

**State Water Project and Central Valley Project  
Drought Contingency Plan  
February 1, 2021 – September 30, 2021**

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**State Water Project and Central Valley Project  
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This Drought Contingency Plan (DCP) is prepared by the California of Water Resources (DWR) and the U.S. Bureau of Reclamation (Reclamation) in an effort to provide an initial outline of areas of potential concern given the current dry hydrology of 2021. 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 Incidental Take Permit (CDFW 2020) (ITP). This DCP will be submitted by DWR to the California Department of Fish and Wildlife (CDFW) on or before February 1, 2021 in response to Condition 8.21 of CDFW's ITP. Concurrently, this plan will be shared with the Water Operations Management Team (WOMT) which includes representatives from DWR, Reclamation, USFWS, NMFS, CDFW, and the State Water Resources Control Board (SWRCB) (collectively referred to as Agencies).

Over the past several months, as part of implementing the action included in the 2019 Biological Opinions and ITP DWR and Reclamation have worked with the Agencies to identify actions that could potentially be implemented during a drought (not specifically for water year 2021) to manage the State's limited water supplies. This Drought Toolkit describes the anticipated coordination, process, planning and potential drought response actions in the event of a drought. At the time this initial report was being finalized in late-January, the largest precipitation event of the water year was passing through with forecasts that could potentially add 10 inches of precipitation within a week. The combination of the extremely dry hydrology coupled with this major storm event make any specific planning for a drought extremely speculative. Accordingly, this DCP does not propose specific drought actions for water year 2021; it merely outlines the current conditions and areas of concern. As the hydrology continues to develop and the potential for drought conditions becomes more clear, this DCP will be updated and, if appropriate, specific actions will be identified. In the meantime, DWR and Reclamation are committed to continued development of the Drought Toolkit and will continue to coordinate with the Agencies should it be determined that an action or actions from that Toolkit need to be implemented in WY 2021.

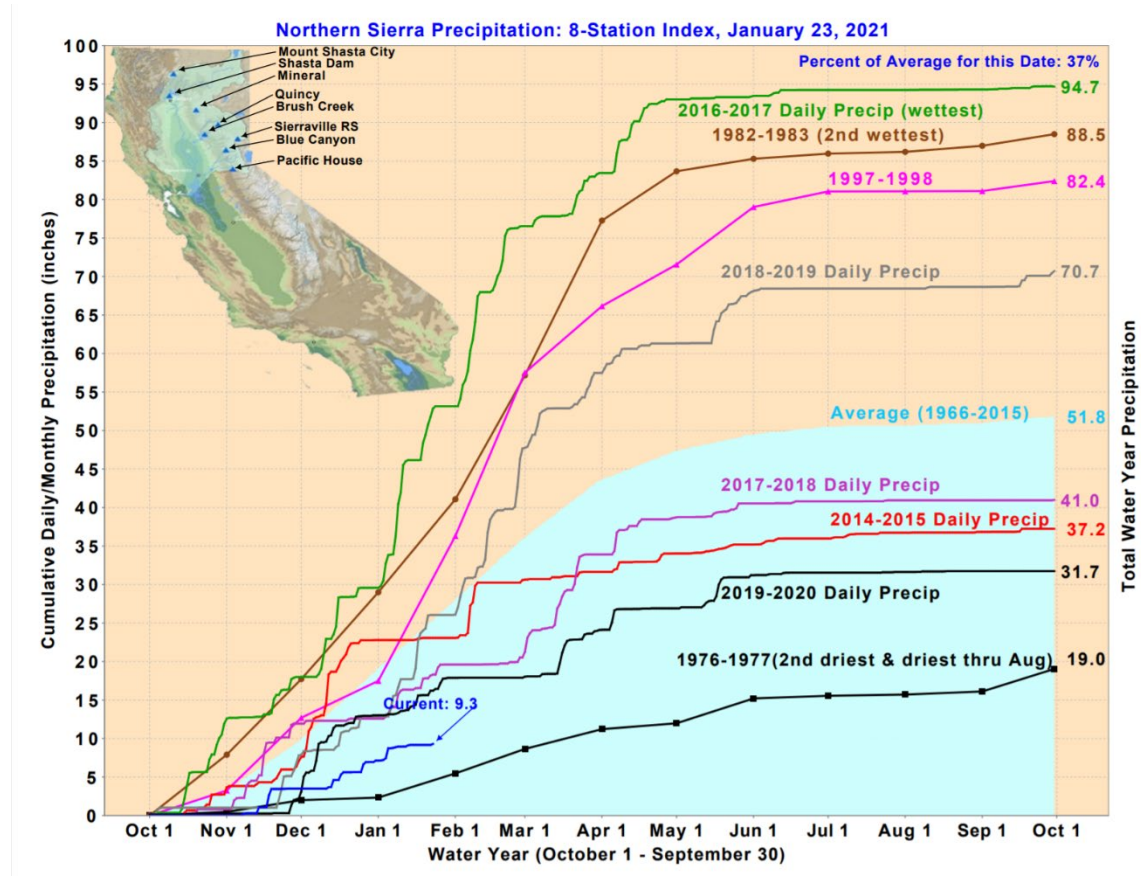
This initial DCP includes an update on the hydrological condition assessment, a species status update, forecasts of hydrology, SWP and CVP (collectively referred to as "Projects") operations, and areas of potential concern. This DCP will be updated as necessary based on changing conditions. Most importantly, the DCP forecasts, as described below, are based upon hydrologic conditions as of January 1, 2021, although the dramatically low precipitation within the first three weeks of January is accounted for in some of the hydrology updates and contributed to the need for this document. Thus, we anticipate changes in drought response actions as the year's hydrology unfolds. Most notably, a series of winter storm events began

moving into the State within the last week of January whose impacts will not be quantified until after February 1. DWR and Reclamation are committed to working with the Agencies through further development of Drought Toolkit actions, weekly WOMT coordination, and other forums as necessary.

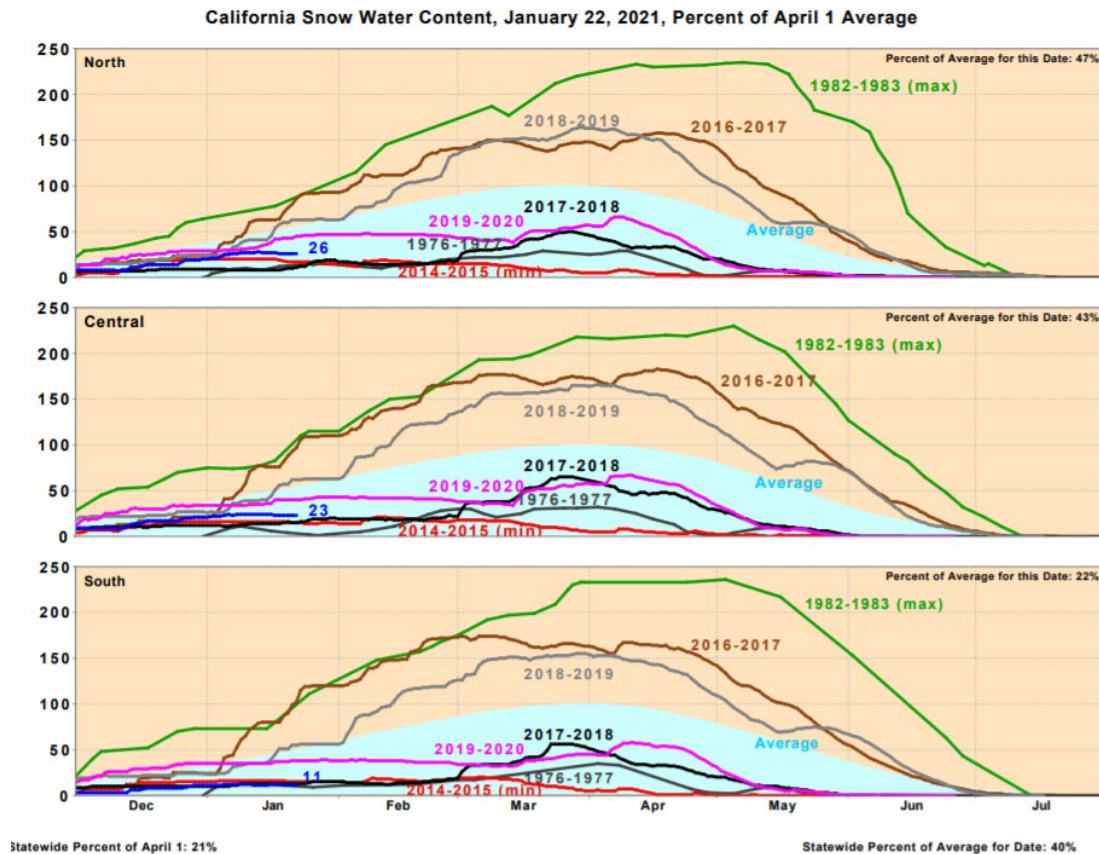
## I. Current Hydrologic Conditions

Conditions to date have been extraordinarily dry. Following an exceptionally dry Water Year (WY) 2020, the State’s January 1, 2021, snow survey found a Sierra Nevada snowpack that is less than half of normal in terms of the amount and water content for this time of year. Furthermore, the Northern Sierra 8-Station Index for WY 2020 was the ninth driest on record, and as of January 23, the WY 2021 October-January period is in the top five driest on record, tracking with historically critical years like 2014. Adequate storage is needed throughout the year, and especially in dry times of the year, in order for the CVP and SWP to supply health and safety needs, continue repelling saltwater intrusion in the Delta, provide for cold water and flow needs of Chinook salmon and meeting each Projects’ senior water rights demands.

As shown in blue on the following chart, the Northern Sierra Precipitation total as of January 23, is 9.3 inches and 37% of average to date.



As of January 22, 2021, Sierra snowpack, which makes up about 30% of California’s water supply, is tracking well below average, as shown on the following graphic. The northern basin is at 47% of historical average and continues to be well below average throughout the entire spine of the Sierras. The southern Sierra snowpack is even worse at 22% of historical average, tracking with the driest years on record.



## A. Water Quality

Salinity and Delta outflow conditions are likely to remain manageable over the next month; however, there is much uncertainty in the current hydrologic forecasts regarding spring water quality. Conditions will continue to be monitored. At this time, storage conservation is a top priority for both Projects as some reservoirs are still losing storage in January while maintaining their minimum required releases. Although increasing releases from reservoirs is one mechanism to improve salinity conditions, doing so could have devastating impacts later in the water year and will only be used if February standards cannot be met through reasonable export reductions. DWR and Reclamation do not anticipate that the Delta Cross Channel (DCC) gates would need to be opened in February to manage salinity. However, if conditions do warrant a change in DCC gate operations, the Projects will coordinate with the State and Federal fishery Agencies through the relevant technical teams and WOMT. Precipitation at the very end of January and within February is expected to play a key role in how Delta outflow and salinity will be managed. Given this uncertainty, conditions beyond February are difficult to predict.

## B. SWP and CVP Upstream Reservoir Storage

In the Sacramento River watershed, storage in upstream reservoirs remains well below average for this time of year. Lake Oroville end-of-December storage was about 1.2 million acre-feet (MAF) (35% of capacity and 57% of historical average). Lake Shasta end-of-December storage was about 2.0 MAF (45% of capacity and 72% of historical average), and Lake Folsom end-of-December storage was approximately 288 TAF (30% of capacity and 61% of historical average).

In the San Joaquin watershed, storage in New Melones Reservoir was 1.5 MAF, which is 64% of capacity and 112% of historical average, but 450 TAF lower than this time last year.

## C. Biology

### i. Salmonids

DWR and Reclamation are implementing the 2019 NMFS and USFWS Biological Opinions, and DWR also operates to the ITP. As of January 14, 2021, the preliminary estimate of natural juvenile winter-run Chinook salmon emigration past the Red Bluff Diversion Dam is 1,972,732, based on USFWS rotary screw trap monitoring. This is the second highest number of juvenile salmon estimated to have emigrated past RBDD since 2010. As of January 19, 2021, the Salmonid Monitoring Team (SaMT) determined the weekly risk forecast of exceeding yearly and daily entrainment thresholds remains low due to persistent low-flow, low turbidity conditions. However, risk level for the daily entrainment threshold could change quickly with a precipitation-driven high flow event.

Livingston-Stone hatchery winter-run are expected to be released January 30; the number expected to be released into the Sacramento River is around 302,166. Although most surveys are up and running for salmon monitoring, there have been very few detections of winter-run in lower Sacramento River monitoring, most likely due to a combination of an extended rearing period in the River (i.e. slow migration rates) and poor catch efficiency under this year's low-flow, low-turbidity conditions. The dearth of detections is continuing to force the SaMT to base distribution estimates mainly on historical patterns. The SaMT estimates of natural-production salmon and Steelhead estimated to be in the Delta has gone up a bit each week since November, and at the January 26 meeting, the ranges identified were: winter-run at 35-65% (up from 30-60%), spring-run at 15-25% (up from 10-20%), and Steelhead at 10-25% (up from 10-20%). However, as noted above, these estimates are expectations based almost entirely on historical patterns. For this reason, the SaMT agreed that going forward this year, estimates will be made in multiples of 5% to express low accuracy and precision.



Location	Yet to Enter Delta (Upstream of Knights Landing)	In the Delta	Exited the Delta (Past Chipps Island)
<i>Young-of-year (YOY) winter-run Chinook salmon</i>	35-65% (last week: 40-70%)	35 - 65% (last week: 30 - 60)	0% (last week: same)
<i>YOY spring-run Chinook salmon</i>	75-85% (last week: 80-90% )	15 - 25% (last week: 10 - 20%)	0% (last week: same)
<i>Steelhead</i>	75-85% (last week: 80-90%)	10% - 25% (last week:10 – 20%)	0-5% (last week: same)

## ii. Delta Smelt

DWR and Reclamation operate to the 2019 USFWS Delta Smelt Biological Opinion, and DWR also operates to the ITP. The Smelt Monitoring Team (SMT) began meeting to discuss current-year conditions at the end of November 2020. The 2020 Fall Midwater Trawl was completed in December, and the 2020 index was zero (“0”) for the third year in a row. Additionally, the Spring Kodiak Trawl (SKT) did not detect any Delta Smelt in January. The only survey that has caught Delta Smelt on a quasi-regular basis in recent years is the Enhanced Delta Smelt Monitoring Program (EDSM). EDSM caught Delta Smelt in the Sacramento Deep Water Ship Channel (DWSC) on January 6 and January 26, 2021, a single fish in Suisun Marsh in November of 2020, and a single fish in Suisun Marsh in September of 2020. Additionally, one Delta Smelt was collected in hatchery broodstock sampling in the DWSC on January 15, 2021. This lack of catch reflects the overall decline in the population to levels where we can no longer reliably detect them. Based on sampling and hydrology to date, it is likely that Delta Smelt are at a low risk of entrainment into the South Delta and the export facilities, and the situation continues to be closely monitored by the SMT in their weekly assessments.

## iii. Longfin Smelt

DWR operates to the ITP. 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 2020, 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 January 20, 2021, no Longfin Smelt have been salvaged this water year, though larvae have been detected by the Smelt Larva Survey (SLS) in the lower San Joaquin River near stations 809 and 812. Catch has generally been low, but detections suggest that spawning in the Delta has occurred in both the San Joaquin River and Sacramento River corridors. 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 to moderate risk of entrainment and no recommendations have been made to date. Lastly, Barker Slough Pumping Plant (BSPP) operations can be affected under the ITP when a Longfin Smelt larvae is detected at station 716 in Lindsey Slough. Such a detection occurred in the first SLS

of January, limiting BSPP operations to no more than 60 cubic feet per second (cfs) on a seven-day average.

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

DWR and Reclamation have developed preliminary operational forecasts through September 30, 2021, using the 50% and 90% exceedance forecasts from the January 1 forecast from DWR's Hydrology and Flood Operations Office within the Division of Flood Management. The operational forecasts developed for this DCP are designed to make the most efficient use of the limited water resources in 2021 for multiple beneficial uses while meeting regulatory requirements and managing the potential risks of continued drought conditions into next year. There are three main goals of Project operations within this forecast: 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; and 3) Meet regulatory and senior/riparian water right obligations throughout the basins.

The operational forecasts provided in this DCP reflect potential outcomes given the hydrologic forecast on January 1 and assumptions on initial regulatory and policy decisions regarding prioritization of an extremely limited water supply. However, the actual operation is still uncertain at this time because of both changing hydrology and future decision-making of how to achieve the goals enumerated above. The hydrologic scenarios used in this DCP are discussed in the Projected Hydrology and Runoff section later in the document.

The following are the Projects' critical operational considerations and objectives under the potential drought conditions, reflected in the operational forecasts. Critical drought conditions are primarily reflected in the 90% exceedance 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 2021 and WY 2022 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 currently 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.

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

The SWP and CVP operations outlined in this DCP are consistent with the requirements set forth in the 2019 Biological Opinions to address unavoidable impacts to endangered species due to drought. They also address SWP obligations under the California ESA (CESA). As noted above, this DCP does not set forth specific operations due to the uncertain hydrology. Future revisions to this DCP, including identifying potential actions, will follow the process set forth in the 2019 Biological Opinions. DWR will also follow the provisions set forth in the ITP.

The operations forecast included in this DCP covers February 1 to September 30. A primary consideration involves the need to conserve enough cold water in Project reservoirs early in the year to maintain cool water temperatures in the Sacramento River and tributaries to support the various runs of Chinook salmon and steelhead. If conditions remain dry, these same water supplies may be needed to provide for other critical operational considerations throughout 2021. The timing, flow rate, and rate of any flow changes for instream fishery needs will also vary with storage and hydrologic conditions.

## **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. The current 90% forecast indicates all dry-year provisions will be triggered in 2021.

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

## **A. January 1, 2021 – Projected Hydrology and Runoff**

The DWR's Hydrology and Flood Operations Office within the Division of Flood Management produces estimates of water year runoff for the major watersheds of the Sacramento and San Joaquin River basins beginning in December and updates these as part of DWR's Bulletin 120 update process through May of each year. The Water Supply Index (WSI) forecasts that are

utilized for this February 1 DCP are unique to this water year and informed by precipitation, runoff, and other antecedent hydrologic conditions as they existed on January 1, 2021. The February 1 Bulletin 120 runoff forecast will also incorporate actual snowpack measurements.

These forecasts combine the runoff associated with antecedent conditions with the anticipated runoff resulting from precipitation predicted to occur through September 30 under the 50% and 90% hydrologic exceedance scenarios. 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 50% probability assumes there is even chance that it will be drier or wetter from this point forward.

The WSI forecast is summarized as follows:

Sacramento River Unimpaired Runoff	50% Exceedance: 10.9 MAF (61% average)
Sacramento Valley Index	50% Exceedance: 5.3 MAF (Critical) Oct-Dec Runoff: 39% of historical average
San Joaquin Valley Index	75% Exceedance: 1.5 MAF (Critical) Oct-Dec Runoff: 20% of historical average

## B. SWP and CVP Operations Forecasts

The January 1, 2021 SWP and CVP operations forecasts are included in Attachment 1. The forecasts used the 50% and 90% exceedance hydrologic forecasts as model inputs to simulate Project operations under various regulatory requirements and produce forecasted reservoir storages, releases, flows, and deliveries under the same set of hydrologic exceedances. These operations forecasts give general guidance for annual water delivery, storage management, and power planning purposes for each exceedance assumption. Actual hydrologic events act 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. Output from forecast models as provided in this DCP represent system responses to the overlay of very specific operating criteria on each of the discrete hydrologic scenarios.

The base forecast assumptions utilize existing storage conditions, actual precipitation through December 2020, forecasted precipitation based on the hydrology, projected water supply deliveries, and meeting existing flow and water quality standards, and fish and wildlife protections. Each forecast includes monthly storage levels, reservoir releases, Delta export rates, and Delta outflow through September 30, 2021. Much is still unknown about the hydrology for this year. The hydrology will likely continue to fluctuate between the scenarios making the need for specific actions difficult to predict this early in the water year. Therefore, DWR and Reclamation will be planning for several potential scenarios based on the current dry trend and the significant unknowns about this year's hydrology.

The storage and flows under the January 1, 2021 50% and 90% hydrologic scenarios are included in Attachment 1. The January 1, 2021 50% and 90% exceedance scenarios were selected to show standard ranges of hydrology for potential future conditions. These operations forecast updates are generally completed by the third week of the month.

### **C. Contractual Obligations**

Under both the hydrologic scenarios, the model assumes fulfilling the contractual obligations between DWR and North Delta Water Agency. For the Feather River Settlement Contractors, the 50% shortage provision is assumed to be triggered under the 90% hydrology scenario. A final determination of the delivery to the Feather River Settlement Contractors will be made based on the April 1 forecast. Deliveries to Sacramento River Settlement contractors, San Joaquin River Exchange contractors, and wildlife Refuges are determined by the Shasta Index. For 2021, an index below 3.9 MAF indicates a “Shasta Critical” year, which triggers reduced allocations. Because both the January 50% and 90% exceedance hydrology indicates the index will be less than 3.9 MAF, the Sacramento River Settlement contractors, the San Joaquin River Exchange contractors, and the wildlife refuges are represented as reduced to their Shasta Critical volumes. Reclamation will make an initial determination of allocations on or before February 15 based on the Shasta index from the February 1 forecast and update as needed with future forecasts.

## **IV. SWP and CVP Areas of Potential Concern**

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 50% and 90% probability exceedance forecasts presented in this document are very general and are not the only drivers of actions that may be needed in the future. The purpose of this document is to identify generally foreseeable areas of concern in the 50% and 90% exceedance scenarios.

WY 2021 is classified as critical for both the 50% and 90% hydrological exceedances. However, significant concerns are only presented in the 90% exceedance scenario as summarized below.

### **A. January 1, 2021 50% Exceedance**

Both Projects are anticipated to be able to meet the Sacramento Valley in-basin requirements (which include senior water rights diverters and SWRCB D-1641 Bay-Delta standards), the contractual obligations of the both the Sacramento River and Feather River Settlement Contractors, and minimum health and safety needs.

Although the Projects are able to meet the Sacramento Valley in-Basin requirements and D-1641 Bay-Delta standards, should WY 2022 be classified as a third consecutive dry or critical

year, the low carryover storage will likely lead to concerns and challenges in meeting system demands.

## **B. January 1, 2021 90% Exceedance**

The 90% exceedance forecast incorporates very dry conditions for WY 2021. Each Project reservoir exhibits extremely low carryover storage. This forecast includes the trade-off between storage management and meeting the Sacramento Valley in-basin uses. Should these extreme dry conditions persist, there will likely be challenges in meeting WY 2021 system demands.

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 for the end of September is extremely low at just over 600 TAF and does not leave a storage buffer in the event 2022 is also dry. In addition, low storages of this level also typically bring temperature management concerns both in this water year and in WY 2022.

### **ii. Sacramento River**

Flow releases at Keswick are currently at the minimum of 3,250 cfs. Reclamation's goal is to maintain this flow throughout this winter and spring as much as practicable to help conserve storage in Shasta Lake; however, releases for Delta requirements and senior water right demands may require increases before the summer releases begin.

Absent early increases in releases, flows are expected to begin increasing in the mid-April timeframe for meeting in-river temperatures, senior water right deliveries and Delta requirements. Procedures and commitments consistent with the 2019 Proposed Action under the 2019 NMFS Biological Opinion will be applied through this period.

The key areas of concern for the upper Sacramento River include temperature management, meeting in-basin demands (including senior water right deliveries and Delta requirements) and carryover storage. Temperature management is of significant concern given the projected storage peaks in March and indicates that the full use of the temperature control device will not be possible. In particular, there will be little to no ability to release warmer water in the spring prior to the hot summer temperatures and instead will require colder water to be released earlier in the season, and therefore not be available later in the late summer/early fall. This could present significant concern for fishery protection in the late summer/early fall season. Preliminary estimates, based solely on the forecasted storage on April 30, indicate that 56°F will not be achievable at the Clear Creek gauge throughout the water year. The ability to manage temperatures will be heavily influenced by required releases for in-basin demands including

Delta requirements under D-1641 and senior water right holder deliveries for the Sacramento River Settlement Contractors. Although close coordination can make for a more efficient operation, the reduced volume of available supply for 2021 presents challenges with both temperature management and carryover storage. The 90% exceedance forecast shows a carryover storage of approximately 1,100 TAF. This is similar to storages seen in 2014 and would likely cause challenges in WY2022 should that year also be dry.

### **iii. Clear Creek**

Flows on Clear Creek will be consistent with the Proposed Action (PA) and the 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**

Total flows on the Feather River through the High Flow channel of the Feather River are currently at the minimum 1,250 cfs as required by the 1983 agreement between DWR and CDFW and the current Federal Energy Regulatory Commission license which included consultation with NMFS and USFWS. The flow through the Low Flow Channel is 800 cfs. The carryover storage in the 90% exceedance is 665 TAF, an unprecedented low. At this storage, temperature management is solely through the low-level outlet of Lake Oroville, and blending operations are not available. In addition, with this low storage, there may be limited outflow capability to meet Sacramento Valley in-basin requirements in WY 2021 and in WY 2022, should dry conditions persist.

### **v. American River**

Flows on the American River will be consistent with the provisions of action included in the 2019 NMFS Biological Opinion. Flows in the winter and spring will generally follow the minimum flows from the 2017 revised American River Flow Management plan although they may need to be increased above minimums due to meeting Delta requirements. Flows in the summer and into the fall may also be adjusted for meeting the temperature plan for Folsom Lake and the American River. Typically 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. The key areas of concerns for the American River include temperature management, meeting minimum health and safety deliveries within the American River basin and carryover storage. Temperature management is of significant concern given the projected storage for April and May, which indicate the highest shutter gates will not be able to be operated, requiring colder water to be released earlier in the season and therefore not be available later in the late summer/early fall. Folsom is a key (and sometimes the sole) water source for many M&I communities within the American River basin, some with senior water rights. For many in the area, this supply is contingent on a minimum storage within Folsom Reservoir. Although the exact storage varies with the demand expected, Reclamation generally assumes a storage less than 110 TAF is not adequate to operate the facilities to meet

expected demands. A storage below this level would require Reclamation to install emergency pumps to continue minimal deliveries. The current storage in the 90% exceedance forecast shows a Folsom storage of just at 110 TAF for the end of September. This indicates a significant concern with meeting minimum health and safety deliveries within the American River basin. This projected extremely low storage would likely cause challenges in WY2022 should that year also be dry.

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

Flows on the Stanislaus River will be consistent with the provisions of the PA and the NMFS Biological Opinion. Generally, flows in the winter and spring will follow the Stepped Release Plan schedules (from the PA) as modified through the interagency Stanislaus Watershed Team. The key areas of concern for the Stanislaus River basin include primarily 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. For this reason, storage within New Melones can be relied upon for meeting basin requirements for several years after the last filling. The 90% exceedance forecast shows a carryover storage of approximately 1,100 TAF at the end of September. While this storage is relatively high compared to the other reservoir within the system, it may still present challenges with regard to meeting future requirements should WY 2022 or even 2023 also be dry.

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

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

The current dry conditions have highlighted the need to improve the array of information that is collected to support management decisions pertaining to the effect of winter/spring exports on the Delta Smelt population. Since the previous major drought, a new management-relevant survey has been developed--EDSM, which conducts high intensity sampling year-round and provides regional population 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 key surveys, including the Smelt Larva Survey and 20-mm Survey, which focus on early life stages. As part of the new ITP, DFW, DWR, and partners will be testing improved methods to measure larval smelt entrainment at the SWP.

Despite these advancements in survey methods, the Delta Smelt population is at extremely low abundances in WY 2021, so catch is expected to be limited. As a consequence, 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**

In WY 2021, various salmonid monitoring efforts will continue, as long as drought conditions continue. Additional trawling and beach seining in the northern Delta and more frequent sampling at rotary screw traps further upstream in the Sacramento River Basin (as permitted given COVID safety restrictions), and implementation of a DCC gate operations trigger matrix would accompany any modifications in operations of the DCC gates from those specified in the NMFS Biological Opinion or D-1641. An increase in sampling duration at the salvage facilities may be considered as part of the monitoring plan to minimize inaccuracies in expanded salvage counts and loss calculations. However, in 2018, DOSS advised NMFS against increased sampling duration because the disadvantages would outweigh the potential benefits, and the SaMT may provide similar advice this year.

Other studies on migration paths and mortality will continue in 2021 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. These models will be used to inform real-time management decisions to minimize the impact of drought actions on the survival of salmon migrating through the Delta.

As a potential additional tool, DWR's ITP requires the development of a predictive tool to improve management of winter-run Chinook Salmon salvage. One of the potential models is already in an advanced state of development, and another will be initiated. These models will be piloted by SaMT to provide additional information regarding real-time operations, potentially improving our ability to reduce entrainment throughout the winter and spring.

This monitoring in 2021 and beyond was developed, partly in response to previous droughts, to improve our understanding of timing and distribution of species in the Delta, as well as inform targeted research and fill data gaps that further detail risks resulting from water operations.

## **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).

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)

currently has a Flow Alteration Team (FLoAT) that coordinates a broad suite of monitoring, studies, and synthesis activities. As drought conditions progress, we propose to develop a work plan that summarizes predictions and the monitoring effort required to track ecosystem responses. We expect that the ecosystem monitoring will include many previous monitoring metrics, in addition to focused special studies. Examples of the latter effort include Reclamation's Directed Outflow Project (DOP), which is designed to provide key supplemental information on Delta Smelt responses to changes in outflow. Similarly, if a drought barrier is implemented, a focused monitoring effort will be used to assess the effects of this management action (e.g. Kimmerer et al. 2019).

## VI. Next Steps

As noted in this DCP, winter hydrological conditions are very dynamic, and there is uncertainty in the forecast. Although current conditions have been tracking critically dry, we are only halfway through the key months when California receives most of its rainfall, and the third wettest month is yet ahead of us. In addition, the last week of January 2021 is forecasted to bring much needed rainfall and snow to Northern California, with the chance of storm systems continuing into February.

However, there is considerable deficit of rain and snowpack, and it is important that DWR and Reclamation begin this coordinated planning effort should dry conditions return in February and beyond. Many actions implemented during the 2014-2015 drought required significant coordination and planning with State and federal agencies, Public Water Agencies, and stakeholders.

DWR and Reclamation will continue to collaborate with Agencies on the development of the Drought Toolkit and provide weekly hydrology and operations updates to WOMT. In addition, this DCP will be updated to include the current hydrological conditions, SWP and CVP operational forecasts that incorporate the February 1 Bulletin 120 forecast, and potential actions, if warranted.

## REFERENCES

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**OPERATIONS FORECAST RESULTS**  
For the February 1, 2021 Drought  
Contingency Plan

January 1st WSI - 50% HYDROLOGY

**END OF MONTH STORAGES (TAF)**

RESERVOIRS	2021							
	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
Trinity	1361	1509	1646	1513	1398	1276	1123	972
Shasta	2766	3183	3371	3456	3182	2829	2566	2499
Folsom	541	755	825	918	828	700	641	588
Oroville	1468	1778	1957	1953	1835	1615	1472	1478
New Melones	1575	1597	1571	1522	1445	1363	1296	1256

**MONTHLY AVERAGE RELEASES (CFS)**

RESERVOIRS	2021							
	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
Trinity	300	300	600	2920	790	450	860	870
Sacramento	3250	3250	4500	5500	10000	10000	8500	5650
American	1000	1300	3050	1950	3350	3250	2000	2000
Feather	1250	1050	800	800	1400	2950	2600	1100
Stanislaus	210	200	460	400	150	150	150	150

**DELTA SUMMARY (CFS)**

	2021							
	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
Rio Vista Flows	17200	15150	8700	5250	6250	4950	4250	3950
Sac River at Freeport	20250	18150	11200	7950	11700	11800	10650	9750
SJ River at Vernalis	2000	1950	1950	2000	950	800	750	850
Computed Outflow	19200	16150	11800	6800	6500	4150	4250	4250
Combined Project Pumping	5650	5550	1100	1550	2700	4250	3550	4250

**OPERATIONS FORECAST RESULTS**  
For the February 1, 2021 Drought Contingency Plan

January 1st WSI - 90% HYDROLOGY

**END OF MONTH STORAGES (TAF)**

RESERVOIRS	2021							
	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
Trinity	1238	1348	1395	1341	1206	1080	927	773
Shasta	2237	2424	2286	2046	1784	1407	1153	1095
Folsom	331	420	376	395	369	206	151	111
Oroville	1265	1363	1358	1231	978	814	690	665
New Melones	1521	1494	1425	1340	1265	1185	1122	1087

**MONTHLY AVERAGE RELEASES (CFS)**

RESERVOIRS	2021							
	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
Trinity	300	300	600	1500	780	450	860	870
Sacramento	3250	3300	7050	8000	8950	10000	7950	5050
American	850	850	2350	800	1200	3350	1600	1250
Feather	1250	1050	1900	1550	2900	1650	1450	1250
Stanislaus	210	200	460	400	150	150	150	150

**DELTA SUMMARY (CFS)**

	2021							
	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
Rio Vista Flows	7350	6200	6150	3550	3050	2350	1450	2200
Sac River at Freeport	8950	7850	8250	5950	7500	8150	6750	7200
SJ River at Vernalis	1500	1600	1400	1400	650	700	600	700
Computed Outflow	7750	7800	7600	4250	3500	3400	2500	4000
Combined Project Pumping	3800	2000	1100	1100	1100	1150	1100	1600