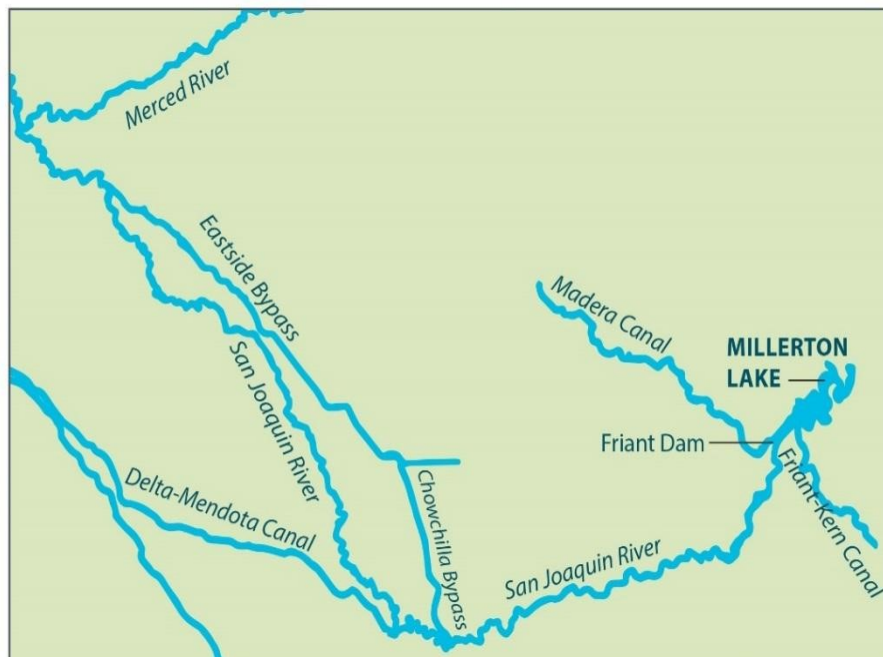


The San Joaquin River Restoration Program (SJRRP) implements the San Joaquin River Restoration Settlement Act (Settlement Act) in Title X of Public Law 111-11. USFWS and NMFS issued BOs in 2012 that included project-level consultation for SJRRP flow releases up to 1,660 cfs, but require reconsultation for flows higher than that amount. recapture of those flows in the lower San Joaquin River



and the Delta, and all physical restoration and water management actions listed in the Settlement Act. Flows in the San Joaquin River below the Merced River confluence to the Delta are controlled in large part by releases from reservoirs located on the tributary systems to satisfy contract deliveries and instream flow requirements and operational agreements such as D-1641.

Figure 3.3-6. San Joaquin River Facilities

3.4 Alternative 1

Alternative 1 includes a combination of flow-related actions, habitat restoration, and intervention measures. Table 3.4-1, Components of Alternative 1, shows each of the components of Alternative 1, including both operational changes and nonflow habitat and facility improvements. The table shows whether each action is covered at a project or program level of analysis in this EIS. Alternative 1 components within each basin are described in more detail in the sections following the table. If not mentioned in the table, the No Action Alternative operations remain (Appendix D includes a comparison table with all components).

Table 3.4-1. Components of Alternative 1

Title	Project-Level Analysis or Program-Level Analysis	Construction Effects
Upper Sacramento		
Spring Pulse Flows	Project	–
Shasta Cold Water Pool Management	Project	–
Fall and Winter Refill and Redd Maintenance	Project	–
Rice Decomposition Smoothing	Project	–
Spring Management of Spawning Locations	Program	–
Coldwater Management Tools (e.g., Battle Creek Restoration, Intake Lowering near Wilkins Slough, Shasta TCD Improvements)	Program	X
Spawning and Rearing Habitat Restoration	Program	X
Small Screen Program	Program	X
Winter-Run Conservation Hatchery Production	Program	X
Adult Rescue	Program	–
Juvenile Trap and Haul	Program	X
Trinity		
Whiskeytown Reservoir Operations/Clear Creek Flows	Project	–
Feather River		
FERC Project #2100-134 controls operations; Alt 1 analyzes downstream of the FERC boundary	Project	–
American River		
2017 Flow Management Standard Releases and Planning Minimum	Project	–
Spawning and Rearing Habitat Restoration	Program	X
Drought Temperature Facility Improvements	Program	X
Stanislaus		
Stanislaus Stepped Release Plan	Project	–
Alteration of Stanislaus DO Requirement	Project	–
Spawning and Rearing Habitat Restoration	Program	X
Temperature Management Study	Program	–
San Joaquin		
Lower San Joaquin River Habitat	Program	X
Bay-Delta		
Delta Cross Channel Operations	Project	–
Water Transfers	Project	–
Clifton Court Aquatic Weed and Algal Bloom Management	Project	–
OMR Management	Project	–
Tracy Fish Collection Facility CO2 Injector and Release Sites	Project	–
Operations		
Delta Smelt Summer-Fall Habitat	Project	–
San Joaquin Basin Steelhead Telemetry Study	Project	–

Title	Project-Level Analysis or Program-Level Analysis	Construction Effects
Sacramento Deepwater Ship Channel Food Study	Program	–
North Delta Food Subsidies/Colusa Basin Drain Study	Program	–
Suisun Marsh Roaring River Distribution System Food Subsidies Study	Program	–
Habitat Restoration		
Predator Hot Spot Removal	Program	–
Facility Improvements		
Delta Cross Channel Gate Improvements	Program	X
Tracy Fish Facility Improvements	Program	X
Skinner Fish Facility Improvements	Program	X
Small Screen Program	Program	X
Fish Intervention		
Reintroduction efforts from Fish Conservation and Culture Laboratory	Project	–
Delta Fish Species Conservation Hatchery	Program	X

OMR = Old and Middle River; TCD = temperature control device

3.4.1 Upper Sacramento River (Shasta and Sacramento Divisions)

3.4.1.1 *Seasonal Operations*

Reclamation would continue to operate by season with the same primary purposes during each season as described for the No Action Alternative. For spring base flows under wetter hydrology, during the March through May time period, downstream demands are minimal and are generally met through unstored accretions to the system. Under these conditions, Reclamation aims to reduce Keswick flows during the fall-winter period. Operations under these conditions help build storage in those types of years. Other changes to specific operations are described below.

In addition to the requirements under D-1641, ramping rates for Keswick Dam between July 1 – March 31 would be reduced between sunset and sunrise:

- Keswick releases > 6,000 cfs, reductions in releases may not exceed 15% per night, and no more than 2.5% per hour.
- Keswick releases 4,000 cfs to 5,999 cfs reductions in releases may not exceed 200 cfs per night, or 100 cfs per hour.
- Keswick releases between 3,250 cfs and 3,999 cfs; reductions in releases may not exceed 100 cfs per night.

Ramping rates do not apply during flood control or if needed for facility operational concerns. The working groups may also determine a need for a variance.

3.4.1.2 *Spring Pulse Flows*

Under Alternative 1, Reclamation would release spring pulse flows to help Spring-Run Chinook Salmon juvenile out-migration when the projected total May 1 Shasta Reservoir storage indicates a likelihood of

sufficient coldwater to support summer coldwater pool management. Reclamation would evaluate the projected May 1 Shasta Reservoir storage at the time of the February forecast to determine whether a spring pulse would be allowed in March and would evaluate the projected May 1 Shasta Reservoir storage at the time of the March forecast to determine whether a spring pulse would be allowed in April. If Shasta Reservoir total storage on May 1 is projected to be sufficient for coldwater pool management, Reclamation could make a spring pulse release of up to 150 TAF in coordination with the upper Sacramento River scheduling team. Reclamation would make a determination of whether water could be released without affecting temperature management; Reclamation thinks that this volume is about 4 MAF, which is used as a surrogate for planning and analysis. Reclamation would not make pulse flow releases during times that Shasta Reservoir is releasing flood flows or if the release would interfere with the ability to meet other anticipated demands on the reservoir. Figure 3.4-1, Lake Shasta Spring Pulse Flow Operations, summarizes this operational regime. This figure shows timing of pulse flows potentially in March, April, or May, but the pulse flow total volume during the March through May period is up to 150 TAF total.

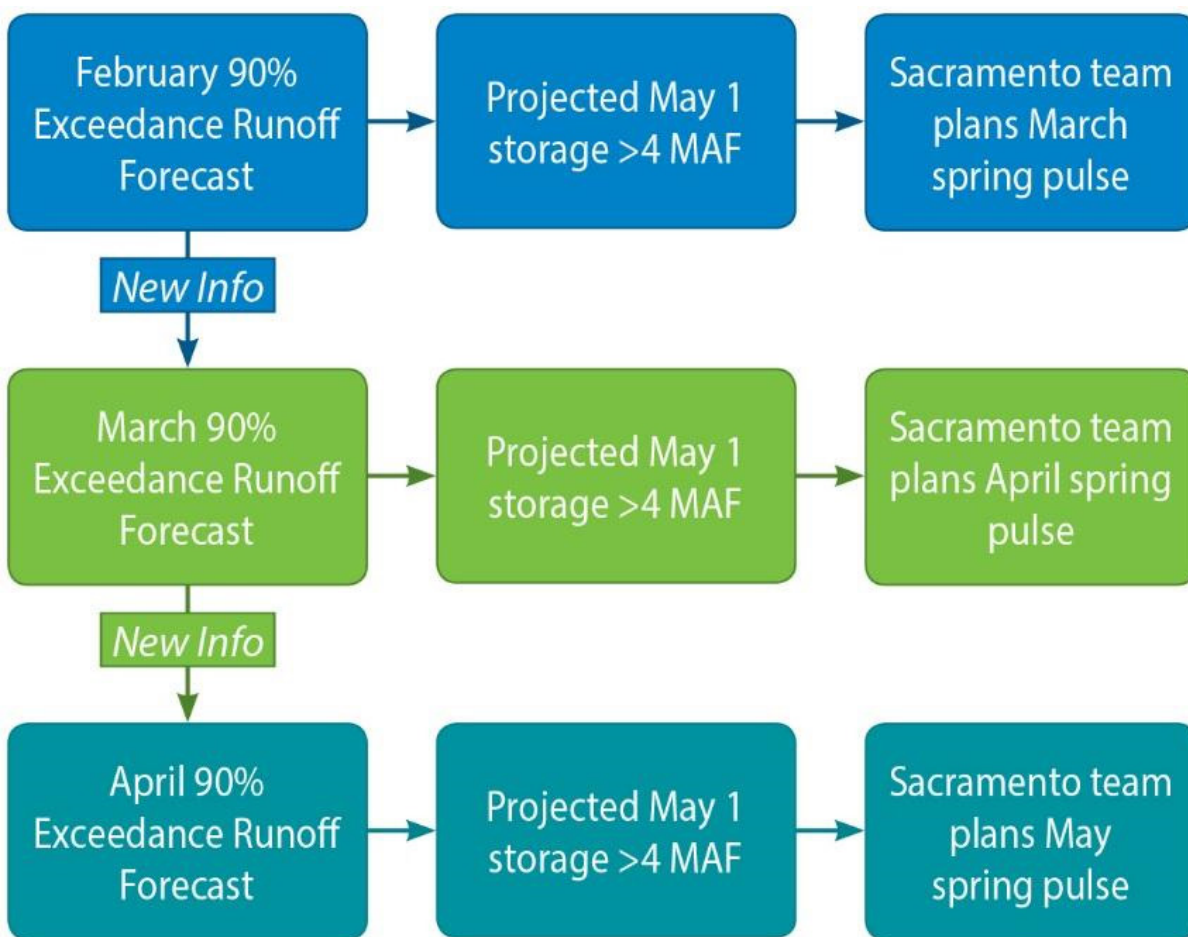


Figure 3.4-1. Lake Shasta Spring Pulse Flow Operations

3.4.1.3 Coldwater Pool Management

The closer Shasta Reservoir is to full by the end of May, the greater the likelihood of being able to meet the Winter-Run Chinook Salmon temperature control criteria throughout the entire temperature control season. If Shasta Reservoir storage is high enough to use the Shasta TCD upper shutters by the end of

May, Reclamation can maximize the coldwater pool potential. Figure 3.4-2, Relationship between Temperature Compliance, Total Storage in Shasta Reservoir, and Coldwater Pool in Shasta Reservoir, provides an approximate rule of thumb for the relationship between temperature compliance, total storage in Shasta Reservoir, and coldwater pool in Shasta Reservoir.

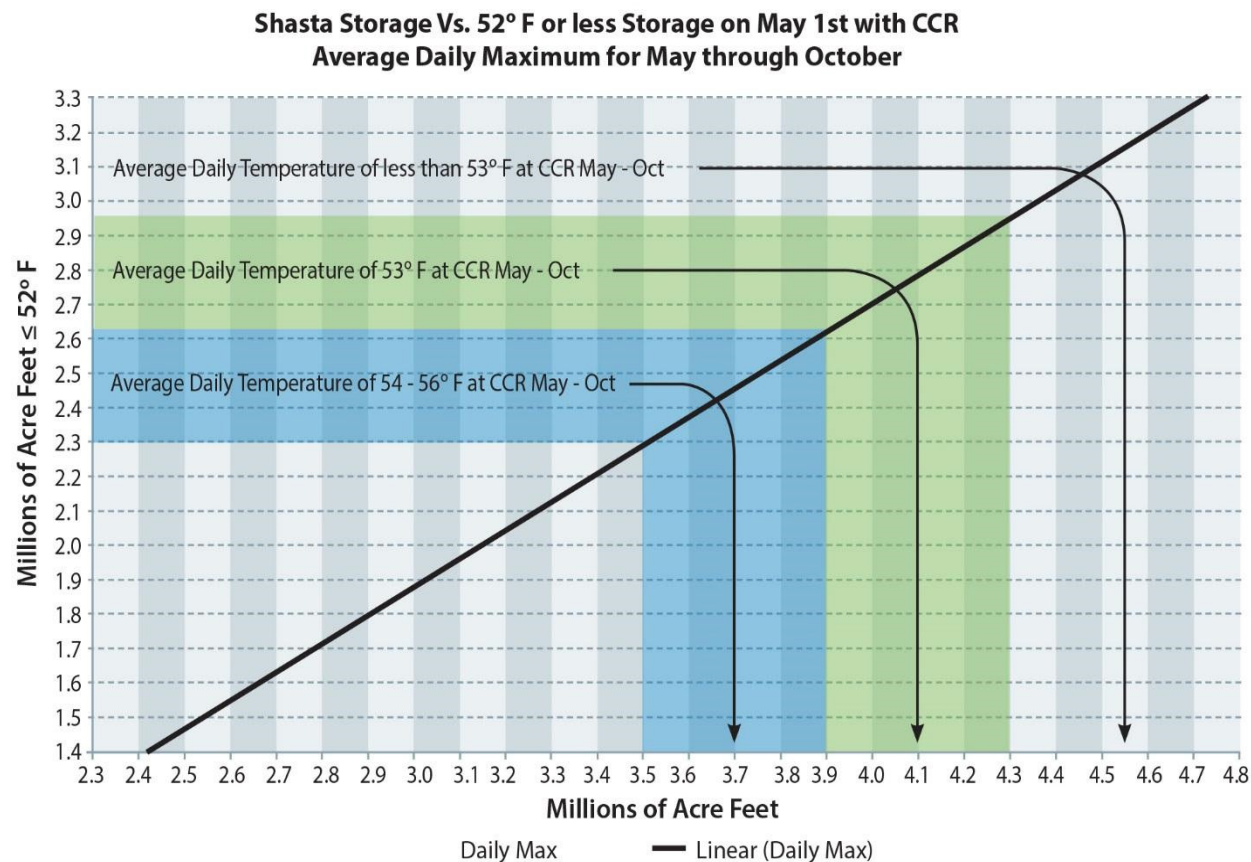


Figure 3.4-2. Relationship between Temperature Compliance, Total Storage in Shasta Reservoir, and Coldwater Pool in Shasta Reservoir

3.4.1.3.1 Summer Coldwater Pool Management

Under Alternative 1, Reclamation would operate the Shasta TCD to continue providing temperature management in accordance with CVPIA Section 3406(b)(6) while minimizing impacts on power generation. Coldwater pool is defined as the volume of water in Shasta Reservoir that is less than 52°F, which Reclamation would determine based on monthly (or more frequently) reservoir temperature profiles. The Sacramento River above Clear Creek gage is a surrogate for the downstream extent of most Winter-Run Chinook Salmon redds. Temperature management would start after May 15 or when the monitoring working group determines, based on real-time information, that Winter-Run Chinook Salmon have spawned, whichever is later. Temperature management would end October 31 or when the monitoring working group determines, based on real-time monitoring, that 95% of Winter-Run Chinook Salmon eggs have hatched and alevin have emerged, whichever is earlier.

Reclamation would address coldwater management using a tiered strategy that allows for strategically selected temperature objectives, based on projected total storage and coldwater pool, meteorology, Delta conditions, and habitat suitability for incoming fish population size and location. The tiered strategy

recognizes that coldwater is a scarce resource that can be managed to achieve desired water temperatures for fisheries objectives. Figure 3.4-3, Decision Tree for Shasta Reservoir Temperature Management, provides a decision tree explaining the decision points for Shasta Reservoir temperature management.

Reclamation would provide a draft temperature management plan to the Sacramento River Temperature Task Group (SRTTG) in April for its review and comment, consistent with WRO 90-5. The draft temperature management plan would describe which of the four tiers Reclamation forecasts for that year's summer temperature management season, along with a temperature modeling scenario and the operations forecast. The scenario would include projected reservoir releases, assumed meteorological conditions, and anticipated water temperatures and target locations for the planned water temperature targets (including allowable tolerances). Reclamation expects that tolerances would be based on conditions and modeling for

that year.

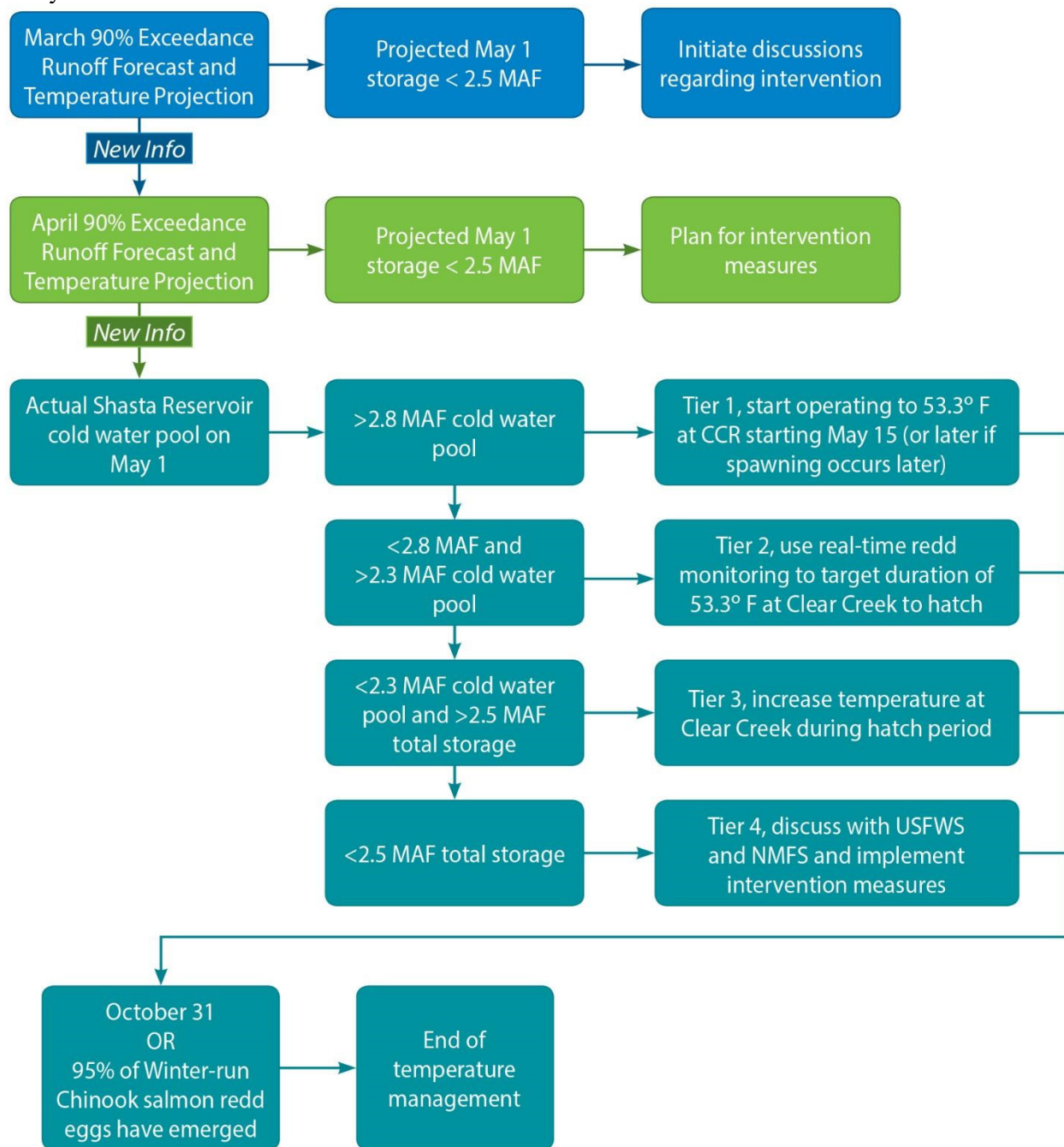


Figure 3.4-3. Decision Tree for Shasta Reservoir Temperature Management

3.4.1.3.2 Commitment to Coldwater Management Tiers

Once the initial tier is selected by May 15th, Reclamation would not cause a shift into a warmer tier during real-time implementation of the Shasta Coldwater Management Plan except in the event of responding to emergency and/or unforeseen conditions. Reclamation would reevaluate the temperature management plan (and associated tier) at least monthly and would notify NMFS within 2 business days of determining a potential change to the plan is necessary. Reclamation may be able to adjust operations to

overcome unexpected events without changing to a lower tier. Should Reclamation be unable to remain within the same or cooler tier identified by the Shasta Cold Water Pool Management Plan, Reclamation would coordinate with NMFS on the need to charter an independent panel, at the end of the temperature management season, consistent with “Chartering of Independent Panels) under the “Governance” section of Alternative 1. The purpose of the independent review would be to evaluate the conditions experienced during the years under review, the success of the implementation of the tiered strategy, the effect of the implementation on the species, and, if needed, to develop recommendations to improve its implementation.

3.4.1.3.3 Upper Sacramento Performance Metrics

Reclamation would apply performance metrics for assessing coldwater management under the different tiers. The objective is to ensure that the performance falls within the modeled range, and shows a tendency towards performing at least as well as the distribution produced by the simulation modeling of Alternative 1. If Alternative 1 performance falls outside the performance metrics in any single year, Reclamation would work with NMFS to determine if an independent panel is necessary. If necessary, the independent panel process would move forward as described in the “Governance” section of Alternative 1.

3.4.1.4 *Fall and Winter Refill and Redd Maintenance*

Under Alternative 1, Reclamation would rebuild storage and coldwater pool for the subsequent year. Maintaining releases to keep late spawning Winter-Run Chinook Salmon redds underwater may drawdown storage necessary for temperature management in a subsequent year. Reclamation would minimize effects with a risk analysis of the remaining Winter-Run Chinook Salmon redds, the probability of sufficient coldwater in a subsequent year, and a conservative distribution and timing of subsequent Winter-Run Chinook Salmon redds. If the combined productivity of the remaining redds plus a conservative scenario for the following year is less than the productivity of maintaining releases, Reclamation would reduce releases to rebuild storage. The conservative scenario for the following year would include a 75% (dry) hydrology; 75% (warm) climate; a median distribution for the timing of redds; and the ability to remain within Tier 3 or higher (colder) tiers. The forecast for flows in the fall would include any approved water transfers that may occur during this period.

Demands by the wildlife refuges, upstream CVP contractors, and the Sacramento River Settlement Contractors in October result in Keswick Dam releases that are generally not maintained throughout the winter due to needs to store water for beneficial uses the following year. These releases result in some early fall Chinook redds being dewatered at winter base flows. If, based on the above analysis, Reclamation determines releases need to be reduced to rebuild storage, targets for winter base flows (December 1 through the end of February) from Keswick Dam would be set in October based on Shasta Reservoir end-of-September storage. These targets would be set based on end-of-September storage and the current hydrology after accounting for Winter-run Chinook Salmon redd stranding. Base flows would be set based on historical performance to accomplish improved refill capabilities for Shasta Reservoir to build coldwater pool for the following year. Table 3.4-2, Keswick Dam Example Release Schedule for End-of-September Storage, shows examples of possible Keswick Dam releases based on Shasta Reservoir storage condition; these would be refined through future modeling efforts as part of the seasonal operations planning.

Table 3.4-2. Keswick Dam Example Release Schedule for End-of-September Storage

Keswick Release	Shasta End-of-September Storage
3,250 cfs	≤ 2.2 MAF
4,000 cfs	≤ 2.8 MAF
4,500 cfs	≤ 3.2 MAF
5,000 cfs	> 3.2 MAF

cfs = cubic feet per second

High storage years are not necessarily correlated with a following wetter fall and winter. As a result, Reclamation would manage the real time releases based on conditions observed. In scenarios where higher storage exists at the end of September but the fall hydrology is dry (generally defined as below 90% exceedance of historical hydrology), Reclamation would coordinate with appropriate agencies, including NMFS and CDFW at a minimum, to reduce flows below those described in the table, if possible.

3.4.1.5 Additional Operations Components

In addition to the changes to Shasta Reservoir coldwater pool operations, Alternative 1 includes multiple components to increase water deliveries and protect listed fish:

- Rice Decomposition Smoothing – Following the emergence of Winter-Run Chinook Salmon and prior to the majority of Fall-Run Chinook Salmon spawning, upstream Sacramento Valley CVP contractors and Sacramento River Settlement Contractors would work to synchronize their diversions to lower peak rice decomposition demand.
- Spring Management of Spawning Locations – Reclamation would establish experiments to refine the state of the science and determine if keeping water colder earlier induces earlier spawning or if keeping April to May Sacramento River temperatures warmer induces later spawning.
- Coldwater Management Tools – Reclamation would explore additional opportunities to extend the coldwater pool. Options include:
 - *Temperature Modeling Platform*: Reclamation would continue work to develop a new temperature model for the Upper Sacramento River (Shasta and Keswick Reservoirs) through a collaborative process that includes the NMFS Science Center.
 - *Battle Creek Restoration* – Reclamation would accelerate implementation of the Battle Creek Salmon and Steelhead Restoration Project. Completion of this project would reintroduce a new population of Winter-Run Chinook Salmon, which could provide temperature compliance flexibility.
 - Lower Intakes near Wilkins Slough – This action would provide grants to water users within this area to install new diversions and screens that would operate at lower flows, which would allow Reclamation to have greater flexibility in managing Sacramento River flows and temperatures for both water users and wildlife, including listed salmonids (NCWA 2014).
 - Shasta TCD Improvements – Reclamation would study the feasibility of infrastructure improvements to enhance TCD performance, including reducing the leakage of warm water into the structure.

3.4.1.6 *Habitat Restoration Components*

Alternative 1 includes the following habitat restoration components:

- Spawning Habitat – Reclamation would create additional spawning habitat by adding approximately 15,000 to 40,000 tons of gravel annually into the Sacramento River to 2030, using the following sites: Keswick Dam Gravel Injection Site, Market Street Injection Site, Redding Riffle, Turtle Bay, Tobiasson Island, Shea Levee sites, and Kapusta.
- Rearing Habitat – Reclamation, in coordination with Sacramento River Settlement Contractors, would create 40 to 60 acres of side channel and floodplain habitat at multiple sites in the Sacramento River by 2030.
- Small Screen Program – Reclamation and DWR would continue to work within existing authorities (e.g., Anadromous Fish Screen Program) to screen small diversions throughout Central Valley CVP and SWP streams and the Bay-Delta.

3.4.1.7 *Intervention Components*

Alternative 1 includes the following intervention components:

- Winter-Run Chinook Salmon Conservation Hatchery Production – In a Tier 4 coldwater pool management year, Reclamation would work with USFWS to increase production of Winter-Run Chinook Salmon.
- Adult Rescue – Reclamation would trap and haul adult salmonids and sturgeon from Yolo and Sutter Bypasses during droughts and after periods of bypass flooding, when flows from the bypasses are most likely to attract upstream migrating adults and move them up the Sacramento River to spawning grounds.
- Trap and Haul – If Reclamation projects a Tier 4 year (less than 2.5 MAF of storage at the beginning of May), Reclamation would implement a downstream trap and haul strategy for the capture and transport of juvenile Chinook Salmon and steelhead in the Sacramento River watershed. Tier 4 years are anticipated to be drought years when low flows and resulting high water temperatures are unsuitable for volitional downstream migration and survival.
- Director Meetings – In the event of two successive years with total egg-to-fry survival less than 15% in each year, Reclamation would convene a meeting of the Regional Directors of DWR, NMFS, USFWS, and CDFW to identify and implement actions to address the potential for a third year of low survival.

3.4.2 **Trinity River Division**

Seasonal operations in Trinity Reservoir would continue to be integrated with Shasta Reservoir operations, as described in the No Action Alternative. Additionally, Reclamation would continue to implement the Trinity River ROD and lower Klamath River augmentation flows (from the 2017 Lower Klamath ROD) that are described in the No Action Alternative. Whiskeytown Reservoir operations would be similar to those described for the No Action Alternative, with minor changes to accommodate Clear Creek flow measures described below. While Lewiston Dam releases to the Trinity River would in accordance with the ROD of 2000, modifications of operations of the CVP could cause minor changes in

the operations on the Trinity River. Spring Creek Debris Dam operations and the Clear Creek Restoration Program would continue as described in the No Action Alternative.

3.4.2.1 Clear Creek Flows

Reclamation would release Clear Creek flows in accordance with the 2000 agreement between Reclamation, USFWS, and CDFW and the April 15, 2002 SWRCB permit, which established minimum flows to be released to Clear Creek at Whiskeytown Dam. Reclamation would release a minimum base flow in Clear Creek of 200 cfs from October through May and 150 cfs from June through September in all water year types except critical water year types. In critical years, Clear Creek base flows may be reduced below 150 cfs based on available water from Trinity Reservoir. Additional flow may be required for temperature management during the fall.

In addition, Reclamation would create pulse flows for both channel maintenance and spring attraction flows. For spring attraction flows, Reclamation would release 10 TAF (measured at the release), with daily release up to the safe release capacity (approximately 900 cfs, depending on reservoir elevation and downstream capacity), in all water year types except for critical water year types to be shaped by the Clear Creek Implementation Team in coordination with Reclamation's Central Valley Operations Office. For channel maintenance flows, Reclamation would release 10 TAF from Whiskeytown Dam, with a daily release up to the safe release capacity, in all water year types except dry and critical (based on the Sacramento Valley index) to be shaped by the Clear Creek Implementation Team in coordination with Reclamation Central Valley Operations Office.

The outlet from Whiskeytown Reservoir to Clear Creek is equipped with outlets at two different elevations. Releases can be made from either or both outlets to manage downstream temperature releases. Reclamation would manage Whiskeytown releases to meet a daily average water temperature of 60°F at the Igo gage from June 1 through September 15 and 56°F or less at the Igo gage from September 15 to October 31. Reclamation may not be able to meet these temperatures in critical or dry water year types. In those years, Reclamation would operate as close to these temperatures as possible.

Reclamation, CDFW, and SWRCB have a memorandum of understanding (MOU) regarding operations of the Spring Creek Reservoir to manage runoff from Iron Mountain Mine for the protection of water quality in the Sacramento River. Concentrations of toxic metals in acidic drainage from Iron Mountain Mine have decreased steadily because of remedial actions, so the agencies are negotiating a new MOU for inclusion in the No Action Alternative. Reclamation expects for the interim operations (currently in place) to continue into the future.

3.4.3 Feather River

DWR would operate Oroville Dam consistent with the NMFS, USFWS, and CDFW environmental requirements applicable for the current FERC license for the Oroville Complex (FERC Project #2100-134), as under the No Action Alternative. If FERC issues a new license, DWR would operate to the terms in that license.

3.4.4 American River Division

Reclamation would operate Folsom Reservoir to meet water rights, contracts, and agreements that are specific to the American River Division and to those that apply to the entire CVP, including the Delta Division. For lower American River flows (below Nimbus Dam), Reclamation would adopt the minimum flow schedule and approach proposed by the Sacramento Area Water Forum in 2017 in the 2017 *Flow Management Standard Releases and Planning Minimum* (2017 FMS).

Under Alternative 1, Reclamation would work together with the American River water agencies to define an appropriate amount of storage in Folsom Reservoir that represents the lower bound for typical forecasting processes at the end of calendar year (that is, the planning minimum). The implementation of a planning minimum would allow Reclamation to work with the American River Group to identify conditions when local water actions may be necessary to ensure storage is adequate for diversion from the municipal water intake at Folsom Dam and/or the extreme hydrology presents a risk that needs to be properly communicated to the public and surrounding communities.

3.4.4.1 *Seasonal Operations*

In winter and spring, Reclamation would not reduce flows more than 500 cfs per day or more than 100 cfs per hour, except if necessary, for flood control operations. Reclamation would minimize releases above 4,000 cfs during sensitive life stages (eggs, incubation, rearing) of salmonids and steelhead to the extent feasible. As part of the 2017 FMS, Reclamation would implement redd dewatering protective adjustments to limit potential redd dewatering due to reductions in the minimum release during the January through May period.

During non-flood control operations within the fall and winter months, Reclamation would operate to build storage by making minimum releases and capturing inflows, although drier conditions may require releases for Delta requirements. To the extent possible, releases would be held relatively consistent to minimize potential redd dewatering.

Spring releases would be controlled by flood control requirements or, in drier hydrology, Delta requirements and water supply. Reclamation would operate Folsom Dam in a manner designed to maximize capture of the spring runoff to fill as close to full as possible. To the extent practicable, Reclamation would accommodate requests for spring pulse flows by reshaping previously planned releases; however, these requests would not be accommodated in times when they may compromise temperature operations later in the year.

Reclamation would continue making summer releases for instream temperature control, Delta outflow, and exports, typically above the planning minimum flows. By late October, it is typical for Folsom Reservoir to have depleted the coldwater pool. The primary way to provide additional instream cooling is to release water from the lower outlet works.

Reclamation would ramp down releases in the American River below Nimbus Dam as shown in Table 3.4-3.

Table 3.4-3: American River Ramping Rates

Lower American River Daily Rate of Change (cfs)	Amount of decrease in 24 hrs (cfs)	Maximum change per step (cfs)
20,000 to 16,000	4,000	1,350
16,000 to 13,000	3,000	1,000
13,000 to 11,000	2,000	700
11,000 to 9,500	1,500	500
9,500 to 8,300	1,200	400
8,300 to 7,300	1,000	350
7,300 to 6,400	900	300
6,400 to 5,650	750	250
5,650 to 5,000	650	250
<5,000	500	100

Ramping rates would not apply during flood control or if needed for facility operational concerns. The working groups may also determine a need for a variance.

3.4.4.2 Temperature Management

Reclamation would prepare a draft temperature management plan by May 15 for the summer through fall temperature management season using the best available (as determined by Reclamation) decision support tools. The draft plan would be shared with the American River Group before finalization and may be updated monthly based on system conditions.

3.4.4.3 Water Operations Component

In addition to the changes to Folsom Reservoir operations, Alternative 1 includes a component to increase water deliveries and protect listed fish:

- Drought Temperature Management – In severe or worse droughts, Reclamation would evaluate and implement alternative shutter configurations at Folsom Dam to allow temperature flexibility.

3.4.4.4 Habitat Restoration Components

Alternative 1 includes the following habitat restoration components:

- Spawning and Rearing Habitat – Pursuant to CVPIA 3406(b)(13), Reclamation would implement the Cordova Creek Phase II and Carmichael Creek Restoration projects and increase woody material in the American River. Reclamation would also conduct gravel augmentation and floodplain work at: Paradise Beach, Howe Ave, Howe Avenue to Watt Avenue, William Pond Outlet, Upper River Bend, Ancil Hoffman, Sacramento Bar—North, El Manto, Sacramento Bar—South, Lower Sunrise, Sunrise, Upper Sunrise, Lower Sailor Bar, Nimbus main channel and side channel, Discovery Park, and Sunrise Stranding Reduction.
- Reclamation would continue maintenance activities at Nimbus Basin, Upper Sailor Bar, Lower Sailor Bar, Upper Sunrise, Lower Sunrise, and River Bend restoration sites.

3.4.4.5 *Intervention Components*

Alternative 1 would include improvements to Nimbus Fish Hatchery to improve management. Reclamation would complete a Hatchery Genetics Management Plan for Steelhead and a Hatchery Management Plan for Fall-run Chinook Salmon as part of Nimbus Fish Hatchery management. Reclamation would work with CDFW and NMFS to establish clear goals, appropriate time horizons, and reasonable cost estimates for this effort.

3.4.5 *Bay-Delta*

As described in the No Action Alternative, the CVP and SWP divert water in the Delta through the Jones and Banks Pumping Plants for delivery to the Central Valley, San Francisco Bay Area, and Southern California. Operations of these facilities would continue in Alternative 1 with the changes described below.

3.4.5.1 *Delta Cross Channel*

Under Alternative 1, Reclamation would operate the DCC gates to reduce juvenile salmonid entrainment risk beyond actions described in D-1641, consistent with Delta water quality requirements in D-1641. From October 1 to November 30, if the Knights Landing Catch Index or Sacramento Catch Index are greater than three fish per day Reclamation would operate based on Table 3.4-3, Delta Cross Channel October 1–November 30 Action, and Table 3.4-4, Water Quality Concern Level Targets, to determine whether to close the DCC gates and for what duration. From December 1 to January 31, the DCC gates would be closed. If drought conditions were observed (i.e., fall inflow conditions were less than 90% of historic flows), Reclamation and DWR would consider opening the DCC gates for up to 5 days for up to two events within this period to avoid D-1641 water quality exceedances. Reclamation and DWR would coordinate with USFWS, NMFS, and the SWRCB on how to balance D-1641 water quality and ESA-listed fish requirements. Reclamation and DWR would conduct a risk assessment that would consider the Knights Landing Rotary Screw Trap monitoring, Delta juvenile fish monitoring program (Sacramento trawl, beach seines), Rio Vista flow standards, acoustic telemetered fish monitoring information as well as DSM2 modeling informed with recent hydrology, salinity, and tidal data. Reclamation would also consider the cumulative entrainment from prior years. Reclamation would evaluate this information to determine if fish responses may be altered by DCC operations. If the risk assessment determines that survival, route entrainment, or behavior change to create a new adverse effect or a greater range of an adverse effect, not considered under this alternative, Reclamation would not open the DCC. During a DCC gate opening between December 1 and January 31, the CVP and SWP would divert at health and safety pumping levels.

From May 21 to June 15, Reclamation would close the DCC gates for 14 days during this period, consistent with D-1641. Reclamation and DWR's risk assessment would consider the Knights Landing Rotary Screw Trap, Delta juvenile fish monitoring program (Sacramento trawl, beach seines), Rio Vista flow standards, acoustic telemetered fish monitoring information, Delta Simulation Model II – DSM2 modeling informed with recent hydrology, salinity, and tidal data. Reclamation would evaluate this information to determine if fish responses may be altered by DCC operations. If the risk assessment determines that survival, route entrainment, or behavior change would create a new adverse effect not considered under Alternative 1, Reclamation would not open the DCC.

Table 3.4-4. Delta Cross Channel October 1–November 30 Action

Date	Action Triggers	Action Responses
October 1–November 30	Water quality criteria per D-1641 are met and either the Knights Landing Catch Index or Sacramento Catch Index is greater than five fish per day.	Within 48 hours, close the DCC gates and keep closed until the catch index is less than three fish per day at both the Knights Landing and Sacramento monitoring sites.
	Water quality criteria per D-1641 are met and either Knights Landing Catch Index or the Sacramento Catch Index are greater than three fish per day but less than or equal to five fish per day.	Within 48 hours of trigger, DCC gates are closed. Gates would remain closed for 3 days.
	Water quality criteria per D-1641 are met, real-time hydrodynamic and salinity modeling shows water quality concern level targets are not exceeded during 28-day period following DCC closure, there is no observed deterioration of interior Delta water quality.	Within 48 hours of start of lower Mokelumne River attraction flow release, close the DCC gates for up to 5 days (dependent upon continuity of favorable water quality conditions).
	Water quality criteria per D-1641 are met and real time hydrodynamic and salinity modeling shows water quality concern level targets are exceeded during 14-day period following DCC closure.	No closure of DCC gates.
	The KLCI or SCI triggers are met but water quality criteria are not met per D-1641 criteria.	Monitoring groups review monitoring data and provide to Reclamation. Reclamation and DWR determine what to do with a risk assessment.

DCC = Delta Cross Channel, DWR = California Department of Water Resources, KLCI = Knights Landing Catch Index, SCI = Sacramento Catch Index

Table 3.4-5. Water Quality Concern Level Targets

Water Quality Concern Level Targets (Water Quality Model Simulated 14-day Average Electrical Conductivity)	
Jersey Point	1,800 µmhos/cm
Bethel Island	1,000 µmhos/cm
Holland Cut	800 µmhos/cm
Bacon Island	700 µmhos/cm

µmhos/cm = micromhos per centimeter

3.4.5.2 North Bay Aqueduct Operations

The NBA and Barker Slough Pumping Plant would continue to operate under applicable regulatory requirements and remove sediment and aquatic weeds as needed.

Sediment Removal

Sediment accumulates in the concrete apron sediment trap in front of the Barker Slough Pumping Plant fish screens and within the pump wells behind the fish screens. Sediment removal from the sediment trap and the pump wells would be removed as needed.

Accumulated sediment from the apron in front of the fish screen and in the pump wells behind the fish screen would be removed by suction dredge. Removal of sediment from within the pump wells would occur as needed, year-round. Removal of sediment from the apron area in front of the fish screens would occur during summer and early fall months and during the annual North Bay Aqueduct shutdown in March. The North Bay Aqueduct is annually taken off-line for one-to-two weeks for routine maintenance and repairs, and the Barker Slough Pumping Plant is non-operational during the shutdown.

Aquatic Weed Removal

Aquatic weeds would be removed, as needed, from in front of the fish screens at Barker Slough Pumping Plant. Aquatic weeds accumulate on the fish screens, blocking water flow, and causing water levels to drop behind the screens in the pump wells. The low water level inside of the pump wells causes the pumps to automatically shut off to protect the pumps from cavitation. The aquatic weed removal system consists of grappling hooks attached by chains to an aluminum frame. A boom truck, staged on the platform in front of the Barker Slough Pumping Plant pumps, would lower the grappling system into the water to retrieve the accumulated aquatic vegetation. The removed aquatic weeds would be transported to two aggregate base spoil sites located near the pumping plant. Removal of aquatic weeds from the fish screens would typically occur during summer and fall months when aquatic weed production is highest. Floating aquatic vegetation (i.e., water hyacinth) may need to be removed during spring months if it becomes entrained into Barker Slough and accumulates in front of the fish screens.

3.4.5.3 Contra Costa Water District Operations

Contra Costa Water District facilities would continue to be operated and maintained under applicable permits.

3.4.5.4 Water Transfers

Reclamation and DWR would continue to transfer project and nonproject water supplies through CVP and SWP facilities, including north-to-south transfers and Sacramento River north-to-north transfers. Alternative 1 would include the same volume of transfers as included in the No Action Alternative, but Reclamation and DWR would provide an extended transfer window from July 1 through November 30. Allowing fall transfers is expected to have water supply benefits and may provide flexibility to improve Sacramento River temperature operations during dry conditions, such as those that occurred during the 2014–2015 drought conditions. Quantities and timing would be similar to the transfers implemented in 2014.

3.4.5.5 Clifton Court Aquatic Weed Removal

DWR would continue to apply copper-based aquatic herbicides and algaecides to control aquatic weeds and algal blooms and use mechanical harvesters on an as-needed basis in CCF (as described in the No Action Alternative), but would also apply Aquathol® K aquatic herbicide and peroxygen-based algaecides (e.g. PAK 27) and extend the treatment window beyond July 1 to August 31. DWR could apply Aquathol K, a chelated copper herbicide (copper-ethylenediamine complex and copper sulfate pentahydrate), a copper carbonate compound, or other copper-based herbicides. Algaecides may include peroxygen-based algaecides (e.g., PAK 27). These products are used to control algal blooms that can degrade drinking water quality through production of taste and odor compounds of algal toxins and can cause excessive filter clogging at drinking water treatment plants. Treatment areas would typically be about 900 acres and no more than 50% of the 2,180 total surface acres.

Aquatic weed and algae treatments would occur on an as-needed basis depending upon the level of vegetation biomass, cyanotoxin concentration from the harmful algal blooms, or concentration of taste and odor compounds. Operational procedures would minimize impacts on listed species during aquatic herbicide treatment for application of Aquathol K and copper-based products and algaecide treatment for application of peroxide-based algaecides in CCF. The timing of application is an avoidance measure and is based on the life history of Chinook Salmon and steelhead in the Central Valley Delta region and of Delta Smelt. Applications of aquatic herbicides and algaecides would be contained within CCF. The radial intake gates to CCF would be closed prior to, during, and following the application. More detail on these procedures is included in Appendix D, Section 4.3.5.4.

3.4.5.6 *Old and Middle River Management*

Reclamation and DWR would operate the CVP and SWP in a manner that maximizes exports while minimizing entrainment of fish and protecting critical habitat. Net flow from Old and Middle River provides a surrogate indicator for how export pumping at Banks and Jones Pumping Plants influence hydrodynamics in the south Delta. OMR management, in combination with other environmental variables, can minimize or avoid the entrainment of fish in the south Delta and at CVP and SWP salvage facilities. Reclamation and DWR would maximize exports by incorporating real-time monitoring of fish distribution, turbidity, temperature, hydrodynamic models, and entrainment models into the decision support for OMR management to focus protections for fish when necessary and provide flexibility where possible, consistent with the Water Infrastructure Improvements for the Nation Act Sections 4002 and 4003. Estimates of species distribution would be described by multiagency, Delta-focused technical teams.

From the onset of OMR management to the end, Reclamation and DWR would operate to an OMR index no more negative than a 14-day moving average of $-5,000$ cfs unless a storm event occurs (see below for storm-related OMR flexibility). Grimaldo et al. (2017) indicate that $-5,000$ cfs OMR is an inflection point for fish entrainment. The OMR could be more positive than $-5,000$ cfs if additional real-time OMR restrictions are triggered (described below), or constraints other than OMR control exports. Reclamation and DWR would operate to an OMR index computed using an equation. An OMR index allows for shorter-term operational planning and real-time adjustments. Reclamation and DWR would make a change to exports within 3 days of the trigger when monitoring, modeling, and criteria indicate protection for fish is necessary. The 3-day trigger would allow for efficient power scheduling.

3.4.5.6.1 Onset of OMR Management

Reclamation and DWR would start OMR management when one or more of the following conditions have occurred:

- Integrated Early Winter Pulse Protection (First Flush Turbidity Event) – To minimize project influence on migration (or dispersal) of Delta Smelt, Reclamation and DWR would reduce exports for 14 consecutive days so that the 14-day averaged OMR index for the period would not be more negative than $-2,000$ cfs, in response to “First Flush” conditions in the Delta. The population-scale migration of Delta Smelt is believed to occur quickly in response to inflowing freshwater and turbidity (Grimaldo et al. 2009; Sommer et al. 2011). Thereafter, best available scientific information suggests that fish make local movements, but there is no evidence for further population-scale migration (Polanksky et al. 2018). “First flush” may be triggered between December 1 and January 31 and include:
 - Running 3-day average of the daily flows at Freeport is greater than 25,000 cfs and

- Running 3-day average of the daily turbidity at Freeport is 50 Nephelometric Turbidity Unit (NTU) or greater or
- Real-time monitoring indicates a high risk of migration and dispersal into areas at high risk of future entrainment.

This “First Flush” action may only be initiated once during the December through January period and would not be required if:

- Water temperature reaches 12°C based on a three station daily mean at Honker Bay, Antioch, and Rio Vista; and/or
- Ripe or spent Delta Smelt are collected in a monitoring survey.
- Salmonids Presence: After January 1, if more than 5% of any one or more salmonid species (wild young-of-year Winter-Run, wild young-of-year Spring-Run, or wild California Central Valley Steelhead) are estimated to be present in the Delta as determined by their appropriate monitoring working group based on available real-time data, historical information, and modeling.

3.4.5.6.2 Additional Real-Time OMR Restrictions and Performance Objectives

Reclamation and DWR would manage to a more positive OMR than –5,000 cfs based on the following conditions:

- Turbidity Bridge Avoidance (South Delta Turbidity) –After the Integrated Early Winter Pulse Protection or February 1, whichever comes first, and prior to April 1, Reclamation and DWR would manage exports in order to maintain daily average turbidity in Old River at Bacon Island (OBI) at a level of less than 12 NTU. The purpose of this action is to protect Delta Smelt from damaging levels of entrainment after a First Flush and in years when a First Flush does not occur. This action seeks to avoid the formation of a continuous turbidity bridge from the San Joaquin River shipping channel to the fish facilities, which historically has been associated with elevated salvage of pre-spawning adult Delta Smelt. If the daily average turbidity at Bacon Island could not be maintained at less than 12 NTU, Reclamation and DWR would manage exports to achieve an OMR no more negative than –2,000 cfs until the average turbidity at Bacon Island drops below 12 NTU. After 5 days, Reclamation and DWR could determine that real-time OMR restrictions were not required to avoid damaging levels of entrainment based on the distribution of Delta Smelt in real-time monitoring and the absence of detections in salvage (i.e., less than 5% of the population).
- Larval and Juvenile Delta Smelt – When Q-West (net flow on the San Joaquin River at Jersey Point) is negative and larval or juvenile smelt are within the entrainment zone of the pumps based on real-time sampling, Reclamation and/or DWR would run hydrodynamic models informed by the Enhanced Delta Smelt Monitoring Program (EDSM), 20 mm, or other relevant survey data to estimate the percentage of larval and juvenile smelt that could be entrained and operated to avoid greater than 10% loss of modeled larval and juvenile cohort Delta Smelt. Typically, this would come into effect beginning the middle of March.
- Cumulative Loss Threshold:
 - Reclamation and DWR would avoid exceeding cumulative loss thresholds over the duration of the 2019 Biological Opinions for wild Winter-Run Chinook Salmon, hatchery Winter-Run Chinook Salmon, wild Central Valley Steelhead from December through March, and wild Central Valley Steelhead from April 1 through June 15th. Wild Central Valley Steelhead would be

separated into two time periods to protect San Joaquin origin fish that historically appear in the Mossdale trawls later than Sacramento origin fish. The loss threshold and loss tracking for hatchery Winter-Run Chinook Salmon does not include releases into Battle Creek. Loss (for development of thresholds and ongoing tracking) for Chinook salmon are based on length-at-date criteria.

- The cumulative loss thresholds would be based on cumulative historical loss from 2010 through 2018. Reclamation's and DWR's performance objectives would set a trajectory such that this cumulative loss threshold (measured as the 2010-2018 average cumulative loss multiplied by 10 years) would not be exceeded by 2030.
- If, at any time prior to 2024, Reclamation and DWR would exceed 50% of the cumulative loss threshold, Reclamation and DWR would convene an independent panel to review the actions contributing to this loss trajectory and make recommendations on modifications or additional actions to stay within the cumulative loss threshold, if any.
- In the year 2024, Reclamation and DWR would convene an independent panel to review the first five years of actions and determine whether continuing these actions are likely to reliably maintain the trajectory associated with this performance objective for the duration of the period.
- If, during real-time operations, Reclamation and DWR would exceed the cumulative loss threshold, Reclamation and DWR would immediately seek technical assistance from USFWS and NMFS, as appropriate, on the coordinated operation of the CVP and SWP for the remainder of the OMR management period. In addition, Reclamation and DWR would, prior to the next OMR management season, charter an independent panel to review the OMR Management Action consistent with "Chartering of Independent Panels" under the "Governance" section of Alternative 1. The purpose of the independent review would be to evaluate the efficacy of actions to reduce the adverse effects on listed species under OMR management and the non-flow measures to improve survival in the south Delta and for San Joaquin origin fish
- Single-Year Salvage Threshold:
 - In each year, Reclamation and DWR would avoid exceeding an annual loss threshold equal to 90% of the greatest salvage loss that occurred in the historical record from 2010 through 2018 for each of wild Winter-Run Chinook Salmon, hatchery Winter-Run Chinook Salmon, wild Central Valley Steelhead from December through March, and wild Central Valley Steelhead from April through June 15. Wild Central Valley Steelhead are separated into two time periods to protect San Joaquin Origin fish that historically appear in the Mossdale trawls later than Sacramento origin fish. The loss threshold and loss tracking for hatchery Winter-Run Chinook Salmon does not include releases into Battle Creek. Loss (for development of thresholds and ongoing tracking) for Chinook salmon would be based on length-at-date criteria.
 - During the year, if Reclamation and DWR would exceed the annual loss from 2010 through 2018, Reclamation and DWR would review recent fish distribution information and operations with the fisheries agencies at the Water Operations Management Team (WOMT) and seek technical assistance on future planned operations. Any agency could elevate from WOMT to a Directors discussion, as appropriate.
 - During the year, if Reclamation and DWR exceed 50% of the annual loss threshold, Reclamation and DWR would restrict OMR to a 14-day moving average OMR index of no more negative than -3,500 cfs, unless Reclamation and DWR determine that further OMR restrictions are not required to benefit fish movement because a risk assessment shows that the risk is no longer present based on real-time information.

- The -3,500 cfs OMR operational criterion adjusted and informed by this risk assessment would remain in effect for the rest of the season. Reclamation and DWR would seek NMFS technical assistance on the risk assessment and real-time operations.
- During the year, if Reclamation and DWR exceed 75% of the annual loss threshold, Reclamation and DWR would restrict OMR to a 14-day moving average OMR index of no more negative than -2,500 cfs, unless Reclamation and DWR determine that further OMR restrictions are not required to benefit fish movement because a risk assessment shows that the risk is no longer present based on real-time information.
- The -2,500 cfs OMR operational criterion adjusted and informed by this risk assessment would remain in effect for the rest of the season. Reclamation and DWR would seek NMFS technical assistance on the risk assessment and real-time operations.
- Risk assessment: Reclamation and DWR would determine and adjust OMR restrictions under this section by preparing a risk assessment that considers several factors including, but not limited to, real-time monitoring detects few fish in the south Delta and few fish are detected in salvage. Reclamation and DWR would share its technical analysis and supporting documentation with USFWS and NMFS, seek their technical assistance, discuss the risk assessment and future operations with WOMT at its next meeting, and elevate to the Directors as appropriate.
- If, during real-time operations, Reclamation and DWR would exceed the single-year loss threshold, Reclamation and DWR would immediately seek technical assistance from USFWS and NMFS, as appropriate, on the coordinated operation of the CVP and SWP for the remainder of the OMR management period. In addition, Reclamation and DWR would, prior to the next OMR management season, charter an independent panel to review the OMR Management Action consistent with “Chartering of Independent Panels” under the “Governance” section of Alternative 1. The purpose of the independent review would be to evaluate the efficacy of actions to reduce the adverse effects on listed species under OMR management and the non-flow measures to improve survival in the south Delta and for San Joaquin origin fish.
- Reclamation and DWR would consider the historical monthly distribution of loss to avoid disproportionately salvaging fish during any single month.

Reclamation and DWR would continue monitoring and reporting the salvage at the Tracy Fish Collection Facility and Skinner Fish Protection Facility. Reclamation and DWR would continue the release and monitoring of yearling Coleman National Fish Hatchery Late-Fall run as yearling Spring-Run Chinook Salmon surrogates.

3.4.5.6.3 Storm-Related OMR Flexibility

Reclamation and DWR could operate to a more negative OMR up to a maximum (otherwise permitted) export rate of 14,900 cfs (which could result in a range of OMR values) at Banks and Jones Pumping Plants to capture peak flows during storm-related events. Reclamation and DWR would continue to monitor fish in real-time and would operate in accordance with the thresholds in “Additional Real-Time OMR Restrictions” (see Section 3.4.5.5.2).

Under the following conditions, Reclamation and DWR would not cause OMR to be more negative for capturing peak flows from storm-related events:

- Integrated Early Winter Pulse Protection (above) or Additional Real-Time OMR Restrictions (above) are triggered. Under such conditions, Reclamation and DWR would have already determined that more restrictive OMR is required.

- An evaluation of environmental and biological conditions indicates more negative OMR would likely cause Reclamation and DWR to trigger an Additional Real-Time OMR Restriction (above).
- Salvage of yearling Coleman National Fish Hatchery Late-Fall run (as yearling Spring-Run Chinook Salmon surrogates) exceeds 0.5% within any of the release groups.
- Reclamation and DWR identify changes in spawning, foraging, sheltering, or migration behavior beyond those described in the 2019 Biological Opinion for this project.

Reclamation and DWR would continue to monitor conditions and could resume management of OMR to no more negative than $-5,000$ cfs if conditions indicate the above offramps are necessary to avoid additional adverse effects. If storm-related flexibility causes the conditions in “Additional Real-Time OMR Restrictions”, Reclamation and DWR would implement additional real-time OMR restrictions.

3.4.5.6.4 End of OMR Management

OMR criteria may control operations until June 30 (for Delta Smelt and Chinook salmon), until June 15 (for steelhead/rainbow trout), or when the following species-specific off ramps have occurred, whichever is earlier:

- Delta Smelt: When the daily mean water temperature at CCF reaches 77°F for 3 consecutive days.
- Salmonids:
 - When more than 95% of salmonids have migrated past Chipps Island, as determined by their monitoring working group, or
 - After daily average water temperatures at Mossdale exceed 72°F for 7 days during June (the 7 days do not have to be consecutive).

3.4.5.6.5 Real-Time Decision-Making and Salvage Thresholds

Reclamation and DWR may confer with the Directors of NMFS, USFWS, and CDFW if they desire to operate to a more negative OMR than what is specified in Additional Real-Time OMR Restrictions. Upon mutual agreement, the Directors of NMFS and USFWS may authorize Reclamation to operate to a more negative OMR than the Additional Real-Time OMR Restrictions, but no more negative than $-5,000$ cfs. The Director of CDFW may authorize DWR to operate to a more negative OMR than the Additional Real-Time OMR Restrictions, but no more negative than $-5,000$ cfs.

Figure 3.4-4, Decision Tree for OMR Reverse Flow Management, shows OMR management in a decision tree.

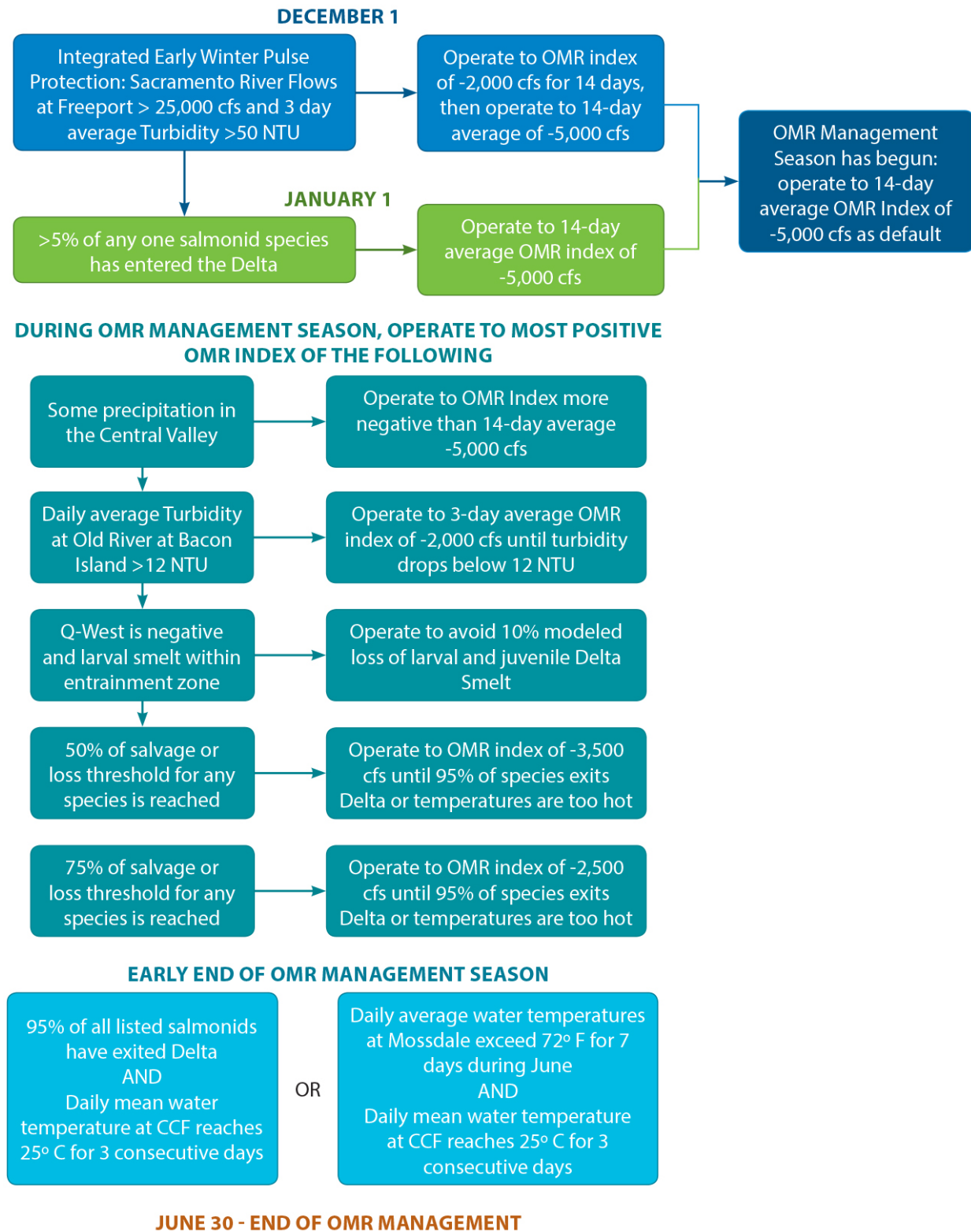


Figure 3.4-4. Decision Tree for OMR Reverse Flow Management

3.4.5.7 Tracy Fish Collection Facility Carbon Dioxide Injection and Release Sites

Reclamation would continue to screen fish from Jones Pumping Plant with the TFCF. Hauling trucks used to transport salvaged fish to release sites inject oxygen and contain an 8 parts per thousand salt solution to reduce stress. The CVP uses two release sites: one on the Sacramento River near Horseshoe Bend and one on the San Joaquin River immediately upstream of Antioch Bridge. Reclamation would increase the number of release sites to reduce predation. Reclamation would conduct studies and physical improvements aimed to improve fish survival and improve TFCF efficiency, reducing mortality through the facility, fish hauling and release operations through the Tracy Fish Facility Improvement Program. Activities include louver improvement and replacement, predation studies and piscivorous predator control, improvement of hydrologic monitoring and telemetry systems, holding area improvements including fish count automation and tank aeration and screening, improvement of data management as well as aquaculture facility maintenance, operation and improvements.

3.4.5.8 Delta Smelt Summer-Fall Habitat

Reclamation and DWR would use structured decision-making to implement Delta Smelt habitat actions. In the summer and fall (June through October) of below normal, above normal, and wet years, based on the Sacramento Valley Index, the environmental and biological goals are, to the extent practicable, the following:

- Maintain low salinity habitat in Suisun Marsh and Grizzly Bay when water temperatures are suitable;
- Manage the low salinity zone to overlap with turbid water and available food supplies; and
- Establish contiguous low salinity habitat from Cache Slough Complex to Suisun Marsh.

The Delta Smelt Summer-Fall Habitat action would be incorporated into the “Four Year Review” under the “Governance” section of Alternative 1.

The Delta Smelt Habitat Action described below is intended to improve Delta Smelt food supply and habitat, thereby contributing to the recruitment, growth, and survival of Delta Smelt. The current conceptual model is that Delta Smelt habitat should include low salinity conditions of 0–6 parts per thousand (ppt), turbidity of approximately 12 NTU or greater, temperatures below 25°C, food availability, and littoral or open water physical habitats (FLaSH Synthesis, pp. 15-25). The Delta Smelt Habitat Action is being undertaken, recognizing that the highest quality habitat in this large geographical region 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 Delta Smelt Habitat Action is to provide these habitat components in the same geographic area through a range of action to improve water quality and food supplies.

The action may include, but is not limited to the following components:

- Suisun Marsh Salinity Control Gates (SMSCG) operations for up to 60 days (not necessarily consecutive) in June through October of below normal, above normal, and wet years;
- Project operations to maintain a monthly average 2 ppt isohaline at 80 kilometers (km) from the Golden Gate Bridge in above normal and wet water years in September and October with offramp criteria when:
 - Sufficient habitat acreages in Suisun Marsh, Grizzly Bay, and other adjacent areas are available to support Delta Smelt recruitment (e.g. 0-6 ppt at Hunter’s Cut, non-lethal temperatures, etc.);

- Suitable recruitment projections based on Service approved lifecycle modeling and/or monitoring to indicate a positive trend in Delta Smelt and a determination that the Summer-Fall Habitat Action is not necessary to continue that trend; or
- The absence of Delta Smelt in target areas based on EDSM or similar sampling; or other factors that would limit the benefits of the action (lack of suitable habitat, based on presence/absence modeling such as the Hurdle Model or similar).
- Food enhancement actions; for example, those included in the Delta Smelt Resiliency Plan to enhance food supply, the North Delta Food Subsidies and Colusa Basin Drain project, Sacramento River Deepwater Ship Channel lock reoperation, and Suisun Marsh Food Subsidies (Roaring River distribution system reoperation).

Through collaborative planning (described in Section 3.4.8), Reclamation and DWR would develop a Summer-Fall Habitat Plan to meet the environmental and biological goals in years when summer-fall habitat actions are triggered. In above normal and wet years, operating to a monthly average X2 of 80 km in September and October is an operational back-stop that would be available to provide a specific acreage of low salinity habitat. In every action year, Reclamation and DWR would propose, based on discussions with the USFWS, a suite of actions that would meet the action's environmental and biological goals. If it is determined that any of the off-ramps identified above are applicable, Reclamation and DWR would include a discussion of those off-ramps in the Summer-Fall Habitat Plan.

As part of the Delta Smelt Habitat Action, Reclamation intends to meet Delta outflow augmentation in the fall primarily through export reductions as they are the operational control with the most flexibility in September and October. Storage releases from upstream reservoirs may be used to initiate the action by pushing the salinity out further in August and early September; however, the need for this initial action would depend on the particular hydrologic, tidal, storage, and demand conditions at the time. In addition, storage releases could be made in combination with export reductions during the fall period during high storage scenarios where near-term flood releases to meet flood control limitations are expected. In these scenarios, Reclamation would make releases in a manner that minimizes redd dewatering where possible.

The offramp criteria would be more fully defined and examples of potential implementation developed through the structured decision making or other review process. The review would include selection of appropriate models, sampling programs, and other information to be used. The specific offramp criteria may be modified through the process. The process would be completed prior to implementation and may be improved in subsequent years as additional information is synthesized and reviewed.

3.4.5.9 *Additional Operations Components*

In addition to the changes to CVP and SWP export operations, Alternative 1 would continue the San Joaquin Basin Steelhead Telemetry Study. This is a 6-year study on the migration and survival of San Joaquin Origin Central Valley Steelhead. Alternative 1 also includes steelhead lifecycle monitoring on the Stanislaus River, a Sacramento basin CVP tributary (such as Clear Creek, Upper Sacramento River, or American River), and the San Joaquin River.

3.4.5.10 *Habitat Components*

DWR and Reclamation would continue to implement existing and ongoing restoration efforts that are underway but not complete, including:

- Coordination with water users – Reclamation would coordinate with water users to remove predator hot spots in the Bay-Delta, which includes minimizing lighting at fish screens and bridges and possibly removing abandoned structures.
- Small Screen Program – Reclamation and DWR continue to work with existing authorities (Anadromous Fish Screen Program) to screen small diversions throughout Central Valley CVP and SWP streams and the Bay-Delta.

3.4.5.11 Intervention Components

Reclamation and DWR would continue implementation of the following projects to reduce mortality of ESA-listed fish species:

- Head of Old River: Reclamation and DWR would form a project team to address the scour hole in the San Joaquin River at the Head of Old River. The project team would plan and implement measures to reduce the predation intensity at that site through modifications to the channel geometry and associated habitats.
- Delta Cross-Channel Gate Improvements – Reclamation would modernize the DCC gate materials and mechanics to include adding industrial control systems, and improve physical and biological monitoring associated with the DCC daily and/or tidal operations as necessary to maximize water supply deliveries.
- Tracy Fish Collection Facility Improvements – Reclamation would improve the TFCF to reduce loss by (1) incorporating additional fish exclusion barrier technology into the primary fish removal barriers; (2) incorporating additional debris removal systems at each trash removal barrier, screen, and fish barrier; (3) constructing additional channels to distribute the fish collection and debris removal among redundant paths through the facility; (4) constructing additional fish handling systems and holding tanks to improve system reliability; and (5) incorporating remote operation into the design and construction of the facility.
- Skinner Fish Facility Improvements – DWR would continue implementation of projects to reduce mortality of ESA-listed fish species. These measures that would be implemented include (1) electroshocking and relocating predators, (2) controlling aquatic weeds, (3) developing a fishing incentives or reward program for catching predators or predator relocation, and (4) implementing operational changes when listed species are present.
- Release Sites – Reclamation would continue work with DWR to incorporate flexibility in salvage release sites, using DWR’s sites, or alternative fish release methods.
- Conservation and Culture Laboratory: The existing Fish Conservation and Culture Laboratory would be used in the interim to begin supplementation of the wild Delta Smelt population with captive produced Delta Smelt prior to construction of the new conservation hatchery.
- Delta Fish Species Conservation Hatchery – Reclamation would partner with DWR to complete construction and operate a conservation hatchery for Delta Smelt, by 2030.

3.4.6 Stanislaus River

As discussed in the No Action Alternative, Reclamation has worked with water users and related agencies to develop an operating plan for New Melones Reservoir to meet the multiple objectives on the system,

but a plan is not complete. Alternative 1 includes an operating plan, described below, which is intended to replace often overlapping and conflicting operational components of previous federal and state flow requirements and is representative of Reclamation's contribution to any current or future flow objectives on the lower San Joaquin River at Vernalis.

3.4.6.1 *Seasonal Operations*

Reclamation would meet water rights, contracts, and agreements that are specific to the East Side Division and Stanislaus River. Senior water right holders (Oakdale Irrigation District and South San Joaquin Irrigation District) would receive annual water deliveries consistent with the 1988 agreement and stipulation, and water would be made available to CVP contractors in accordance with their contracts and applicable shortage provisions.

In high storage, high inflow conditions, Reclamation would operate for flood control in accordance with the USACE flood control manual. Reclamation would operate New Melones Reservoir (as measured at Goodwin Dam) in accordance with a stepped release plan (SRP) that varies by hydrologic condition and water year type as shown in Table 3.4-6, New Melones SRP Annual Releases by Water Year Type.

Table 3.4-6. New Melones SRP Annual Releases by Water Year Type

Water Year Type	Annual Release (TAF)
Critically dry	184.3
Dry	233.3
Below normal	344.6
Above normal	344.6
Wet	476.3

TAF = thousand acre-feet

The New Melones SRP would be implemented similarly to the No Action Alternative with a default daily hydrograph and the ability to shape monthly and seasonal flow volumes to meet specific biological objectives. The default daily hydrograph is the same as prescribed under the No Action Alternative for critically dry, dry, and below-normal water year types. The difference occurs in above normal and wet years, where the minimum requirement for larger releases is reduced from the No Action Alternative to promote storage for potential future droughts and preserve coldwater pool. When compared to minimum daily flows from the No Action Alternative, the daily hydrograph for the New Melones SRP is identical for critically dry, and below normal year types; above normal and wet year types follow daily hydrographs for below normal and above normal year types from current operating requirements, respectively.

During the summer, Reclamation would be required to maintain applicable dissolved oxygen standards on the lower Stanislaus River for species protection. Reclamation currently operates to a 7 milligrams per liter dissolved oxygen requirement at Ripon from June 1 to September 30. Reclamation would move the compliance location to Orange Blossom Bridge, where the species are primarily located at that time of year.

3.4.6.2 *Habitat Components*

Alternative 1 includes the following habitat components:

- Spawning Habitat – Under the CVPIA (b)(13) program, Reclamation's annual goal of gravel placement is approximately 4,500 tons in the Stanislaus River. Continued gravel placement sites

would include River Mile 58 on the lower Stanislaus River, Goodwin Canyon (at the cable crossing and float tube pool), Honolulu Bar, Buttonbush, and Rodden Road. Reclamation would also work with new sites, including Two Mile Bar, Kerr Park, and Goodwin Canyon.

- Rearing Habitat – Reclamation would construct an additional 50 acres of rearing habitat adjacent to the Stanislaus River by 2030. Reclamation may improve or add to existing projects at Lancaster Road, Honolulu Bar, Buttonbush, or Rodden Road. Reclamation would also work with new sites at Two Mile Bar or Kerr Park.
- Temperature Management – Reclamation would study approaches to improving temperature for listed species on the lower Stanislaus River to include evaluating the utility of conducting temperature measurements or profiles in New Melones Reservoir.

3.4.7 San Joaquin River

Reclamation would continue to implement the SJRRP as described in the No Action Alternative. Additionally, Reclamation would implement rearing habitat restoration on the lower San Joaquin River. Reclamation would work with private landowners to create a locally driven, regional partnership to define and implement a large-scale floodplain habitat restoration effort in the lower San Joaquin River.

3.4.8 Governance

Reclamation would work with DWR, NMFS, USFWS, CDFW, public water agencies, and other participants to manage operations in multiple ways. Key governance functions are described below.

3.4.8.1 Core Water Operation

Reclamation and DWR would operate the CVP and SWP, while reducing the stressors on listed species influenced by those ongoing operations. through real-time monitoring. Reclamation would implement activities, monitor performance, and report on compliance with the commitments in Alternative 1. The Real-Time Water Operations Charter (Charter) establishes how Reclamation and DWR would monitor and report on ESA Section 7 commitments under Alternative 1 and how the five agencies, public water agencies, and other participants would communicate, and coordinate real-time water operations decisions. The Charter also describes the deliverables, schedule, and decision making processes.

NMFS, USFWS, and CDFW would provide information to Reclamation and DWR on the real-time disposition of species through specific monitoring workgroups. This information would inform the risk analysis performed by Reclamation and DWR.

3.4.8.2 Scheduling

Fishery agencies and water users in watershed-based groups would provide scheduling recommendations to Reclamation and DWR on duration, timing, and magnitude of specific blocks of water related to Alternative 1 components that have schedule flexibility. Reclamation and DWR would evaluate and consider the recommendations and operate the CVP and SWP to those schedules as feasible.

3.4.8.3 Collaborative Planning

As part of Alternative 1, Reclamation would pursue and implement certain actions through collaborative planning with the goal of continuing to identify and undertake actions that benefit listed species. Collaborative planning would make use of the Collaborative Science and Adaptive Management

Program, CVPIA, Interagency Ecological Program, and Delta Plan Interagency Implementation Committee, successors to the forums, or complementary forums (e.g. Voluntary Agreement forums). Each of these programs has established governance, work planning, implementation, reporting, and independent review.

3.4.8.4 Compliance and Performance Reporting

Reclamation and DWR would annually report on water operations and fish performance seasonally and in an annual summary. Changes to Alternative 1 would occur based on the reinitiation triggers provided by 50 CFR 402.16. These triggers include:

- a) If the amount or extent of taking specified in the incidental take statement is exceeded;
- b) If new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered;
- c) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion; or
- d) If a new species is listed or critical habitat designated that may be affected by the identified action.

Reclamation would monitor take for the purpose of evaluating trigger (a) above; Reclamation would monitor the effects of Alternative 1 for the purpose of evaluating trigger (b) above. If Reclamation decides to modify Alternative 1, Reclamation would evaluate the changes to Alternative 1 based on trigger (c) above. Consistent with 50 CFR 402.16, the USFWS and/or NMFS could also reinitiate formal consultation as appropriate. Reclamation would coordinate with DWR as an “applicant” and support DWR’s coordination with CDFW.

3.4.8.5 Drought and Dry Year Actions

Within 18 months of executing the Record of Decision, Reclamation would coordinate with DWR to develop a voluntary toolkit to be exercised at the discretion of Reclamation, DWR, other agencies, participating water users, and/or others for the operation of Shasta Reservoir during critical hydrologic year types. The toolkit would include, at a minimum: measures at the Livingston-Stone National Fish Hatchery; the potential for translocation of fish; and facility improvements to reduce the adverse effects of critical and dry years on listed species. Drought and dry year planning would include the measures under Shasta Cold Water Pool Management Dry Years, Drought Years, and Successive Dry Years.

On October 1st, if the prior water year was dry or critical, Reclamation would meet and confer with USFWS, NMFS, DWR, CDFW, and Sacramento River Settlement Contractors on voluntary measures to be considered if drought conditions continue into the following year, including measures that may be beyond Reclamation and DWR’s discretion. If dry conditions continue, Reclamation would regularly meet with this group (and potentially other agencies and organizations) to evaluate current hydrologic conditions and the potential for continued dry conditions that may necessitate the need for development of a drought contingency plan (that may include actions from the toolkit) for the water year.

By February of each year following a critical hydrologic year type, Reclamation would report on the measures employed and assess the effectiveness. The toolkit would be revisited at a frequency of not more than 5 years after the Record of Decision.

3.4.8.6 Chartering of Independent Panels

Reclamation and DWR would charter independent panels to review particular actions as described in certain components of Alternative 1. Independent panels would review actions consistent with the

standards of the Delta Stewardship Council and applicable Reclamation and DWR guidance. Experts on the panel would provide information and recommendations but would not make consensus recommendations to Reclamation. NMFS and FWS could provide technical assistance and input in the development of the charter. Reclamation and DWR would provide the results of the independent review to NMFS and FWS. Reclamation would coordinate with DWR to document a response to the independent review including whether implementation of alternative strategies would require reinitiation consistent with the reinitiation triggers provided by 50 CFR 402.16. Nothing associated with the chartering of and responding to independent panels precludes NMFS nor FWS from exercising its statutory responsibilities under the ESA.

3.4.8.7 Four Year Reviews

In January of 2024 and January of 2028, Reclamation and DWR would charter an independent panel to review the following actions:

- Upper Sacramento Performance Metrics
- OMR management and measures to improve survival through the South delta
- Delta Smelt Summer and Fall Habitat Actions

Reclamation and DWR could incorporate additional information into the reviews in coordination with local, state, and federal partners.

3.5 Alternative 2

Alternative 2 reflects a condition where Reclamation would operate the CVP to meet the legal requirements associated with its water rights but would not release additional flows for fish and wildlife purposes. DWR would continue to operate Lake Oroville according to the most recent FERC license, and Delta operations would be governed by water right requirements. Most of the water right conditions are from D-1641 (SWRCB 2000), which sets forth the water right requirements to meet the objectives in the Bay-Delta WQCP (SWRCB 1995).).

Table 3.5-1, Components of Alternative 2, includes a column that considers if a component is covered at a project or program level of analysis in this EIS. Alternative 2 does not have any components considered program level. Unlike Alternative 1, this table does not include a column for construction effects because Alternative 2 does not have any construction components. If not mentioned in the table, the operations of the No Action Alternative remain. Appendix D includes a comparison of components for each alternative.