported into Suisun Marsh and Suisun Bay during Fall X2 actions as part of the 2025 ITP Amendment 1 to temporarily operate the SWP without the Fall X2 action in 2025 (California Department of Fish and Wildlife 2025a). DWR conducted a similar analysis of zooplankton transport and determined that the total biomass of *Pseudodiaptomus* spp. transported into Suisun Bay and Suisun Marsh from June through October by a Fall X2 action was 796 kilograms

(kg), and SWP's proportional share of this subsidy (20 percent) is 159 kg. Managed wetlands can produce zooplankton at densities that average 250 micrograms per liter ($\mu\text{g/L}$) and can reach as high as 600 $\mu\text{g/L}$ (Phillips et al. 2026), and most wetlands can flood to approximately 0.5 meter deep, meaning that an area of approximately 315 acres can produce the 159 kg of zooplankton that would have been transported by the SWP's proportional share of Fall X2. See the "Food Effects" subsection of Section 2.2.2.2, "Delta Smelt," and Attachment 1 for details on these calculations.

1.2.2.2 Condition 9.1.4, Delta Smelt Supplementation Program

- Proposed modification of COA 9.1.4 includes an additional condition "9.1.4.2 Delta Smelt Survival Evaluation and Enhancement Plan" with the goal to improve Delta Smelt survival and abundance, and the production of hatchery smelt for applied science activities. The Delta Smelt Survival Evaluation and Enhancement Plan (DSSEEP) activities may include development of key research questions and implementation of hypothesis-driven studies to inform process improvements to the Delta Smelt Supplementation Program. These activities are complementary to, but distinct from, Supplementation Program releases. The DSSEEP will be focused on evaluating improvements in supplementation methods (e.g., pre-release conditioning, transport methods, release methods) with the goal of increasing the survival of adult Delta Smelt post-release. To avoid compromising current plans to meet the production targets stipulated in COA 9.1.4, additional production capacity for fish specifically designated for the DSSEEP will be needed. DWR proposes expanding production capacity by up to 100,000 fish (>200 dph) to provide fish for the DSSEEP.

Justification for Proposed Modification to Condition 9.1.4

Monitoring program recaptures of released hatchery Delta Smelt, along with larval sampling and genetics data, indicate that survival of released adult Delta Smelt and subsequent spawning and recruitment is substantially lower than what is needed for the success of the Supplementation Program. Historical Delta Smelt pre-spawning adult (November–March) survival estimates were >90 percent, while current estimates during the Supplementation Program period are <9 percent (Figure 2-4; U.S. Fish and Wildlife Service 2026). Observations of monitoring data indicate emerging trends that hatchery-reared Delta Smelt may exhibit different behaviors from the historical population (e.g., migratory behavior, responses to environmental conditions, distribution); however, there is insufficient evidence to definitively describe any putative differences or how those differences could influence survival in the Delta. Differences between hatchery and wild-origin conspecifics are not uncommon (e.g., survival of released Steelhead trout (Melnichuk et al. 2014) and narrowed habitat use and migratory behaviors of Chinook Salmon (Chen et al. 2025). Under COA 9.1.4, DWR, along with Reclamation, is required to meet production targets for hatchery Delta Smelt, culminating in producing a minimum of 500,000 fish (>200 dph) by WY 2034. With the recent observations of poor survival among released fish, there are potential benefits in supporting a DSSEEP that will be created in collaboration with the CASS SC.

1.3 Summary of the 2024 LTO ITP Timelines and Amendments

CDFW approved the 2024 LTO ITP on November 4, 2024, for the potential take of five CESA-listed fish species associated with the long-term operation of the SWP facilities in the Delta. DWR's Notice

of Determination for the 2024 FEIR, prepared to support the ITP, was filed with the State Clearinghouse on October 28, 2024.

In August 2025, DWR requested an amendment to the 2024 ITP and prepared an addendum to the 2024 FEIR to evaluate modifications to the Fall X2 requirement and SMSCG operations described in Sections 2.3.6.1 and 2.3.6.2 of the FEIR. DWR filed the EIR Addendum with the California Office of Land Use and Climate Innovation, State Clearinghouse on August 26, 2025. CDFW issued Amendment 1 to the 2024 ITP (No. 2081-2023-054-00) on September 29, 2025.

DWR submitted proposed Amendment 2 to CDFW on November 18, 2025, which proposed to update the 2024 ITP governance COAs 8.5.1 and 8.6.1, which in turn would update implementation of specific Delta Smelt protection actions (ITP COAs 8.3.1, 8.3.2). These COAs are described in the FEIR in Section 2.3.3.2, “Start of OMR Management,” subsections of Section 2.3.3, “Real-Time Adjustments,” including “Adult Delta Smelt Entrainment Protection Action” and “Larval and Juvenile Delta Smelt Protection Action,” and Section 2.3.22.4, “Delta.”

DWR submitted proposed Amendment 3 to CDFW on May 28, 2026, which proposed to update the 2024 ITP COAs 9.1.3 and 9.1.4. These COAs are described in the FEIR in Section 2.3.6.3, “One-Time Water Commitment for Delta Outflow.”

Other than proposed Amendment 3, the subject of this document, all other provisions of the 2024 LTO ITP would remain in effect, and all operations would continue to comply with applicable laws, contractual obligations, and agreements. All provisions in the amended 2024 LTO ITP and operation of the SWP will continue to protect the five species covered under the 2024 LTO ITP after the proposed revisions to the ITP are accepted by CDFW and the ITP is amended.

1.4 Purpose of the Environmental Impact Report Addendum

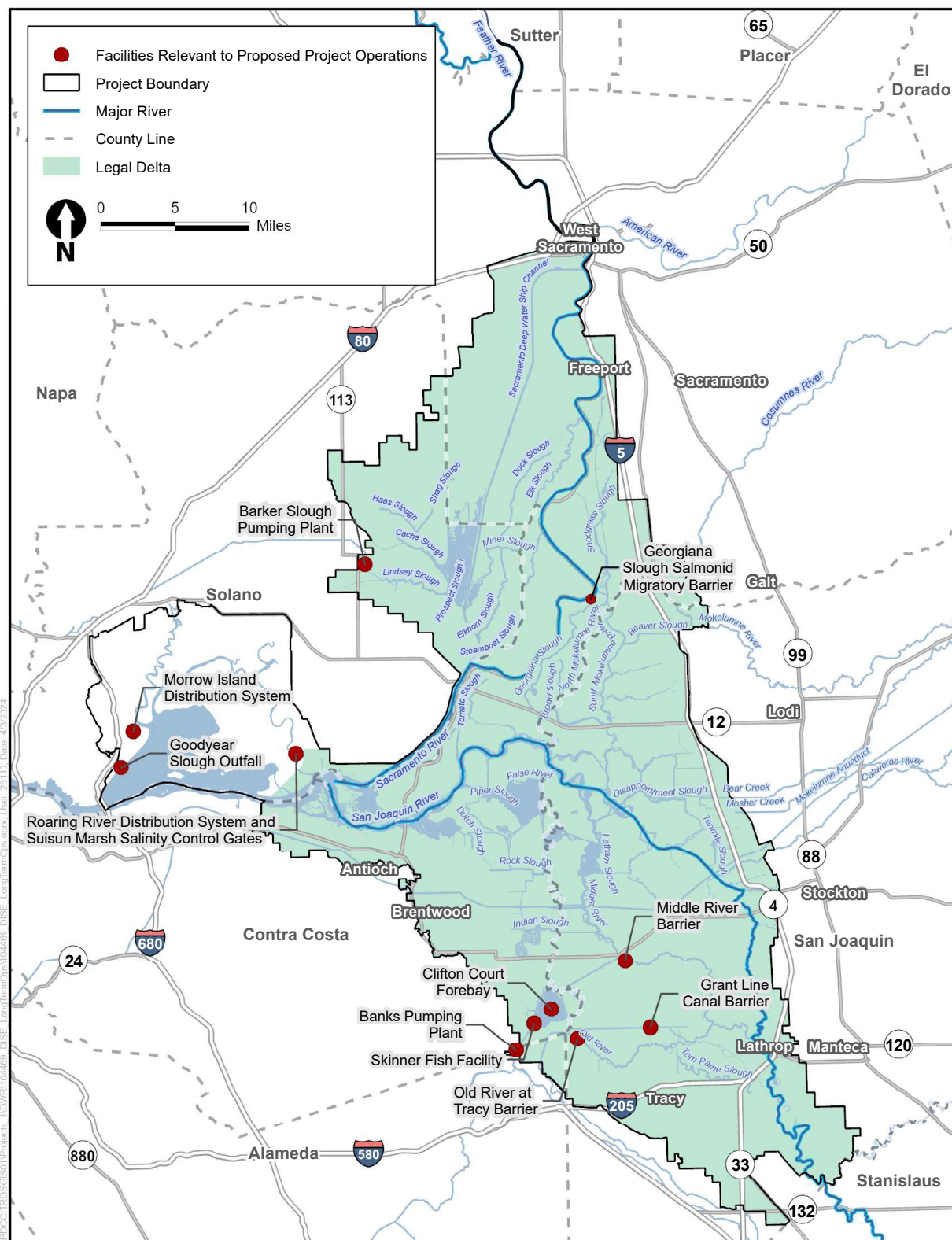
According to Section 15164(a) of the CEQA Guidelines, the lead agency or a responsible agency shall prepare an addendum to a previously certified EIR if some changes or additions are necessary, but none of the conditions described in Section 15162 requiring preparation of a subsequent EIR have occurred. Section 15162 of the CEQA Guidelines lists the conditions that would require the preparation of a subsequent EIR rather than an addendum. These include the following:

1. Substantial changes are proposed in the project which will require major revisions of the previous EIR or negative declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects;
2. Substantial changes occur with respect to the circumstances under which the project is undertaken which will require major revisions of the previous EIR or negative declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects; or

3. New information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at the time of the previous EIR was certified as complete or the negative declaration was adopted, shows any of the following:
 - a. The project will have one or more significant effects not discussed in the previous EIR or negative declaration;
 - b. Significant effects previously examined will be substantially more severe than shown in the previous EIR;
 - c. Mitigation measures or alternatives previously found not to be feasible would in fact be feasible, and would substantially reduce one or more significant effects of the Project, but the project proponents decline to adopt the mitigation measure or alternative; or
 - d. Mitigation measures or alternatives which are considerably different from those analyzed in the previous EIR would substantially reduce one or more significant effects on the environment, but the project proponents decline to adopt the mitigation measure or alternative.

This Addendum concludes that the proposed changes to COAs 9.1.3 and 9.1.4 of the 2024 LTO ITP do not trigger any of the CEQA Guidelines Section 15162 conditions described above. The proposed changes to the ITP do not require revisions to the conclusions or findings presented in the 2024 FEIR because no new or substantially more intense, severe significant environmental impacts, or potentially significant environmental impacts would occur.

The level of protection for the five covered species, as well as other aquatic species evaluated in the 2024 FEIR will not change as a result of the requested amendment to COAs 9.1.3 and 9.1.4 of the 2024 LTO ITP. DWR does not propose changes to any other ITP conditions.



Source: California Department of Water Resources 2024.

Figure 1-1. Locations of Facilities Relevant to Proposed Project Operations in the Delta, Suisun Marsh, and Suisun Bay

2.1 Summary of Previous Environmental Review Process

The effects on the environment of long-term operations of the SWP facilities in the Delta and issuance of an ITP to provide incidental take coverage for five CESA-listed fish species were addressed in the 2024 FEIR.

The analyses presented in the 2024 FEIR concluded that the Proposed Project and the alternatives considered would have either no impact or a less-than-significant impact on the environment, depending on the resource category evaluated (e.g., DWR identified no impact on Aesthetics and less-than-significant impacts on Aquatic Biological Resources; see Appendix 3A and Chapter 6 of the 2024 FEIR). DWR selected the Proposed Project as the long-term operations of the SWP.

Further, the Proposed Project included measures to meet the legal standard under CESA to minimize and fully mitigate the take of listed species consistent with DWR's application for an ITP. The Proposed Project provides flow management in Old and Middle rivers to minimize entrainment into the SWP pumping facilities; freshwater outflow in the spring, summer, and fall; and other actions to benefit CESA-listed fish species. The Proposed Project is expected to protect CESA-listed and other special-status aquatic species better than historical operations.

The Proposed Project was determined to have no impacts or less-than-significant impacts on all environmental resources evaluated and includes measures that minimize and fully mitigate impacts on CESA-listed fish species. Therefore, the long-term operation of the SWP and issuance of the ITP:

1. Will not degrade environmental quality, substantially reduce habitat, cause a wildlife population to drop below self-sustaining levels, reduce the number or restrict the range of special-status species, or eliminate important examples of California history or prehistory.
2. Does not have the potential to achieve short-term environmental goals to the disadvantage of long-term environmental goals.
3. Will not have impacts that are individually limited but cumulatively considerable.
4. Will not have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly.

The environmental analyses and findings presented in the 2024 FEIR reflect the independent judgment of DWR as the lead agency under CEQA.

2.2 Environmental Analysis

This section of the addendum analyzes the potential effects on the physical environment from implementing the proposed change to the *Delta Smelt Summer-Fall Habitat Action* (ITP COA 9.1.3) and *Delta Smelt Supplementation Program* (ITP COA 9.1.4). This analysis has been prepared to determine whether any of the conditions in Section 15162 or 15163 of the State CEQA Guidelines (as described in Section 1.4, “Purpose of the Environmental Impact Report Addendum”) would occur as a result of the proposed major amendment to the ITP.

2.2.1 Topics Considered in This Addendum

The proposed changes are described in detail in Section 1.2.2, “Proposed Modifications to Conditions of Approval 9.1.3 and 9.1.4,” and would modify the Summer-Fall Action (ITP COA 9.1.3) and the Delta Smelt Supplementation Program (ITP COA 9.1.4). The proposed modification of the Summer-Fall Action includes a permanent off-ramp of the implementation of Fall X2 and inclusion of an alternative action to address SWP impacts by flooding 315 acres of wetlands during the summer and fall to provide food subsidies in Suisun Marsh. The modification of the Delta Smelt Supplementation Program has the goal to improve Delta Smelt survival and abundance, and the production of hatchery smelt for applied science activities.

These proposed changes would not substantially modify the actions evaluated in the 2024 FEIR. Therefore, the proposed changes would not result in new significant impacts or a substantial increase in the intensity or severity of environmental effects for any of the following topic areas:

- Aesthetics
- Agriculture/Forestry Resources
- Air Quality
- Biological Resources
- Cultural Resources
- Energy
- Geology/Soils
- Greenhouse Gas Emissions
- Growth Inducement
- Hazards and Hazardous Materials
- Hydrology/Water Quality
- Land Use/Planning
- Mineral Resources
- Noise
- Population/Housing
- Public Services
- Recreation
- Transportation
- Tribal Cultural Resources
- Utilities/Service Systems
- Wildfire
- Environmental Justice
- Climate Change Resiliency and Adaptation

The following sections provide additional analysis on aquatic biological resources related to the proposed change.

2.2.2 Analysis of Effects on CESA-Listed Fish Species of Management Concern

2.2.2.1 Quantitative Hydrological Scenarios

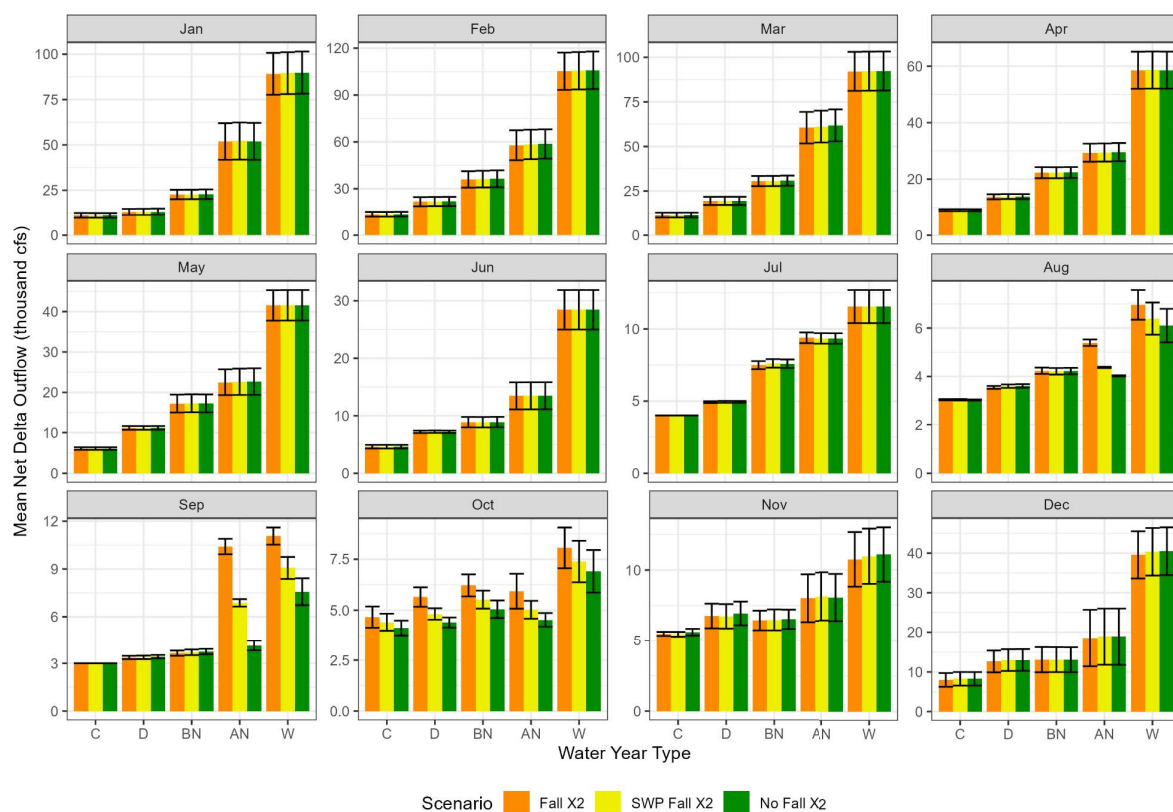
To illustrate potential effects of the proposed major amendment to permanently off-ramp the Fall X2 action, hydrological scenarios for WYs 1922–2021 were modeled using CalSim 3. Operational assumptions for the scenarios reflect other operational criteria (e.g., D-1641) as they currently exist, in tandem with the 2024 ITP. Three scenarios were included in the CalSim 3 modeling:

- Fall X2: this is CalSim 3 scenario FEIR_9bv2 and represents the operations permitted by the 2024 SWP ITP, including both SWP and CVP operating to Fall X2—this illustrates the effect of the permitted project
- SWP Fall X2: this is CalSim 3 scenario FEIR_9bv2_SWPFallX2 and is the same as the Fall X2 scenario except it includes only the SWP proportional share of the Fall X2 action—this provides additional context for considering SWP effects specifically
- No Fall X2: this is CalSim 3 scenario FEIR_9bv2_NoFallX2 and represents the operations permitted by the 2024 SWP ITP except it excludes the Fall X2 action—this represents the proposed major amendment

A summary of outputs of key variables from the CalSim 3 analysis is provided in Table 2-1.

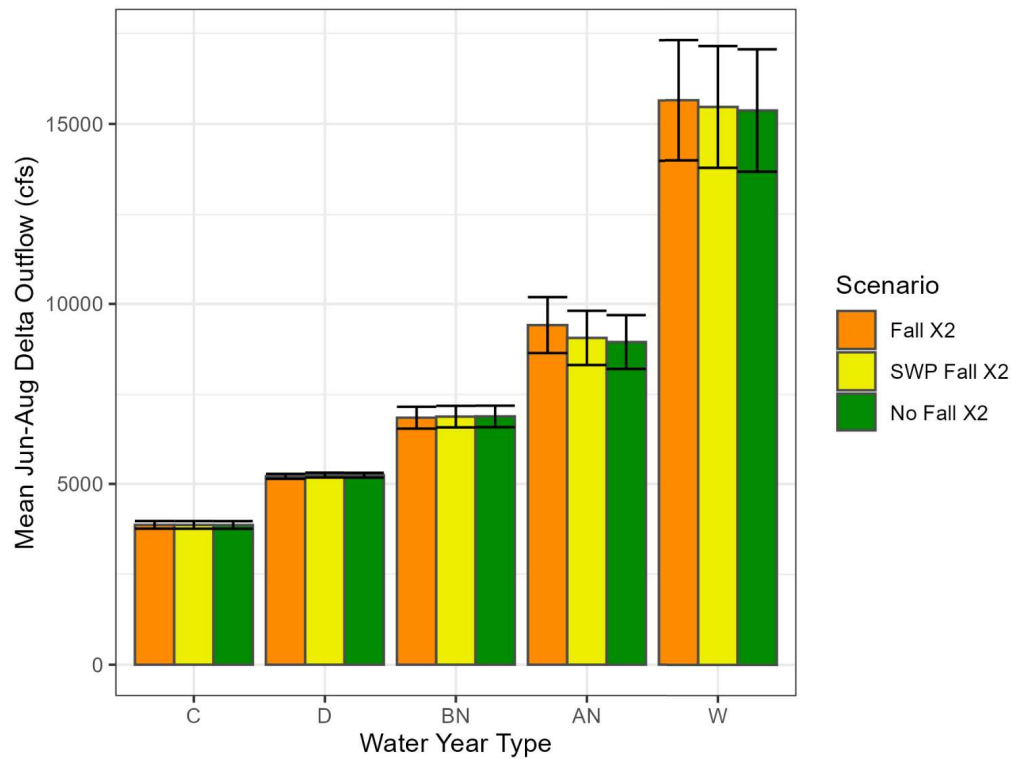
CalSim 3 model results show only minor (<3 percent) change to Delta outflow in November–September of Critically Dry, Dry, or Below Normal water year types, with the bulk of the changes in flow occurring in September of Above Normal and Wet water years as well as October of the following water year (Figure 2-1). There were also decreases to outflow in August, since operations frequently need to increase flows starting in August in order to meet the September Fall X2 standard (i.e., decreases of 5 percent in Wet years and 9 percent in Above Normal years under the No Fall X2 scenario relative to the SWP Fall X2 scenario, Table 2-1). Changes in August flows led to an overall decrease in average summer (June–August) outflow of less than 2 percent across all years under the No Fall X2 scenario relative to the SWP Fall X2 scenario (Figure 2-2).

Exclusion of Fall X2 resulted in incidental differences in other variables, such as greater Oroville storage (e.g., up to 7 percent more under the No Fall X2 scenario compared to SWP Fall X2 scenario) and higher or lower Feather River High Flow Channel flow depending on month (Table 2-1). Removal of the Fall X2 requirement under the proposed major amendment leads to greater probability of Oroville Reservoir spill during winter/spring; this is illustrated by 100,000 acre-feet or more of additional January–June Delta outflow in around 15% of years under the No Fall X2 scenario compared to the SWP Fall X2 scenario (Figure 2-3). Other differences in CalSim 3 output variables relevant to the covered fish species are discussed in the sections below.



Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-1. Mean Net Delta Outflow (± 1 SE) as Modeled by CalSim 3 for Each Month and Water Year Type.



Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

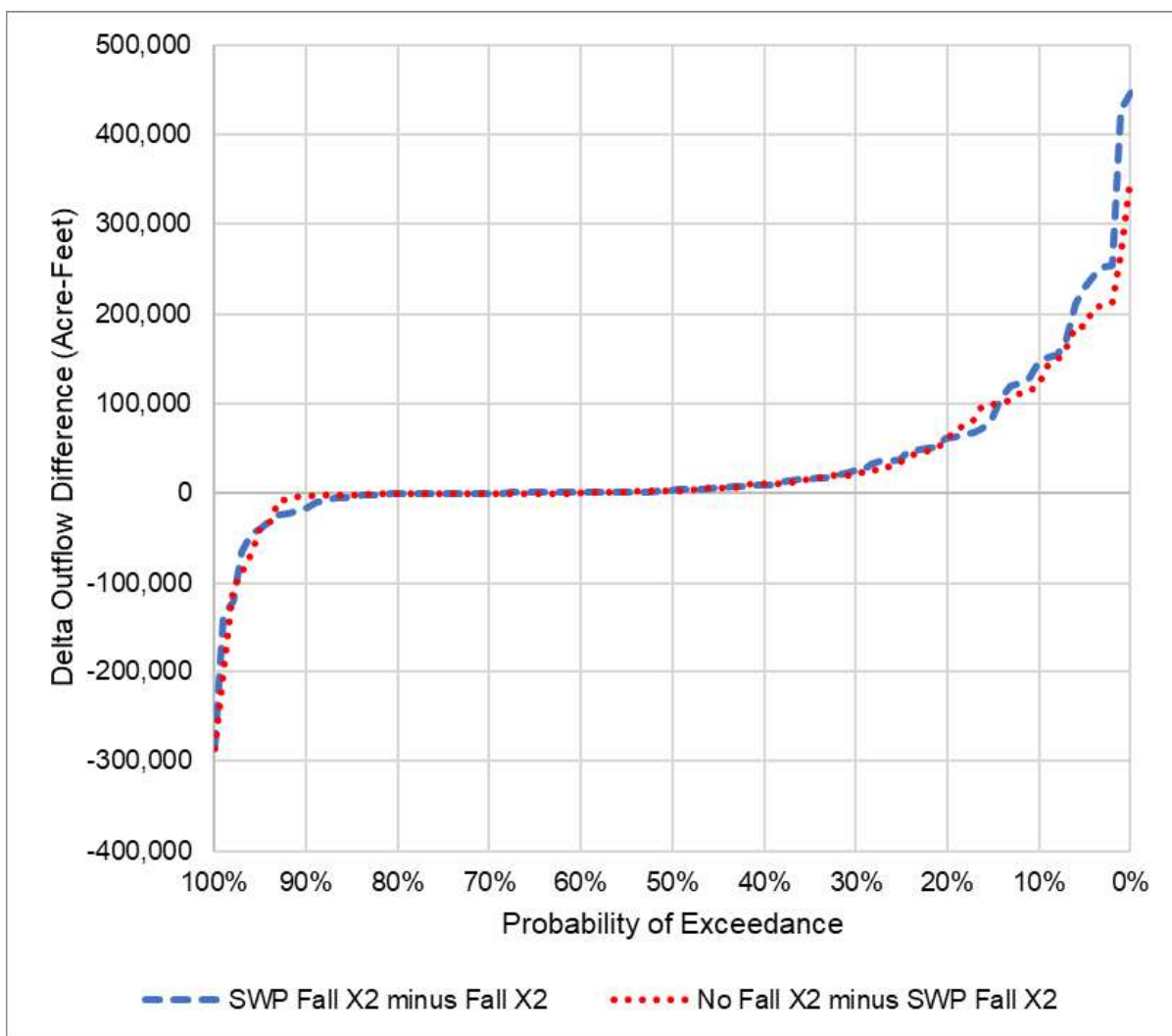
Figure 2-2. Mean June–August Net Delta Outflow (± 1 SE) as Modeled by CalSim 3, Grouped by Water Year Type.

Table 2-1. Summary of Mean Monthly Hydrological Outputs over the 1922–2021 CalSim 3 Modeling Period.

Month	Water Year Type	Oroville Storage (taf)			Feather River High Flow Channel (cfs)			Sacramento River at Freeport Flow (cfs)			Banks SWP Export (cfs)			Old and Middle River Flow (cfs)			QWEST Flow (cfs)			Delta Outflow (cfs)			X2 (km)		
		Fall X2	SWP Fall X2	No Fall X2	Fall X2	SWP Fall X2	No Fall X2	Fall X2	SWP Fall X2	No Fall X2	Fall X2	SWP Fall X2	No Fall X2	Fall X2	SWP Fall X2	No Fall X2	Fall X2	SWP Fall X2	No Fall X2	Fall X2	SWP Fall X2	No Fall X2	Fall X2	SWP Fall X2	No Fall X2
October	Wet	1,985	2,040 (3%)	2,106 (3%)	2,671	2,492 (-7%)	2,275 (-9%)	13,157	12,911 (-2%)	12,712 (-2%)	4,056	4,145 (2%)	4,304 (4%)	-6,194	-6,458 (-4%)	-6,622 (-3%)	24	-366 (-1626%)	-588 (-61%)	7,753	7,222 (-7%)	6,845 (-5%)	78.5	81.3 (2.8)	83.7 (2.4)
October	Above Normal	1,661	1,718 (3%)	1,793 (4%)	2,485	2,421 (-3%)	2,046 (-15%)	10,922	10,459 (-4%)	10,676 (2%)	2,270	2,701 (19%)	3,368 (25%)	-4,461	-5,287 (-19%)	-6,363 (-20%)	964	-87 (-109%)	-1,189 (-1260%)	6,550	5,191 (-21%)	4,245 (-18%)	80.0	84.8 (4.8)	88.9 (4.1)
October	Below Normal	1,870	1,947 (4%)	2,010 (3%)	2,771	2,504 (-10%)	2,561 (2%)	11,338	11,062 (-2%)	11,481 (4%)	3,013	3,293 (9%)	3,777 (15%)	-5,446	-5,902 (-8%)	-6,705 (-14%)	370	-205 (-156%)	-959 (-367%)	6,412	5,641 (-12%)	5,189 (-8%)	89.1	88.9 (-0.1)	88.9 (0.0)
October	Dry	1,668	1,754 (5%)	1,836 (5%)	2,480	2,130 (-14%)	1,986 (-7%)	10,922	10,452 (-4%)	10,518 (1%)	2,732	2,956 (8%)	3,303 (12%)	-5,309	-5,693 (-7%)	-6,163 (-8%)	380	-242 (-164%)	-682 (-182%)	5,762	4,874 (-15%)	4,432 (-9%)	91.8	91.8 (0.0)	91.7 (0.0)
October	Critically Dry	1,393	1,396 (0%)	1,455 (4%)	1,569	1,614 (3%)	1,607 (0%)	8,499	8,430 (-1%)	8,404 (0%)	1,681	1,773 (5%)	1,967 (11%)	-3,890	-4,010 (-3%)	-4,219 (-5%)	599	419 (-30%)	189 (-55%)	4,558	4,359 (-4%)	4,105 (-6%)	93.9	93.8 (-0.1)	93.8 (0.0)
November	Wet	1,971	2,025 (3%)	2,090 (3%)	2,337	2,346 (0%)	2,364 (1%)	16,166	16,378 (1%)	16,256 (-1%)	5,103	5,114 (0%)	4,957 (-3%)	-7,206	-7,215 (0%)	-7,065 (2%)	-1,504	-1,508 (0%)	-1,336 (11%)	11,123	11,337 (2%)	11,377 (0%)	80.3	81.4 (1.1)	83.0 (1.6)
November	Above Normal	1,660	1,714 (3%)	1,791 (5%)	1,719	1,753 (2%)	1,696 (-3%)	12,825	12,997 (1%)	12,348 (-5%)	4,392	4,410 (0%)	3,761 (-15%)	-6,814	-6,824 (0%)	-6,091 (11%)	-2,397	-2,406 (0%)	-1,701 (29%)	6,695	6,821 (2%)	6,986 (2%)	82.4	84.4 (2.0)	86.9 (2.4)
November	Below Normal	1,865	1,937 (4%)	1,995 (3%)	1,486	1,558 (5%)	1,646 (6%)	12,302	12,376 (1%)	12,048 (-3%)	4,038	4,052 (0%)	3,849 (-5%)	-6,749	-6,779 (0%)	-6,443 (5%)	-1,982	-1,999 (-1%)	-1,666 (17%)	6,435	6,478 (1%)	6,520 (1%)	88.8	88.7 (-0.1)	88.7 (0.0)
November	Dry	1,649	1,734 (5%)	1,816 (5%)	1,567	1,570 (0%)	1,587 (0%)	12,457	12,524 (1%)	12,056 (-4%)	3,579	3,646 (2%)	3,348 (-8%)	-6,286	-6,342 (-1%)	-5,722 (10%)	-1,957	-2,004 (-2%)	-1,447 (28%)	6,820	6,822 (0%)	7,036 (3%)	89.0	89.0 (0.0)	89.0 (0.0)
November	Critically Dry	1,336	1,339 (0%)	1,396 (4%)	1,312	1,321 (1%)	1,385 (5%)	8,891	8,948 (1%)	8,898 (-1%)	1,687	1,771 (5%)	1,664 (-6%)	-3,550	-3,652 (-3%)	-3,482 (5%)	-311	-410 (-32%)	-203 (51%)	5,487	5,428 (-1%)	5,565 (3%)	92.5	92.5 (0.0)	92.6 (0.1)
December	Wet	2,265	2,296 (1%)	2,336 (2%)	4,399	4,781 (9%)	5,177 (0%)	34,106	34,561 (1%)	34,665 (0%)	4,270	4,168 (-2%)	4,102 (-2%)	-5,487	-5,477 (0%)	-5,470 (0%)	4,360	4,438 (2%)	4,461 (1%)	39,962	40,732 (2%)	40,913 (0%)	74.5	74.6 (0.0)	74.9 (0.3)
December	Above Normal	1,758	1,814 (3%)	1,892 (4%)	2,205	2,179 (-1%)	2,179 (0%)	20,821	20,378 (-2%)	20,418 (0%)	4,417	4,158 (-6%)	4,250 (2%)	-6,854	-6,135 (10%)	-6,313 (-3%)	-1,722	-900 (48%)	-1,081 (-20%)	16,262	16,624 (2%)	16,482 (-1%)	78.1	78.2 (0.0)	78.7 (0.5)
December	Below Normal	1,941	2,014 (4%)	2,069 (3%)	1,483	1,485 (0%)	1,490 (0%)	16,165	16,150 (0%)	15,916 (-1%)	3,553	3,520 (-1%)	3,480 (-1%)	-5,142	-5,073 (1%)	-4,901 (3%)	-798	-724 (9%)	-567 (22%)	13,080	13,115 (0%)	13,070 (0%)	74.8	74.8 (0.0)	74.8 (0.0)
December	Dry	1,750	1,839 (5%)	1,915 (4%)	1,464	1,412 (-3%)	1,470 (4%)	16,405	16,354 (0%)	16,394 (0%)	3,242	3,041 (-6%)	2,983 (-2%)	-5,018	-4,649 (7%)	-4,663 (0%)	-975	-539 (45%)	-514 (5%)	12,590	12,949 (3%)	12,975 (0%)	79.8	79.8 (-0.1)	79.8 (0.0)
December	Critically Dry	1,369	1,373 (0%)	1,430 (4%)	1,159	1,146 (-1%)	1,147 (0%)	11,839	11,816 (0%)	11,852 (0%)	2,591	2,426 (-6%)	2,445 (1%)	-4,053	-3,802 (6%)	-3,839 (-1%)	-608	-317 (48%)	-351 (-11%)	8,252	8,502 (3%)	8,498 (0%)	87.4	87.3 (-0.1)	87.4 (0.0)
January	Wet	2,562	2,578 (1%)	2,600 (1%)	9,419	9,651 (2%)	9,944 (3%)	52,280	52,377 (0%)	52,408 (0%)	4,770	4,784 (0%)	4,796 (0%)	-2,752	-2,737 (1%)	-2,675 (2%)	15,820	15,853 (0%)	15,924 (0%)	89,342	89,665 (0%)	89,997 (0%)	56.5	56.5 (0.0)	56.5 (0.0)
January	Above Normal	2,086	2,141 (3%)	2,219 (4%)	3,712	3,712 (0%)	3,712 (0%)	41,092	41,484 (1%)	41,211 (-1%)	2,781	2,788 (0%)	2,790 (0%)	-4,010	-4,010 (0%)	-4,010 (0%)	6,379	6,440 (1%)	6,404 (-1%)	51,953	52,400 (1%)	52,096 (-1%)	61.8	61.7 (-0.1)	61.6 (-0.1)
January	Below Normal	2,047	2,117 (3%)	2,168 (2%)	1,922	1,958 (2%)	2,022 (3%)	22,756	22,783 (0%)	22,880 (0%)	2,757	2,828 (3%)	2,770 (-2%)	-3,992	-4,003 (0%)	-3,983 (0%)	1,972	1,966 (0%)	2,001 (2%)	22,178	22,198 (0%)	22,326 (1%)	71.8	71.8 (0.0)	71.7 (0.0)
January	Dry	1,776	1,864 (5%)	1,940 (4%)	1,414	1,403 (-1%)	1,413 (1%)	15,753	15,792 (0%)	15,833 (0%)	2,587	2,611 (1%)	2,590 (-1%)	-4,091	-4,097 (0%)	-4,046 (1%)	-308	-340 (-10%)	-278 (18%)	13,507	13,538 (0%)	13,642 (1%)	78.0	77.8 (-0.2)	77.7 (-0.1)
January	Critically Dry	1,356	1,359 (0%)	1,416 (4%)	1,216	1,226 (1%)	1,231 (0%)	12,972	13,014 (0%)	13,056 (0%)	2,052	2,144 (5%)	2,158 (1%)	-3,159	-3,233 (-2%)	-3,304 (-2%)	-30	-105 (-248%)	-177 (-68%)	11,076	11,040 (0%)	11,003 (0%)	82.0	81.8 (-0.2)	81.9 (0.1)
February	Wet	2,751	2,759 (0%)	2,768 (0%)	12,759	12,922 (1%)	13,155 (2%)	60,704	60,766 (0%)	60,811 (0%)	5,993	6,056 (1%)	6,046 (0%)	-2,463	-2,456 (0%)	-2,460 (0%)	19,022	19,041 (0%)	19,043 (0%)	105,756	105,963 (0%)	106,188 (0%)	53.2	53.1 (0.0)	53.1 (0.0)
February	Above Normal	2,396	2,432 (1%)	2,487 (2%)	3,117	3,451 (11%)	3,816 (13%)	43,198	43,398 (0%)	43,496 (0%)	3,527	3,776 (7%)	3,744 (-1%)	-3,946	-3,946 (0%)	-3,946 (0%)	8,946	8,981 (0%)	8,996 (0%)	54,372	54,861 (1%)	55,207 (1%)	57.0	56.9 (0.0)	56.8 (-0.1)
February	Below Normal	2,267	2,314 (2%)	2,354 (2%)	2,697	3,107 (15%)	3,339 (7%)	30,260	30,459 (1%)	30,611 (0%)	3,026	3,052 (1%)	3,021 (-1%)	-3,852	-3,868 (0%)	-3,868 (0%)	5,800	5,812 (0%)	5,833 (0%)	35,447	35,850 (1%)	36,182 (1%)	63.3	63.1 (-0.2)	63.0 (-0.1)
February	Dry	1,963	2,047 (4%)	2,121 (4%)	1,763	1,882 (7%)	1,917 (2%)	22,731	22,840 (0%)	22,893 (0%)	2,244	2,247 (0%)	2,248 (0%)	-3,862	-3,868 (0%)	-3,868 (0%)	2,274	2,284 (0%)	2,292 (0%)	22,774	22,894 (1%)	22,959 (0%)	69.6	69.3 (-0.3)	69.3 (0.0)
February	Critically Dry	1,463	1,466 (0%)	1,522 (4%)	1,136	1,136 (0%)	1,155 (2%)	15,599	15,603 (0%)	15,859 (2%)	2,221	2,234 (1%)	2,205 (-1%)	-3,777	-3,787 (0%)	-3,966 (-5%)	831	829 (0%)	675 (-19%)	14,008	14,009 (0%)	14,080 (1%)	76.4	76.5 (0.1)	76.3 (-0.2)
March	Wet	2,828	2,828 (0%)	2,828 (0%)	15,506	15,636 (1%)	15,787 (1%)	56,174	56,202 (0%)	56,271 (0%)	5,578	5,702 (2%)	5,764 (1%)	-1,674	-1,654 (1%)	-1,721 (-4%)	18,519	18,548 (0%)	18,486 (0%)	93,064	93,233 (0%)	93,315 (0%)	53.6	53.6 (0.0)	53.5 (0.0)
March	Above Normal	2,826	2,826 (0%)	2,832 (0%)	5,732	6,316 (10%)	7,142 (13%)	44,296	44,673 (1%)	45,165 (1%)	2,966	3,039 (2%)	3,036 (0%)	-3,031	-3,030 (0%)	-3,030 (0%)	9,316	9,374 (1%)	9,444 (1%)	54,604	55,148 (1%)	55,952 (1%)	56.5	56.4 (-0.1)	56.3 (-0.2)
March	Below Normal	2,544	2,589 (2%)	2,619 (1%)	4,018	4,044 (1%)	4,212 (4%)	29,512	29,560 (0%)	29,713 (1%)	2,419	2,404 (-1%)	2,424 (1%)	-3,026	-3,026 (0%)	-3,026 (0%)	6,248	6,256 (0%)	6,277 (0%)	32,251	32,307 (0%)	32,483 (1%)	60.9	60.9 (0.0)	60.8 (-0.1)
March	Dry	2,285	2,368 (4%)	2,442 (3%)	1,473	1,473 (0%)	1,477 (0%)	20,883	20,915 (0%)	20,920 (0%)	1,784	1,805 (1%)	1,823 (1%)	-3,417	-3,417 (0%)	-3,417 (0%)	2,362	2,369 (0%)	2,369 (0%)	20,047	20,082 (0%)	20,085 (0%)	67.4	67.4 (0.0)	67.4 (0.0)
March	Critically Dry	1,631	1,634 (0%)	1,687 (3%)	1,194	1,192 (0%)	1,192 (0%)	13,235	13,214 (0%)	13,235 (0%)	1,539	1,541 (0%)	1,545 (0%)	-2,772	-2,769 (0%)	-2,775 (0%)	1,273	1,283 (1%)	1,280 (0%)	11,627	11,618 (0%)	11,633 (0%)	76.0	76.0 (0.1)	75.9 (-0.1)
April	Wet	3,209	3,209 (0%)	3,209 (0%)	9,863	9,864 (0%)	9,865 (0%)	43,115	43,130 (0%)	43,144 (0%)	4,246	4,238 (0%)	4,232 (0%)	-1,086	-1,072 (1%)	-1,065 (1%)	15,557	15,576 (0%)	15,585 (0%)	58,305	58,373 (0%)	58,346 (0%)	56.4	56.4 (0.0)	56.4 (0.0)
April	Above Normal	3,189	3,189 (0%)	3,189 (0%)	3,339	3,338 (0%)	3,432 (3%)	24,926	24,997 (0%)	25,141 (1%)	1,337	1,339 (0%)	1,339 (0%)	-1,229	-1,230 (0%)	-1,230 (0%)	7,810	7,824 (0%)	7,844 (0%)	28,644	28,723 (0%)	28,871 (1%)	60.5	60.5 (0.0)	60.4 (-0.1)
April	Below Normal	2,894	2,940 (2%)	2,965 (1%)	1,412	1,403 (-1%)	1,478 (5%)	17,648	17,654 (0%)	17,727 (0%)	1,290	1,317 (2%)	1,321 (0%)	135	112 (-17%)	108 (-3%)	7,669	7,647 (0%)	7,653 (0%)	22,235	22,218 (0%)	22,288 (0%)	64.4	64.4 (0.0)	64.3 (-0.1)
April	Dry	2,490	2,573 (3%)	2,647 (3%)	1,457	1,460 (0%)	1,445 (-1%)	12,532	12,617 (1%)	12,599 (0%)	684	683 (0%)	683 (0%)	-640	-639 (0%)	-639 (0%)	4,051	4,066 (0%)	4,064 (0%)	13,937	14,024 (1%)	14,006 (0%)	71.2	71.2 (0.0)	71.2 (0.0)
April	Critically Dry	1,682	1,686 (0%)	1,738 (3%)	1,607	1,603 (0%)	1,602 (0%)	9,616	9,611 (0%)	9,595 (0%)	742	740 (0%)	732 (-1%)	-939	-937 (0%)	-929 (1%)	2,561	2,563 (0%)	2,570 (0%)	9,486	9,486 (0%)	9,480 (0%)	78.8	78.8 (0.0)	78.8 (0.0)
May	Wet	3,415	3,415 (0%)	3,415 (0%)	8,503	8,503 (0%)																			

Month	Water Year Type	Oroville Storage (taf)			Feather River High Flow Channel (cfs)			Sacramento River at Freeport Flow (cfs)			Banks SWP Export (cfs)			Old and Middle River Flow (cfs)			QWEST Flow (cfs)			Delta Outflow (cfs)			X2 (km)		
		Fall X2	SWP Fall X2	No Fall X2	Fall X2	SWP Fall X2	No Fall X2	Fall X2	SWP Fall X2	No Fall X2	Fall X2	SWP Fall X2	No Fall X2	Fall X2	SWP Fall X2	No Fall X2	Fall X2	SWP Fall X2	No Fall X2	Fall X2	SWP Fall X2	No Fall X2	Fall X2	SWP Fall X2	No Fall X2
May	Critically Dry	1,618	1,619 (0%)	1,667 (3%)	996	997 (0%)	1,007 (1%)	8,128	8,142 (0%)	8,151 (0%)	894	906 (1%)	920 (2%)	-1,471	-1,483 (-1%)	-1,496 (-1%)	1,668	1,661 (0%)	1,649 (-1%)	6,552	6,558 (0%)	6,551 (0%)	82.9	83.1 (0.2)	83.0 (-0.1)
June	Wet	3,398	3,398 (0%)	3,398 (0%)	6,684	6,684 (0%)	6,684 (0%)	27,082	27,086 (0%)	27,086 (0%)	3,878	3,879 (0%)	3,879 (0%)	-3,430	-3,429 (0%)	-3,429 (0%)	8,575	8,579 (0%)	8,580 (0%)	27,638	27,646 (0%)	27,645 (0%)	64.3	64.3 (0.0)	64.3 (0.0)
June	Above Normal	3,304	3,303 (0%)	3,303 (0%)	5,323	5,334 (0%)	5,349 (0%)	19,221	19,237 (0%)	19,244 (0%)	2,225	2,217 (0%)	2,226 (0%)	-4,119	-4,119 (0%)	-4,119 (0%)	3,827	3,834 (0%)	3,837 (0%)	15,403	15,420 (0%)	15,426 (0%)	70.4	70.4 (0.0)	70.4 (0.0)
June	Below Normal	2,919	2,964 (2%)	2,986 (1%)	3,982	3,970 (0%)	4,012 (1%)	13,559	13,544 (0%)	13,575 (0%)	2,045	2,036 (0%)	2,053 (1%)	-4,306	-4,306 (0%)	-4,306 (0%)	2,132	2,130 (0%)	2,139 (0%)	8,811	8,799 (0%)	8,828 (0%)	77.0	76.9 (0.0)	76.9 (0.0)
June	Dry	2,187	2,267 (4%)	2,340 (3%)	4,966	4,995 (1%)	5,003 (0%)	13,007	13,023 (0%)	13,026 (0%)	1,706	1,714 (0%)	1,729 (1%)	-4,384	-4,381 (0%)	-4,399 (0%)	1,077	1,087 (1%)	1,069 (-2%)	7,038	7,061 (0%)	7,044 (0%)	80.9	80.9 (0.0)	80.9 (0.0)
June	Critically Dry	1,389	1,393 (0%)	1,448 (4%)	3,408	3,385 (-1%)	3,382 (0%)	9,589	9,597 (0%)	9,543 (-1%)	700	669 (-4%)	656 (-2%)	-2,536	-2,547 (0%)	-2,498 (2%)	1,844	1,836 (0%)	1,873 (2%)	5,000	4,999 (0%)	4,999 (0%)	86.7	86.7 (0.0)	86.7 (0.0)
July	Wet	3,058	3,059 (0%)	3,059 (0%)	6,005	6,000 (0%)	6,001 (0%)	20,058	20,060 (0%)	20,055 (0%)	7,080	7,080 (0%)	7,080 (0%)	-9,420	-9,416 (0%)	-9,419 (0%)	1,009	1,016 (1%)	1,011 (0%)	11,545	11,553 (0%)	11,545 (0%)	73.0	73.0 (0.0)	73.0 (0.0)
July	Above Normal	2,720	2,724 (0%)	2,720 (0%)	8,651	8,574 (-1%)	8,642 (1%)	21,289	21,149 (-1%)	21,218 (0%)	7,116	7,060 (-1%)	7,100 (1%)	-10,313	-10,272 (0%)	-10,308 (0%)	-1,784	-1,782 (0%)	-1,797 (-1%)	9,297	9,208 (-1%)	9,239 (0%)	76.8	76.9 (0.1)	76.9 (0.0)
July	Below Normal	2,310	2,345 (2%)	2,367 (1%)	8,559	8,714 (2%)	8,721 (0%)	20,776	21,064 (1%)	21,042 (0%)	6,468	6,597 (2%)	6,622 (0%)	-10,726	-10,880 (-1%)	-10,885 (0%)	-2,838	-2,907 (-2%)	-2,919 (0%)	7,660	7,783 (2%)	7,760 (0%)	81.6	81.5 (-0.1)	81.5 (0.0)
July	Dry	1,671	1,713 (3%)	1,764 (3%)	6,808	7,376 (8%)	7,628 (3%)	16,671	17,163 (3%)	17,402 (1%)	4,189	4,742 (13%)	5,006 (6%)	-8,853	-9,285 (-5%)	-9,507 (-2%)	-2,590	-2,893 (-12%)	-3,056 (-6%)	5,016	5,041 (1%)	5,039 (0%)	85.3	85.2 (-0.1)	85.2 (0.0)
July	Critically Dry	1,070	1,074 (0%)	1,108 (3%)	3,550	3,513 (-1%)	3,849 (10%)	10,174	10,310 (1%)	10,488 (2%)	488	562 (15%)	768 (37%)	-3,258	-3,384 (-4%)	-3,553 (-5%)	1,151	1,062 (-8%)	938 (-12%)	4,004	4,004 (0%)	4,005 (0%)	89.7	89.7 (0.0)	89.7 (0.0)
August	Wet	2,810	2,827 (1%)	2,844 (1%)	4,262	4,000 (-6%)	3,719 (-7%)	17,743	17,240 (-3%)	16,978 (-2%)	7,149	7,149 (0%)	7,149 (0%)	-10,286	-10,336 (0%)	-10,366 (0%)	-1,809	-2,025 (-12%)	-2,142 (-6%)	6,885	6,329 (-8%)	6,035 (-5%)	80.1	80.6 (0.5)	80.8 (0.2)
August	Above Normal	2,247	2,272 (1%)	2,291 (1%)	7,495	7,139 (-5%)	6,780 (-5%)	18,111	17,120 (-5%)	17,090 (0%)	6,858	6,855 (0%)	6,857 (0%)	-10,582	-10,791 (-2%)	-11,132 (-3%)	-3,143	-3,691 (-17%)	-4,068 (-10%)	5,615	4,392 (-22%)	4,000 (-9%)	82.7	83.8 (1.1)	84.1 (0.3)
August	Below Normal	1,885	1,904 (1%)	1,916 (1%)	6,445	6,699 (4%)	6,862 (2%)	16,754	16,908 (1%)	17,037 (1%)	5,461	5,718 (5%)	5,888 (3%)	-10,186	-10,354 (-2%)	-10,459 (-1%)	-3,455	-3,584 (-4%)	-3,655 (-2%)	4,254	4,229 (-1%)	4,243 (0%)	85.4	85.3 (-0.1)	85.3 (0.0)
August	Dry	1,484	1,505 (1%)	1,547 (3%)	2,513	2,873 (14%)	3,041 (6%)	10,964	11,433 (4%)	11,605 (2%)	825	1,166 (41%)	1,313 (13%)	-5,035	-5,413 (-8%)	-5,563 (-3%)	-189	-448 (-138%)	-555 (-24%)	3,616	3,672 (2%)	3,682 (0%)	88.6	88.5 (-0.1)	88.5 (0.0)
August	Critically Dry	883	886 (0%)	919 (4%)	2,363	2,405 (2%)	2,412 (0%)	7,644	7,758 (1%)	7,721 (0%)	300	301 (0%)	346 (15%)	-2,414	-2,435 (-1%)	-2,495 (-2%)	1,325	1,340 (1%)	1,262 (-6%)	3,034	3,031 (0%)	3,026 (0%)	91.9	91.9 (0.0)	91.9 (0.0)
September	Wet	2,596	2,686 (3%)	2,782 (4%)	4,862	3,633 (-25%)	2,313 (-36%)	20,322	18,652 (-8%)	17,802 (-5%)	6,054	6,257 (3%)	6,517 (4%)	-9,357	-9,702 (-4%)	-10,307 (-6%)	30	-886 (-3070%)	-1,818 (-105%)	10,985	8,943 (-19%)	7,421 (-17%)	78.4	80.8 (2.4)	82.5 (1.7)
September	Above Normal	1,977	2,081 (5%)	2,236 (7%)	5,678	4,348 (-23%)	2,052 (-53%)	19,287	16,680 (-14%)	14,976 (-10%)	4,131	4,410 (7%)	5,127 (16%)	-7,331	-8,580 (-17%)	-9,830 (-15%)	1,216	-979 (-181%)	-2,887 (-195%)	11,150	7,195 (-35%)	4,136 (-43%)	79.9	84.5 (4.6)	87.6 (3.1)
September	Below Normal	1,840	1,854 (1%)	1,862 (0%)	1,592	1,643 (3%)	1,709 (4%)	12,753	12,935 (1%)	13,102 (1%)	3,047	3,089 (1%)	3,170 (3%)	-7,888	-8,007 (-1%)	-8,125 (-1%)	-1,838	-1,906 (-4%)	-1,979 (-4%)	3,724	3,780 (1%)	3,818 (1%)	88.8	88.7 (-0.1)	88.7 (0.0)
September	Dry	1,474	1,495 (1%)	1,534 (3%)	949	948 (0%)	1,021 (8%)	10,088	10,141 (1%)	10,239 (1%)	1,276	1,289 (1%)	1,345 (4%)	-5,301	-5,345 (-1%)	-5,396 (-1%)	-406	-434 (-7%)	-459 (-6%)	3,431	3,440 (0%)	3,484 (1%)	91.0	90.9 (-0.1)	90.8 (0.0)
September	Critically Dry	849	849 (0%)	886 (4%)	1,151	1,205 (5%)	1,142 (-5%)	7,991	8,056 (1%)	8,024 (0%)	555	561 (1%)	558 (0%)	-3,376	-3,439 (-2%)	-3,410 (1%)	500	447 (-11%)	473 (6%)	3,002	3,002 (0%)	3,002 (0%)	92.9	92.9 (0.0)	92.9 (0.0)

Notes: Values in parentheses represent the difference of the SWP Fall X2 scenario from the Fall X2 scenario and the difference of the No Fall X2 scenario from the SWP Fall X2 scenario, with percentages for storage and flow variables and absolute values for X2. Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except only includes SWP operating to Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2. *X2 is averaged based on calendar year, assuming the water year commencing in October applies to the subsequent January–December calendar year.



Note: Lines represent difference in total January–June Delta outflow (blue broken line = SWP Fall X2 scenario minus Fall X2 scenario; red dotted line = No Fall X2 scenario minus SWP Fall X2 scenario). Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-3. Difference in January–June Delta Outflow from CalSim 3 Modeling.

2.2.2.2 Delta Smelt

Current Delta Smelt Spatial Distribution and Population Status

Since hatchery releases of Delta Smelt began in late fall of 2021, Delta Smelt detections, recapture rates, survival rates, and abundance estimates have remained low despite increasing adult releases in recent years (Table 2-2). These outcomes are inconsistent with USFWS life cycle modeling results that suggested positive population growth should have been evident after two to five years of Delta Smelt releases based on stocking densities (U.S. Fish and Wildlife Service 2026). Contrasting the weekly Enhanced Delta Smelt Monitoring Program (EDSM) abundance estimates from adult detections with Delta Smelt Life Cycle Model results demonstrates that adult survival of hatchery-

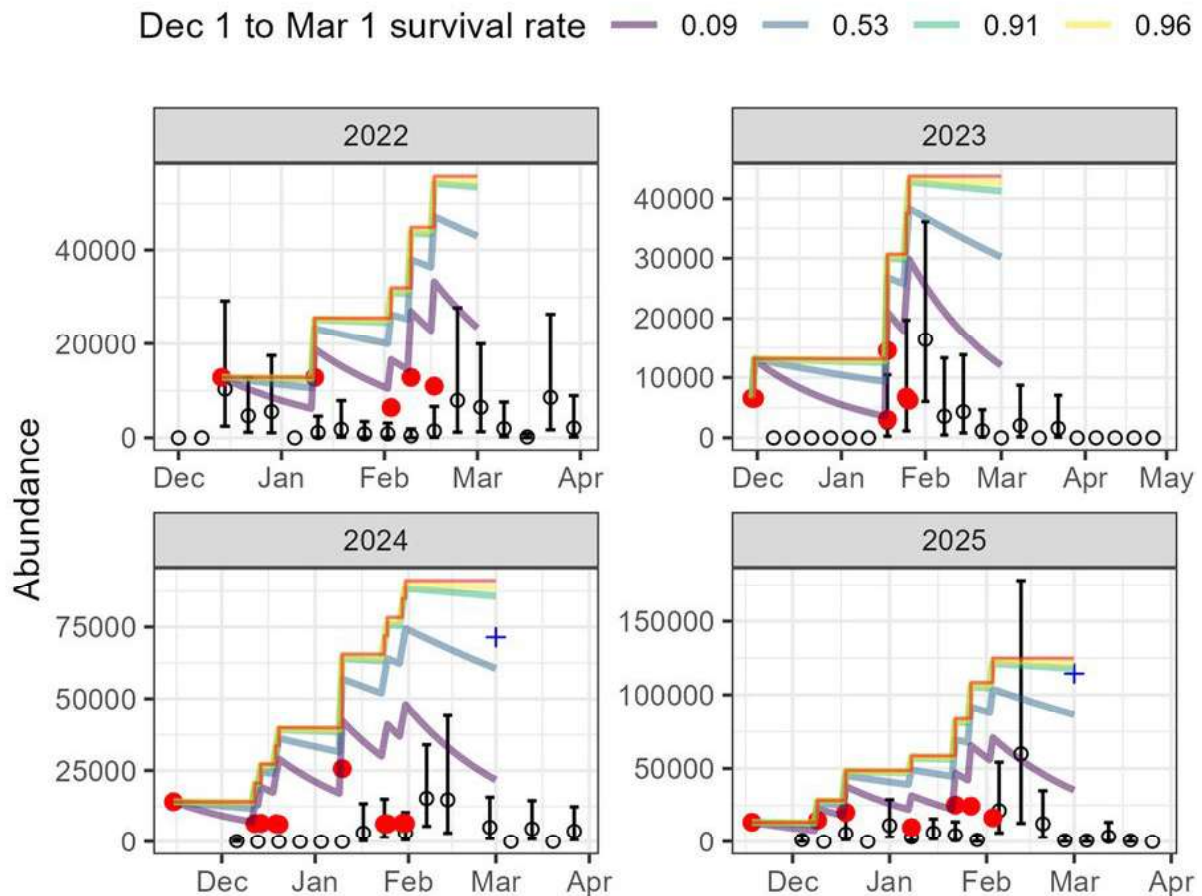
released smelt from December 1 to March 1, 2022–2025, has been exceptionally low (<9 percent; Figure 2-4), compared to previous historical adult survival rates based on wild fish from 1995–2015 (>90 percent; Smith et al. 2021). Larval detections have similarly been low to zero, with many putative Delta Smelt larvae later genetically confirmed as the Wakasagi smelt congener (Mussman et al. 2026), although monitoring has not always been comprehensive. With low survival of hatchery-released adults (which comprise all or the majority of the population) and limited evidence of larvae, winter and spring salvage of Delta Smelt at SWP and CVP facilities has remained low to zero since releases began six years ago. Contemporary adult salvage rates, as calculated by dividing annual adult salvage by winter adult abundance (either estimated from Spring Kodiak Trawl data [Polansky et al. 2019] or by the total number released), are in line with adult salvage rates after the initiation of Old and Middle River (OMR) management under the 2008 BiOp (2009–2017 [avg 0.0005] vs 2022–2026 [avg 0.0004]; Figure 2-5), indicating that SWP’s proportional take of Delta Smelt has not increased. In recent years, EDSM has detected juvenile Delta Smelt in the summer and fall period, but abundance remains well below the detection limits of long-term surveys including the Summer Towntnet Survey and Fall Midwater Trawl Survey that have monitored the species since 1959 and 1967, respectively. EDSM’s estimated Delta Smelt abundance during summer and fall has remained low in contrast to pre-supplementation estimates (Figure 2-6).

Together with low adult survival, larval presence, and low abundance through summer and fall (Table 2-2), evidence that Delta Smelt are completing their life cycle in the wild remains low and the population relies on annual supplementation to prevent extinction. Survival of adult Delta Smelt remains a critical problem consistent across a variety of conditions, and supplementation releases are arguably the highest-priority action required for the species. In an effort to address this, DWR proposes to establish and implement the DSSEEP with the goal of investigating mechanisms of mortality, identified in coordination and collaboration with the CASS, and testing implementation strategies to improve survival (see description in Section 1.2.2.2, “Condition 9.1.4, Delta Smelt Supplementation Program”).

Table 2-2. Summary of Hatchery Delta Smelt Releases and Detections (individual fish caught), Salvage Estimates (expanded), and Percent Survival Calculated from EDSM Abundance Estimates and the Delta Smelt Life Cycle Model.

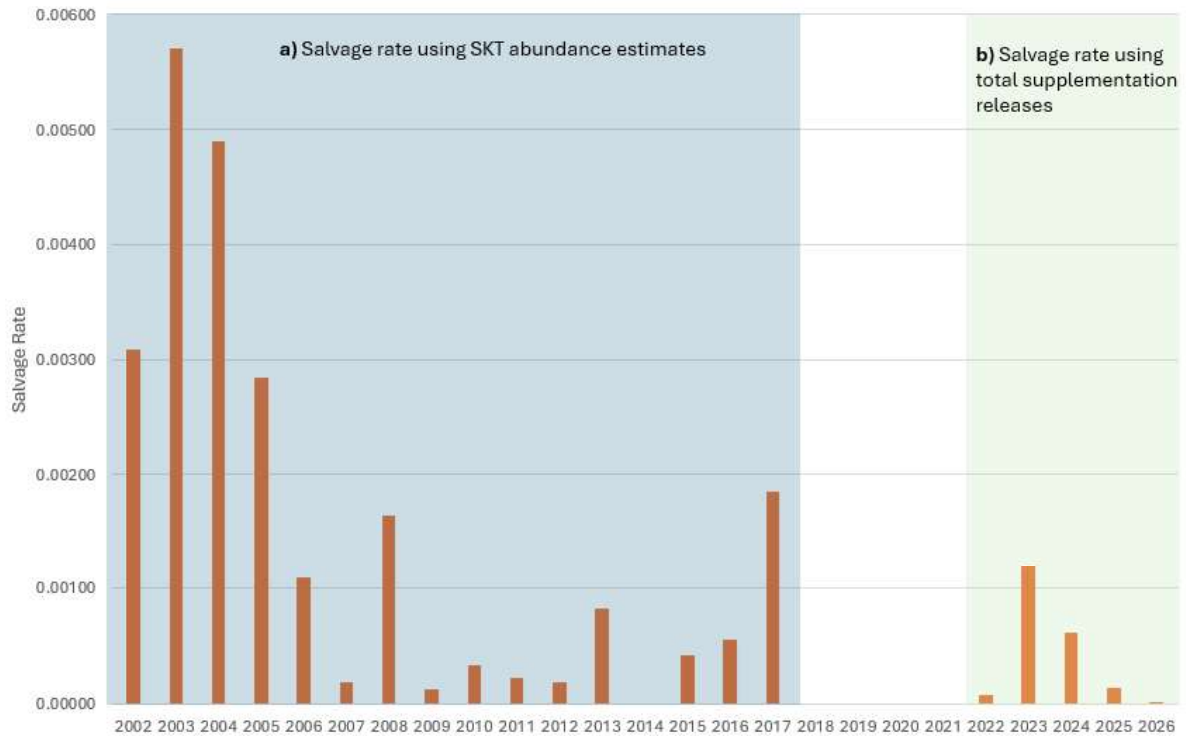
Water Year	Number of Adults Released	Adult Detections	SWP Salvage (Adult)	CVP Salvage (Adult)	Recapture Rate (Adult)	Percent Survival (Adult)	Summer-Fall Detections (Juvenile)
2022	55,733	77	0	4	0.14	<9	8
2023	43,705	43	16	36	0.10	<9	9
2024	91,464	49	0	56	0.05	<9	1
2025	124,946	80	0	17	0.06	<9	7
2026	163,349	74*	0	1	0.05*	<9*	-

* Adults are classified by age (>200 dph) and not size. Released fish in 2026 were not distinguished with an adipose-fin clip or tag, the recapture rate is estimated and may reflect some individuals not directly released. Summer-fall detections reflect unmarked wild-origin detections >20 mm between June 1 and October 31 before the next WY releases occurred.



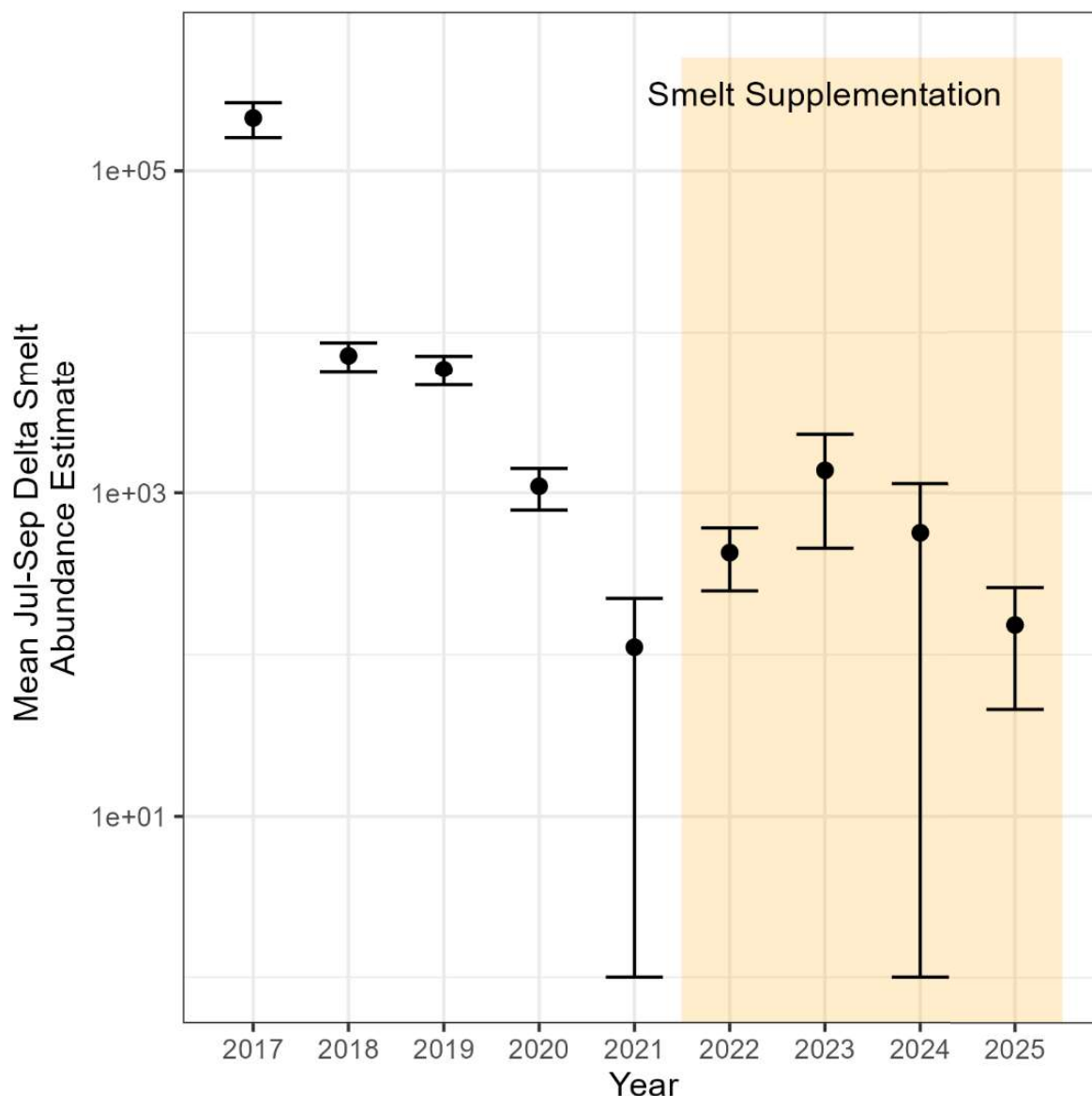
Source: Polansky pers. comm. Note: Plots show natural (untransformed) vertical axis scale. Survival assumptions for November 1–March 1 were 0.09 (purple solid line), 0.53 (blue line), and 0.96 (yellow line). Analyses based on methods from Polansky et al. 2021, 2024.

Figure 2-4. Delta Smelt Abundance Indices and 95% Confidence Intervals from Enhanced Delta Smelt Monitoring Weekly Surveys (Clear Circles and Error Bars), November 1–March 1 Water Years 2022 to 2026, Compared to Delta Smelt Life Cycle Model (LCM) Results Assuming Three Levels of Survival (Solid Lines), With Number of Delta Smelt Released by Date (Red Dots) and Cumulatively (Red [2022–2025] or Broken [2026] Line). If the LCM correctly estimates survival, the abundance estimates should track the colored line associated with the correct level of survival. Because the points generally fall below the 0.09 survival line, it indicates survival is less than 9%.



Note: Data for 2002–2017 (blue shade) use population abundance estimates based on Spring Kodiak Trawl (Polansky et al. 2019), and data for 2022–2026 use total release numbers as part of the supplementation program (Table 2-2).

Figure 2-5. Annual Delta Smelt Salvage Rates (Number Salvaged Divided by Population Abundance) at the SWP and CVP by Water Year.



Source: California Department of Water Resources and U.S. Bureau of Reclamation 2026. Note: Estimates were calculated on a weekly basis by EDSM (courtesy of Lara Mitchel, USFWS), and summarized by calculating the average ($\pm$ SE) over the summer-fall season.

Figure 2-6. Mean Delta Smelt Abundance Estimate for Summer and Fall (July 1 to September 30), 2017–2025.

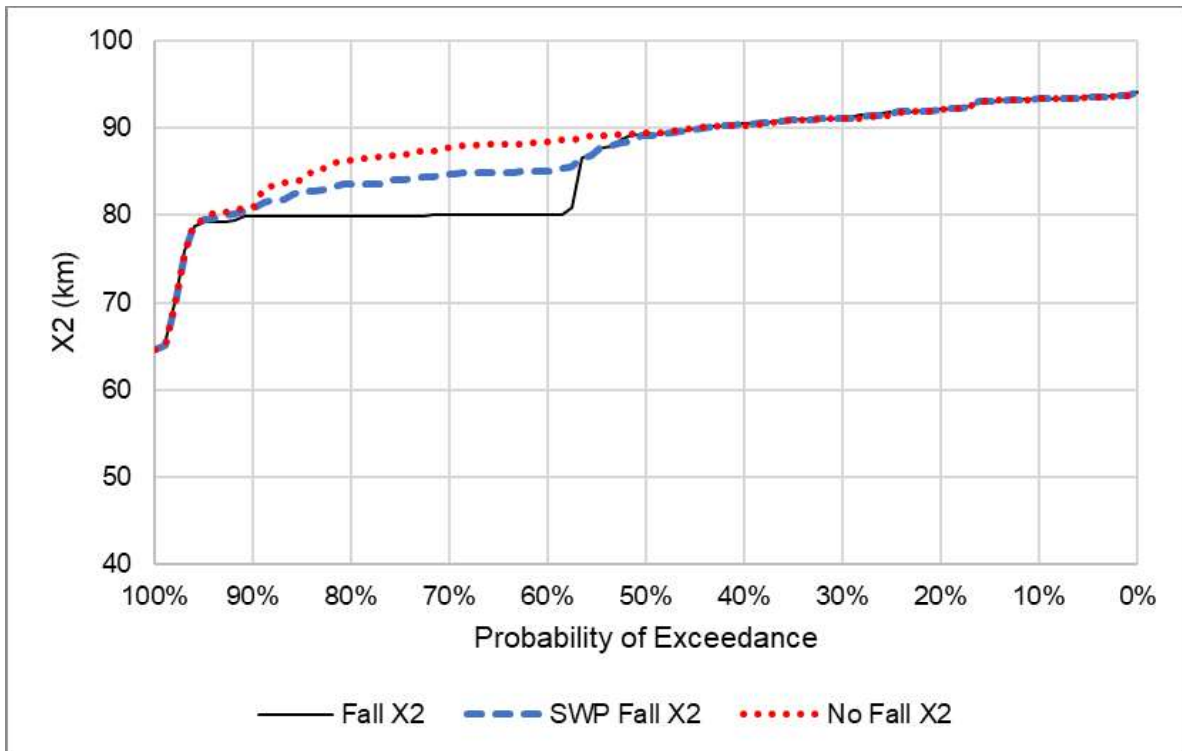
State Water Project and Central Valley Project Entrainment

Delta Smelt are not likely to be entrained at the south Delta export facilities during the fall based on historical data (Grimaldo et al. 2009). Additionally, entrainment risk is further reduced by supplementation program releases occurring in areas of the Delta that generally have zero to low risk of entrainment, such as Suisun Marsh or near Rio Vista, as demonstrated by previous release years (Table 2-2, Figure 2-5). Though there are limited detections, offspring from the previous year's releases remain rare in the fall and detections have been generally near the areas of release

(Suisun Marsh and Bay, Sacramento Deep Water Ship Channel). Furthermore, the potential for subsequent increased winter spill may contribute to further reductions in entrainment risk, though this effect will likely be minor. Therefore, any differences in south Delta exports because of the proposed major amendment would not result in increased take by entrainment. Entrainment risk during the winter–spring period of entrainment vulnerability would continue to be minimized by meeting the requirements of various COAs included in the 2024 ITP (in particular COA 8.1, *Real-Time Operations, Monitoring, and Technical Teams*; COA 8.3, *Onset of OMR Management*; COA 8.4, *Additional Real-time OMR Management*; COA 8.5, *Storm Flex*; and COA 8.6, *End of OMR Management*).

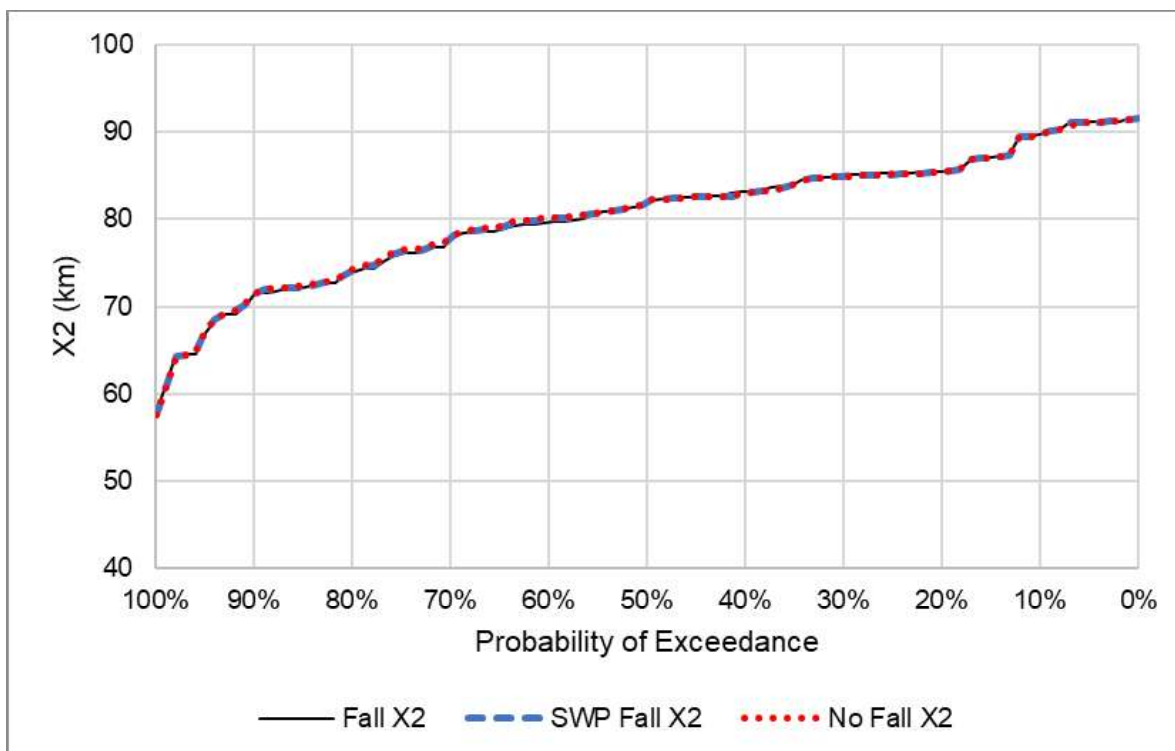
Habitat Effects

The percentage of time that summer and fall habitat is suitable for Delta Smelt is generally inversely related to X2 in Grizzly Bay, Suisun Bay, and Suisun Marsh (Feyrer et al. 2007; Nobriga et al. 2008; Sommer and Mejia 2013; Delta Coordination Group Science and Monitoring Work Group 2026:Figure 8). This primarily reflects the increase in low salinity (<6 psu) habitat with increasing Delta outflow. Off-ramping of the Fall X2 action would result in higher fall X2 than retaining the SWP proportional share of the Fall X2 action (Figure 2-7) and therefore would tend to decrease the percentage of time that habitat is suitable for Delta Smelt in fall. Overall operations would not greatly differ in summer in terms of X2 (Figure 2-8). SMSCG operations would continue to occur under COA 9.1.3 to maintain suitable habitat within Suisun Marsh in Above Normal, Below Normal, and Dry water years, as occurred in 2018, 2023, and 2024 (Sommer et al. 2020; Delta Coordination Group Science and Monitoring Work Group 2026:Figure 13). Although there is the potential for negative effects on habitat as a result of off-ramping of Fall X2, biotic responses from Delta Smelt would be anticipated to be minimal given observed and modeled effects on growth, health, and survival (discussed below in “Growth and Health Effects” and “Survival Effects”).



Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-7. Mean September–October X2 from CalSim 3 Modeling.



Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-8. Mean June–August X2 from CalSim 3 Modeling.

Delta Smelt generally do not spatially overlap areas with the most severe cyanobacteria harmful algal blooms (cHABs) in the Delta, which occur most often in the south Delta and San Joaquin River areas, not the north Delta or Suisun Bay and Marsh where Delta Smelt are most commonly found (Bouma-Gregson et al. 2024). However, studies have found that cHABs may negatively affect the Delta Smelt zooplankton prey *Pseudodiaptomus forbesi* (Ger et al. 2018). Residence time is positively related to cHAB abundance, but recent analysis indicates that the low-salinity zone is not a useful proxy for residence time in the area of the Delta that experiences the most severe cHABs (the south Delta and San Joaquin River regions) and that climatic conditions (temperature and water year type) have the greatest influence on *Microcystis* abundance (Preece and Hartman 2024). Therefore, the proposed major amendment would likely have minimal effect on cHABs.

Food Effects

Pseudodiaptomus Abundance

It is well established that increased summer outflow increases biomass of important Delta Smelt food taxa in the low-salinity zone, particularly the calanoid copepod *P. forbesi*, but also that this subsidy decreases in the fall (September–October) when compared to summer (June–July). Lee et al. (2023) found support for higher abundance of *P. forbesi* in Suisun Bay and Suisun Marsh during years of higher September–November Delta outflow (2017 and 2019) relative to years with lower Delta outflow (2018 and 2020), and a similar trend has been observed in subsequent years. Kimmerer et al. (2018a) also found increased abundance in downstream regions with higher flows.

These empirical observations of greater *P. forbesi* density with greater Delta outflow are supported by several modeling analyses (Kimmerer et al. 2018b; Hassrick et al. 2023), although it may be difficult to detect increased *P. forbesi* density in the low-salinity zone due to the volume of Delta outflow required (Hassrick et al. 2023).

However, none of these analyses conclusively linked increased abundance of *P. forbesi* and Delta Smelt growth in the years of higher outflow. While *P. forbesi* is one of the most important components of Delta Smelt diet in the summer, other taxa, such as *Limnoithona* spp., *Acartiella* spp., and *Tortanus* spp., also provide an important source of food in the low-salinity zone, particularly in fall after *P. forbesi* has peaked, and these taxa frequently increase with lower outflow (Slater et al. 2019). Other analyses have found largely nonlinear relationships between outflow and calanoid copepod biomass in the Delta and Suisun Marsh/Bay, with potential for negative effects of greater September/October outflow on Delta Smelt prey at several locations (Hamilton et al. 2020). Consistent with prior studies, the DCG SMWG found a variety of relationships between Delta Smelt prey and Delta outflow during June–October, 1995–2024 (Delta Coordination Group Science and Monitoring Work Group 2026:Figure 18).

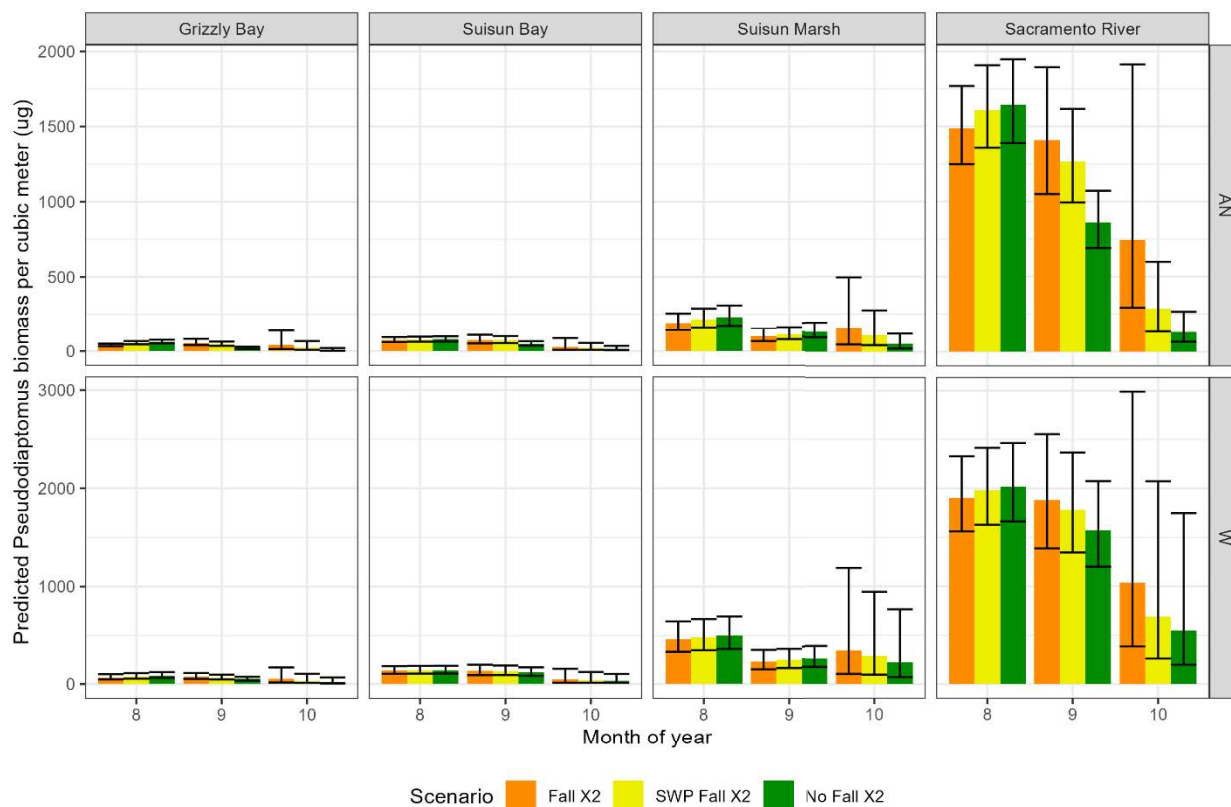
Pseudodiaptomus spp. is by far the most abundant taxon with a positive flow-abundance relationship and so was explored further by the DCG SMWG (2026:Figure 18). This showed that the negative correlations between X2 and *Pseudodiaptomus* spp. generally are stronger in summer (June–August) than fall (September–October) and in Grizzly Bay, Suisun Bay, and Suisun Marsh than in the Sacramento River (Delta Coordination Group Science and Monitoring Work Group 2026:Figure 20).

To quantify potential differences in *Pseudodiaptomus* abundance in Suisun Marsh, Suisun Bay, Grizzly Bay, and the lower Sacramento River due to the Fall X2 action, this effects analysis used a set of generalized additive models included in the DCG’s Summer-Fall synthesis report that described the relationship between Delta outflow and *Pseudodiaptomus* biomass per unit volume. A full description of the models can be found in DCG SMWG (2026). In brief, the ‘gam’ function in the ‘mgcv’ package in R (Pedersen et al. 2019) was used to develop a model for log-transformed biomass of *Pseudodiaptomus* spp. juveniles and adults in each region—Grizzly Bay, Suisun Marsh, Suisun Bay, and the Lower Sacramento River. The predictor terms in the model were the tensor product smooth of log-transformed daily mean net Delta outflow and day of year using $k=5$ and cubic splines with shrinkage. A smooth of year (as a factor) was also included as a random effect, using the following formula:

$$\log(\text{Biomass}+1) \sim \text{te}(\log(\text{Outflow}), \text{DayofYear}, k=c(5,5), \text{bs}=c("cs", "cs")) + s(\text{Year}, \text{bs}="re") + s(\text{Station}, \text{bs}="re")$$

The ‘predict.gam’ function was then used to calculate the predicted biomass and standard error of *Pseudodiaptomus* in each region for each month of the summer in each scenario as modeled by CalSim 3 (see Section 2.2.2.1, “Quantitative Hydrological Scenarios”).

The analysis showed the potential for a decrease in *Pseudodiaptomus* biomass in September and October in all regions without Fall X2 compared to Fall X2 or SWP Fall X2, but the standard error in the predictions indicates very high uncertainty in the effect size and considerable overlap between the three scenarios (Figure 2-9).



Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except only includes SWP operating to Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-9. *Pseudodiaptomus* Biomass (micrograms per cubic meter, ± 1 SE) as Predicted by a Generalized Additive Model of Biomass versus Delta Outflow in each Region.

Zooplankton Transport

To estimate the biomass of *Pseudodiaptomus* transported into Suisun Marsh and Suisun Bay by the Fall X2 action, DWR used Delta Simulation Model II (DSM2) to estimate the transport of passive particles from seven different locations upstream in the Delta to Suisun Bay and Suisun Marsh (see Attachment 1, Figure 1). Particles were released at the start of June, July, August, September, and October; tracked for 30 days; and then the number of particles transported to Suisun Bay, Suisun Marsh, entrained by the CVP and SWP, or remaining in the Delta was calculated. Hydrology from 2016 (a Below Normal water year modified to replicate operations in an Above Normal water year) and 2024 (an Above Normal year) was used, with boundary conditions to simulate two scenarios: one with a Fall X2 action at 80 km in September and October, and one without any Fall X2 requirement. Modifications to the hydrology were developed by DWR in spring 2025 for evaluation of different summer outflow scenarios.

Zooplankton densities from long-term monitoring programs were then used to weigh the results of the particle tracking models. Using the 'zooper' package (Bashevkin et al. 2022), data were gathered on *P. forbesi* (adults), and *Pseudodiaptomus* spp. (copepodites) catch per unit effort from the Summer Townet Survey, 20-mm survey, Fall Midwater Trawl Survey, and Environmental Monitoring Program from Above Normal WYs 2000, 2003, 2005, 2016 [actually a Below Normal

year, but used as Above Normal in the simulated hydrology], and 2024). These values were converted to biomass per unit effort by multiplying catch per unit volume (in cubic meters) by the average biomass of each life stage of *P. forbesi* (3.27 µg for adults, 1.15 µg for copepodites; Kayfetz et al. 2020).

The zooplankton samples were spatially aggregated based on the station designations from Slater et al. (2023) and grouped the stations to the nearest injection node within the particle-tracking model. See Attachment 1, Table 1, for details on how the monitoring stations are grouped into injection nodes, water volumes in each region, and average *Pseudodiaptomus* spp. biomass per cubic meter of water. The estimated *Pseudodiaptomus* spp. densities for each injection point (measured in biomass per volume) were multiplied by the volume of each station (Slater et al. 2023) to provide a value for total *Pseudodiaptomus* spp. biomass throughout the Delta. These biomass estimates were then incorporated into the particle tracking model results to calculate the fates of the total *Pseudodiaptomus* spp. biomass under the two different outflow scenarios.

The average *Pseudodiaptomus* spp. transport into the Suisun Bay/Marsh region under a No Fall X2 scenario from June to October was 1,047 kg per month, while the average June to October transport with a Fall X2 action scenario was 1,206 kg per month (Figure 2-10), with a total average difference between scenarios of 796 kg of *Pseudodiaptomus*. An SWP-only X2 scenario was not modeled; however, given that the proportional share of SWP water used in a Fall X2 action is 20 percent, the SWP proportional share of total average zooplankton transported would be 159 kg.

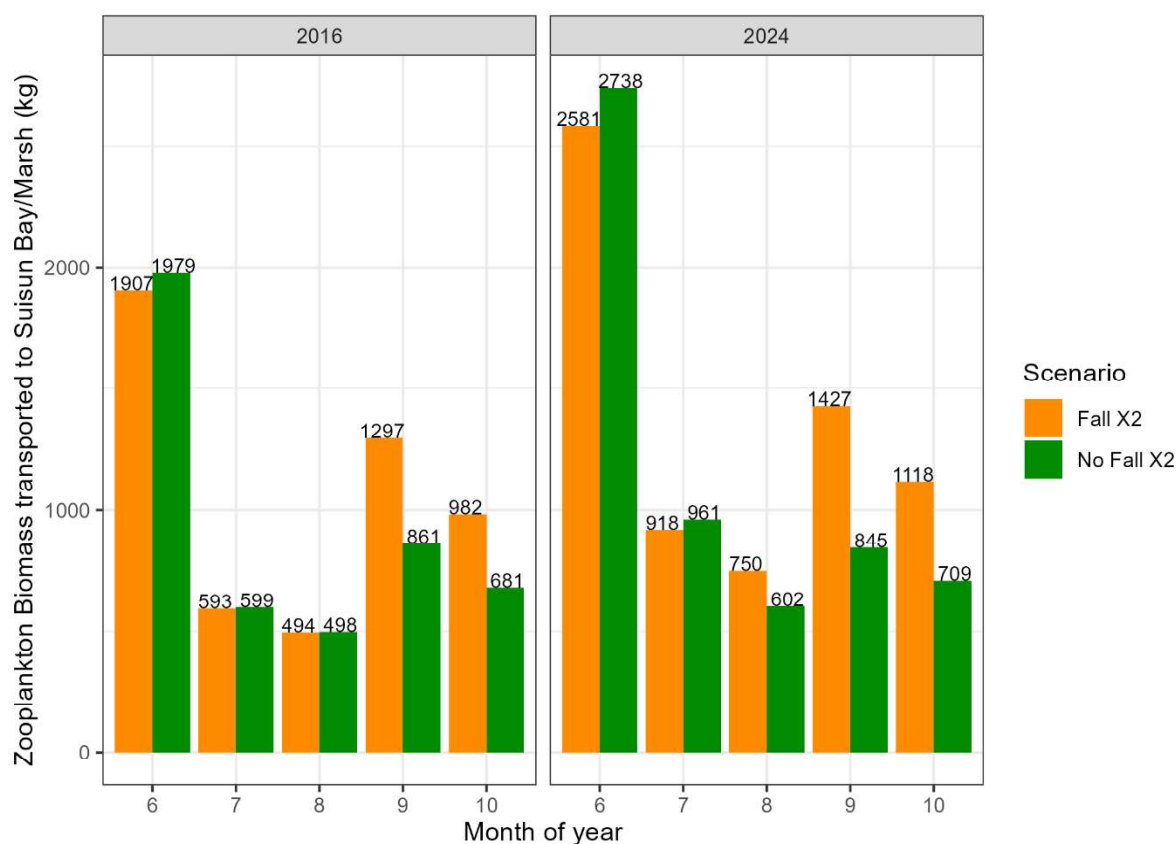


Figure 2-10. Estimated Monthly Transport of *Pseudodiaptomus* spp. Biomass (kg) from the Delta to Suisun Bay and Suisun Marsh in 2016 and 2024 after 30 days With and Without a Fall X2 Action.

Although off-ramping the Fall X2 action could have some negative effects on the abundance of Delta Smelt zooplankton prey, such effects would be anticipated to be limited (Figures 2-9 and 2-10) and operation of the SMSCG will continue as part of COA 9.1.3, *Delta Smelt Summer-Fall Habitat Action*, to provide smelt zooplankton prey and suitable Delta Smelt habitat in Suisun Marsh. To recover the potential loss of zooplankton subsidy provided by Fall X2, DWR is also proposing supplementation of smelt food resources within Suisun Marsh using managed wetlands.

Managed wetlands comprise most of the area of Suisun Marsh, mostly operated for seasonal waterfowl habitat by CDFW or private landowners. Previous studies have demonstrated that managed wetlands have much higher biomass of phytoplankton and zooplankton than surrounding channels (Williamshen et al. 2021), and that juvenile fish grow faster in the outfall of managed wetlands than open-water areas (Aha et al. 2021). Density of zooplankton on these wetlands during the winter averages has a median of 250 µg/L, and can reach as high as 600 µg/L (Phillips et al. 2026), and most wetlands can flood to approximately 0.5 meter deep, meaning that an area of approximately 315 acres can produce the 159 kg of zooplankton that would have been transported by the SWP's proportional share of Fall X2 in an Above Normal water year.

Therefore, in all Above Normal and Wet years, DWR will produce zooplankton on 315 acres of managed wetlands, either on its own land or through contracts with willing landowners, as described in Section 1.2.2, "Proposed Modifications to Conditions of Approval 9.1.3 and 9.1.4." Monitoring during the action will include chlorophyll concentration, zooplankton abundance, dissolved oxygen, temperature, pH, and potentially presence of fish at the outlet of the wetland while draining. From these data, DWR will calculate total zooplankton produced and any potential negative impacts on water quality in surrounding channels.

Growth and Health Effects

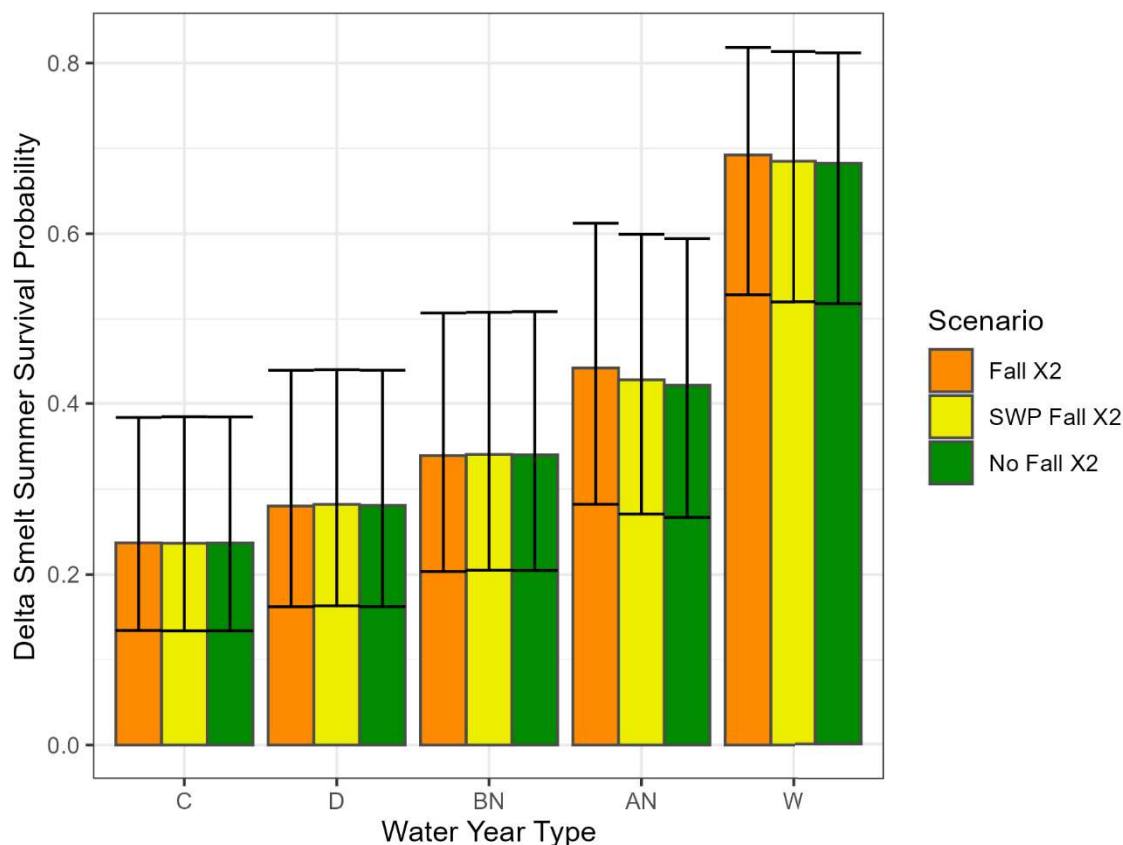
The DCG SMWG (2026) examined whether there was evidence for lower X2 leading to higher smelt growth and nutrition in summer and fall based on empirical observations and bioenergetic modeling. When accounting for water temperature, they found a negative relationship between growth rate as measured with otoliths and X2 in summer and a weaker, positive relationship in fall (Delta Coordination Group Science and Monitoring Work Group 2026:Figure 30). Bioenergetic modeling with an approach similar to Smith and Nobriga (2023) also suggested a significant negative relationship of growth rate to X2 in summer, but not fall, in regions with salinity less than 6 psu (Delta Coordination Group Science and Monitoring Work Group 2026:Figure 36). Other studies have had mixed results when relating X2 to Delta Smelt health, with Hammock et al. (2022) showing lower condition factor with lower X2, though the effect size was small.

The DCG SMWG's (2026) analysis of Delta Smelt nutrition focused on liver weight. They found that predicted liver weight generally was greater at lower X2 for larger individuals (Delta Coordination Group Science and Monitoring Work Group 2026:Figure 42), which they suggested reflected larger Delta Smelt being physically and physiologically better equipped to exploit greater feeding conditions associated with the activation of higher-quality habitats in lower X2 conditions. They further found that greater nutrition (higher liver weight) was associated with lower X2 at higher water temperature, such as seen in summer rather than fall, and that the greatest benefit was at very low X2 (less than 70 km), which is rare in fall (Delta Coordination Group Science and Monitoring Work Group 2026:Figure 43). This is supported by Hammock et al. (2022), who found lower X2 was correlated to higher hepatosomatic index (i.e., proportion of liver weight to body weight).

Based on the various results of the growth and nutrition analyses from the DCG SMWG (2026), there would not be expected to be appreciable effects on Delta Smelt growth and health from off-ramping of Fall X2, given the extent of the differences in summer and Fall X2 under the proposed major amendment (Figures 2-7 and 2-8), and the focus on changing Fall X2, which occurs when temperatures are cooler (limiting the effect of X2 on smelt liver size), and when no relationship was apparent between X2 and growth.

Survival Effects

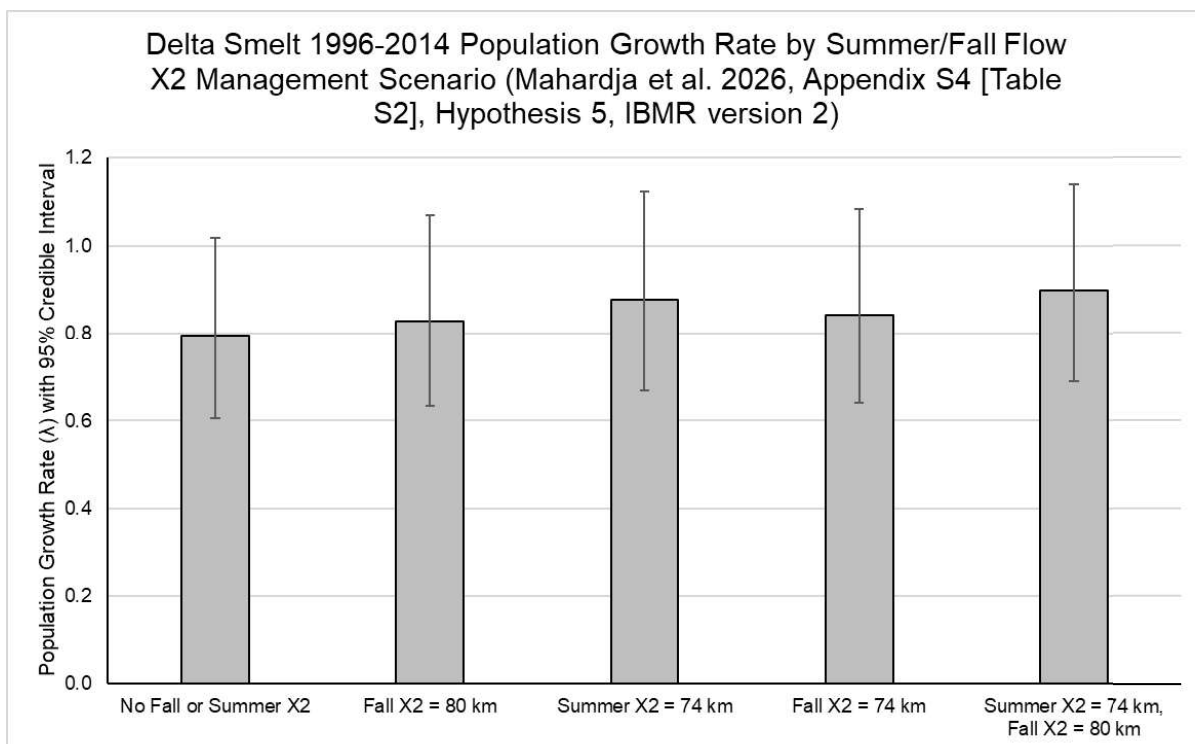
A recently published life cycle model analysis shows that Delta Smelt summer survival (June–August) is significantly correlated with summer outflow, whereas fall survival is weakly correlated to fall outflow (Polansky et al. 2024). Thus, the statistical life cycle model best explaining Delta Smelt population growth includes summer outflow but not fall outflow (Polansky et al. 2024). Other studies supporting this result include Mac Nally et al. (2010) and Thomson et al. (2010), which found no relationship between X2 and Delta Smelt population indices. USFWS summarized the previously published life cycle model summer and fall flow results (Polansky et al. 2021, 2023, 2024) for the analysis of the Proposed Action in its LTO BiOp, concluding that the Fall X2 component of the Summer-Fall Action is not supported as being likely to result in a detectable change in Delta Smelt survival based on the life cycle modeling (U.S. Fish and Wildlife Service 2024:133). For this effects analysis, DWR applied the relationship between outflow and summer survival from the USFWS life cycle model to the change in summer flows under the proposed major amendment, as summarized in Section 2.2.2.1, “Quantitative Hydrological Scenarios.” The only difference in flows in summer was a change in August of Wet and Above Normal years, which is caused by the increase in flows at the end of August to prepare for Fall X2. There was no difference in flows during June or July. The life cycle model uses the three-month average of June, July, and August, and the change in the three-month average corresponded to less than 2 percent difference in Delta Smelt summer survival when comparing the Fall X2 scenario to the No Fall X2 scenario, and less than 1 percent difference in survival when comparing the SWP Fall X2 scenario to the No Fall X2 scenario (Figure 2-11). These differences are much smaller than the 50 percent confidence interval, as shown in Figure 2-11, meaning that the difference will be impossible to detect with empirical data. This analysis focused on potential effects on summer survival from changes in summer outflow and did not apply the full life cycle model to assess how removal of Fall X2 could affect other life stages because of incidental changes in south Delta operations, Delta outflow, and other factors; such effects are addressed in the sections above discussing entrainment, habitat, food, and growth and health effects.



Note: Error bars show the 25th and 75th quantiles. Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-11. Median Probability of Delta Smelt Summer Survival as Calculated by the USFWS Life Cycle Model using the Summer Outflow modeled by CalSim 3 for the Fall X2, SWP Fall X2, and No Fall X2 Scenarios.

Mahardja et al. (2026) used a modification of the Delta Smelt individual-based model by Rose et al. (2013) to compare various summer/fall X2 management strategies, including no action (which is representative of the proposed off-ramping of Fall X2) and status quo (i.e., Fall X2 of 80 km in Wet and Above Normal water years). Mahardja et al. (2026) found that Delta Smelt population growth rate was somewhat lower without the Fall X2 action than with it, with the extent of differences depending on the model's representation of bioenergetic components and hypotheses regarding the effects of flow on movement of Delta Smelt and their zooplankton prey. The hypothesis considered most likely by experts had geometric mean population growth rate of 0.829 with Fall X2 and 0.797 without Fall X2, with considerably overlapping 95 percent credible intervals (Figure 2-12). Together, the results from the summer survival function of the Polansky et al. (2024) life cycle model and the individual-based model suggest that off-ramping the Fall X2 action would not have appreciable effects on Delta Smelt survival.

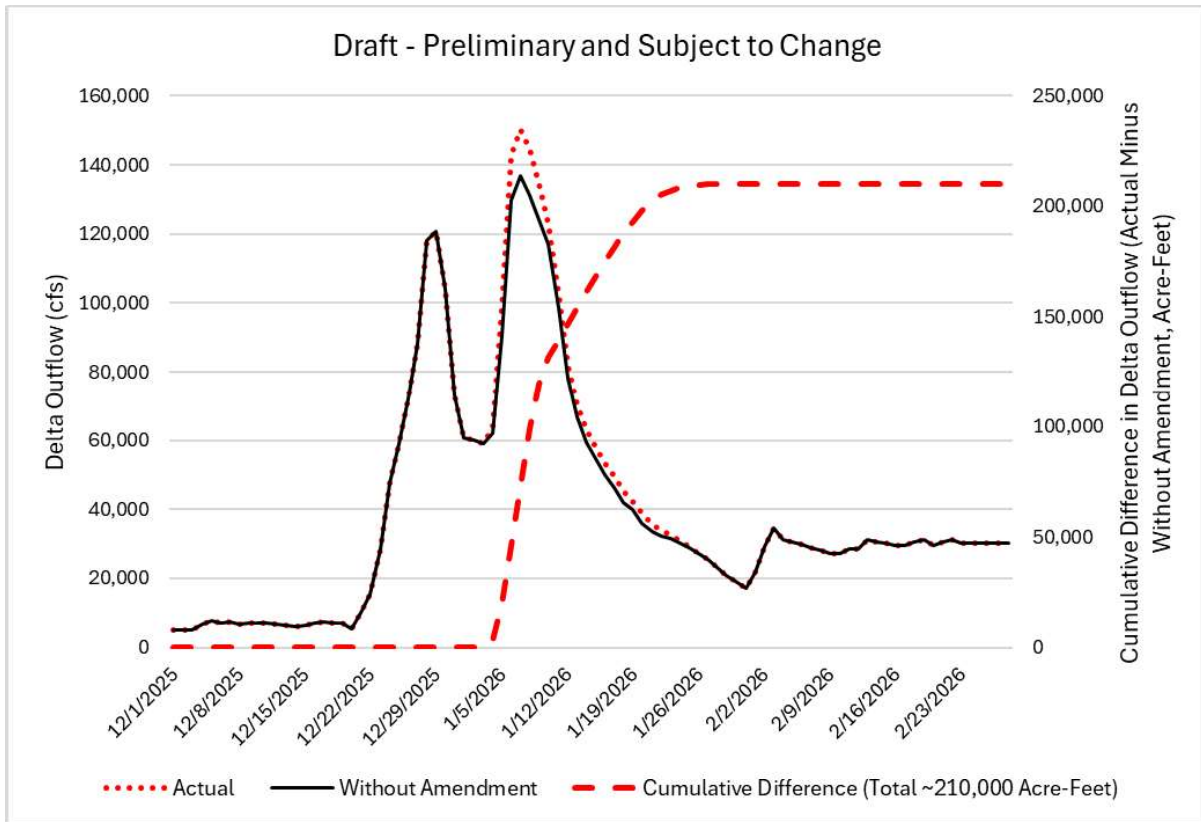


Source: Developed from Appendix S4 (Table S2) of Mahardja et al. (2026). Note: These results are for Hypothesis 5. No Fall or Summer X2 is analogous to off-ramping of Fall X2 for this proposed major amendment, whereas Fall X2 = 80 km is analogous to the status quo (i.e., not off-ramping Fall X2).

Figure 2-12. Modeled Delta Smelt Population Growth Rate (1996–2014) for Various Summer/Fall X2 Management Scenarios Studied by Mahardja et al. (2026).

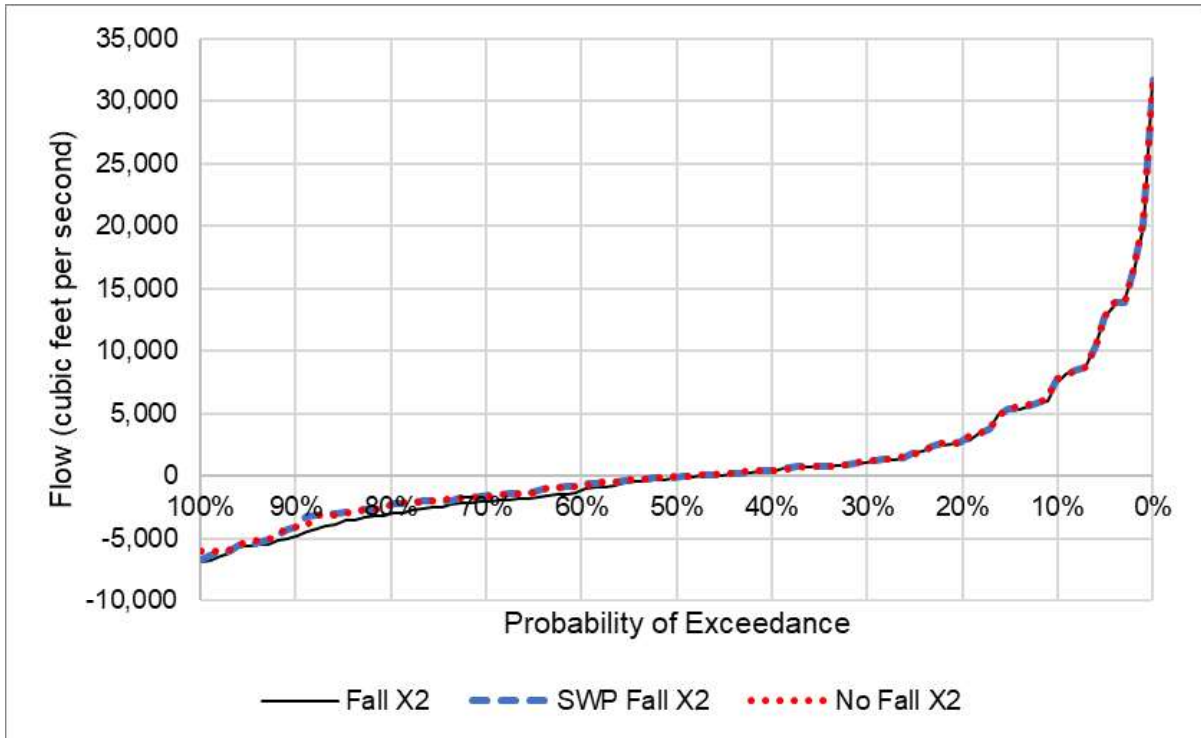
2.2.2.3 Longfin Smelt

There is no evidence that Longfin Smelt would be adversely affected by the proposed major amendment's change in Fall X2/outflow because the species is mostly distributed seaward (e.g., San Francisco Bay or ocean) of Suisun Bay during September and October (ICF 2023:4-66). There is the potential for Longfin Smelt to benefit in winter/spring following a Fall X2 action year because of increased potential for reservoir spill by not implementing a Fall X2 action, resulting in greater potential for increased incidental Delta outflow. This potential increase in Delta outflow was illustrated by the 100-year CalSim modeling (Figure 2-3) and a WY 2026 comparison of actual Delta outflow to Delta outflow that would have occurred without an SWP Fall X2 amendment in 2025, for which the amendment resulted in additional Delta outflow (Figure 2-13). Incidental increase in outflow, and a slightly more positive QWEST, could result in lower entrainment risk. The amount of increased reservoir spill will vary among years and within year types based on actual storage and hydrologic conditions of each given year. Based on the Calsim 3 results, such differences predict marginal effects (Table 2-1; Figures 2-14 through 2-17). Similarly, there is likely to be little to no effect on population abundance given the very similar Delta outflow during the spring months that are hypothesized to underly outflow-abundance relationships (ICF 2023:4-58; Figures 18 and 19; Kimmerer and Gross 2022).



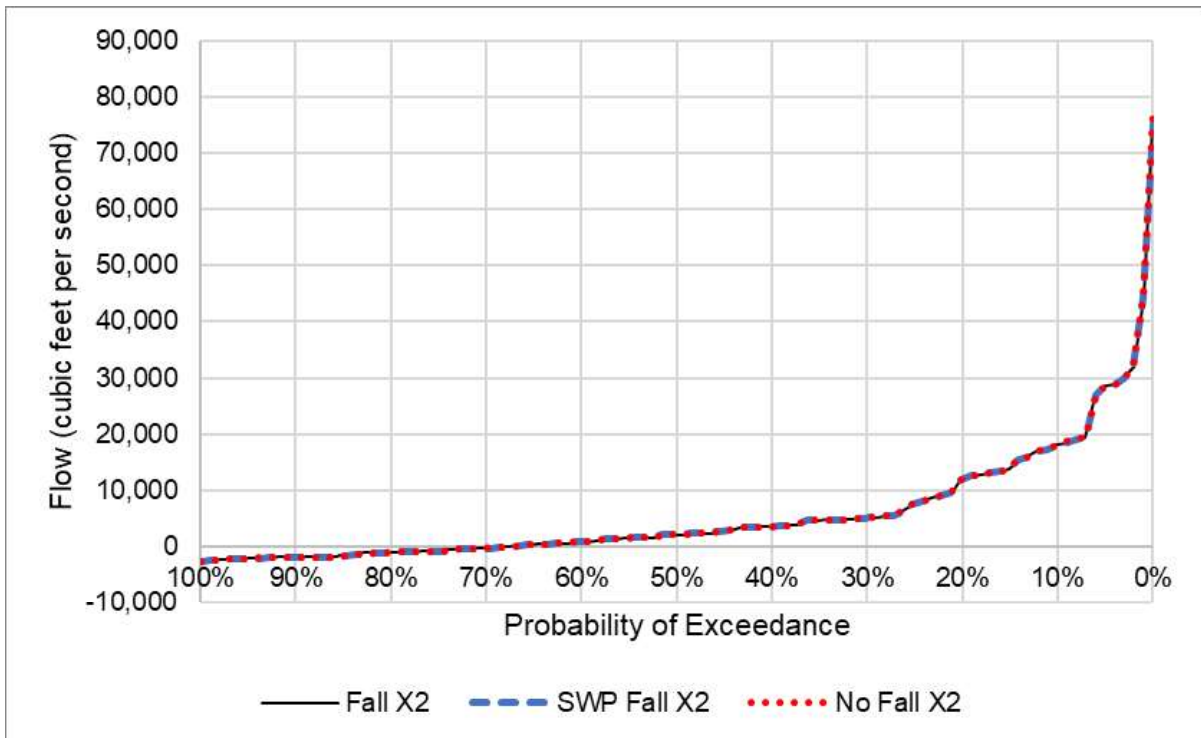
Note: Draft – preliminary and subject to change. Dotted red line represents actual Delta outflow, solid black line represents Delta outflow estimate without Fall X2 amendment, dashed red line represents cumulative difference (acre-feet) as actual Delta outflow minus Delta outflow without Fall X2 amendment.

Figure 2-13. Actual Delta Outflow Compared to Delta Outflow Without Fall X2 Amendment, December 2025–February 2026.



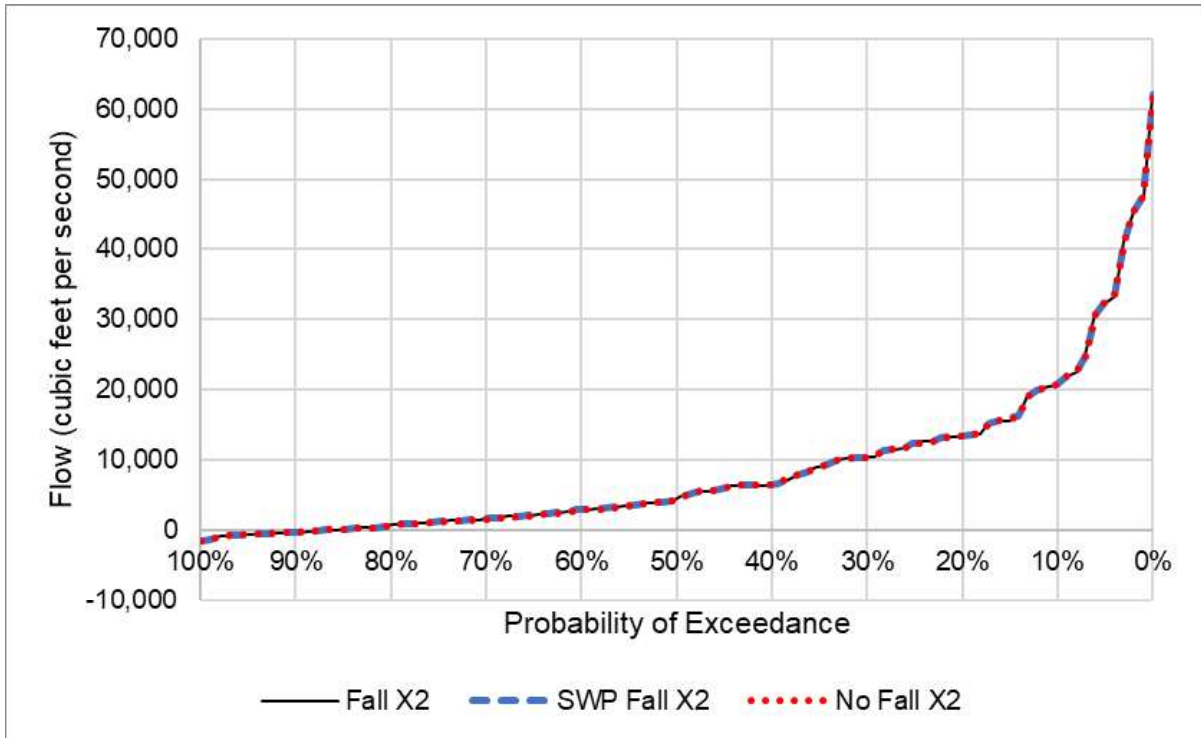
Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-14. December QWEST from CalSim 3 Modeling.



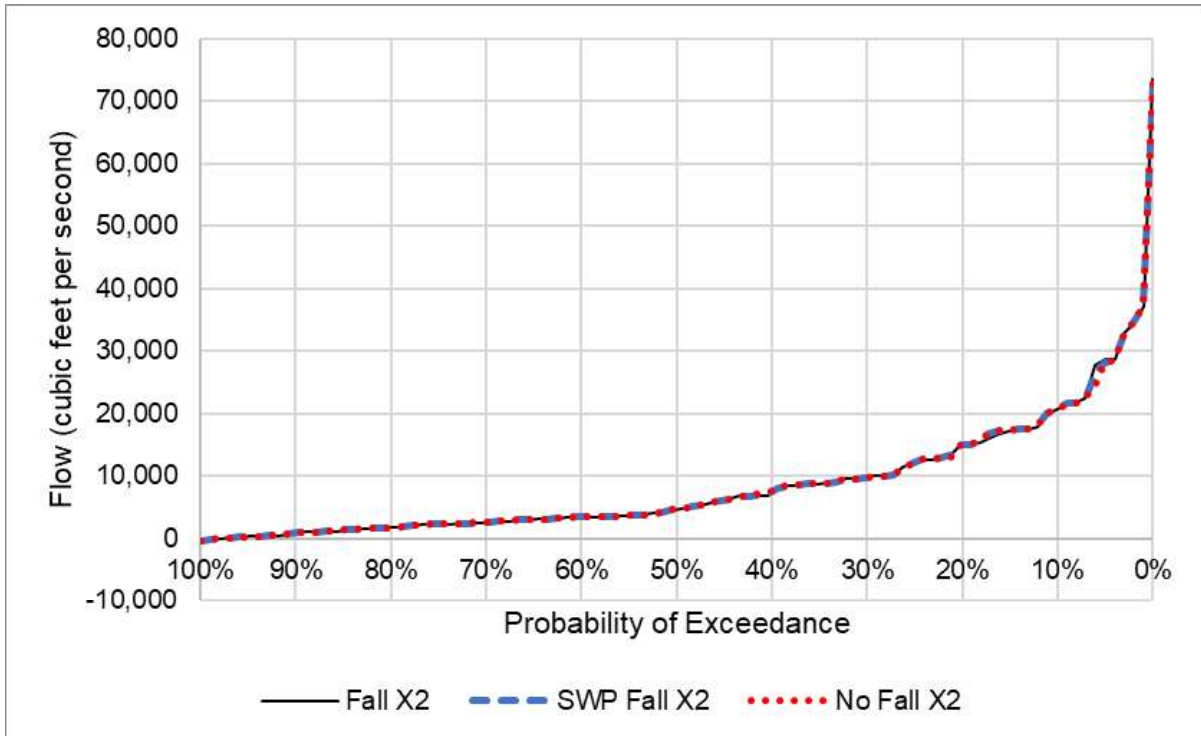
Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-15. January QWEST from CalSim 3 Modeling.



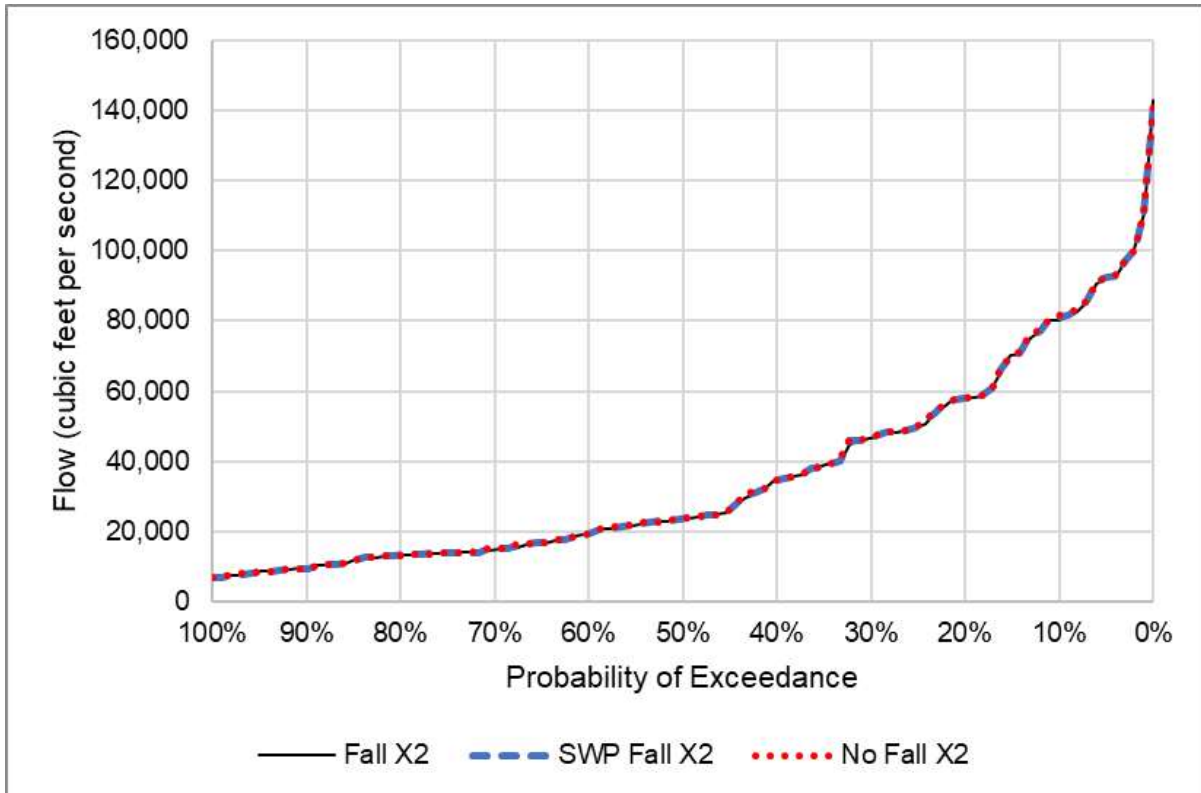
Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-16. February QWEST from CalSim 3 Modeling.



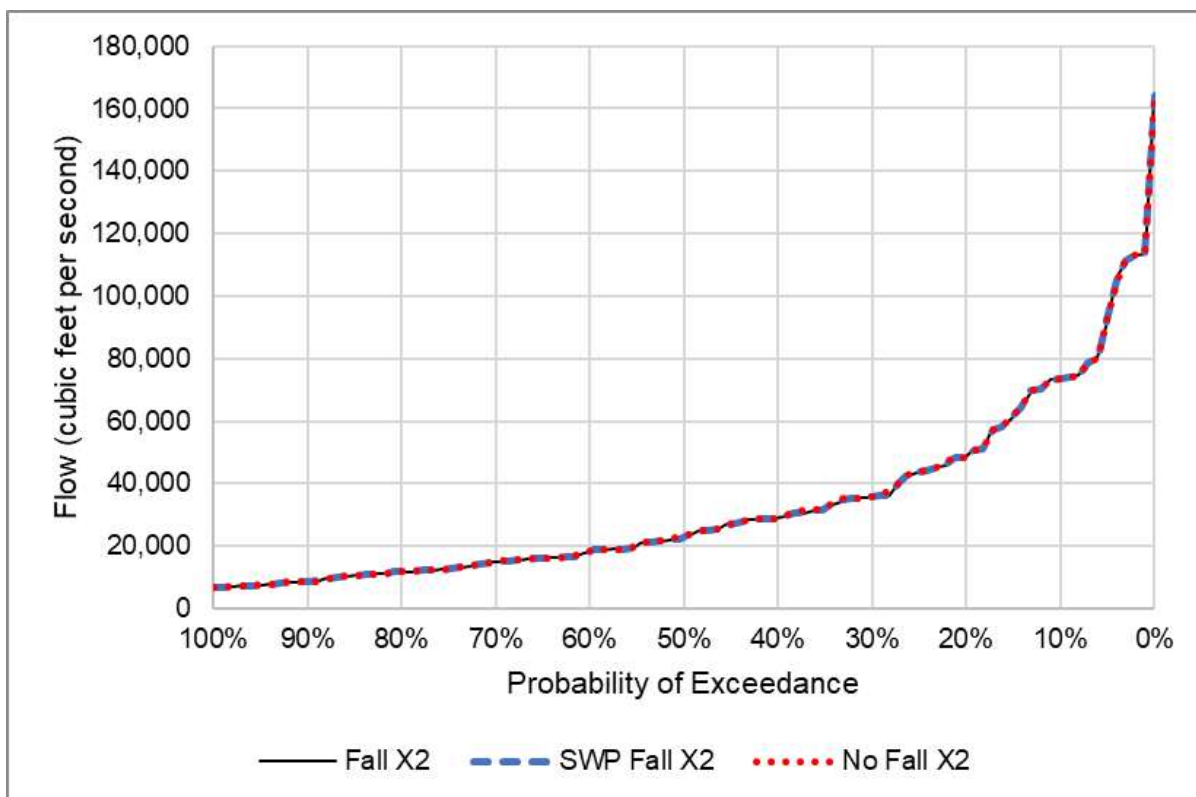
Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-17. March QWEST from CalSim 3 Modeling.



Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-18. Mean December–May Delta Outflow from CalSim 3 Modeling.



Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-19. Mean March–May Delta Outflow from CalSim 3 Modeling.

2.2.2.4 Winter-Run and Spring-Run Chinook Salmon

Historical loss density data (i.e., number of fish lost to entrainment per 1,000 acre-feet of water exported at the Banks Pumping Plant) of genetically identified and coded-wire-tagged winter-run and spring-run Chinook Salmon illustrates that entrainment loss occurs during December–June and so there would be no potential for temporal overlap with the Fall X2 period (Tables 2-3 through 2-6). Therefore, there is no evidence for entrainment-related or other effects resulting from the proposed major amendment during September–October. OMR flows during December–June are similar between the No Fall X2 and SWP Fall X2 scenarios and reflect the inclusion of entrainment risk minimization measures under all scenarios such as OMR flows at or more positive than -5,000 cubic feet per second (Figures 2-20 through 2-26). There are a number of ongoing measures from the 2024 ITP to avoid and minimize entrainment loss. These include measures related to entrainment loss, including COA 8.2.1, *Natural Origin Winter-run Chinook Salmon Early Season Weekly Loss Thresholds*, 8.4.3, *Winter-run Chinook Salmon Annual Loss Thresholds*, 8.4.4, *Natural-origin Winter-run Chinook Salmon Weekly Distributed Loss Thresholds*, and 8.4.5, *Spring-run Chinook Salmon Protection Action and Surrogate Annual Loss Thresholds*, for example. Other measures reduce the probability of juvenile winter- and spring-run Chinook Salmon routing towards the south Delta, in particular COA 8.11.1, *Install and Operate the Georgiana Slough Salmonid Migratory Barrier*, and COA 9.2.1, *Implementation of the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project*. Assessment of the Georgiana Slough Salmonid Migratory Barrier deployment in 2024 found that the

barrier reduced juvenile Chinook Salmon routing into Georgiana Slough from 26.5 to 15.9 percent (Raboin et al. 2026). The similarity in OMR flows, coupled with ongoing ITP measures to avoid and minimize SWP entrainment loss, indicate it would be unlikely for entrainment risk to vary in any measurable manner as a result of the proposed major amendment request.

Table 2-3. Mean Monthly Loss Density (Number of Fish Lost to Entrainment Per 1,000 Acre-Feet of Water Exported at the Banks Pumping Plant) of Genetically Identified Winter-Run Chinook Salmon by Water Year Type, Water Years 2010–2024

Month	Wet	Above Normal	Below Normal	Dry	Critically Dry
January	0.020	0.046	0.054	0.000	0.000
February	0.447	0.078	0.739	0.000	0.000
March	1.210	0.605	2.308	0.719	0.039
April	0.196	0.000	0.076	0.152	0.143
May	0.004	0.000	0.000	0.000	0.000
June	0.000	0.000	0.000	0.000	0.000
July	0.000	0.000	0.000	0.000	0.000
August	0.000	0.000	0.000	0.000	0.000
September	0.000	0.000	0.000	0.000	0.000
October	0.000	0.000	0.000	0.000	0.000
November	0.000	0.000	0.000	0.000	0.000
December	0.012	0.000	0.000	0.000	0.000

Source: Reece pers. comm. (loss data); <https://apps.wildlife.ca.gov/Salvage> (export data).

Table 2-4. Mean Monthly Loss Density (Number of Fish Lost to Entrainment Per 1,000 Acre-Feet of Water Exported at the Banks Pumping Plant) of Coded-Wire-Tagged Winter-Run Chinook Salmon by Water Year Type, Water Years 2010–2024

Month	Wet	Above Normal	Below Normal	Dry	Critically Dry
January	0.000	0.000	0.000	0.000	0.000
February	0.000	0.000	0.000	0.000	0.013
March	0.000	0.025	0.099	0.029	0.000
April	0.000	0.000	0.036	0.000	0.000
May	0.000	0.000	0.000	0.000	0.000
June	0.000	0.000	0.000	0.000	0.000
July	0.000	0.000	0.000	0.000	0.000
August	0.000	0.000	0.000	0.000	0.000
September	0.000	0.000	0.000	0.000	0.000
October	0.000	0.000	0.000	0.000	0.000
November	0.000	0.000	0.000	0.000	0.000
December	0.000	0.000	0.000	0.000	0.000

Sources: Costa pers. comm.; Reece pers. comm. (loss data); <https://apps.wildlife.ca.gov/Salvage> (export data).

Table 2-5. Mean Monthly Loss Density (Number of Fish Lost to Entrainment Per 1,000 Acre-Feet of Water Exported at the Banks Pumping Plant) of Genetically Identified Spring-Run Chinook Salmon by Water Year Type, Water Years 2017–2024

Month	Wet	Above Normal	Below Normal	Dry	Critically Dry
January	0.005	0.157	0.000	0.000	0.000
February	0.010	1.203	0.000	0.000	0.000
March	0.017	4.326	0.124	0.000	0.000
April	0.082	2.068	0.635	0.488	0.142
May	0.216	0.000	0.000	0.000	0.101
June	0.000	0.054	0.000	0.000	0.000
July	0.000	0.000	0.000	0.000	0.000
August	0.000	0.000	0.000	0.000	0.000
September	0.000	0.000	0.000	0.000	0.000
October	0.000	0.000	0.000	0.000	0.000
November	0.000	0.000	0.000	0.000	0.000
December	0.058	0.000	0.000	0.000	0.000

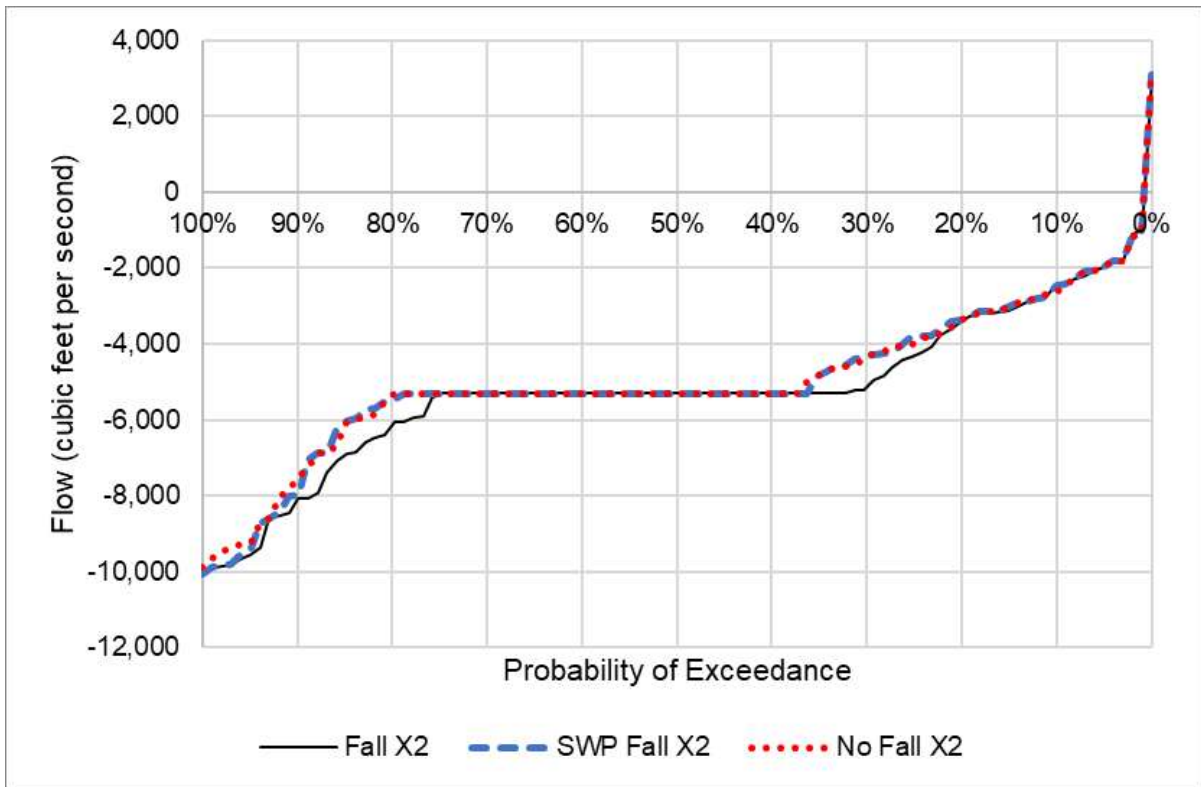
Source: Reece pers. comm. (loss data); <https://apps.wildlife.ca.gov/Salvage> (export data).

Note: Methods for genetic identification of spring-run Chinook Salmon continue to be refined; preliminary analysis for water year 2024 with refined genetic methods suggests that just over 25% of juvenile Chinook Salmon lost to entrainment that were identified as spring-run Chinook Salmon with prior genetic methods would have been identified as spring-run based on the refined genetic methods (Nguyen pers. comm.). The loss-density data summarized herein used the prior methods because only one year (2024) had data available for the refined methods.

Table 2-6. Mean Monthly Loss Density (Number of Fish Lost to Entrainment Per 1,000 Acre-Feet of Water Exported at the Banks Pumping Plant) of Coded-Wire-Tagged Spring-Run Chinook Salmon by Water Year Type, Water Years 2010–2024

Month	Wet	Above Normal	Below Normal	Dry	Critically Dry
January	0.000	0.000	0.000	0.000	0.000
February	0.000	0.000	0.000	0.000	0.000
March	0.000	0.000	0.000	0.000	0.000
April	0.000	0.040	0.014	0.016	0.000
May	0.000	0.000	0.000	0.000	0.000
June	0.000	0.000	0.000	0.000	0.000
July	0.000	0.000	0.000	0.000	0.000
August	0.000	0.000	0.000	0.000	0.000
September	0.000	0.000	0.000	0.000	0.000
October	0.000	0.000	0.000	0.000	0.000
November	0.000	0.000	0.000	0.000	0.000
December	0.000	0.000	0.000	0.000	0.000

Source: Costa pers. comm.; Reece pers. comm. (loss data); <https://apps.wildlife.ca.gov/Salvage> (export data).



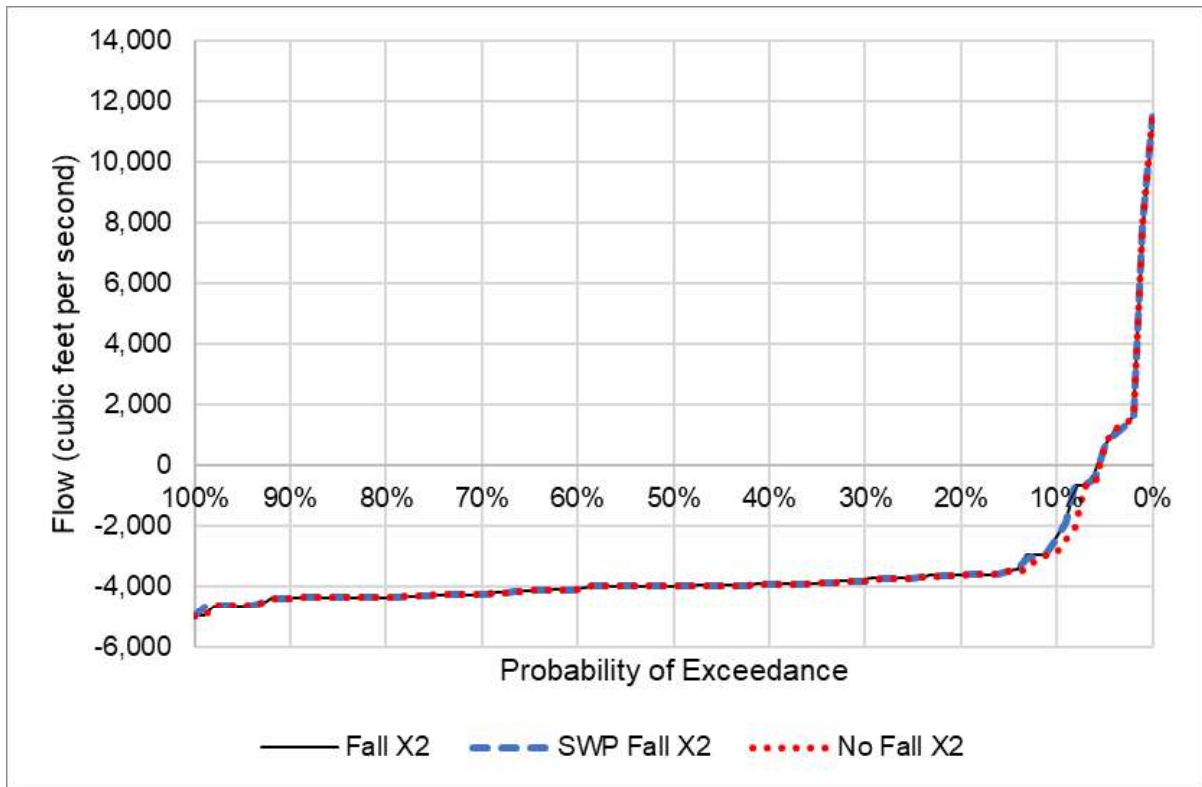
Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except it only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-20. December Old and Middle River Flows from CalSim 3 Modeling.



Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except it only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-21. January Old and Middle River Flows from CalSim 3 Modeling.



Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except it only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-22. February Old and Middle River Flows from CalSim 3 Modeling.



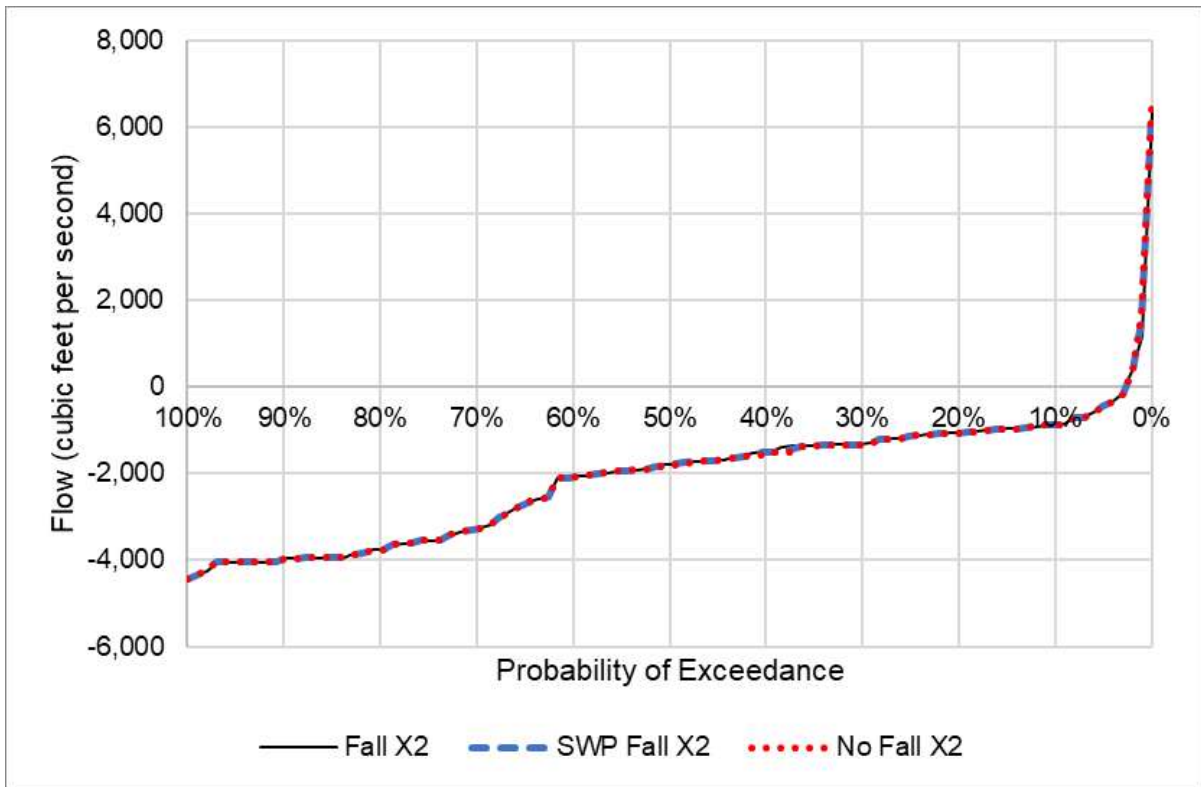
Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except it only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-23. March Old and Middle River Flows from CalSim 3 Modeling.



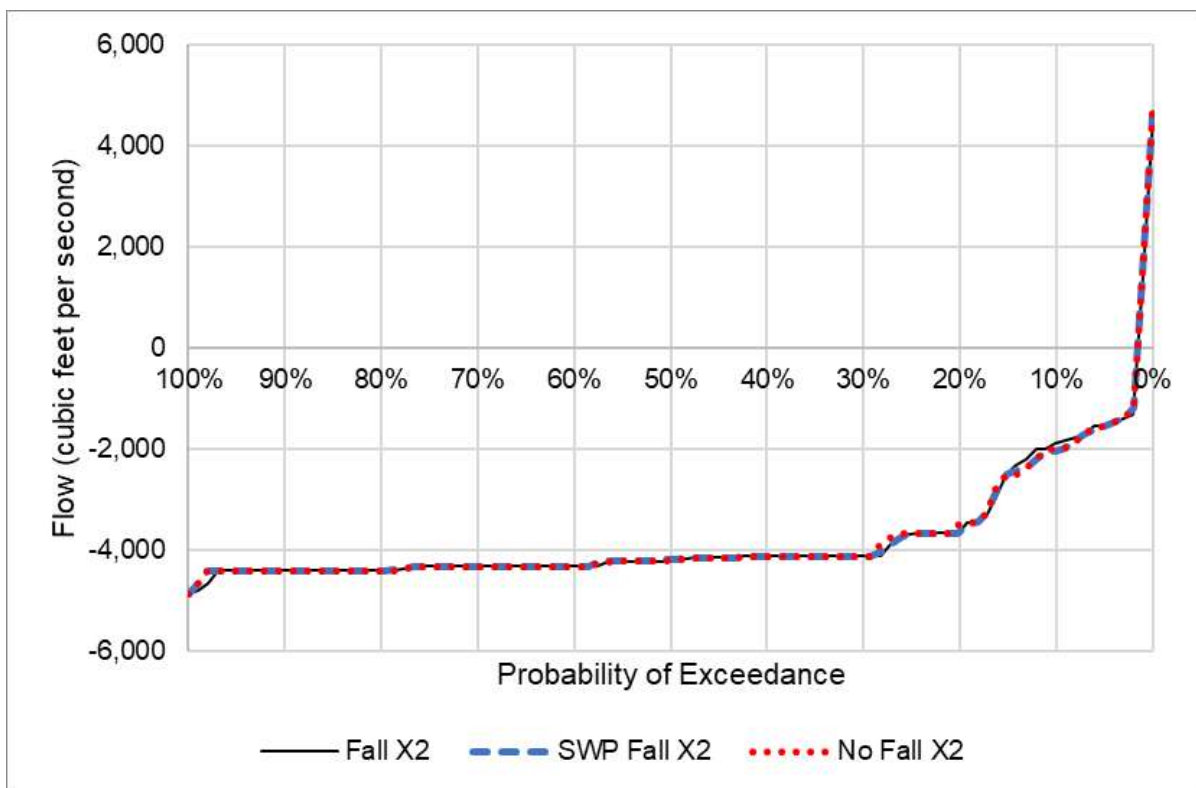
Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except it only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-24. April Old and Middle River Flows from CalSim 3 Modeling.



Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except it only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-25. May Old and Middle River Flows from CalSim 3 Modeling.



Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except it only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-26. June Old and Middle River Flows from CalSim 3 Modeling.

Through-Delta survival of juvenile Chinook Salmon from the Sacramento River basin is positively correlated with Sacramento River flow at Freeport (Hance et al. 2022; Jensen et al. 2025; Perry et al. 2018), with no evidence supporting an effect of south Delta exports on through-Delta survival (Hance et al. 2022; Jensen et al. 2025). Although there are some differences in modeled Sacramento River at Freeport flow between SWP Fall X2 and No Fall X2 scenarios in the early months of the broader September–June salmonid outmigration period considered in the ITP Amendment (Table 2-1), differences in Freeport flow are limited during the main outmigration periods of juvenile winter-run Chinook Salmon (December–April; ICF 2023:Chapter 2, Tables 2-3, 2-4a, and 2-4b) and spring-run Chinook Salmon (December–May/June for young-of-the-year and fall/winter for yearlings; ICF 2023:Chapter 2, Tables 2-6, 2-6a, and 2-6b). Relative to the SWP Fall X2 scenario, Freeport flow under the No Fall X2 scenario ranges from 1 percent lower to 2 percent higher, with most months/water years having differences of 0–1 percent (Table 2-1). This indicates that the proposed major amendment would be expected to have limited, if any, effect on juvenile winter-run and spring-run Chinook Salmon through-Delta survival compared to inclusion of Fall X2.

Spring-run Chinook Salmon occur in the Feather River, for which the CalSim modeling showed differences in Oroville storage and flow in the high-flow channel between the three modeled scenarios (Table 2-1). Although there are differences between scenarios, Oroville Dam releases are undertaken to benefit coldwater fisheries, including spring-run Chinook Salmon. For example, minimum flow releases occur for spawning and will increase once the renewed Federal Energy Regulatory Commission license is issued. Flow releases are ramped at rates intended to reduce the

potential for stranding of fish such as juvenile spring-run Chinook Salmon, and there are various temperature objectives to limit potential negative effects on oversummering salmonids. Operations under the proposed major amendment and any other operational scenario would meet applicable criteria for spring-run Chinook Salmon and therefore would not have measurable effects relative to operations, including Fall X2.

2.2.2.5 White Sturgeon

South Delta Entrainment

Historical salvage-density data from 2009 through 2025 indicate limited temporal overlap of White Sturgeon salvage with the September–October Fall X2 period (Table 2-7). During these years, White Sturgeon salvage in September–October of Wet and Above Normal years generally was 0 percent of total annual salvage (Table 2-7). Based on these historical patterns, combined with modeled differences in SWP exports for SWP Fall X2 and No Fall X2 scenarios generally indicating limited differences in SWP exports in these and other months (Table 2-1), there would be limited potential for increased White Sturgeon salvage under the proposed major amendment. 2024 SWP ITP COA 8.4.7, *White Sturgeon Entrainment Protection Action*, and any eventual refinement to it through COA 8.4.8, *Evaluate and Develop Alternative White Sturgeon Entrainment Minimization During Real-Time OMR Management*, would remain in place year-round to minimize entrainment and subsequent take of White Sturgeon through the development of a risk assessment and coordinated actions (California Department of Fish and Wildlife 2024, Attachment 7:127–129).

Table 2-7. White Sturgeon Total SWP Salvage and Monthly Salvage as Percentage of Total Annual Salvage, 2009–2025

Year	Total SWP Salvage	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
2009	4	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%
2010	4	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2011	10	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
2012	12	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%
2013	12	50%	0%	0%	0%	50%	0%	0%	0%	0%	0%	0%	0%
2014	0	—	—	—	—	—	—	—	—	—	—	—	—
2015	0	—	—	—	—	—	—	—	—	—	—	—	—
2016	2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
2017	52	6%	8%	0%	0%	8%	4%	23%	15%	0%	0%	2%	35%
2018	4	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%
2019	12	67%	0%	33%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2020	0	—	—	—	—	—	—	—	—	—	—	—	—
2021	0	—	—	—	—	—	—	—	—	—	—	—	—
2022	0	—	—	—	—	—	—	—	—	—	—	—	—
2023	26	0%	0%	0%	0%	0%	0%	0%	0%	8%	0%	15%	77%
2024	69	16%	61%	0%	0%	0%	17%	0%	0%	0%	0%	6%	0%
2025	0	—	—	—	—	—	—	—	—	—	—	—	—

Source: <https://apps.wildlife.ca.gov/Salvage>. Note: Shading represents September and October in Wet and Above Normal years meeting criteria for Fall X2 implementation from the 2024 ITP.

Delta Outflow Effects

Adults

Based on modeling by Arroyo-Esquivel et al. (2026), there is little evidence to support that the proposed major amendment will affect the White Sturgeon adult spawning migration (Table 2-1). The CalSim 3 modeling indicates small differences (0–1 percent) between the SWP Fall X2 and No Fall X2 scenarios in mean Delta outflow during the February–April months (Table 2-1) that are positively correlated with the probability of visiting spawning sites (Arroyo-Esquivel et al. 2026:Figure 4).

Young-of-the-Year

Arroyo-Esquivel et al. (2026) found a positive correlation between 30-day-lagged mean fall (September–November) Delta outflow and (1) the probability of catching a young-of-the-year White Sturgeon, and (2) the mean catch of young-of-the-year White Sturgeon per 1,000 cubic meters sampled. They also found such correlations for winter (December–February), spring (March–May), and summer (June–August) Delta outflow. Arroyo-Esquivel et al. (2026) described the correlations with Delta outflow as supporting the hypothesis that successful recruitment events occur mainly during Wet water years. Arroyo-Esquivel et al. (2026) concluded that it is unclear why recruitment events for White Sturgeon are successful only infrequently, more specifically during wetter years, given that adult White Sturgeon visit spawning sites every year. They proposed three possible mechanisms for this observation:

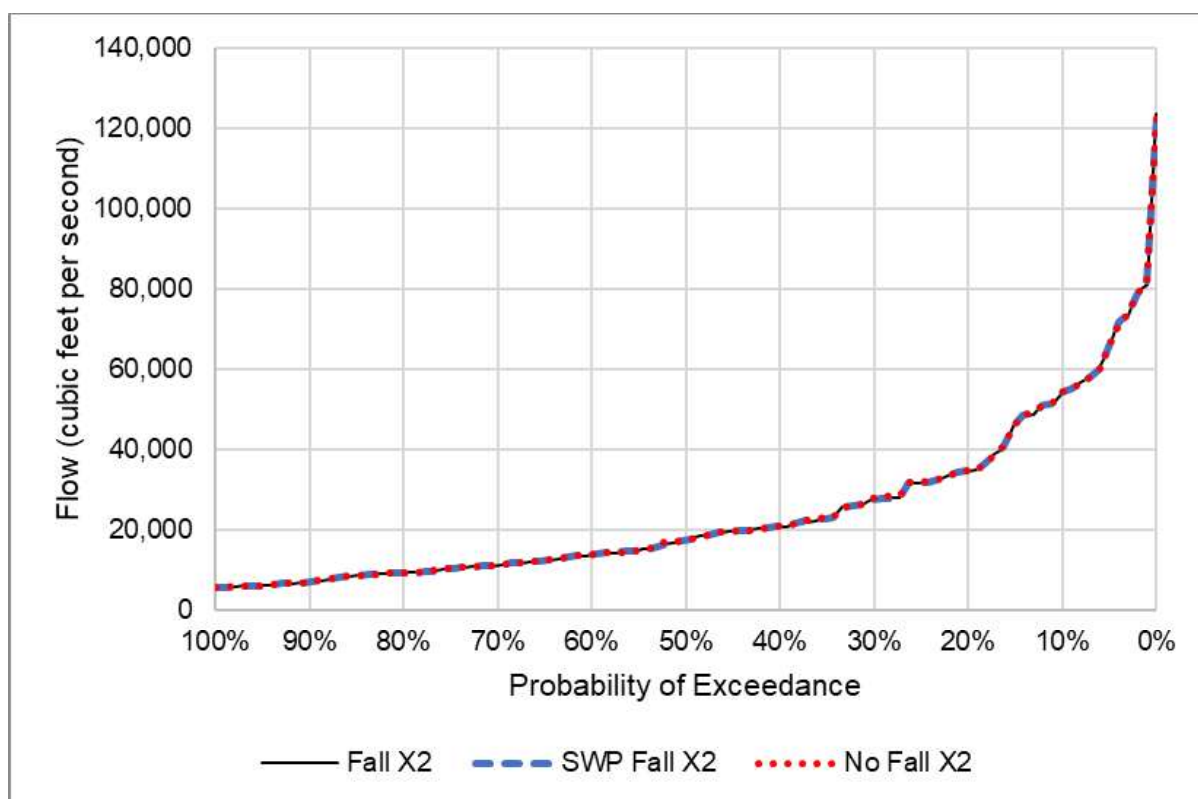
- During drier years the river flow is low enough that fewer adult White Sturgeon experience the pulse flows that trigger spawning, leading to lower egg production.
- Adult White Sturgeon are able to spawn in drier years but higher water temperatures and lower flow conditions during drier years lead to higher egg, larval, and juvenile mortality, potentially due to low availability of food and suitable substrate.
- White Sturgeon could experience atresia during warmer years, which could reduce the effective production of eggs.

Arroyo-Esquivel et al. (2026) further reviewed available information to suggest that high flows improve spawning habitat quality by flooding off-channel areas, creating conditions that enhance egg survival through reduced predation and improved incubation substrate.¹ They also stated that after hatching, the downstream dispersal of White Sturgeon larvae is passive and lasts 10 days, which potentially makes them susceptible to predation, especially at lower river flows where larval passive movement is slower than during higher river flows.

Of the various mechanisms and related information discussed by Arroyo-Esquivel et al. (2026) summarized above, most pertain to effects occurring at life stages not spatially overlapping the Delta or temporally overlapping fall. It is possible that effects on juvenile mortality that Arroyo-Esquivel et al. (2026) hypothesized as occurring in drier years because of low availability of food and suitable substrate could apply to fall, although they did not make such a link explicitly. Overall, there is little evidence suggesting there would be a detectable effect on White Sturgeon from the proposed major

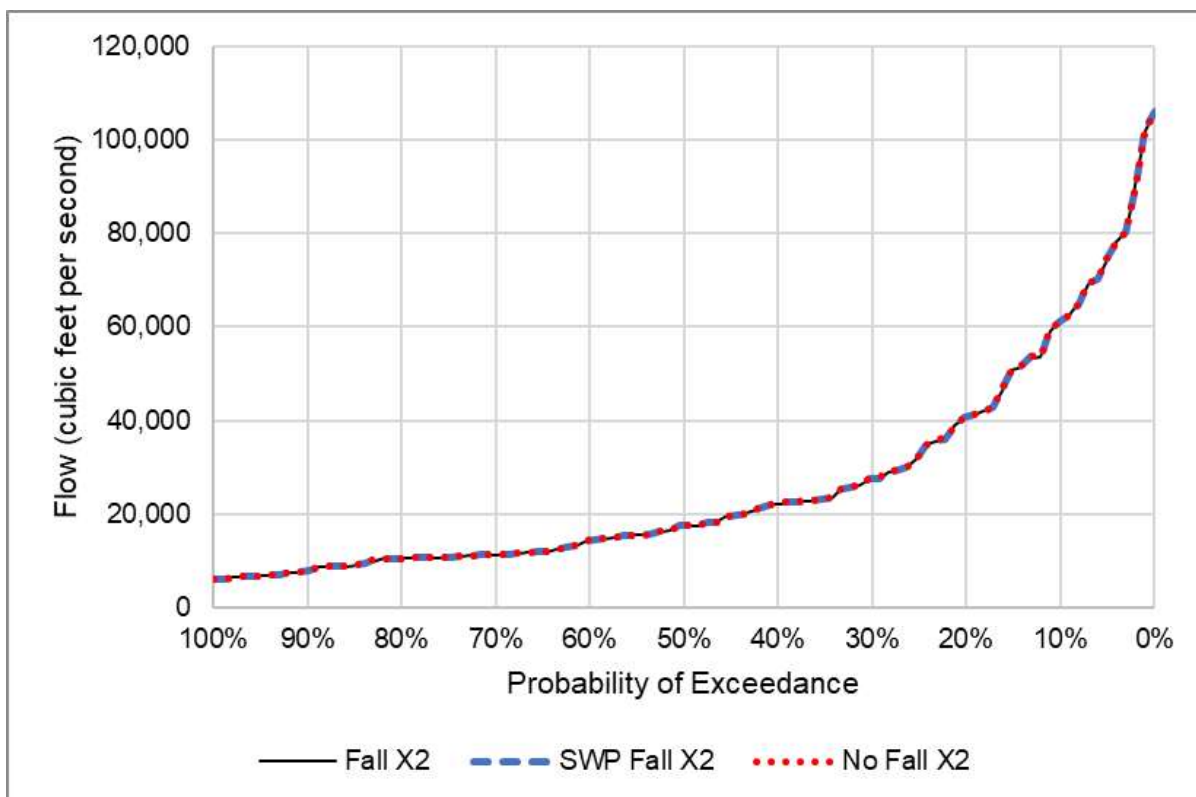
¹ The timing of high flows affecting spawning habitat quality would be approximately February–May, with a peak in April (Kohlhorst 1976).

amendment, given the unclear conceptual linkage to the life cycle as well as broad confidence intervals on the fall correlations (Arroyo-Esquivel et al. 2026:Figure 9). Arroyo-Esquivel et al. (2026) noted that Delta outflow and Delta inflow have a correlation of 99.3 percent, which suggests that models using inflow or other variables would result in a similar fit to the models using outflow presented in their paper. If the main driver of population dynamics is the result of effects on spawning and egg incubation habitat, consistent with some of the potential mechanisms discussed by Arroyo-Esquivel et al. (2026), then there is no supporting evidence that the proposed major amendment would affect spawning habitat, which primarily occurs in the Sacramento River from Knights Landing to just upstream of Colusa (Kohlhorst 1976). The SWP ITP Application supplement for White Sturgeon examined potential effects based on March–July and April–May Delta outflow (ICF 2024:4-5); there are very limited differences in Delta outflow between the scenarios modeled in CalSim 3 during these months (Table 2-1; Figures 2-27 and 2-28), which provides evidence that there is likely little effect of the proposed major amendment without Fall X2 relative to inclusion of Fall X2.



Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except it only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-27. Mean March–July Delta Outflow from CalSim 3 Modeling.



Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-28. Mean April–May Delta Outflow from CalSim 3 Modeling.

DWR is implementing 2024 ITP COA 7.10.1, *White Sturgeon Science Program*, including planning development of a life cycle model and related activities, with the goal of informing management and identifying potential additional management actions that could improve species status. It is anticipated that this effort will further elucidate potential flow-related mechanisms, including seasonal Delta outflow.

2.2.2.6 Significance of Impacts on Delta Smelt, Longfin Smelt, Winter-Run and Spring-Run Chinook Salmon, and White Sturgeon

Because modifying ITP COA 9.1.3, *Delta Smelt Summer-Fall Habitat Action*, by permanently removing the requirement to maintain X2 at or above 80 km in Wet and Above Normal water year types in exchange for additional alternative actions, including wetland habitat creation and the DSSEEP are expected to provide equal or better benefits to CEQA-listed species and would have limited effects on south Delta entrainment risk and survival or abundance for those species. Therefore, impacts of the Proposed Project on Delta Smelt, Longfin Smelt, winter-run and spring-run Chinook Salmon, and White Sturgeon would be **less than significant**.

All other provisions of the ITP would remain in effect. No changes to SWP facilities or other operations are proposed and, thus, would have no impact on the species.

2.2.3 Analysis of Effects on Other Fish and Aquatic Species of Management Concern

Other fish and aquatic species were considered based on listing by federal agencies as endangered or threatened; California Species of Special Concern (critical, high, or moderate concern status); and species of tribal, commercial, or recreational importance (California Department of Water Resources 2024:Table 6-1).

Federally listed species include Central Valley steelhead and Green Sturgeon. There are no anticipated effects on adult steelhead migrating upstream due to the proposed major amendment because there is no evidence to suggest that reductions in Delta outflow from removal of Fall X2 or incidental increases in winter-spring Delta outflow would affect their migration cues to upstream natal habitats. Juvenile steelhead would not experience significant differences in through-Delta survival or south Delta entrainment risk under the proposed major amendment, given the temporal overlap with winter- and spring-run Chinook Salmon and effects discussed for those species in Section 2.2.2.4, “Winter-Run and Spring-Run Chinook Salmon.” Steelhead entrainment risk would continue to be limited by existing OMR management (California Department of Water Resources 2024:2-29–2-30). Green Sturgeon are found in the Delta year-round and there is no evidence that the resulting salinity or X2 from the proposed major amendment would affect their rearing conditions because they freely move between brackish and freshwater habitats (Miller et al. 2020; Sellheim et al. 2022; Thomas et al. 2022). Green Sturgeon have been salvaged in four of 17 years since 2009 at the SWP Skinner Delta Fish Protective Facility, with the timing of salvage varying but including August–November in 2024–2025 (Table 2-8). The relative scarcity of Green Sturgeon in SWP salvage suggests that changes in south Delta exports and OMR flows during the Fall X2 period as a result of the proposed major amendment generally would be expected to result in little difference in entrainment effects on Green Sturgeon as a result of the proposed major amendment, although there is the potential for minor increases in entrainment given increases in Banks SWP exports during the months with observed salvage in 2024–2025 (Table 2-1). SWP/CVP operations include a combined take limit for Green Sturgeon (National Marine Fisheries Service 2024:900). That limit is presently under re-evaluation through an ongoing coordination effort between the National Marine Fisheries Service and Reclamation.

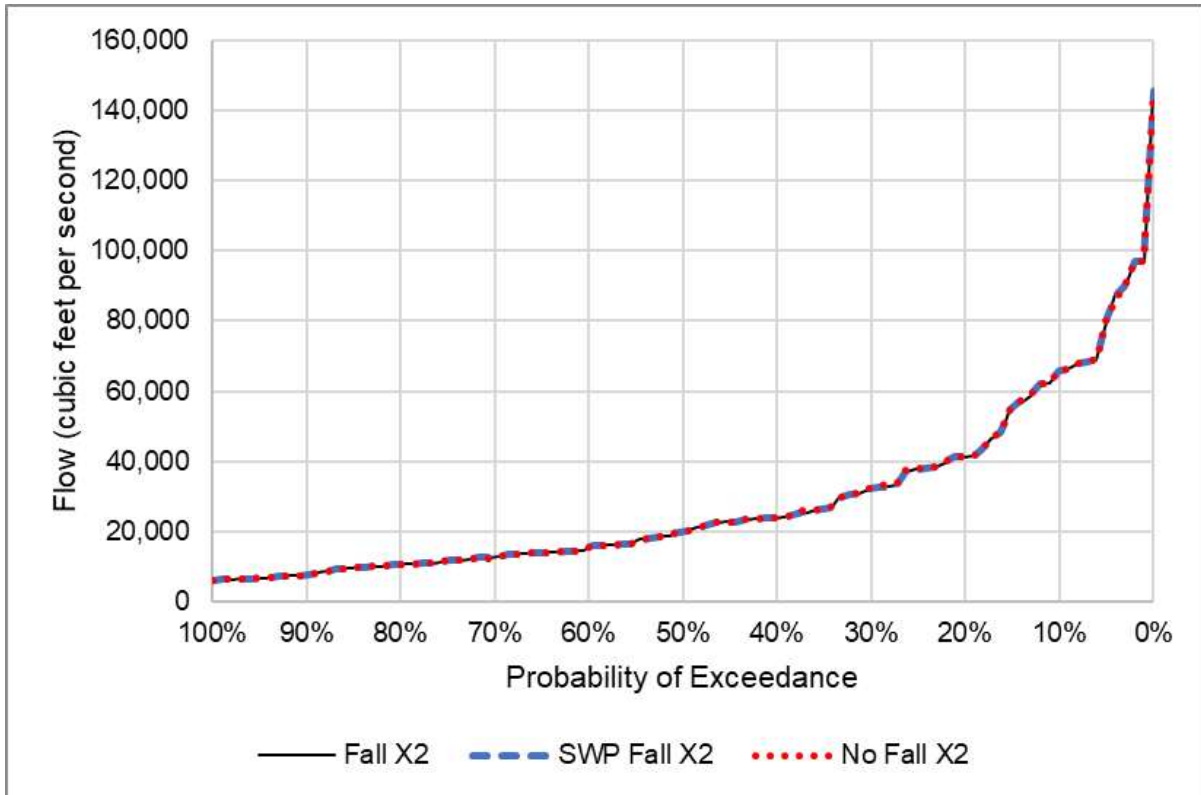
Table 2-8. Green Sturgeon Total SWP Salvage and Monthly Salvage as Percentage of Total Annual Salvage, 2009–2025

Year	Total SWP Salvage	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
2009	0	—	—	—	—	—	—	—	—	—	—	—	—
2010	0	—	—	—	—	—	—	—	—	—	—	—	—
2011	2	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2012	0	—	—	—	—	—	—	—	—	—	—	—	—
2013	0	—	—	—	—	—	—	—	—	—	—	—	—
2014	0	—	—	—	—	—	—	—	—	—	—	—	—
2015	0	—	—	—	—	—	—	—	—	—	—	—	—
2016	4	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2017	0	—	—	—	—	—	—	—	—	—	—	—	—
2018	0	—	—	—	—	—	—	—	—	—	—	—	—
2019	0	—	—	—	—	—	—	—	—	—	—	—	—
2020	0	—	—	—	—	—	—	—	—	—	—	—	—
2021	0	—	—	—	—	—	—	—	—	—	—	—	—
2022	0	—	—	—	—	—	—	—	—	—	—	—	—
2023	0	—	—	—	—	—	—	—	—	—	—	—	—
2024	6	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%
2025	18	0%	0%	0%	0%	0%	0%	0%	11%	56%	0%	33%	0%

Source: <https://apps.wildlife.ca.gov/Salvage>. Note: Shading represents September and October in Wet and Above Normal years meeting criteria for Fall X2 implementation from the 2024 ITP.

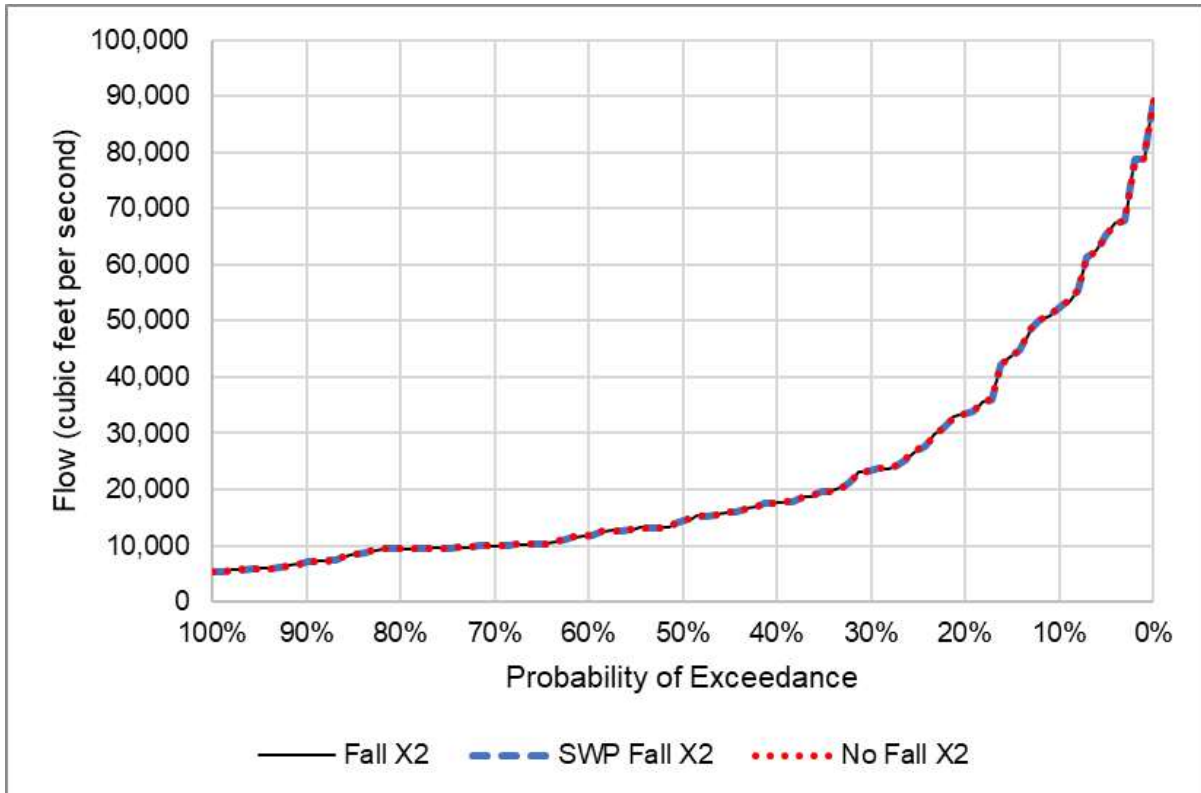
Non-listed fish and aquatic species which have had historical salvage greater than a small number of individuals include fall-run and late fall-run Chinook Salmon, lamprey, Sacramento Splittail, Striped Bass, and Largemouth Bass (California Department of Water Resources 2024:Appendix 6B, Tables 6B-5, 6B-6, 6B-14, 6B-22, 6B-26, and 6B-32). As described in the 2024 FEIR, the effects on these species from differences in operational scenarios would tend to be limited because of ancillary effects of OMR flow management for listed species (in particular, management for listed salmonids in the case of fall-run and late fall-run Chinook Salmon [California Department of Water Resources 2024:6-245]; see also Section 2.2.2.4, “Winter-Run and Spring-Run Chinook Salmon”); south Delta entrainment not being a driver of population dynamics for Sacramento Splittail or Striped Bass; low population-level entrainment effect because of low population occurrence in the south Delta for lamprey; and occupancy of nearshore habitat probably providing a buffer from entrainment for Largemouth Bass (California Department of Water Resources 2024:6-285, 6A-85, 6-281, and 6-311).

Besides south Delta entrainment effects, juvenile fall-run and late fall-run Chinook Salmon would not experience significant differences in through-Delta survival or south Delta entrainment risk under the proposed major amendment, given the temporal overlap with winter- and spring-run Chinook Salmon and limited effects discussed for those species in Section 2.2.2.4, “Winter-Run and Spring-Run Chinook Salmon.” Several other species have Delta outflow-abundance index relationships that overlap the winter/spring period, as described in the FEIR (i.e., Starry Flounder, Striped Bass, and American Shad), but there would not be significant effects of the proposed major amendment based on the relatively limited magnitude of difference in Delta outflow between modeled scenarios for the outflow periods relevant to each of these species (Starry Flounder: March–June [Figure 2-29]; Striped Bass: April–June [Figure 2-30]; and American Shad: February–June [Figure 2-31]; see also Table 2-1).



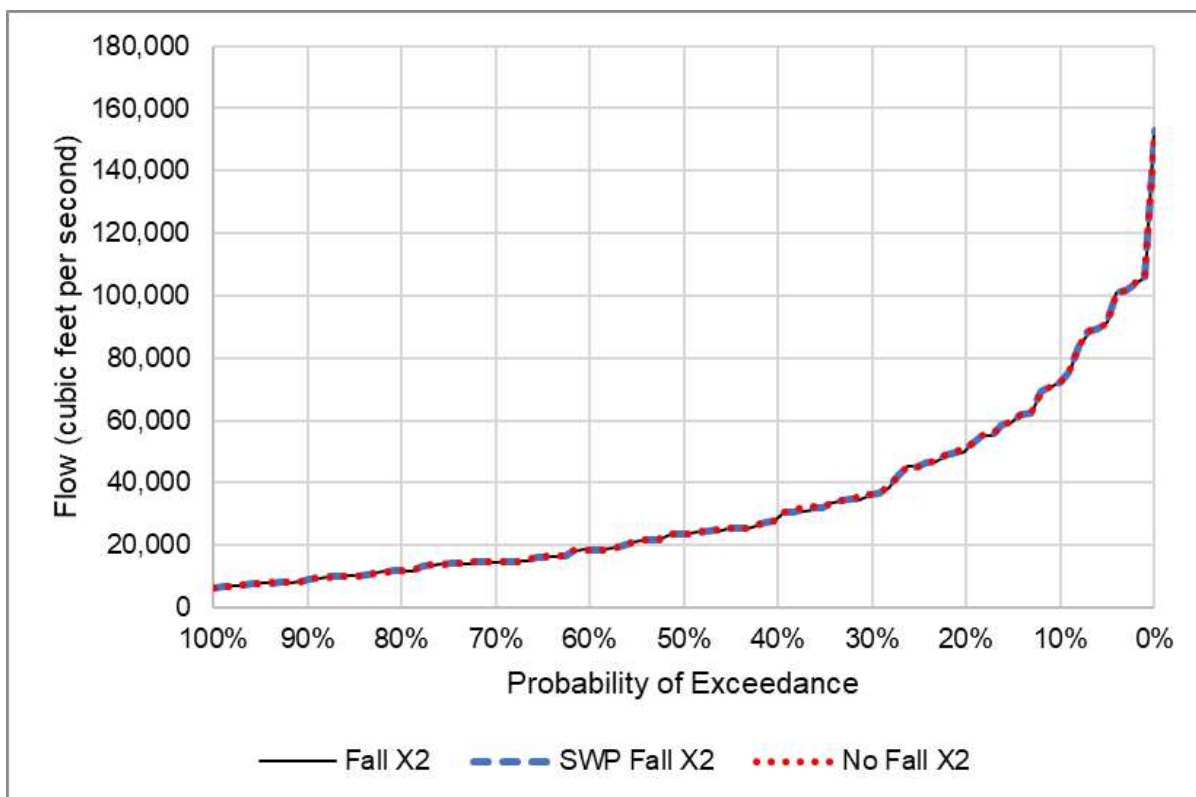
Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-29. Mean March–June Delta Outflow from CalSim 3 Modeling.



Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-30. Mean April-June Delta Outflow from CalSim 3 Modeling.



Note: Fall X2 scenario represents operations permitted by 2024 SWP ITP, including both SWP and CVP operating to Fall X2; SWP X2 scenario is the same as Fall X2 scenario except only includes SWP proportional share of Fall X2; No Fall X2 scenario represents the proposed major amendment and excludes Fall X2.

Figure 2-31. Mean February–June Delta Outflow from CalSim 3 Modeling.

As described in Section 1.2.2.1, “Condition 9.1.3, Delta Smelt Summer-Fall Habitat Action,” the proposed major amendment includes an alternative action for COA 9.1.3 that would flood 315 acres of wetlands during the summer and fall to provide food subsidies in Suisun Marsh, where historically Delta Smelt have been most present. This action would likely have little to no potential for effects on the listed fish species other than Delta Smelt because of factors such as little to no spatiotemporal overlap of the species with the action. This action could increase food supply for some of the other fish and aquatic species of management of concern occurring in Suisun Marsh, such as Sacramento Splittail and Striped Bass (Colombano et al. 2020, 2021). Monitoring for water quality would occur to assess potential negative effects on factors such as dissolved oxygen, although such effects would be expected to be limited in the open waters of Suisun Marsh receiving water released from the managed wetland based on observations of an initial decrease in dissolved oxygen following flooding of a wetland followed by improvement as organic matter microbial decomposition decreases (Phillips et al. 2026).

All other provisions of the 2024 LTO ITP would remain in effect. No changes to SWP facilities or other operations are proposed and, thus, would have no impact on other fish and aquatic species of management concern.

2.2.3.1 Significance of Impacts on Other Fish and Aquatic Species of Management Concern

Because the proposed major amendment would have limited effects on south Delta entrainment risk and survival or abundance for other fish and aquatic species of management concern, impacts associated with the proposed major amendment would be **less than significant**.

2.2.4 Cumulative Impacts

As described in the 2024 FEIR, the incremental contribution of the long-term operations of the SWP to the cumulative impact on aquatic and terrestrial biological resources would not be cumulatively considerable because the proposed SWP operations are subject to the same regulatory framework promulgated by the federal and state resource agencies, and include environmental commitments, conservation, or protective measures specifically intended to offset, reduce, or otherwise limit potential impacts on aquatic species. Because modification of ITP COAs 9.1.3 and 9.1.4 would not result in additional significant impacts on fish and aquatic species of management concern and DWR would continue to implement operational criteria and minimization/mitigation measures (e.g., as described in the 2024 FEIR and required by the 2024 SWP ITP), the long-term operation of the SWP would not result in cumulatively considerable impacts.

2.3 Conclusions

As described in this Addendum, the proposed change to COAs 9.1.3 and 9.1.4 of the 2024 LTO ITP does not require revisions to the conclusions or findings presented in the 2024 FEIR because no new or substantially more intense or severe significant environmental impacts, or potentially significant environmental impacts would occur.

Based on the discussion presented in Section 2.2, “Environmental Analysis,” the Proposed Project Description updates (i.e., changes to COAs 9.1.3 and 9.1.4 of the 2024 LTO ITP) would not result in any of the conditions described in Sections 15162 and 15163 of the State CEQA Guidelines that call for preparation of a subsequent EIR or supplemental EIR.

In summary, the proposed modifications to COAs 9.1.3, *Delta Smelt Summer-Fall Habitat Action*, and 9.1.4, *Delta Smelt Supplementation Program*, of the 2024 LTO ITP would not result in any of the following:

- New significant or potentially significant environmental effects.
- Substantial increases in the intensity or severity of previously identified significant effects.
- Mitigation measures or alternatives previously found to be infeasible becoming feasible.
- Availability/implementation of mitigation measures or alternatives that are considerably different from those analyzed in the 2024 FEIR that would substantially reduce one or more significant or potentially significant effects on the physical environment.

These conclusions confirm that a subsequent or supplemental EIR is not warranted, and this Addendum to the 2024 FEIR is the appropriate CEQA document pursuant to State CEQA Guidelines Section 15164 to evaluate and document the changes and additions to the long-term operation of

the SWP facilities in the Delta. No changes are needed to the certified 2024 FEIR for long-term operations of the SWP.

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3.2 Personal Communications

Costa, Vanessa. Senior Environmental Scientist, Specialist, State Water Project Permitting Unit, Ecosystem Conservation Division – Water Branch, California Department of Fish and Wildlife. June 19, 2024—Email containing coded wire tagged winter-run and spring-run Chinook Salmon loss data Excel file sent to Marin Greenwood, Aquatic Ecologist, ICF, Sacramento, CA.

Nguyen, Bryan. Senior Environmental Scientist (Specialist), Division of Integrated Science and Engineering, California Department of Water Resources, West Sacramento, California. May 20, 2025—Email containing tab-separated-value file with spring-run Chinook Salmon genetic identification data sent to Marin Greenwood, Aquatic Ecologist, ICF, Sacramento, CA.

Polansky, Leo. Quantitative Ecologist, U.S. Fish and Wildlife Service, Sacramento, California. March 20, 2026 — Catch data from the Enhanced Delta Smelt Monitoring Program and modeled survival for Nov to March using historical Delta Smelt catch sent to Brian Schreier, Environmental Program Manager, California Department of Water Resources, West Sacramento, CA.

Reece, Kevin. Environmental Program Manager, Water Initiatives Planning and Management Branch, Division of Operations and Maintenance, California Department of Water Resources, Sacramento, California. July 21 and September 1, 2023; May 13 and August 12, 2025—Emails containing Excel files with genetically identified and coded wire tagged winter-run and spring-run Chinook Salmon loss data sent to Marin Greenwood, Aquatic Ecologist, ICF, Sacramento, CA.