

**State Water Project and Central Valley Project  
Drought Contingency Plan  
and Report on Condition 3 of the February 15, 2022  
Temporary Urgency Change Order**

**April 29, 2022**

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**State Water Project and Central Valley Project  
Drought Contingency Plan  
April 1, 2022 – September 30, 2022**

This Drought Contingency Plan (Drought Plan) is prepared by the California of Water Resources (DWR) and the U.S. Bureau of Reclamation (Reclamation) to provide updated information about areas of potential concern given the current hydrology and water operation conditions in 2022.

DWR and Reclamation operate the State Water Project (SWP) and the Central Valley Project (CVP), respectively, to the 2019 U.S. Fish and Wildlife Service (USFWS) Biological Opinion and 2019 National Marine Fisheries Service (NMFS) Biological Opinion (Collectively the 2019 Biological Opinions), and DWR also operates to the 2020 California Department of Fish and Wildlife Incidental Take Permit (ITP). This Drought Plan will be submitted by DWR to the California Department of Fish and Wildlife (CDFW) in response to Condition 8.21 of the ITP. This update also includes the items required by Condition 3 of the Temporary Urgency Change Order (TUCO) adopted by the State Water Resources Control Board (SWRCB) on February 15, 2022 and issued to Reclamation and DWR. Concurrently, this plan will also be shared with the members of the Water Operations Management Team (WOMT) which includes representatives from DWR, Reclamation, USFWS, NMFS, CDFW, and the SWRCB (collectively referred to as Agencies).

Condition 3 of the February 15, 2022, Temporary Urgency Change Order (TUCO) specifically requires DWR and Reclamation to identify and implement needed improvements to forecast methods to avoid significant over- or under- estimates of available water supplies and provide updates to the Board on these efforts along with updates on current hydrologic and operational forecasts for the water year on a monthly basis starting in April of 2022 and continuing until the drought emergency is over.

Condition 3 also requires DWR and Reclamation to submit in writing monthly hydrologic and operational forecasts and include information on forecasted inflows; reservoir releases; water supply deliveries; reservoir storage levels; any Coordinated Operations Agreement debts; planned water transfers, forbearance agreement actions, exchanges, and other actions of this nature; and other relevant information that may be requested by the SWRCB's Executive Director to inform future drought-related decision making. Since much of this information is already presented in the Drought Plans and updates provided to CDFW, this report is intended to serve the needs of both the CDFW and SWRCB reporting requirements.

In anticipation of drought conditions continuing into 2022, DWR and Reclamation initiated early drought action activities in 2021. These actions included the approval to delay the removal of the West False River Drought Barrier to November 2022, and a submittal of a Temporary Urgency Change Petition (TUCP) to the SWRCB requesting a modification of certain water rights Decision 1641 (D1641) standards during February through April 2022. On January 18, 2022, DWR and Reclamation withdrew this TUCP because of improved storage conditions in Folsom and

Oroville. However, the historically dry January through March 2022 conditions offset the storage gains realized in October and December 2021. Therefore, DWR and Reclamation submitted a new TUCP for April, May, and June 2022, and will continue to evaluate whether additional TUCPs would provide benefits later in the year. These drought actions are further described in this Drought Plan.

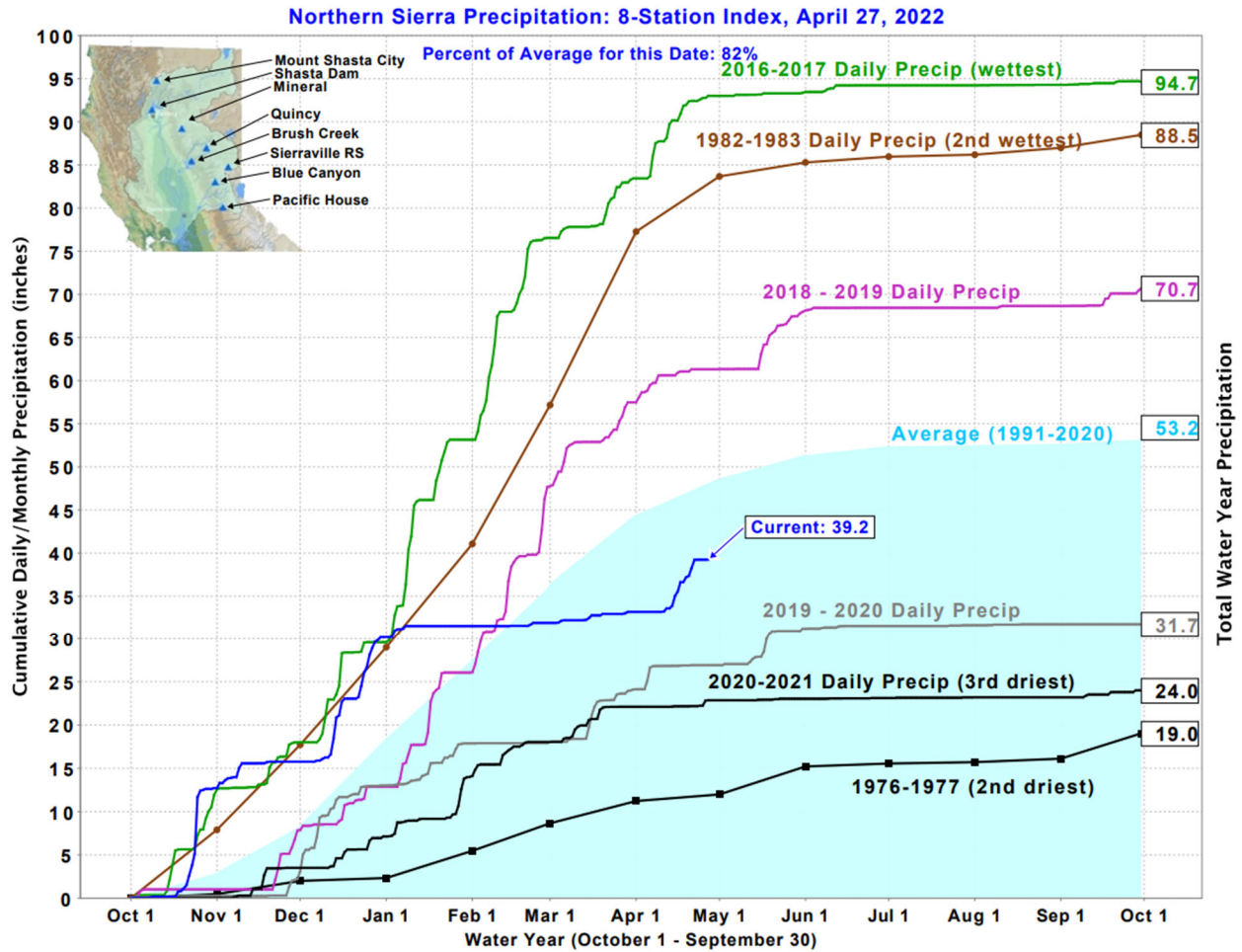
This Drought Plan also includes current hydrologic conditions, a species status update, SWP and CVP (collectively referred to as Projects) operations forecasts which utilize the April 1 hydrology forecasts (adjusted with observed April inflow), water supply forecasting improvements, and known WY 2022 drought actions. This Drought Plan reflects the very dry conditions experienced between January and March, as captured in the updated April 1 water supply forecast, as well as the above-average precipitation conditions in April in Northern California.

DWR and Reclamation are committed to working with the Agencies through further development of drought actions, weekly WOMT coordination, and other forums as necessary.

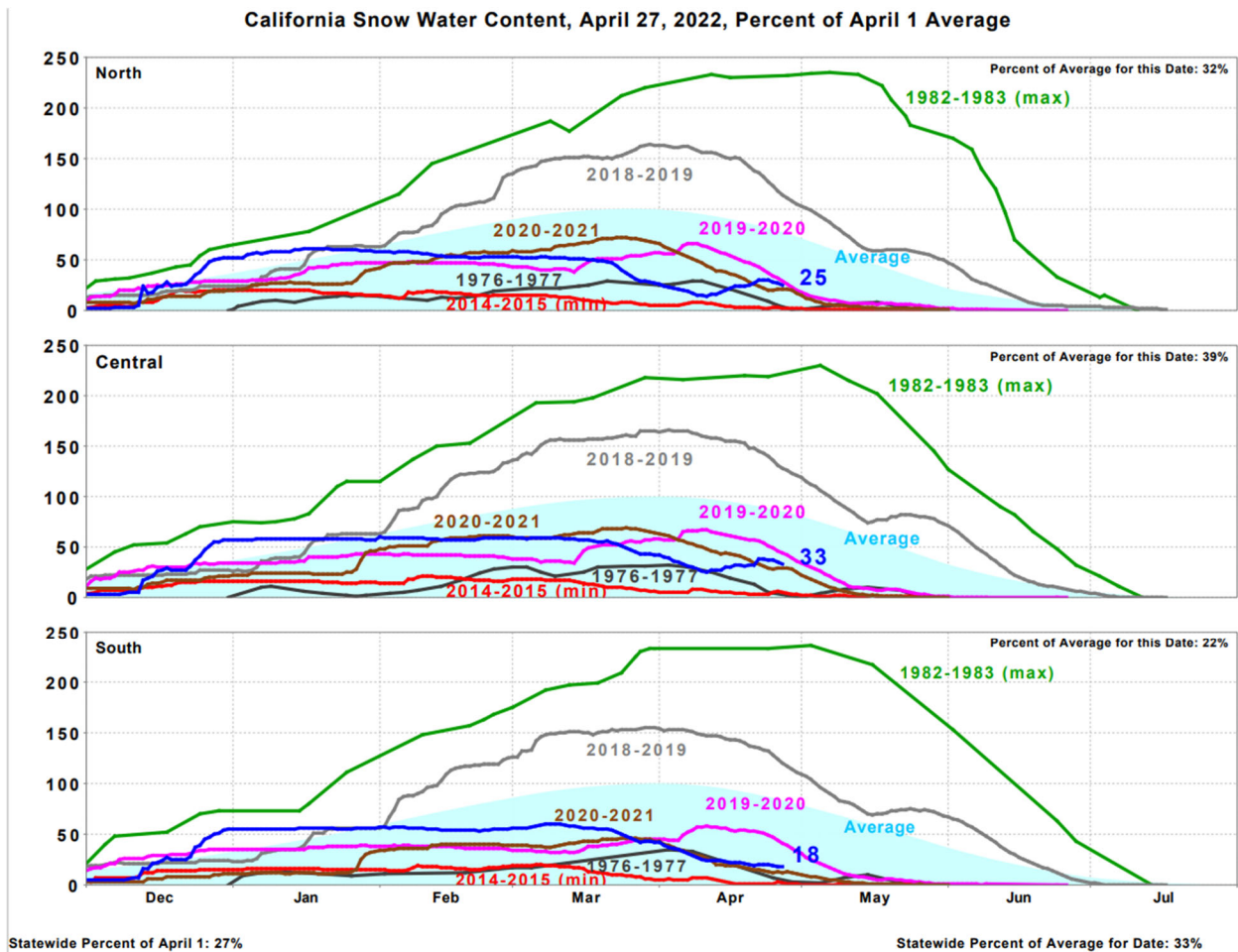
## **I. Current Hydrologic Conditions**

After the large storms of October and December 2021, there was minimal precipitation across the state in January, February, and March, which resulted in the driest January-through-March period on record. April brought above average precipitation, which did help in increasing storages in Folsom and Oroville reservoirs; however, it has not alleviated the overall deficit in the amount of precipitation during the previous three months. The Northern Sierra 8-Station Precipitation Index (8SI) saw its second wettest October on record and a well above-average December and April, but January through March saw only three inches of precipitation (during this period, average precipitation would be 26.1 inches).

As shown in blue on the following chart, the Northern Sierra Precipitation total as of April 27, 2022, is 39.2 inches and 82% of average to date and 73% of average for the water year.



The state saw a series of significant storm events in December leading to large accumulations of snowpack across the state, especially in the Central Sierras. However, since the first of the year, there has been minimal additional snow accumulation and, in some areas, there has been substantial snowmelt. This year's snowpack was the fifth smallest snowpack on record dating back to 1950, behind WYs 2015, 1977, 2014, and 1988. Statewide snowpack has fallen throughout the winter. There was a small increase from recent April storms; however, the snowpack remains well below average at 33% of normal. The following chart shows snowpack statewide across the Sierra Nevada as of April 27, 2022:



## A. SWP and CVP Conditions

- Storage

Storage conservation at Shasta, Trinity, Folsom, New Melones and Oroville reservoirs has been a priority this winter and spring. The 2022 TUCO, which was conditionally approved on April 4, allowed the Projects to decrease reservoir releases in April and continue conserving storage this spring to help meet needs this summer. Above average April precipitation also allowed for higher than forecasted inflows into primarily Oroville and Folsom reservoirs. As of April 22, storage in Oroville remains well below average for this time of year, whereas Folsom is now average after the recent April storms.

Lake Oroville storage is about 1.85 million acre-feet (MAF) (52% of capacity and 69% of historical average). Due to both early season snowmelt and April's above average precipitation, storage continues to increase. In April, Oroville storage has gained over 200 TAF.

Lake Shasta storage is about 1.78 MAF (39% of capacity and 47% of historical average). Trinity Reservoir storage is about 801 TAF (33% of capacity and 43% of historical average). Unfortunately, Lake Shasta and Trinity Reservoir have not benefited significantly from the storm

events in WY 2022 since most of the storms centered on watersheds further south or west. It is likely these reservoirs are at or near their maximum storage for the water year. Folsom Lake storage is approximately 708 TAF (72% of capacity and 101% of historical average). Due to both early season snowmelt and April's above average precipitation, storage continues to increase and may not reach maximum storage until May or June.

In the San Joaquin watershed, storage in New Melones Reservoir is 928 TAF, which is 38% of capacity and 62% of historical average.

- Releases

Releases to the Sacramento River from Keswick Reservoir are at the minimum of 3,250 cubic feet per second (cfs). Reclamation is operating Shasta Reservoir and the Sacramento River consistent with a multi-agency agreement on maximum average Keswick releases of 4,500 cfs from May through August. Recent April storm events have delayed the need for increasing releases above the minimum of 3,250 cfs in April. Total releases to the Feather River from Lake Oroville are at a minimum of 800 cfs.

Releases from Folsom are at the minimum release of 1,000 cfs for both storage conservation and to conserve cold water for temperature management later in the summer.

Releases from New Melones throughout March and early April have been supporting minimum Vernalis flows and were able to ramp back down to the minimum flow of 200 cfs by early April. Releases will be increased April 18 through May 18 to implement the spring pulse flow under the Stepped Release Plan. During this time, flows will range from 200 cfs to 1,250 cfs.

## **B. Biology**

### **i. Salmonids**

As of April 22, 2022, all natural juvenile winter-run Chinook Salmon are considered to have migrated past the Red Bluff Diversion Dam, and the total estimate for this brood year is 572,390, based on USFWS rotary screw trap monitoring. A large proportion of natural winter-run Chinook Salmon entered the Delta during the unusually wet fall months of 2021. The eventual cumulative catch record at the end of the migration season will likely show that well over half the winter-run catch in monitoring stations near the entrance to the Delta occurred prior to January 1, resulting in this year's cohort having the earliest migration timing into the Delta of any cohort on record (i.e., for any given percentile on each cohort's cumulative catch curve). As of April 26, 2022, SaMT estimated as much as 98-100% of the population had entered the Delta, and as much as 80% had exited the Delta (see Table 1 below). On April 26, 2022, the Salmonid Monitoring Team (SaMT) determined the weekly risk forecast of exceeding yearly entrainment thresholds remains low due to low salvage, and this risk assessment will likely stay low for the duration of the migration season ending in June. However, SaMT estimated the risk level for exceeding the daily loss threshold for natural winter-run Chinook salmon is high, and the risk assessment will



likely continue to be high through April due to low loss thresholds, which will typically be exceeded by a single SWP salvage event. In fact, the daily loss threshold for natural winter-run was exceeded on two days in April prior to April 19 but did not require a change in operations because other regulatory requirements were causing OMR to be less negative than required by the ITP Condition of Approval 8.6.3. The low daily natural winter-run daily loss thresholds are in turn due to a relatively low winter-run Juvenile Production Estimate. Risk of exceeding daily thresholds in May will likely relax somewhat to medium, and again to low in June, as fewer winter-run juveniles are expected to remain in the Delta in these months.

Greater than 95% of hatchery winter-run are estimated to have exited the Delta, and the risk of exceeding annual loss thresholds is low and will likely remain low for the duration of the migration season. Although the majority of natural spring-run are estimated to still be in the Delta, spring-run are regulated using hatchery surrogate releases rather than estimates of natural production, and because of overall low salvage rates of salmon, the risk of exceeding annual loss thresholds for spring-run surrogates this migration season is and will likely remain low. Although daily loss of natural winter-run Chinook Salmon was the greatest issue of concern regarding salmon-related export management, historically and consistent with current monitoring, their migration season is rapidly nearing conclusion, and other regulatory actions will likely continue to be the controlling factors governing OMR and project operations.

Table 1. Salmon Monitoring Team estimated salmon distributions as of April 26, 2022.

<b>Location</b>	<b>In River</b>	<b>In Delta</b>	<b>Exited Delta</b>
Winter-run (natural)	Current:	Current:	Current:
	0-2%	20-43%	55-80%
	Last Week:	Last Week:	Last Week:
	0-2%	25-28%	40-75%
Spring-run (natural)	Current:	Current:	Current:
	5-10%	30-55%	40-60%
	Last Week:	Last Week:	Last Week:
	5-10%	60-75%	20-30%
Winter-run (hatchery)	Current:	Current:	Current:
	0%	0-5%	95-100%
	Last Week:	Last Week:	Last Week:
	0-1%	9-20%	80-90%

## ii. Delta Smelt

The Smelt Monitoring Team (SMT) began meeting to discuss current-year conditions at the end of November 2021. The 2021 Fall Midwater Trawl was completed in December, and the 2021 index was zero (“0”) for the fourth year in a row. The only survey that has caught Delta Smelt on a quasi-regular basis in recent years is the Enhanced Delta Smelt Monitoring Program (EDSM). WY 2022 was the first year of Delta Smelt experimental releases, with 55,733 hatchery-reared fish released into the lower Sacramento River, Sacramento Deep Water Shipping Channel, and Suisun Marsh. Releases occurred from December 15, 2021, through February 17, 2022, and have concluded for the water year. In the period since the first release, as of April 21, 2022,

EDSM has caught 56 released (i.e., tagged) Delta Smelt in the lower Sacramento River, the Sacramento Deep Water Ship Channel (DWSC), Suisun Marsh, and the lower San Joaquin River. Additionally, two Delta Smelt were collected by the Chipps Island Trawl during this period. One released fish was also collected in salvage at the CVP on January 16, 2022, 18 released fish were collected in the Spring Kodiak Trawl, and one released fish was collected by the January Bay Study survey in the lower Sacramento River. One wild Delta Smelt, confirmed genetically, has been collected in WY 2022 by EDSM in the lower Sacramento River on January 5, 2022. Larval Delta Smelt have been detected among several surveys in WY 2022, with one larva in Smelt Larva Surveys, 30 larvae in 20mm Surveys (including one larva in Old River), and three larvae in Fish Restoration Program monitoring. Lastly, SWP Barker Slough Pumping Plant (BSPP) operations can be affected under the ITP (Condition of Approval 8.12) when Delta Smelt larvae are detected between March 1 and June 30 at station 716 in Cache Slough in Dry and Critical years. This trigger was met by the first 20mm Survey of WY 2022, but the second and third 20mm Surveys did not detect larvae and there are currently no restrictions on BSPP operations as of April 27, 2022. ITP Condition of Approval 8.12 protections for Delta Smelt end on June 30, 2022.

### iii. Longfin Smelt

Salvage data from WY 1994 through WY 2014 indicates that salvage of adult Longfin Smelt is generally rare and typically occurs between the months of December and February. In WY 2021, young of year (age 0) Longfin Smelt were mostly observed at the salvage facilities between April and May. The majority of Longfin Smelt salvage typically occurs after February when young of year fish rearing in the south and central Delta have grown large enough to be effectively screened by the fish collection facilities. As of April 27, 2022, 5,815 juvenile Longfin Smelt have been salvaged this water year at both the SWP and CVP. Additionally, qualitative larval sampling at both salvage facilities has detected Longfin Smelt under 20 mm in length. Longfin Smelt larvae have been regularly detected by the Smelt Larva Survey (SLS) and 20mm Survey in the lower San Joaquin River and Old and Middle Rivers throughout WY 2022, most recently with 20mm Survey #3 during April 18-21, 2022. Additionally, the pilot Larval Smelt Entrainment Monitoring Program detected Longfin Smelt larvae in West Canal near Clifton Court Forebay in January and February of 2022. Catch in the central and south Delta has generally been low relative to other areas of the estuary, but detections suggest that spawning in the Delta has occurred in both the San Joaquin River and Sacramento River corridors. Large catches have also occurred downstream of the confluence by SLS. The SMT tracks Longfin Smelt distribution and salvage to assess risk and make appropriate operational recommendations consistent with the Longfin Smelt ITP, and the most recent assessment showed low risk of entrainment for fish outside the OMR corridor, and high risk for fish within the OMR corridor. A recommendation of -1,250 cfs OMR was made on April 26, 2022, under ITP Condition of Approval 8.4.2, which was triggered by 20mm Survey #3, to limit entrainment of larvae and juveniles within the OMR corridor. Lastly, Barker Slough Pumping Plant (BSPP) operations can be affected under the ITP (Condition of Approval 8.12) when Longfin Smelt larvae are detected between January 15 and March 31 at station 716 in Cache Slough in Dry and Critical years. This

trigger was reached by several SLS surveys in WY 2022, and on March 31, 2022, BSPP protections for Longfin Smelt under ITP Condition of Approval 8.12 off-ramped.

## **II. SWP and CVP Operational Considerations**

DWR and Reclamation have developed preliminary operational forecasts through September 2022, using the 90% exceedance forecast from the April 1, 2022, Bulletin 120 forecast developed by DWR's Division of Flood Management. The operational forecast included in this Drought Plan is designed to make the most efficient use of the limited water resources in 2022 for multiple beneficial uses while meeting regulatory requirements and managing the potential risks of continued drought conditions into next year. There are four main goals of Project operations within the forecasts: 1) Meet health and safety requirements throughout the SWP and CVP service areas, including those that rely on Project exports; 2) Preserve upstream storage to the extent possible for temperature management, instream uses in the water year, and carry-over storage for future drought protection; 3) Meet regulatory and senior/riparian water right obligations throughout the basins; and 4) Deliver available project water not needed to meet the previous three goals.

The operational forecast provided reflects a potential outcome given the hydrologic forecast on April 1 and assumptions on initial regulatory and policy decisions regarding prioritization of a limited water supply. The hydrologic scenario used in this Drought Plan is discussed in the Projected Hydrology and Runoff section later in the document, as are improvements to hydrologic forecasting methods.

The following are the Projects' critical operational considerations and objectives under the potential continued drought condition and are also reflected in the operational forecast.

### **A. Health and Safety Requirements**

Operations of the SWP and CVP must provide for, at a minimum, essential human health and safety needs throughout the SWP and CVP service areas and retain the capability to provide for such minimum needs throughout WY 2022 and possibly into WY 2023, should extremely dry conditions persist. For clarity, DWR and Reclamation's consideration of these essential human health and safety needs includes adequate water supplies and water quality for drinking water, sanitation, and fire suppression, but does not extend to other urban water demands, an example of which is outdoor landscape irrigation. While most California communities may have reserve water supplies, some communities will require continued delivery of limited amounts of water through the CVP and SWP facilities to meet these basic needs.

Reclamation uses its Municipal and Industrial (M&I) Water Shortage Policy to determine the amount of water to be provided to its M&I contractors in those years where human health and safety needs govern CVP allocations to these contractors. Under these conditions, M&I contractors are required to update population estimates and non-CVP water source information

to determine how much water will be needed from the CVP to meet their overall human health and safety demand for that year. The vast majority of CVP contractors throughout the entire service area that receive M&I water from the CVP have other available supplies to help meet their demand, although many alternate supplies relied upon in WY 2021 may not be available in the same capacity for WY 2022.

The SWP's human health and safety demands are based on minimum unmet water supply and are to be no more than 55 gallons per capita per day, consistent with the description contained within the SWRCB's emergency curtailment regulations.

## **B. Preservation of Upstream Storage for Fish and Wildlife and Future Drought Year Protection**

The SWP and CVP operation forecasts are consistent with the requirements set forth in the 2019 NMFS and USFWS Biological Opinions to address impacts to endangered species. They also address SWP obligations under the California ESA (CESA).

The operations forecast included in this Drought Plan covers April 1 to September 30. A primary consideration involves the need to conserve enough cold water in Project reservoirs early in the year to maintain temperature management in the Sacramento, Feather and American Rivers to support the various runs of Chinook salmon and steelhead. As such, a key component of this drought plan is storage conservation, particularly in the spring to maximize the available cold water for use throughout the summer. Additional details regarding these temperature operations are included in the forecast section below. In addition to conserving storage in the spring, Shasta, Oroville and Folsom are also forecasting higher end-of-September carryover storages than were seen in 2021 which will support drought protection into 2023 and serve other critical purposes such as power supply and secured access to water supply intakes.

## **C. Regulatory and Senior Water Right Requirements**

Both DWR and Reclamation have commitments to deliver water for Delta salinity and outflow, to senior water rights holders, and to wildlife refuges. These commitments are made through D-1641, various contracts, and through the Central Valley Project Improvement Act (CVPIA). D-1641 includes reduced requirements in dry and critically dry conditions to recognize the limited water supply in those years. The various senior water right contracts and wildlife refuge deliveries also include provisions for reduced demands in critically dry years. Additional details regarding specific contracts are included in the operational forecasts section.

## **D. Coordinated Operations Agreement**

The Coordinated Operations Agreement (COA) is an agreement between the State of California and the U.S. Government that defines sharing of available water supply and certain regulatory obligations of the Central Valley Project and the State Water Project. It was signed in 1986 and amended in 2018. Due to the extreme hydrology of the current drought, the Projects have been operating since 2021 within the physical and regulatory limitations of the project facilities, which has resulted in a COA debt accumulation by DWR. While DWR accrued a COA debt to Reclamation in 2021, beginning in February 2022, DWR has been adjusting operations to reduce the balance owed to Reclamation. As of the end of March 2022, the COA balance was 222 TAF.

## **III. Improvements to Hydrologic Forecasting**

WY 2022 has been marked by climate-driven extremes far outside the historical norm in California. Following on the heels of intensely dry conditions in 2020 and 2021, the current water year continued a fundamental break from historical norms and required the use of new tools and partnerships to understand rapidly changing conditions and implications for our water supply. Snowmelt this year began sooner and peaked earlier than usual. This acceleration can be expected to continue for the remainder of the year as warm and dry conditions persist. Across nearly all measurable indicators, California's climate is becoming hotter and more unpredictable with larger and more frequent swings between wet and dry periods. These dramatic climate-induced changes create unprecedented forecasting challenges, and DWR is investing heavily to adapt. The Bulletin 120 and Water Supply Index (WSI) forecast for April 2022 utilizes data from more sources than ever before, including updated state-of-the-art electronic monitoring stations, Airborne Snow Observatory flights, satellite data, and modeling techniques that DWR will continue to refine and leverage in coming years to prepare for a new climate reality. Ongoing collaboration with research partners will also help us understand post-fire impacts on snow and hydrology and better model snowmelt and runoff, soil conditions, sublimation, changes to landscape from climate change, fire, and tree mortality. DWR's Snow Surveys and Water Supply Forecasting teams are coordinating with hundreds of scientists, researchers, and partner agencies across the state to present the best picture of runoff conditions possible in the face of unprecedented drought conditions and climate whiplash. DWR is taking an all-hands-on-deck approach to meet the increasing challenges posed by a warming climate. Our current investments and new forecasting efforts plus funding opportunities we are continuing to seek will help get us better answers crucial to the future of forecasting our water supply.

## IV. Operations Forecasts - Projected Hydrology and Runoff, Releases and Storage

### A. April 1, 2022 – Projected Hydrology and Runoff

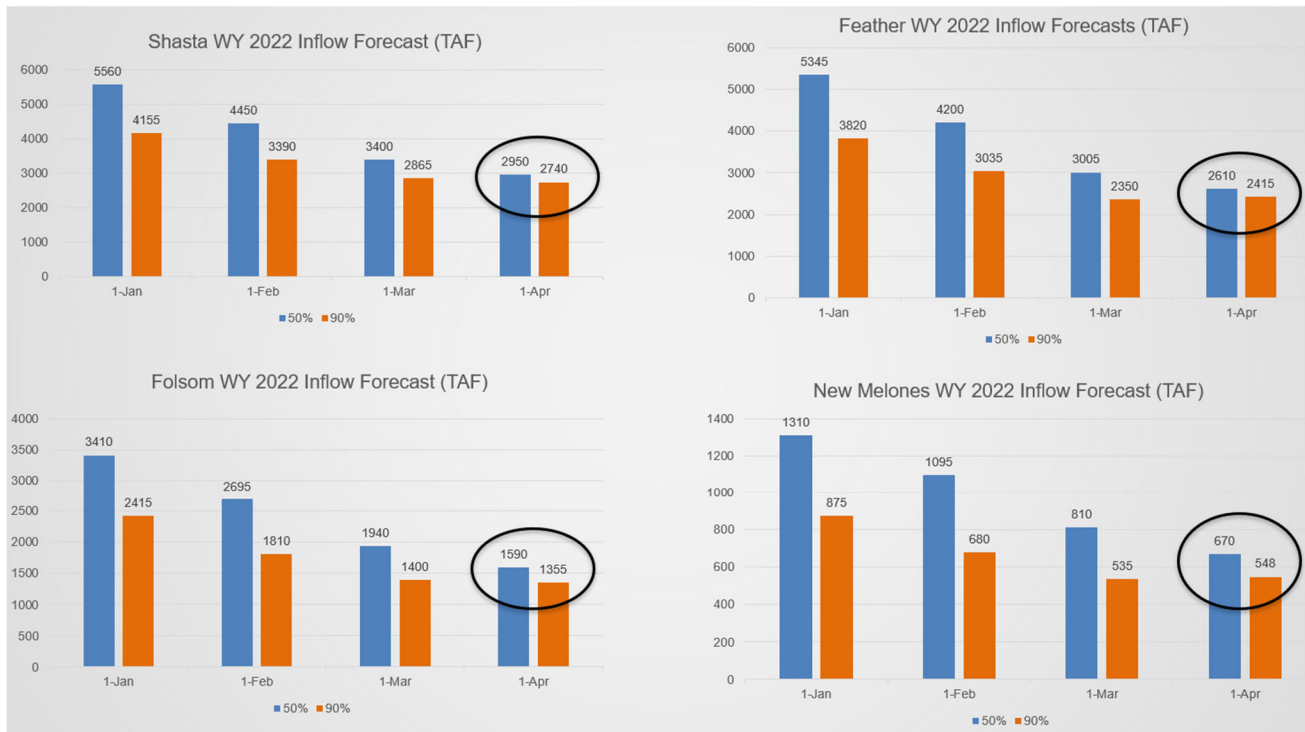
The DWR’s Hydrology and Flood Operations Branch within the Division of Flood Management produces estimates of water year runoff, or the water supply index (WSI), for the major watersheds of the Sacramento and San Joaquin River basins. The WSI forecast is a statistically based forecast of Water Year runoff for each major river basin in the Sacramento and San Joaquin valleys (Sacramento, Feather, Yuba, American, Stanislaus, Tuolumne, Merced, and San Joaquin). The runoff forecasts are produced for six exceedance levels--99%, 90%, 75%, 50%, 25%, and 10%--and are done at the beginning of the month from December through May.

The Projects used the 90% exceedance Water Supply Index (WSI) forecast for the joint operations plan included in this April Drought Plan. The hydrologic forecast is unique to this water year and informed by precipitation, runoff, snowpack, and other antecedent hydrologic conditions as they existed on April 1, 2022. The forecast also combines the runoff associated with the antecedent conditions with the anticipated runoff resulting from precipitation forecasted to occur through September 30. For example, the 90% exceedance hydrology assumes inflows from rainfall and snowmelt at levels that are likely to be exceeded with a 90% probability, or in other words, there is a 10% or less chance of actual conditions turning out to be this dry or drier from this point forward.

The April 1 WSI forecast water year classifications and runoff for the Sacramento Valley and San Joaquin Valley are summarized as follows:

Sacramento River Unimpaired Runoff (50% Exceedance)	9.7 MAF (55% of average)
Sacramento Valley Index (SVI) (50% Exceedance)	4.2 MAF (Critical)
San Joaquin Valley Index (SJI) (75% Exceedance)	1.4 MAF (Critical)

The plots below provide a comparison of the 90% and the 50% exceedance forecasts for Shasta, Oroville, Folsom, and New Melones from January to April 2022. Because of the historic dry calendar year conditions, each successive monthly hydrologic forecast has been increasingly drier; however, the forecasts are converging, which is expected in the spring as the wettest months of the water year are in the past.



## B. SWP and CVP Operations Forecasts

The April 1, 2022 SWP and CVP operations forecast is shown in Attachment 1 and includes storage and flows under the 90% exceedance hydrologic scenario. The February 2022 Drought Plan included a range of operational forecasts to represent the hydrologic variability and operations associated with very dry to average WY conditions. However, as noted in the January through April inflow forecasts above, the forecasts are converging, and given the above average conditions in April, the Projects expect that the 90% exceedance forecast represents a conservative outcome for the remainder of WY 2022. The operations forecast uses the runoff forecast as model inputs to simulate Project operations under various regulatory requirements and produce forecasted reservoir storages, releases, and flows under the same hydrologic exceedances. This operations forecast gives general guidance for annual water delivery, storage management, and power planning purposes for this exceedance assumption. Actual hydrologic events unfold in time steps shorter than a month and are often unpredictable more than a few days to a week out. Day-to-day operations are driven by operating criteria such as those found in U.S. Army Corps of Engineers flood control manuals, SWRCB D-1641 Bay-Delta Standards, the NMFS and USFWS Biological Opinions, and the ITP for the SWP. Outputs from forecast model, as provided in this Drought Plan, represent system responses to the overlay of specific expected monthly operating criteria on each of the discrete hydrologic scenarios provided in the April 1 water supply forecasts.

The forecast assumptions utilize existing storage conditions, actual precipitation through March, forecasted runoff based on the hydrology, projected water supply deliveries, and meeting existing flow and water quality standards, and fish and wildlife protections. The forecast includes monthly storage levels, reservoir releases, Delta export rates, and Delta outflow through

September 30, 2022. DWR and Reclamation will continue to update the operations forecasts with each new monthly water supply forecast, and expect that with each updated operations forecast, SWP and CVP operations may change.

### **C. Contractual Obligations**

The official determination of the delivery to the Feather River Settlement Contractors (FRSC) is based on the April 1 B120 Feather River runoff forecast. The April 1 B120 forecast triggered the drought deficiency criteria of the FRSC Agreements, and as such, the deliveries to the FRSC have been reduced to 50% for WY 2022.

Deliveries to Sacramento River Settlement Contractors, San Joaquin River Exchange contractors, and wildlife refuges are normally determined by the Shasta inflow. For 2022, an annual unimpaired inflow below 4.0 MAF indicates a “Shasta Critical” year, which triggers reduced allocations. The initial determination for the Shasta Critical year was made on February 15 with a projected inflow of 3.39 MAF under the 90% exceedance. Since the February forecast, the projected inflow has continued to decrease, with the April 1 project inflow at 2.7 MAF. Although the Shasta Critical determination can change throughout the year with changing hydrology, it is unlikely the project inflow will increase above 4.0 MAF in the remainder of WY 2022.

Due to the very low storage at Shasta Reservoir and the two back-to-back years of low egg to fry survival for the endangered winter-run Chinook Salmon, Reclamation, DWR, NMFS, FWS, CDFW and the SWRCB worked with the Sacramento River Settlement Contractors to develop a Keswick release plan that conserves Shasta storage and prioritizes temperature management in the Sacramento River. This release plan was used to determine the available water for diversion by the Sacramento River Settlement Contractors and the wildlife refuges north of the Delta. The current estimate is that approximately 18% of the total contract value will be available for delivery in WY 2022 based on this release assumption. This delivery assumption was used in the forecast included in this Drought Plan.

For WY 2022, all CVP water service contracts are allocated 0% for irrigation contractors and only public health and safety for municipal and industrial contractors. SWP water supply allocations are at 5%.

### **V. SWP and CVP Operations Forecast Summary**

Differences in snowpack distribution, variation among basin and sub-basin hydrologic circumstances, disparity among month-to-month hydrologic conditions, and other meteorological uncertainties can also affect real-time reservoir and Delta operations and the available water supply at any given time. The 90% exceedance forecast presented in Attachment 1 of this document includes forecasted inflows, reservoir releases, water supply deliveries, and reservoir storage levels. This forecast is very general and is not the only driver of actions that may be needed in the future. The purpose of this document is to identify generally foreseeable areas of



concern in the 90% exceedance scenario as shown in operations forecast based on the April 1 Water Supply forecast. As described above, hydrological conditions can vary widely, as recently seen in a very dry January, February, and March. Consequently, the condition described below is based on the April 1 water supply forecast, and the system and hydrological conditions known at the time this Drought Plan was developed. System operations and forecasts will change with actual conditions, thus each subsequent water supply forecast and resulting areas of concern will be updated in future Drought Plan updates.

WY 2022 for the Sacramento Valley is classified as Critical in the 90% hydrological exceedance, which is summarized below. The official WY classification will be determined based on the May 1 B120 forecast.

Due to the significant reduction in available water for the Sacramento River Settlement Contractors and north of Delta wildlife refuges, the depletions throughout the system are expected to vary significantly from past drought years. Reclamation and DWR have worked with the Sacramento River Settlement Contractors to adjust the forecasted Sacramento Valley depletions based on this reduction for a more realistic depiction of expected operations. Additional drought actions such as curtailments and reduced demands may further affect the depletions beyond these adjustments. Due to the implementation of several drought actions that have not been implemented in previous drought years, large uncertainties remain regarding the expected depletions for WY 2022.

## **A. April 1, 2022 90% Exceedance**

The 90% exceedance forecast incorporates dry conditions for WY 2022. Current system-specific operations and 90% exceedance forecast areas of potential concern are further described in detail below.

### **i. Trinity River**

Spring flows on the Trinity River will be consistent with the annual allocation as prescribed by the Trinity River Main-stem Fishery Restoration Record of Decision. Consistent with fish health criteria, releases to augment flows in the Lower Klamath River may also be considered. The storage forecasted in the 90% exceedance forecast for the end of September is extremely low at under 500 TAF and does not leave a storage buffer in the event WY 2023 is also dry. In addition, low storage of this level also likely results in temperature management concerns both this water year and in WY 2023. To conserve storage in Trinity Reservoir to the largest degree possible, Reclamation is diverting minimal water from Trinity to the Sacramento River. Imports to the Sacramento River are limited to those necessary to reduce the residence time in Lewiston Reservoir and support temperature management down the Trinity River.

### **ii. Sacramento River**

Due to the very low storage at Shasta Reservoir and the two back-to-back years of low egg to fry survival for the endangered winter-run Chinook Salmon, Reclamation, DWR, NMFS, FWS,

CDFW and the SWRCB worked with the Sacramento River Settlement Contractors to develop a Keswick release plan that conserves Shasta storage and prioritizes temperature management in the Sacramento River. Initially, this schedule assumed releases would begin increasing above minimum flows (3,250 cfs) in April; however, the combination of reduced diversions and April precipitation resulted in maintaining minimum flows through the month of April. The expected monthly release schedule for the remainder of the water year is below.

Operations Information/Month	April	May	June	July	August	September
Shasta Releases (TAF)	183	267	253	257	257	218
Keswick Releases (cfs)	3,250	4,500	4,500	4,500	4,500	4,000
Keswick Releases (TAF)	193	277	268	277	277	238
Spring Creek Power Plant (TAF)	10	10	15	20	20	20
Shasta End-of-Month Storage (TAF)	1,746	1,646	1,523	1,382	1,238	1,135

The release schedule above includes very low releases from Keswick Reservoir into the Sacramento River as well as very low releases from Spring Creek Power Plant into the Sacramento River system. These low flows create a high level of uncertainty with both flow/temperature relationships as well as other river operations such as impacts to riparian diverters. Additionally, downstream depletions, Delta demands, and infrastructure limitations may also change the releases from the schedule above. Reclamation will be working with DWR, NMFS, USFWS, CDFW and the SWRCB regularly regarding these uncertainties and any potential for deviating from the release plan above.

The Final Temperature Management Plan for the lower Sacramento River will be released in early May.

### iii. Clear Creek

Flows on Clear Creek will be consistent with the 2019 NMFS Biological Opinion. The timing of any prescribed pulse flows will be closely evaluated through technical teams to minimize effects on temperature management and/or ability to help meet other system flow needs. Concerns with Clear Creek temperature management will be similar to those of the Trinity system.

#### **iv. Feather River – Lake Oroville**

Based on this water supply forecast, the end of September carryover storage is projected to be about 1.07 MAF, higher than what was seen in WY 2021 and primarily attributed to the April storms. The main intake structure at Lake Oroville has a number of shutters, that can be added or removed to control the elevation and temperature of water released from Lake Oroville. Typically, once a shutter is removed, it is not re-installed until the following year. Because of low lake elevation this year, there was not enough storage to support the installation of all the shutters, which is typical in a critical year. Therefore, during the summer and fall when ambient temperatures are high, storage is low, and the shutters are exhausted, DWR will blend warmer water being conveyed through the main Hyatt intakes with colder water from Oroville Dam's low-level outlet. Releases from Lake Oroville are for meeting in-basin demands, which includes Delta and instream requirements and deliveries to senior water right holders, and Delta exports.

#### **v. American River**

Flows on the American River will be consistent with the provisions of action included in the 2019 NMFS Biological Opinion and the 2019 Folsom Water Control Diagram. Folsom is currently gaining storage as the result of precipitation from the last series of storms and snowmelt. Flows in the April and May will generally follow either the minimum flows from the 2017 revised American River Flow Management plan or higher flows to meet Delta requirements. Flows in the summer and into the fall will likely be adjusted for Delta needs or to meet the temperature plan for the American River. Starting in June, flow releases may increase at Nimbus to facilitate temperature management along the American River, and these increased flows will then be used to meet other Project purposes in the system. Due to the recent April precipitation, Folsom storage and project storage has increased, and concerns regarding both temperature management and the ability to meet public health and safety demands are decreasing. Reclamation will be working with the American River Group on a Folsom temperature management plan in May.

#### **vi. Stanislaus River**

Flows on the Stanislaus River will be consistent with the provisions of the 2019 NMFS Biological Opinion and D1641 Vernalis base flow and water quality requirements. Flows April through June are expected to be primarily driven by the D1641 Vernalis base flow requirement (as modified by the 2022 April-June TUCO), which is met through releases from New Melones combined with flows in the San Joaquin River upstream of the Stanislaus River confluence, and the Stepped Release Plan spring pulse flow. The key area of concern for the Stanislaus River basin is carryover storage. New Melones has a very low refill rate, meaning it only typically fills in very wet years (such as 2017) and can go many years between filling even with non-drought hydrology. The 90% exceedance forecast shows a carryover storage of approximately 611 TAF at the end of September, leaving very little buffer for New Melones should WY 2023 also be dry.

In 2021, Reclamation released a significant volume of water (approximately 148 TAF) from New Melones Reservoir to meet Delta needs and to offset the need for additional releases from

Shasta, Oroville and Folsom reservoirs. This operation was implemented in consideration of the extremely low storages at Shasta, Oroville, and Folsom reservoirs and the relatively higher storage at New Melones Reservoir. Due to the lower storage at New Melones Reservoir this year, there is currently no plan to conduct a similar operation in WY 2022. Reclamation and DWR are coordinating on an appropriate mechanism to recognize this 2021 operation.

#### **vii. Sacramento-San Joaquin Delta**

April through June Project operations are in accordance with the modified D-1641 outflow and water quality standards as conditionally approved by the SWRCB in the April 4, 2022, Temporary Urgency Change Order (TUCO). The TUCO is further described in Section VII.A.

## **VI. Monitoring Efforts to Inform Operations**

### **A. Delta Smelt Surveys**

Since the previous 2014-2016 drought, a new management-relevant survey has been developed—Enhanced Delta Smelt Monitoring Survey (EDSM), which conducts high intensity sampling year-round and provides regional population abundance estimates for Delta Smelt across their range. This information has helped to inform export operational decisions and allowed for flexibility in maximizing export opportunities earlier this year.

The EDSM surveys are conducted in addition to several other surveys, including the Smelt Larva Survey and 20mm Survey, which both focus on early life stages, as well as the Spring Kodiak Trawl, which focuses on spawning adults. As part of the new ITP, CDFW, DWR, and partners are testing improved methods to measure larval smelt entrainment at the SWP, and pilot surveys for this effort began sampling in early January 2022.

Additionally, experimental releases of hatchery-reared Delta Smelt occurred from December 2021 thru February 2022. A total of approximately 55,733 fish were released throughout the North Delta Arc during this period, and recaptures in monitoring indicate that a portion of the releases are surviving and dispersing in the Delta. Between mid-March and mid-April 2022, 39 larval and juvenile Delta Smelt have been collected across several surveys over a large geographic area including the Lower San Joaquin River, Old River, Lower Sacramento River, north Delta, and confluence.

The Delta Smelt population was at extremely low abundance in WY 2021. Catch of wild Delta Smelt during WY 2022 has been limited to one adult fish as of April 21, 2022, though catch of released fish has been more significant, totaling 83 fish to date. Consequently, as outlined in the Biological Opinions and DWR's ITP, management activities may focus more on habitat conditions including turbidity, temperature, and OMR flows when assessing the risk of entrainment. Particle tracking and life cycle models will also be considered, as appropriate, to guide management actions.

## B. Salmonids Near-Term Drought Monitoring

There is no need for augmented monitoring of salmon entering the Delta to inform water operation management because salmonid populations are currently in the Delta and are widely distributed. However, continued very low detection rates of salmon in the Delta, particularly winter-run, have made it extremely challenging to assess the distribution and status of the population.

Other studies on migration paths and mortality will continue in 2022 for winter-run and spring-run salmon, as well as steelhead and sturgeon, to improve scientific knowledge about the population dynamics of these species. Several new or updated models, such as the STARS model and the enhanced Particle Tracking Model, are available to simulate fish migration rate, routing, and survival in the Delta in response to flow and other variables. However, despite increased detection rates of juvenile salmon at the salvage facilities in April, other factors that are controlling OMR management below regulatory requirements associated with salmon loss triggers suggest further export reductions are not needed to minimize the impact of drought actions on the survival of salmon migrating through the Delta.

Similarly, the two predictive model tools under development to improve management of winter-run Chinook Salmon salvage will not be of much use for the duration of this season given the salmonid protections will not likely be controlling of water project operations for the remainder of the salmon migration season.

## C. Ecosystem Drought Monitoring

Monitoring during the previous major drought demonstrated that there can be major ecological changes in the estuary. For example, the previous drought showed increases in harmful algal blooms, aquatic weeds, and alien fishes (e.g., centrarchids). These changes are likely to occur again under drought conditions, and monitoring could focus on measuring these effects to understand the impacts of this potential drought and efficacy of different management actions taken to address these ecological stressors. As a specific example, these data can help evaluate the effects of controllable factors (e.g., diversions) versus factors that can't be managed (e.g., Delta temperature). Many of these changes are not within the reasonable control of the CVP and SWP and should be addressed through the broader science enterprise.

Our approach to drought ecosystem monitoring is expected to build on existing monitoring and synthesis efforts to examine the effects of flow management and extreme flow events (e.g., drought, flood) on critical ecological conditions. The Interagency Ecological Program (IEP) Drought Management Analysis and Synthesis Team (MAST) was originally formed in 2014 to assess the impact of the major drought of 2012-2016. This team was reformed in spring of 2021 with several of the original members as well as many new members to assess the drought of 2020-2021 and future drought impacts. The team contains members from DWR, DSP, Reclamation, CDFW, USFWS, NMFS, and USGS who are all committed to synthesis and monitoring of ecosystem drought impacts. The team works closely with the Reclamation-led effort to develop a Drought Toolkit and the joint DWR/Reclamation team developing the annual

Drought Contingency Plan. The team is analyzing a broad suite of ecosystem parameters in the Delta to assess the impact droughts on the Delta, with particular attention to the drought of 2020-2022 and associated drought actions. An initial report was submitted on February 1 (available: [https://www.waterboards.ca.gov/drought/tucp/docs/2021/20220201\\_report\\_cond7.pdf](https://www.waterboards.ca.gov/drought/tucp/docs/2021/20220201_report_cond7.pdf)) and included major ecosystem changes observed in historical droughts and the current drought. A secondary report will be provided February 1, 2023, with a final report in summer of 2023.

For details, see Attachment 2, the “Drought Ecosystem Monitoring and Synthesis Plan, 2021-2023.”

## VII. WY 2022 Drought Actions

As noted in this Drought Plan, winter hydrological conditions are very dynamic, and there is uncertainty in the April 2022 forecast. The first three months of WY 2022 saw significant precipitation, and there were considerable gains in snowpack, but it is uncertain how the water year will end, especially considering the very dry January, February, and March. The Projects have undertaken the following early actions in response to the continuing drought; however, future Drought Plans may include additional drought actions, should they be needed.

### A. Temporary Urgency Change Petition

DWR and Reclamation submitted a Temporary Urgency Change Petition (TUCP) on December 1, 2021, requesting modifications to specific Decision 1641 objectives between February 1 and April 30, 2022. The purpose of these requested modifications was to conserve upstream storage through operational flexibility. This modification was requested under the assumption that WY 2022 would continue with dry conditions from 2021. Because of the improved hydrology in October and December 2021 and subsequent storage improvement in Oroville and Folsom, DWR and Reclamation submitted a joint letter on January 18, 2022, requesting to withdraw the TUCP for the February through April period.

However, given the historic dry conditions in January through March 2022, the Projects submitted a TUCP on March 18, 2022, for April, May, and June 2022. On April 4, 2022, the SWRCB issued a conditionally approved TUCO. The April through June modified D1641 standards are as follows:

- Delta outflow: reduced from 7,100 – 11,400 cfs to 4,000 cfs;
- Delta salinity: re-located western agriculture salinity compliance standard from Emmaton to Threemile Slough;
- San Joaquin River at Vernalis: reduced minimum Vernalis flows from a range of 710 cfs to 1,140 cfs to 710 cfs; and
- Exports: at or below 1,500 cfs combined when not meeting D1641

While the historic January through March dry conditions were setting up conditions for additional D1641 modifications beyond June 2022, the recent April storm events and subsequent storage

gains have improved conditions in both Oroville and Folsom. The Projects will be reassessing the need for an additional TUCP submittal using the May 1 B120 forecast.

## **B. West False River Emergency Drought Salinity Barrier**

Construction of this rock-filled channel closure, across West False River from Jersey Island to Bradford Island, began on June 3, 2021, and installation was completed on June 22, 2021. Removal of the barrier was originally planned to begin in October and full removal was anticipated by November 30, 2021. (A preliminary report on the effectiveness and impacts of the Barrier has been developed and is included as Attachment 3.)

However, in response to the continuing drought conditions, DWR received approval from CDFW, U.S. Army Corps of Engineers, and the SWRCB to keep the emergency drought salinity barrier in place through the winter. In January 2022, the barrier was notched by removing rock from approximately 400 feet from the center section to allow boat and fish passage. The notch was backfilled on April 13, 2022. The barrier is planned to be fully removed no later than November 30, 2022.

In addition, DWR is working to get all environmental approvals, through standard non-emergency processes, to allow for up to two additional installations of the West False River barrier between 2023 and 2032, if needed. These future barrier installations would occur no sooner than April 1 of any given year and would be fully removed no later than November 30 that same year or the following year.

## **C. Reduction to water available for Sacramento River Settlement Contractors and North of Delta Wildlife Refuges**

As noted above, due to the very low storage at Shasta Reservoir and the two back-to-back years of low egg to fry survival for the endangered winter run chinook salmon, Reclamation, DWR, NMFS, FWS, CDFW and the SWRCB worked with the Sacramento River Settlement Contractors to develop a Keswick release plan that conserves Shasta storage and prioritizes temperature management in the Sacramento River. This release plan was used to determine the available water for diversion by the Sacramento River Settlement Contractors and the wildlife refuges north of the Delta. The current estimate is that approximately 18% of the total contract value will be available for delivery in WY 2022 based on this release assumption. The shortage provision for a Shasta Critical year included in their contracts is 75%.

## **D. Planned Transfers, Forbearance Agreement Actions, Exchanges**

Although there are 34 Intent to Transfer (ITT) proposals submitted to DWR's online database system (Water Transfers Information Management System) for planned transfers and forbearance agreement actions, Sacramento River Settlement Contractors have decided there will be no transfers facilitated to south of the Delta this year from their available supply. Transfers may still occur between various contractors north of the Delta. Table 1 and Table 2 below show the breakdown of the ITT submittals number and estimated quantity in acre-feet by the source(s)

of transfer water and method to make water available to transfer, respectively. Please note the nature of ITT is preliminary, and a submittal of ITT does not warrant an actual transfer action.

Ongoing exchanges through the Consolidated Place of Use (CPOU) between the two Projects continue to be reported through the CPOU monthly reports. On April 1, 2022, Reclamation and DWR submitted additional request for 2021-2022 CPOU to State Water Resources Control Board for approval of an exchange action for up to an additional 100,000 acre-feet (an increase from an approved 50,000 acre-feet to a total of 150,000 acre-feet) among San Joaquin River Exchange Contractors, Arvin-Edison Water Storage District, and Metropolitan Water District. The total quantity of transfers and exchanges will not exceed 431,780 acre-feet as authorized under the 2021-2022 CPOU order.

From the April forecast, Yuba Water Agency expects to provide a total of 158,400 acre-feet of the Yuba Accord water transfer in 2022 in the following preliminary breakdown (Component 1 – 60,000 acre-feet, Component 2 – 30,000 acre-feet, Component 3 – 6,000 acre-feet, and Component 4 groundwater substitution – 62,400 acre-feet) to DWR and Reclamation Participating Contractors. The total quantity will be updated monthly during the transfer year.

Table 2: Number of Intent to Transfer Submitted as of April 22, 2022

Method to Make Water Available for Transfer					
	Sacramento River	Feather River	American River	Delta	Total
Groundwater Substitution	10	3	1	1	15
Cropland Idling/Shifting	3	3	0	0	6
Groundwater Substitution and Cropland Idling	10	2	0	0	12
Reservoir Release	0	0	1	0	1
Total	23	8	2	1	34



Table 3: Maximum Amount of Transfer Water in Acre-feet Based on Intent to Transfer Submitted as of April 22, 2022

Method to Make Water Available for Transfer					
	Sacramento River	Feather River	American River	Delta	Total
Groundwater Substitution	36,270	16,520	10,400	4,000	63,190
Cropland Idling/Shifting	22,398	71,898	0	0	94,296
Groundwater Substitution and Cropland Idling	262,920	35,426	0	0	298,346
Reservoir Release	0	0	20,000	0	20,000
<b>Total</b>	<b>321,588</b>	<b>123,844</b>	<b>30,400</b>	<b>4,000</b>	<b>475,832</b>

## VIII. Next Steps

DWR and Reclamation continue to provide weekly condition and Project operations updates to members of the WOMT. In addition, DWR and Reclamation will continue to coordinate with the existing Long-term Operation Agency working groups and Drought Relief Year Team to develop a robust drought monitoring program with updates to WOMT and other forums as necessary. In addition, this Drought Plan will be updated in May to include the current hydrological conditions, SWP and CVP operational forecasts that incorporate the May 1 Bulletin 120 forecast, and additional potential drought actions, if warranted.

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