SAN JOAQUIN RIVER
RESTORATION PROGRAM

Bureau of Reclamation
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Updated 2024 Restoration Allocation & Default Flow Schedule April 11, 2024

Summary

The updated Restoration Allocation is based on an Unimpaired Runoff Forecast at the 50% probability of exceedance of 1,753 TAF. This results in a Normal-Wet water year type. This value for the runoff forecast was arrived at by blending the DWR and NWS forecasts with a 60/40 ratio, adjusting for observed runoff to date, and applying an offset based on professional judgment. Accordingly, 325.804 TAF is allocated to the Restoration Program as measured at Gravelly Ford. The Restoration Administrator is asked to return a recommendation on or before April 23.

Overview

The following transmits the initial 2024 Restoration Allocation and Default Flow Schedule to the Restoration Administrator for the San Joaquin River Restoration Program (SJRRP), consistent with the January 2020 (version 2.1) Restoration Flow Guidelines (Guidelines or RFG). This Restoration Allocation and Default Flow Schedule provides the following:

- Forecasted water year Unimpaired Runoff: the estimated flows that would occur absent regulation on the river. This value is also known as the "Natural River," "Unimpaired Runoff," "Unimpaired Inflow," or "Full Natural Flow," and is utilized to identify the water year type.
- Hydrograph Volumes: the annual allocation hydrograph based on water year unimpaired runoff, utilizing Method 3.1 with the Gamma Pathway (RFG-Appendix C, Figure C3) agreed to by the Parties in December 2008.
- Default Flow Schedule: the schedule of Restoration Flows in the absence of a recommendation from the Restoration Administrator.
- Additional Allocations: the hypothetical Restoration Allocations that would result from 10%, 50%, 75%, and 90% probability of exceedance of the Unimpaired Runoff forecast.
- Unreleased Restoration Flows: the amount of Restoration Flows not released due to channel capacity constraints, without delaying completion of Phase 1 improvements.

- Flow targets at Gravelly Ford: the flows at the head of Reach 2, and estimated scheduled releases from Friant Dam adjusted for the assumed Holding Contract demands and losses in Exhibit B.
- Restoration Budget: the volumes for the annual allocation, spring flexible flow, base flow, riparian recruitment, and fall flexible flow.
- Remaining Flow Volume: the volume of Restoration Flows released, the remaining volume available, and associated limitations and flexibility.
- Operational Constraints: the flow release limitations based on downstream channel capacity, regulatory, or legal constraints.

Consistent with Paragraph 18 of the Settlement, the Restoration Administrator shall make recommendations to the Secretary of the Interior concerning the manner in which the hydrographs shall be implemented. As described in the Guidelines, the Restoration Administrator is requested to recommend a flow schedule showing the use of the entire annual allocation during the upcoming Restoration Year or otherwise identify Unreleased Restoration Flows and categorize recommended flows by account, if a recommendation is not provided by the Restoration Administrator, the Capacity Constrained Default Flow Schedule (Table 6b) or the most recently approved schedule will be implemented. The Restoration Administrator is asked to return a recommendation on or before April 23.

Forecasted Unimpaired Runoff

Unimpaired Runoff represents the natural water production of a river basin, unaltered by upstream diversions, storage, or by export or import of water to or from other watersheds (a.k.a "Unimpaired Inflow" or "Natural River" or "Full Natural Flow"). It is calculated for the period of a water year. The forecast of the Unimpaired Runoff determines the volume of Restoration Flows available for the Restoration Year (i.e. the Restoration Allocation) (see Table 1). Information for forecasting the Unimpaired Runoff includes:

- Observation of Unimpaired Runoff into Millerton Lake to support the water supply allocation [1];
- The California Department of Water Resources (DWR) Bulletin 120 latest update for San Joaquin River inflow to Millerton Lake Unimpaired Flow, and/or the most current DWR Bulletin Water Supply Index (WSI) [3];
- The National Weather Service (NWS) Ensemble Streamflow Prediction (ESP) Water Supply Forecast for the San Joaquin River at Millerton Lake [5];
- Other forecast models, ground-based observations, remotely-sensed observations, hydrologic models, analysis of historic patterns, and short-term weather forecasts as appropriate.

Table 1 shows the water year 2024 (October 1, 2023 to September 30, 2024) observed accumulated and forecasted water year Unimpaired Runoff into Millerton Lake. This table also includes the published DWR forecast, the DWR forecast adjusted for an expected runoff for the current month, the NWS forecast with and without a 7-day smoothing function applied to remove the day-to-day variance, and the NWS forecast with 7-day smoothing and adjustment for the expected runoff for the current month (Reclamation adjusts the DWR and NWS values by replacing the forecasted runoff for the current month with Reclamation's own estimate of runoff for the current month, which increases accuracy and incorporates the latest data). Figure 1a plots DWR and NWS forecast values over the entire water year, while Figure 1b shows the most recent period in detail.

The DWR Bulletin 120 (B120) forecast for April 1 (issued April 9) was adjusted by Reclamation to better align with observed runoff conditions to date and projections for the remainder of the month (becoming the "Runoff Adjusted DWR values"). Daily NWS forecast values were also adjusted by Reclamation for expected runoff for the remainder of the month. The NWS forecasts consider the modeled future weather over the next 15 days whereas the DWR B120 forecast does not account for current trends to the same degree.

Table 1 — San Joaquin River Water Year Actuals and Forecasts at Millerton Lake, in Thousands of Acre-Feet (TAF)

	Forecast Probability of Exceedance				
	90%	**75%**	**50%**	**25%**	**10%**
Accumulated Unimpaired Runoff ("Natural River") April 9, 2024 [1]	516.6				
Accumulated Unimpaired Runoff as percent of normal [2]	93%				
DWR, April 1, 2024 [3] (Published Value)	1,490	1,600	1,755	1,945	2,070
DWR, April 10, 2024 [4] (Runoff Adjusted)	1,516	1,641	1,801	1,979	2,110
NWS, April 10, 2024 [5] (Published Daily Value)	1,740	1,790	1,880	1,980	2,070
Smoothed NWS, April 10, 2024 [6] (7-day Smoothing)	1,747	1,777	1,877	1,970	2,061
NWS, April 10, 2024 [4] (Smoothed and Runoff Adjusted)	1,723	1,767	1,868	1,974	2,077

1 http://www.usbr.gov/mp/cvo/vungvari/milfln.pdf

2 Based on average accumulation of Unimpaired Runoff totaling 1830 TAF.

3 B120: https://cdec.water.ca.gov/snow/bulletin120/index.html. April-July runoffs are converted to Water Year equivalents in this table.

4 The adjusted data has been updated with the actual Unimpaired Runoff through the current date and projected out for the remainder of the month.

5 https://www.cnrfc.noaa.gov/ensembleProduct.php?id=FRAC1&prodID=9

6 The NWS smoothed data uses a 7-day triangular weighted moving average, where the most recent day (n) is given greater weight than each previous forecast day (n-1, 2, 3, etc.); this reduces noise stemming from ESP model input. The following formula is used: $((Forecast_{n} * 1) + (Forecast_{n-1} * 0.857) + (Forecast_{n-2} * 0.714) + (Forecast_{n-3} * 0.571) + (Forecast_{n-4} * 0.429) + (Forecast_{n-5} * 0.286) + (Forecast_{n-6} * 0.143)) / 4$

7 Values at the 75% exceedance and 25% exceedance are interpolated.

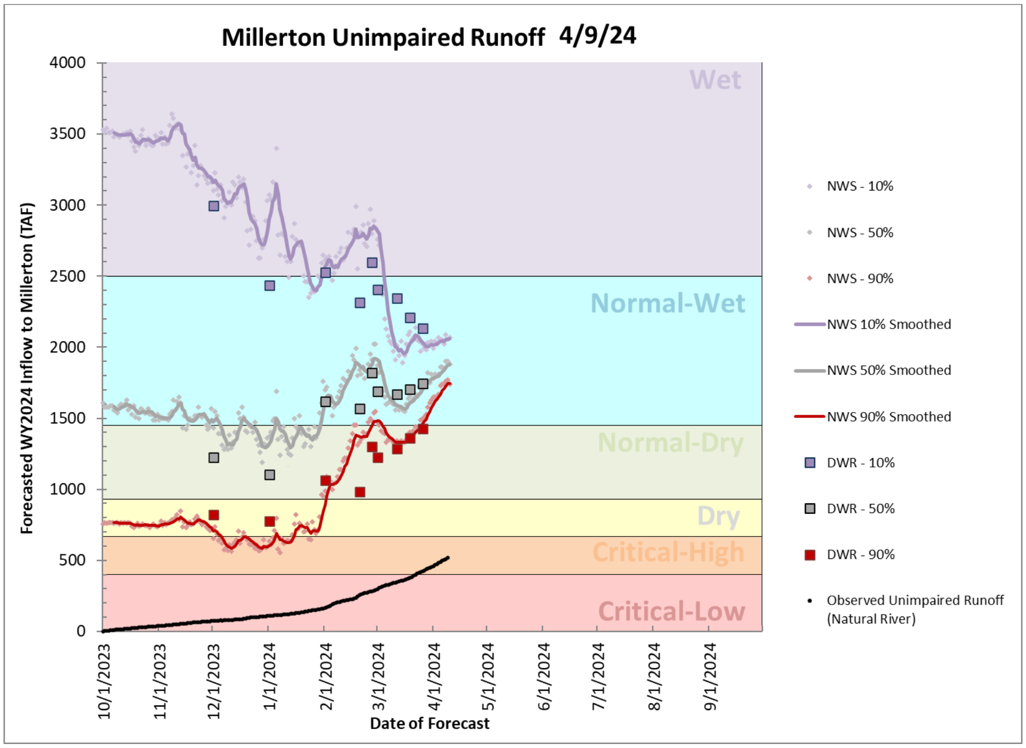

Figure 1a — Plot of 2024 Water Year forecasts. This includes both NWS Ensemble Streamflow Prediction Forecasts and DWR Forecasts at the 90%, 50%, and 10% exceedances.

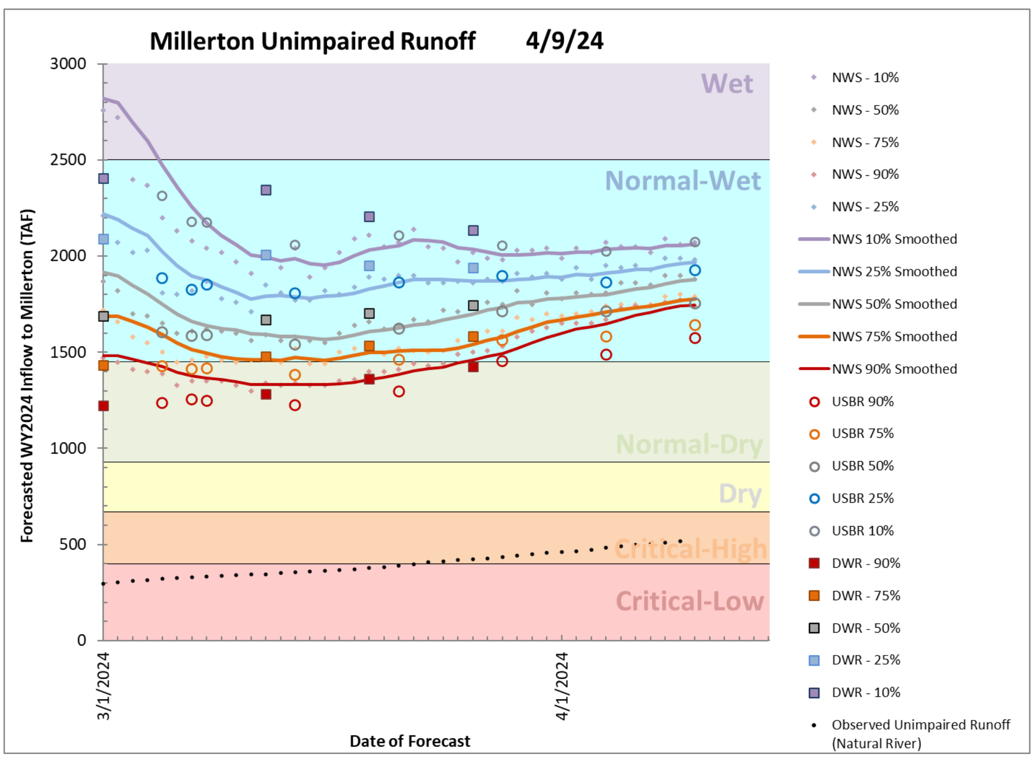

Figure 1b — Detail plot of most recent forecasts. Also shown are Reclamation's "hybrid" forecast with open circles. 75% and 25% exceedances are added in this detailed view.

El Niño climate indices in the Equatorial Pacific Ocean have peaked and are now in rapid retreat. tropical Pacific sea surface temperatures are now cooling and will approach average over the next few months. Atmospheric forcing produced by El Niño will wane over the next few weeks. As depicted in Figure 2, the Sierra Nevada precipitation has trended near average while coastal areas and Southern California have trended above average. The San Joaquin Watershed can be found east and north-east of Fresno and has averaged 91% of average for the water year (see Figure 3).

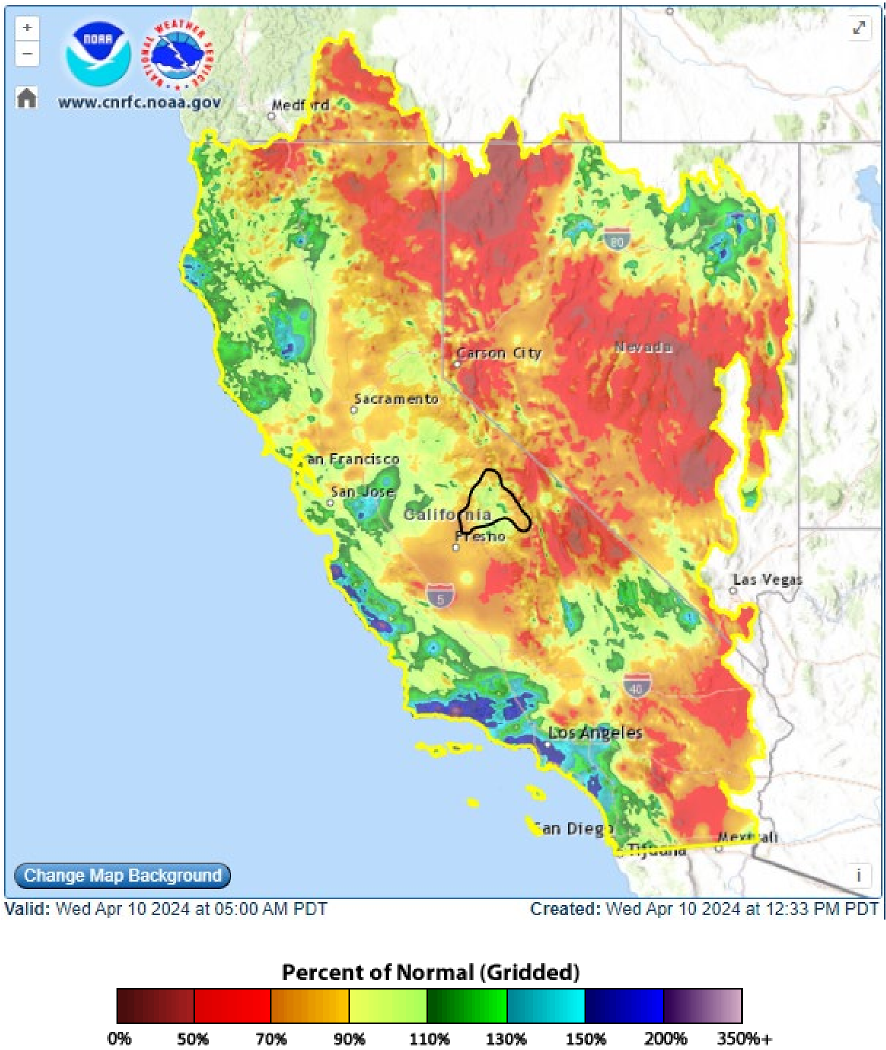

Figure 2 — California Water Year Precipitation as a percent of average. The Sierra Nevada has received near-normal precipitation, with somewhat higher amounts in the Northern Sierra and lower amounts in the Southern Sierra. The Upper San Joaquin watershed is outlined.

Snowpack has continued to grow through March and early April. Peak SWE may occur on April 15 based on the current weather forecast. Snowpack at mid-elevations (5,000' – 8,000') is very near average, while snowpack at high elevations (above 8,000') is lower than average. Snow cover currently extends down to 5,000' elevation, but cover is then from 5,000' to 6,000'.

Reclamation now has many snowpack monitoring tools available. A third Airborne Snow Observatory (ASO) survey was conducted over the San Joaquin Watershed on March 26–27. University of Colorado Boulder's SWE model was updated on April 8 (Figure 3). M3Works iSnobal model results were issued for conditions on April 3 with the late March ASO data assimilated as a calibration (Figure 4). At least one more ASO survey is planned for this water year, with funding being sought for two additional surveys, bringing the total to potentially 6 ASO surveys this water year.

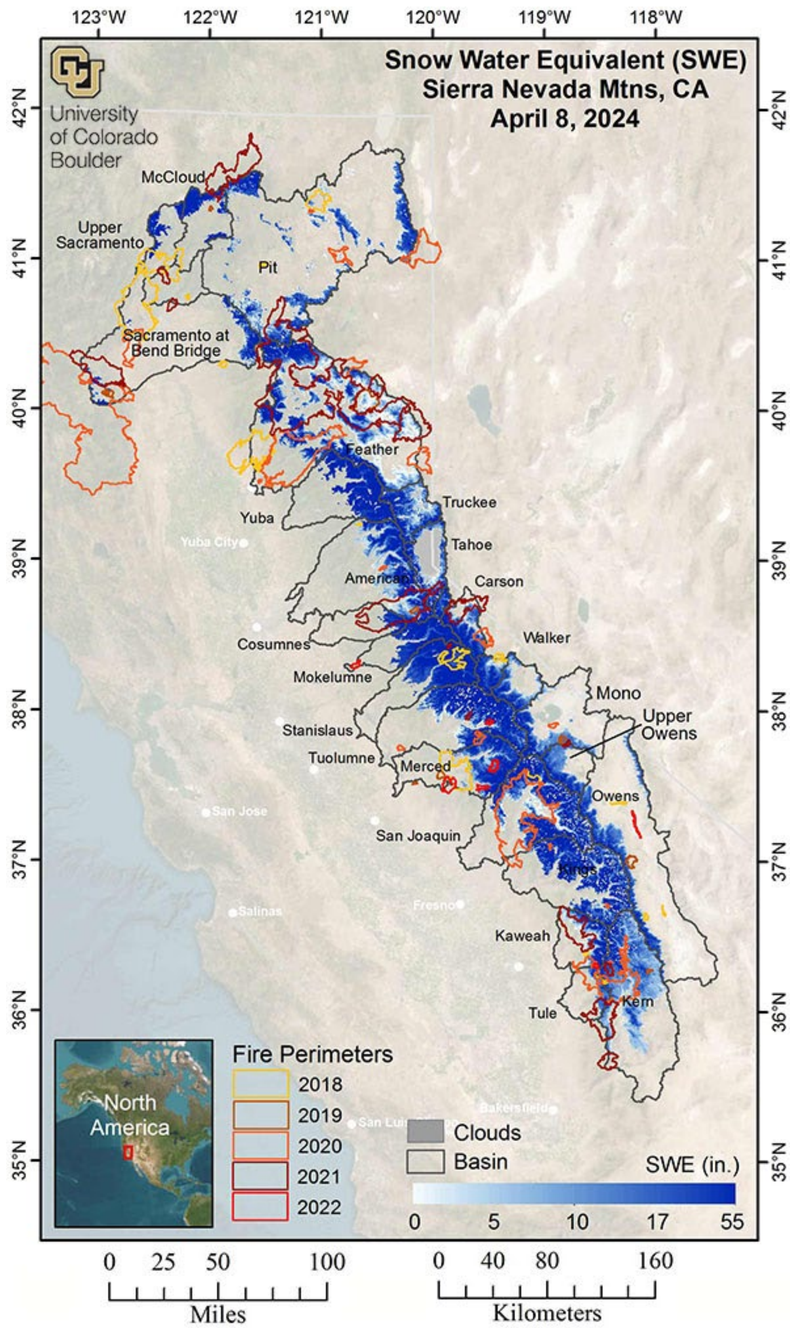

Figure 3 — Sierra Nevada snowpack as modeled by University of Colorado Boulder's "Real-time SWE" model on April 8. This is a fusion model which combines snow-covered area estimates from satellite, ground-based stations, and statistical relationships. The 2020 "Creek Fire" burn areas is shown within the Upper San Joaquin watershed.

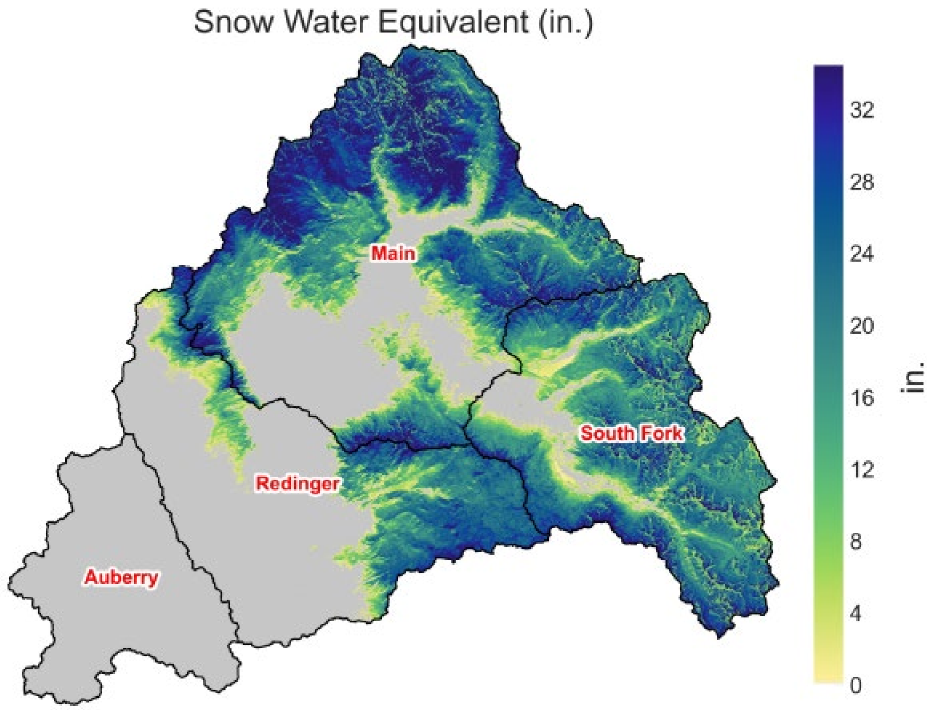

Figure 4 — iSnobal model state on April 3 showing SWE depth. This is a physical distributed model produced by M3Works through a partnership with ASO Inc. Note the lower SWE depth in the South Fork subbasin which is dominated by high elevations.

Snowpack volumes estimated by various models have diverged (Table 2). This is thought to primarily be due to errors in the estimated cumulative precipitation in the basin. The Snow-17 model, which is used by CNRFC to generate their runoff forecasts, was adjusted downward in response to the late February ASO survey but is still trending higher than CU Boulder and iSnobal models. The NOHRSC SNODAS model has the highest snow volume, which is typically the case.

Reclamation's consensus estimates have trended toward the lower end of the model values, guided most strongly by ASO surveys and iSnobal model estimates (Table 2). This judgement by the Millerton Joint Forecasting Team, combined with the observation that snowpack is distributed more across mid-elevations than high elevations in the watershed, is resulting in a lower prediction of water year runoff by Reclamation than the published NWS runoff forecast. An updated understanding of snowpack distribution and volume will occur at the next ASO survey, tentatively scheduled for the period April 29 – May 3.

Table 2 — Total snowpack volume (TAF of Snow Water Equivalent) depicted by models and remote sensing, and a consensus estimate for March 14, 2024.

	Snowpack Model Volumes					
	NWS CNRFC (Snow-17)	NOHRSC (SNODAS)	CU Boulder (Real-time SWE)	M3W (iSnobal)	ASO Inc. (Aerial Snow Survey)	Reclamation Consensus
January 25, 2024	355	291	N/A	N/A	N/A	**288**
February 1, 2024	307	280	347 [8]	N/A	348 [10]	**265**
February 15, 2024	872	749	683 [8]	710 [9]	N/A	**826**
March 1, 2024	996	901	806 [8]	N/A	810 [10]	**820**
March 14, 2024	1204	1231	N/A	1050 [9]	N/A	**1071**
March 27, 2024	1219	1230	1100 [8]	1037 [9]	N/A	**1055**
April 10, 2024	1394	1421	1260 [8]	1084 [9]	969 [10]	**1176**

[8] CU Boulder "Real-time SWE" model was issued Feb 1 at 347 TAF SWE, Feb 12 at 683 TAF SWE, Feb 29 at 806 TAF SWE, Mar 18 at 1100 TAF SWE, and April 8 at 1260 TAF SWE.

[9] The "iSnobal" model for the San Joaquin is produced by M3Works under a contract with ASO. The first model run on Feb 5, which assimilated ASO survey data from Jan 27-29, estimated 645 TAF SWE. The second model run on Mar 6, which assimilated ASO survey data from Feb 22-25, estimated 1078 TAF SWE. The third model run on Mar 13 estimated 1050 TAF SWE. The fourth model run on April 3 estimated 1084 TAF SWE. An intermediate estimate on April 8 indicated 1175 TAF SWE.

[10] First ASO survey was completed Jan 27-29 and found 348 TAF of SWE with an uncertainty of 325-371 TAF. Report was issued after the February 1 consensus estimate. Second ASO survey was completer Feb 22-25 and found 810 TAF of SWE with an uncertainty of 782-838 TAF. This information was integrated into the March 1 Reclamation consensus estimate. The third ASO survey was completed March 27 and estimated 969 TAF of SWE.

Combining Forecasts

Staff from the South-Central California Area Office of Reclamation and SJRRP jointly track and evaluate the accuracy of runoff forecasts on a regular basis. Based on the age of these forecasts, the short-term and long-term weather forecasts, the climatological outlook, observed Unimpaired Runoff, and other available information, a hybrid forecast is generated. The weighting of the different components is regularly evaluated and selected using the best available information and professional judgment. **For the current allocation, the DWR "runoff adjusted" and NWS "smoothed and runoff adjusted" forecasts are combined with a 60/40 blending, respectively (Table 3). Additionally, Reclamation made the decision to offset the blended values lower, applying a greater reduction at the 50% exceedance than the other exceedances.** The selection of this blending ratio is based on the long-term performance of the forecasts, the age of the forecasts, and other data. Offsets are only applied when there is sufficient evidence to depart from the DWR and NWS forecast ranges. The decision to offset the forecast lower was based on two experimental forecasts: Reclamation's water budget model for the San Joaquin as well as an Experimental WRF-Hydro model provided by ASO Inc. Additionally, the March 26-27 ASO survey found less SWE than expected and less than what other models, such as NWS Snow-17, were depicting. While the observed runoff efficiency has risen in recent weeks, it is appears to be anomalously low given that 2024 followed an extremely wet year. This lower efficiency is compounded by snowpack distribution — the majority of snowpack is found at mid-elevation whereas higher elevations have proportionally less snow. High elevation snowpack tends to have greater runoff efficiency. ASO has been valuable in deciphering snowpack distribution this year, especially with several snow pillows not operating correctly.

This caution invoked by offsetting forecast value downward also appears warranted by comparing 2023 to historic analogs. The years 1970, 1979, 1984, 1999 had similar snowpack coverage on April 1 to this year. All four of these historic analog years point to WY2024 runoff values at or below 1700 TAF at the 50% exceedance.

Table 3 — Current Blending and Hybrid Unimpaired Runoff Forecasts (TAF)

	Forecast Probability of Exceedance Using Blending				
	90%	**75%**	**50%**	**25%**	**10%**
Blending Ratio (DWR/NWS)	60/40 Offset: -25 TAF @ 90% / -50 TAF @ 75% / -75 TAF @ 50% / -50 TAF @ 25% / -25 TAF @ 10%				
Hybrid Unimpaired Runoff Forecast (TAF)	1,574	1,642	1,753	1,927	2,072

Restoration Allocation

As per the Guidelines, the **50% probability of exceedance** forecast is used for the allocation under current hydrologic conditions to set the Restoration Flow Allocation. Table 4 below, from the Guidelines version 2.1, depicts the progression of forecast exceedances used to set the Restoration Allocation.

Table 4 — Guidance on Percent Exceedance Forecast to Use for Allocation. The final allocation issuance is made in May or June as per the Guidelines.

		Date of Forecast Used for the Allocation					
	Value (TAF)	**January**	**February**	**March**	**April**	**May**	**June**
If the 50% forecast is:	Above 2200	50	50	50	50	50	—
	1600 to 2200	75	75	50	**50**	50	—
	900 to 1599	75	75	75	50	50	—
	500 to 899	90	90	75	50	50	50
	Below 500	90	90	90	90	75	50

Applying the forecast blending and offsets determined by Reclamation and using the 50% probability of exceedance forecast dictated by the Guidelines, Reclamation calculates an **Unimpaired Runoff hybrid forecast of 1,753 Thousand Acre-Feet (TAF) and a Normal-Wet Water Year Type. This provides a Restoration Allocation of 325.804 TAF as measured at Gravelly Ford (GRF).** Combined with Holding Contracts on the San Joaquin River, **this results in a Friant Dam release of approximately 442.749 TAF (Table 5)**. Other hypothetical allocations are presented in Table 5 as grayed values and indicate the range of probable forecasts and the resulting Restoration Allocations.

Table 5 — SJRRP Water Year Type and Allocation for 2024 Restoration Year Shown with Other Hypothetical Values in Gray

	Forecast Probability of Exceedance using proposed blending				
	90%	75%	50%	25%	10%
Hybrid Unimpaired Runoff Forecast (TAF)	1,574	1,642	**1,753**	1,927	2,072
Water Year Type	Normal-Wet	Normal-Wet	**Normal-Wet**	Normal-Wet	Normal-Wet
Restoration Allocation at GRF (TAF)	300.727	310.253	**325.804**	350.180	370.494
Friant Dam Flow Releases (TAF)	417.672	427.198	**442.749**	467.125	487.439

Unreleased Restoration Flow Pricing

This allocation issuance sets the price for 2024 Tier 2 Unreleased Restoration Flows (URFs) which may be made available to Friant Contractors. Tier 2 URF pricing for 2024 is set at $132.37 per acre-foot. Tier 1 URF pricing is independent of hydrology and fixed at $23.00 per acre-foot.

Contractual Obligation Considerations

Consistent with Section 10004(j) of the San Joaquin River Restoration Settlement Act, the Settlement and the Settlement Act do not modify the rights and obligations of the United States under the Purchase Contract between Miller and Lux and the United States (Purchase Contract) and the Second Amended Exchange Contact between the United States, Department of the Interior, Bureau of Reclamation and Central California Irrigation District (CCID), San Luis Canal Company (SLCC), Firebaugh Canal Water District (FCWD), and Columbia Canal Company (CCC). These four districts are collectively known as the San Joaquin River Exchange Contractors (SJREC). Reclamation's obligations in the Purchase Contract and Exchange Contract remain unchanged by this allocation, which is consistent with Condition 17 of Reclamation's 2013 Water Rights order addressing Restoration Flows.

Hydrologic conditions in Northern California are trending above average. 2024 will be a "Non-Shasta Critical" allocation for the San Joaquin River Exchange Contract. With federal storge in San Luis Reservoir reaching nearly 100% in March, South-of-Delta supplies and expected pumping should be sufficient to meet the Exchange Contract without supplemental supplies from Millerton Lake.

Default Flow Schedule

The Default Flow Schedule, derived from Exhibit B in the Settlement, identifies how Reclamation will schedule the Restoration Allocation for the current Water Year Type and Unimpaired Runoff volume absent a recommendation from the Restoration Administrator. The Guidelines provide detail on how a Default Flow Schedule is parsed from the allocation volume. This approved method of distributing water throughout the year is referred to as “Method 3.1” with the “gamma pathway.”

Exhibit B Method 3.1 Default Flow Schedules

Table 6a shows the Basic Default Flow Schedule flows and corresponding Restoration Allocation volumes for the entire year absent channel capacity and seepage constraints, including total releases from Friant Dam and Restoration Flows releases in excess of Holding Contracts. Volume is distributed as various flow rates across the year as per the methods explained in the Guidelines.

Table 6b shows the Capacity Constrained Default Flow Schedule volumes with all expected operational constraints, primarily controlled by seepage limitations in Reach 4A. Any volume within the Spring Flexible Flow Account and Fall Flexible Flow Account that cannot be released on the default schedule is shifted to times with available capacity as per the Guidelines. This Capacity Constrained Default Flow Schedule depicted in Table 6b will be implemented in the absence of a specific recommendation by the Restoration Administrator. **With these known constraints, a Restoration Flow volume of 148.862 TAF is generated that cannot be scheduled for release without shifting outside of the flexible flow periods (which would require a Water Supply Test). This volume would become Unreleased Restoration Flows (URFs) under the Capacity Constrained Default Flow Schedule.** This is an estimated volume of water, actual URF volumes will depend on several factors including the Restoration Administrator Recommendation, flow schedule to-date, recapture of Restoration Flows at Mendota Pool, any Friant Dam releases made for the Exchange Contract, and real-time assessments of groundwater constraints.

Table 6a — Basic Default Flow Schedule

Flow Period	Flow (cfs)				Volume (TAF)	
	Friant Dam Release	Holding Contracts [11]	Flow Target at GRF	Restoration Flow at GRF	Friant Dam Release	Restoration Flow at GRF
Mar 1 – Mar 15	500	130	375	370	*14.876*	*11.008*
Mar 16 – Mar 31	1500	130	1375	1370	*47.603*	*43.478*
Apr 1 – Apr 15	2500	150	2355	2350	*74.380*	*69.917*
Apr 16 – Apr 30	2955	150	2810	2805	*87.907*	*83.444*
May 1 – May 28	350	190	165	160	*19.438*	*8.886*
May 29 – Jun 30	350	190	165	160	*22.909*	*10.473*
July 1 – July 29	350	230	125	120	*20.132*	*6.902*
Jul 30 – Aug 31	350	230	125	120	*22.909*	*7.855*
Sep 1 – Sep 30	350	210	145	140	*20.826*	*8.331*
Oct 1 – Oct 31	350	160	195	190	*21.521*	*11.683*
Nov 1 – Nov 6	700	130	575	570	*8.331*	*6.783*
Nov 7 – Nov 10	700	130	575	570	*5.554*	*4.522*
Nov 11 – Nov 30	350	120	235	230	*13.884*	*9.124*
Dec 1 – Dec 31	350	120	235	230	*21.521*	*14.142*
Jan 1 – Jan 31	350	100	255	250	*21.521*	*15.372*
Feb 1 – Feb 29	350	100	255	250	*19.438*	*13.884*
				Totals	***442.749***	***325.804***

Table 6b — Capacity Constrained Default Flow Schedule

Flow Period	Flow (cfs)				Volume (TAF)		
	Friant Dam Release	Holding Contracts [11]	Flow Target at GRF	Restoration Flow at GRF	Friant Dam Release	Restoration Flow at GRF	Unreleased Restoration Flow [12]
Mar 1 – Mar 15	514	130	389	384	*15.307*	*11.439*	*-0.431*
Mar 16 – Mar 31	514	130	389	384	*16.327*	*12.201*	*31.276*
Apr 1 – Apr 15	534	150	389	384	*15.902*	*11.439*	*58.478*
Apr 16 – Apr 30	534	150	389	384	*15.902*	*11.439*	*72.005*
May 1 – May 28	574	190	389	384	*31.905*	*21.353*	*-12.467*
May 29 – Jun 30	350	190	165	160	*22.909*	*10.473*	*0.000*
July 1 – July 29	350	230	125	120	*20.132*	*6.902*	*0.000*
Jul 30 – Aug 31	350	230	125	120	*22.909*	*7.855*	*0.000*
Sep 1 – Sep 30	350	210	145	140	*20.826*	*8.331*	*0.000*
Oct 1 – Oct 31	350	160	195	190	*21.521*	*11.683*	*0.000*
Nov 1 – Nov 6	514	130	389	384	*6.123*	*4.576*	*2.208*
Nov 7 – Nov 10	514	130	389	384	*4.082*	*3.050*	*1.472*
Nov 11 – Nov 30	443	120	328	323	*17.564*	*12.804*	*-3.680*
Dec 1 – Dec 31	350	120	235	230	*21.521*	*14.142*	*0.000*
Jan 1 – Jan 31	350	100	255	250	*21.521*	*15.372*	*0.000*
Feb 1 – Feb 29	350	100	255	250	*19.438*	*13.884*	*0.000*
				Totals	***293.887***	***176.942***	***148.862***

[11] In recent years, Holding Contract demands have been higher than assumed under Exhibit B of the Settlement, in which case, flows at Friant are increased to achieve the Gravelly Ford Flow Target.

[12] This estimate of URF volume is based on the most constraining reach, with Spring Flexible Flows redistributed March 1 through May 28 as necessary and Fall Flexible Flows redistributed Sept 3 through December 28 as necessary up to channel capacity constraints. Constrained values are based on actual losses, not Exhibit B losses. Actual URF volume will depend on the Restoration Administrator's recommendations.

Exhibit B Restoration Flow Budget

Table 7 shows the components of the annual water budget for February 1, 2024, through February 28, 2025 (i.e. the Restoration Year including the spring flexible flow period). The Continuity Flow Account, Spring Flexible Flow Account, Riparian Recruitment Flow Account, and Fall Flexible Flow Account reflect the Exhibit B hydrograph for the current Restoration Allocation. The expected 116.945 TAF for Holding Contracts is shown. The volume for each flow account may change with subsequent Restoration Allocations.

Table 7 — Restoration Budget with Flow Accounts

<table>
<tr><th rowspan="2">Period</th><th rowspan="2">Holding Contract Demand (TAF)</th><th colspan="4">Restoration Flow Accounts (TAF)</th></tr>
<tr><th>Continuity Flow Account</th><th>Spring Flexible Flow Account</th><th>Riparian Recruitment Flow Account</th><th>Fall Flexible Flow Account</th></tr>
<tr><td>Feb 1 – Feb 28</td><td>–</td><td>0</td><td rowspan="3">182.419</td><td>–</td><td>–</td></tr>
<tr><td>Mar 1 – Apr 30</td><td>16.919</td><td>25.428</td><td>–</td><td>–</td></tr>
<tr><td>May 1 – May 28</td><td>10.552</td><td>8.886</td><td rowspan="2">0</td><td>–</td></tr>
<tr><td>May 29 – Jul 29</td><td>25.666</td><td>17.375</td><td>–</td><td>–</td></tr>
<tr><td>Jul 30 – Aug 31</td><td>15.055</td><td>7.855</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td>Sep 1 – Sep 30</td><td>12.496</td><td>8.331</td><td>–</td><td>–</td><td rowspan="3">6.942</td></tr>
<tr><td>Oct 1 – Nov 30</td><td>17.177</td><td>25.170</td><td>–</td><td>–</td></tr>
<tr><td>Dec 1 – Dec 31</td><td>7.379</td><td>14.142</td><td>–</td><td>–</td></tr>
<tr><td>Jan 1 – Feb 28</td><td>11.702</td><td>29.256</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td rowspan="3"></td><td rowspan="2">116.945 [13]</td><td>136.443</td><td>182.419</td><td>0</td><td>6.942</td></tr>
<tr><td colspan="4">325.804 (Base Flow Volume)</td></tr>
<tr><td colspan="5">442.749 (approximate Friant Release Volume) [13]</td></tr>
</table>

[13] Since the early 2000s, Holding Contract demands have been higher than assumed under Exhibit B of the Settlement, in which case, flows at Friant are increased to achieve the Gravelly Ford Flow Target.

Remaining Flow Volumes

The amount of water remaining for scheduling is the volume of flows released from Friant Dam in excess of releases required to meet Holding Contract demands, less past releases. Table 8 tracks these balances among the four flow accounts. Tracking these four flow accounts is necessary for application of the Water Supply Test. The released to date volumes are derived from quality-assurance/quality-control (QA/QC) daily average data when available, and partly from provisional data posted to CDEC, and thus may have future adjustments. Such adjustments may also affect the remaining flow volume.

Note that the Restoration Administrator has the option of URF exchange returns in 2024 (Table 9).

Table 8 — Estimated Restoration Flow Volume Remaining and Released to Date

Flow Account		Yearly Allocation (TAF)	Released to River to Date [15] (TAF)	Released as URFs to Date [15] (TAF)	Remaining Flow Volume (TAF)
Base Flows	Continuity Flow Account (Mar 1 — Feb 28)	136.443	17.097	0	119.346
	Spring Flexible Flows (Feb 1 – May 28)	182.419	13.681	42.105	126.633
	Riparian Recruitment Flows (May 1 — Jul 29)	0	0	0	0
	Fall Flexible Flows (Sep 3 – Dec 28)	6.942	0	0	6.942
Buffer Flows [14]		—	0	0	—
Unreleased Restoration Flows (Returned Exchanges)		—	0	—	0
Purchased Water		—	0	—	0
		Totals:	**30.778**	**42.105**	**252.921**

[14] Buffer Flow volumes are based on actual releases, and are not an allocated volume per se.

[15] These are "Base Flow" releases through 3/15/2024

Available URF Exchange Returns

The available water for return to the Restoration Administrator, incorporating the expected agreement revisions, is shown in Table 9. If return water is unused, many of these agreements will have to be modified or purchase clauses in those agreements exercised.

Table 9 — Volume available from URF Exchange Returns

Exchange Partner	Period of Return [16]	Minimum Required Return (TAF)	Maximum Annual Return (TAF)	Notes
AEWSD	Mar-Sep	3.500 [16, 17]	3.500	Expires in 2024, requiring the use of 3,500 AF for last remaining year (2016 agreement modified in 2022 expires in 2024)
SWID-DEID	Mar-Sep	1.200 [16, 17]	1.200	In Normal-Dry through Wet year types only. Must not be any Exchange Contractor Call. (2022 agreement expires in 2024)
FID	Mar-Sep	2.916 [16, 17]	2.916	Exchange is reduced by 10% per year, expires in 2024 (2016 agreement modified in 2021/22 expires in 2024)
FID	Jun-Oct	1.000 [16, 17]	1.000	May not be called upon in same year as 2016 agreement. In Normal-Dry through Wet year types only. (2022 Agreement expires in 2024)
OCID	Mar-Sep	approximately 2.000 in current hydrology [16, 17]	Up to 3.000	Return ratio depends upon Class 1 declaration. (2016 agreement extended in 2021/22 expires in 2024)
OCID	Mar-Sep	approximately 3.000 in current hydrology [16, 17]	Variable, up to 4.667 in 2024	In Normal-Dry through Wet year types only. Must be 50% Class 1 or greater. (2022 agreement expires in 2024)

[16] if minimum volume of water is not taken, unused water is purchased by District
[17] unless otherwise by mutual agreement or modification of agreement

URF Exchange Commitments

Reclamation has previously developed URF agreements which require commitments of water when URFs are made available. These are shown in Table 10.

Table 10 — Volume Committed to URF Exchanges in 2024

Exchange Partner	Exchange Terms	Notes
AEWSD	14% of Tier 2 URF, or by mutual agreement	This previous 1:1 exchange also required additional Tier 2 URF to be sold to AEWSD. Priority URFs sold to AEWSD under this agreement may be capped by current agreement balance. Agreement ends 2024.
DEID	1.800 TAF net URF (1.895 gross URF)	This is a "reverse" exchange — SJRRP was provided water in 2024 with exchanged URF to be provided in first subsequent Dry or Normal-Dry year. URF must be Tier 2 and schedulable across summer.

Operational Constraints

Operating criteria, such as channel conveyance capacity, ramping rate constraints, scheduled maintenance, reservoir storage, contractual obligations, and downstream seepage concerns, may restrict the release of Restoration Flows. Table 11 summarizes known 2024 operational constraints.

Table 11 — Summary of Operational Constraints

Type of Constraint	Period	Flow Limitation
Levee Stability	Currently in effect	1,210 cfs in Reach 2B
	Currently in effect	2,600 cfs in Middle Eastside Bypass
	Currently in effect	2,350 cfs in Reach 5
Seepage Limitation	Currently in effect	Reach 4A: Approx. 275 cfs @ SDP [18]
USFWS Biological Opinion	Until consultation for "Phase 2"	1,660 cfs of Restoration Flows released at Friant Dam

[18] This limitation is a result of Seepage Management Plan Appendix H updates published on March 1, 2024. Refer to latest Flow Bench Evaluation (FBE) (March 5, 2024) for more details. Note that the FBE estimates capacity of 285 cfs; however, this was based on data before calibration measurements were provided for the SDP gauge on March 6, 2024, that suggest lower capacity in Reach 4A. Thus, 275 cfs is an approximate value at this time and an updated Flow Bench Evaluation will be completed as flows stabilize.

The 2024 Channel Capacity Report identifies a maximum flow in Reach 2B of 1,210 cfs due to levee stability constraints. This results in a maximum release from Friant Dam between 1,310 cfs and 1,540 cfs depending on the time of year. The 2024 Channel Capacity Report also identifies a maximum flow in the Middle Eastside Bypass of 2,600 cfs, which was increased from the 2022 Channel Capacity Report value of 1,070 cfs due to the completion of the DWR Reach O levee improvements project and the removal of two weirs within the Eastside Bypass.

A normal update to crop types at various seepage-prone locations changed the seepage threshold at Well MW-18-80b in Reach 4A. This now results in a lower associated flow rate in Reach 4A and is depicted in Table 11. This affects the rates and volumes of Restoration Flows shown in Table 6b.

2024 Allocation History

The Restoration Allocation is adjusted multiple times between the date of the initial allocation and the final allocation; issuances will generally take place on a monthly schedule but may also be issued based on rapidly changing hydrologic conditions. The Restoration Administrator is responsible for contingency planning and managing releases to stay within the current allocation to the extent possible, in accordance with the Guidelines. The final Restoration Allocation will be made in mid-May. Table 12 summarizes the Allocation History for this Restoration Year.

Table 12 — Allocation History

Allocation Type	Issue Date	Forecast Blending Applied	Unimpaired Runoff Forecast (at forecast exceedance)	Year Type	Restoration Allocation at Gravelly Ford	Restoration Flows and URFs Released
Initial	January 19, 2024	20/80	1,039 TAF (@ 75%)	Normal-Dry	228.028 TAF	0 (through 1/19/2024)
Updated	February 16, 2024	20/80	1,479 TAF (@ 75%)	Normal-Wet	287.418 TAF	0 (through 2/14/2024)
Updated	March 15, 2024	30/70 (offset: -100 / -100 / -75 / -50 / -50)	1,382 TAF (@ 75%)	Normal-Dry	274.201 TAF	11.460 (through 3/15/2024)
Updated	April 11, 2024	60/40 (offset: -25 / -50 / -75 / -50 / -25)	1,753 TAF (@ 50%)	Normal-Wet	325.804 TAF	72.883 (through 4/9/2024)

Appendix A: Abbreviations, Acronyms, and Glossary

AEWSD	Arvin–Edison Water Storage District
af	Acre-feet
ASO	Airborne Snow Observatory
B120	DWR Bulletin #120 which forecasts water supply
CCC	Columbia Canal Company
CCID	Central California Irrigation District
CDEC	California Data Exchange Center
cfs	Cubic feet per second
CVP	Central Valley Project
DEID	Delano–Earlimart Irrigation District
Delta	Sacramento–San Joaquin Delta
DWR	California Department of Water Resources
ESP	Ensemble Streamflow Prediction
Exhibit B	Exhibit B of the Settlement depicting Default Hydrograph
FCWD	Firebaugh Canal Water District
GRF	Gravelly Ford Flow Gauge
FID	Fresno Irrigation District
Guidelines	Restoration Flow Guidelines
NWS	National Weather Service
QA/QC	Quality Assurance/Quality Control (i.e. finalized)
OCID	Orange Cove Irrigation District
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
Restoration Year	the cycle of Restoration Flows, March 1 through February 28/29
RFG	Restoration Flow Guidelines
RWA	SJRRP Reclaimed Water Account
Secretary	U.S. Secretary of the Interior
Settlement	Stipulation of Settlement in NRDC, et al., v. Kirk Rodgers, et al.
SJREC	San Joaquin River Exchange Contractors
SJRRP	San Joaquin River Restoration Program
SLCC	San Luis Canal Company
SMP	Seepage Management Plan
SWE	Snow Water Equivalent
TAF	thousand acre–feet
URF	Unreleased Restoration Flows
WSI	DWR Water Supply Index
WY	Water year, October 1 through September 30

Appendix B: Previous Year (2023) Flow Accounting

Table B — Restoration Flow Accounting and Unreleased Restoration Flows, and Holding Contracts, for the period February 2023 through February 2024. Flood management releases to San Joaquin River occurred January 5 – February 5, 2023 and March 8 – July 26, 2023. No releases for the Exchange Contract occurred during this Restoration Year. The final Restoration Allocation was 557.038 TAF. URF Sales and Exchanges removed from the Allocation totaled 373.849 TAF. Additionally, Unreleased Restoration Flow exchange returns of 10.167 TAF were released to the San Joaquin River, and 0 TAF of Buffer Flows. A total of 4.245 TAF was advanced into February 2023. The Restoration Allocation had a year-end balance of -0.002 TAF.

<table>
<tr><th rowspan="2">Flow Period</th><th rowspan="2">Gravelly Ford 5 cfs requirement (TAF)</th><th rowspan="2">Other flows passing GRF (TAF)</th><th rowspan="2">URF sold or exch</th><th colspan="7">Released Restoration Flow Volumes (TAF)</th></tr>
<tr><th>Continuity Flow</th><th>Spring Flexible Flow</th><th>Fall Flexible Flow</th><th>Riparian Recruitment Flow</th><th>Buffer Flow</th><th>Flexible Buffer Flow</th><th>URF returned</th></tr>
<tr><td>Feb 1 – Feb 28</td><td>–</td><td>–</td><td>–</td><td>–</td><td>4.245</td><td>–</td><td>–</td><td>–</td><td>–</td><td>–</td></tr>
<tr><td>Mar 1 – Mar 31</td><td>9.219 [A1]</td><td>297.134</td><td>165.263</td><td>13.527</td><td>9.531</td><td>–</td><td>–</td><td>0</td><td>–</td><td>0</td></tr>
<tr><td>Apr 1 – Apr 30</td><td>45.663 [A1]</td><td>458.132</td><td>0</td><td>11.901</td><td>11.008</td><td>–</td><td>–</td><td>0</td><td>–</td><td>0</td></tr>
<tr><td>May 1 – May 31</td><td>47.324 [A1]</td><td>439.371</td><td>81.054</td><td>9.838</td><td>11.941</td><td>–</td><td rowspan="3">4.600</td><td>0</td><td rowspan="5">0</td><td>0</td></tr>
<tr><td>Jun 1 – Jun 30</td><td>51.285 [A1]</td><td>320.110</td><td>96.000</td><td>9.521</td><td>–</td><td>–</td><td>0</td><td>0</td></tr>
<tr><td>Jul 1 – Jul 31</td><td>48.532 [A1]</td><td>154.540</td><td>29.732</td><td>7.379</td><td>–</td><td>–</td><td>0</td><td>0</td></tr>
<tr><td>Aug 1 – Aug 31</td><td>8.541</td><td>1.327</td><td>0</td><td>9.481</td><td>–</td><td>–</td><td>–</td><td>0</td><td>2.826</td></tr>
<tr><td>Sep 1 – Sep 30</td><td>11.153</td><td>0</td><td>0</td><td>8.331</td><td>–</td><td>0.754</td><td>–</td><td>0</td><td>3.868</td></tr>
<tr><td>Oct 1 – Oct 31</td><td>10.986</td><td>0</td><td>0</td><td>10.342</td><td>–</td><td>0</td><td>–</td><td>0</td><td rowspan="3">0</td><td>2.499</td></tr>
<tr><td>Nov 1 – Nov 30</td><td>11.173</td><td>0</td><td>1.895</td><td>8.933</td><td>–</td><td>4.079</td><td>–</td><td>0</td><td>0</td></tr>
<tr><td>Dec 1 – Dec 31</td><td>9.773</td><td>0</td><td>0</td><td>10.072</td><td>–</td><td>0</td><td>–</td><td>0</td><td>0.974</td></tr>
<tr><td>Jan 1 – Jan 31</td><td>10.130</td><td>0.101</td><td>0</td><td>15.681</td><td>–</td><td>–</td><td>–</td><td>0</td><td>–</td><td>0</td></tr>
<tr><td>Feb 1 – Feb 29</td><td>8.838</td><td>0</td><td>0</td><td>21.933</td><td>–</td><td>–</td><td>–</td><td>0</td><td>–</td><td>0</td></tr>
<tr><td rowspan="6"></td><td rowspan="5">272.616[A1]</td><td rowspan="5">1670.715</td><td rowspan="4">373.944</td><td>136.939</td><td>36.725</td><td>4.833</td><td>4.600</td><td>0</td><td>0</td><td rowspan="3">10.167</td></tr>
<tr><td colspan="4">183.096 (allocated Restoration Flows)</td><td colspan="2">0 (all Buffer Flows)</td></tr>
<tr><td colspan="6">183.096 (Restoration Flows affecting Friant water supply)</td></tr>
<tr><td colspan="7">193.263 (Restoration Flows released to river)</td></tr>
<tr><td colspan="5">557.040 (Restoration Allocation used)</td><td colspan="3"></td></tr>
<tr><td colspan="2"></td><td></td><td colspan="7">2072.656 (Friant Dam releases — excludes removed URFs, Restoration Flows advanced info February, and excludes contributions from tributary inflows)</td></tr>
</table>

[A1] Calculations of the 5 cfs requirement are sensitive to gauge error at GRF or imprecision in Friant Dam release. The values for March through July are likely erroneously high and should instead be considered “Other Flows Passing GRF.”

Appendix C: History of Millerton Unimpaired Runoff

Table C — Water Year Totals in Thousand Acre-Feet

Water Year [A2]	Unimpaired Runoff [A3]	SJRRP Water Year Type [A4]	Water Year [A2]	Unimpaired Runoff [A3]	SJRRP Water Year Type [A4]	Water Year [A2]	Unimpaired Runoff [A3]	SJRRP Water Year Type [A4]	Water Year [A2]	Unimpaired Runoff [A3]	SJRRP Water Year Type [A4]
1901	3,227.9	Wet	1933	1,111.4	Normal-Dry	1965	2,271.191	Normal-Wet	1997	2,817.670	Wet
1902	1,704.0	Normal-Wet	1934	691.5	Dry	1966	1,298.792	Normal-Dry	1998	3,160.759	Wet
1903	1,727.0	Normal-Wet	1935	1,923.2	Normal-Wet	1967	3,233.097	Wet	1999	1,527.040	Normal-Wet
1904	2,062.0	Normal-Wet	1936	1,853.3	Normal-Wet	1968	861.894	Dry	2000	1,735.653	Normal-Wet
1905	1,795.4	Normal-Wet	1937	2,208.0	Normal-Wet	1969	4,040.864	Wet	2001	1,065.318	Normal-Dry
1906	4,367.8	Wet	1938	3,688.4	Wet	1970	1,445.837	Normal-Dry	2002	1,171.457	Normal-Dry
1907	3,113.9	Wet	1939	920.8	Dry	1971	1,416.812	Normal-Dry	2003	1,449.954	Normal-Dry
1908	1,163.4	Normal-Dry	1940	1,880.6	Normal-Wet	1972	1,039.249	Normal-Dry	2004	1,130.823	Normal-Dry
1909	2,900.7	Wet	1941	2,652.5	Wet	1973	2,047.585	Normal-Wet	2005	2,826.872	Wet
1910	2,041.5	Normal-Wet	1942	2,254.0	Normal-Wet	1974	2,190.308	Normal-Wet	2006	3,180.816	Wet
1911	3,586.0	Wet	1943	2,053.7	Normal-Wet	1975	1,795.922	Normal-Wet	2007	684.333	Dry
1912	1,043.9	Normal-Dry	1944	1,265.4	Normal-Dry	1976	629.234	Critical-High	2008	1,116.790	Normal-Dry
1913	879.4	Dry	1945	2,134.633	Normal-Wet	1977	361.253	Critical-Low	2009	1,455.379	Normal-Wet
1914	2,883.4	Wet	1946	1,727.115	Normal-Wet	1978	3,402.805	Wet	2010	2,028.706	Normal-Wet
1915	1,966.3	Normal-Wet	1947	1,121.564	Normal-Dry	1979	1,829.988	Normal-Wet	2011	3,304.824	Wet
1916	2,760.5	Wet	1948	1,201.390	Normal-Dry	1980	2,973.169	Wet	2012	831.582	Dry
1917	1,936.2	Normal-Wet	1949	1,167.008	Normal-Dry	1981	1,067.757	Normal-Dry	2013	856.626	Dry
1918	1,466.8	Normal-Wet	1950	1,317.457	Normal-Dry	1982	3,317.171	Wet	2014	509.579	Critical-High
1919	1,297.5	Normal-Dry	1951	1,827.254	Normal-Wet	1983	4,643.090	Wet	2015	327.410	Critical-Low
1920	1,322.5	Normal-Dry	1952	2,840.854	Wet	1984	2,042.750	Normal-Wet	2016	1,300.986	Normal-Dry
1921	1,604.4	Normal-Wet	1953	1,226.830	Normal-Dry	1985	1,135.975	Normal-Dry	2017	4,395.400	Wet
1922	2,355.1	Normal-Wet	1954	1,313.993	Normal-Dry	1986	3,031.600	Wet	2018	1,348.979	Normal-Dry
1923	1,654.3	Normal-Wet	1955	1,161.161	Normal-Dry	1987	756.853	Dry	2019	2,734.772	Wet
1924	444.1	Critical-High	1956	2,959.812	Wet	1988	862.124	Dry	2020	886.025	Dry
1925	1,438.7	Normal-Dry	1957	1,326.573	Normal-Dry	1989	939.168	Normal-Dry	2021	521.853	Critical-High
1926	1,161.4	Normal-Dry	1958	2,631.392	Wet	1990	742.824	Dry	2022	1059.492	Normal-Dry
1927	2,001.3	Normal-Wet	1959	949.456	Normal-Dry	1991	1,027.209	Normal-Dry	2023	4506.923	Wet
1928	1,153.7	Normal-Dry	1960	826.021	Dry	1992	807.759	Dry			
1929	862.4	Dry	1961	647.428	Critical-High	1993	2,672.322	Wet			
1930	859.1	Dry	1962	1,924.066	Normal-Wet	1994	824.097	Dry			
1931	480.2	Critical-High	1963	1,945.266	Normal-Wet	1995	3,876.370	Wet			
1932	2,047.4	Normal-Wet	1964	922.351	Dry	1996	2,200.707	Normal-Wet			

[A2] Water year is from Oct 1 through Sept 30, for example the 2010 water year began Oct 1, 2009. Unimpaired Runoff is based on Reclamation calculations, and hypothetical water year types are shown here; actual Restoration water year types are based on the final allocation, which may sometimes differ slightly from the calculated water year total.

[A3] Also known as “Natural River” or “Unimpaired Runoff into Millerton” – This is the total runoff that would flow into Millerton Lake if there were no dams or diversions upstream. There was a lower level of precision prior to 1945. Friant Dam uses 1.9835 conversion from cfs to AF.

[A4] The six SJRRP Water Year Types are based on Unimpaired Runoff and are not updated as climatology changes as per the Settlement. Critical-Low= <400 TAF, Critical-High=400-669.999 TAF, Dry= 670-929.999 TAF, Normal-Dry 930-1449.999, Normal-Wet 1450-2500, Wet>2500.

Appendix D: Final Restoration Allocations and Errors

Table D1 — History of Restoration Allocations

Year	Type	Date of Final Allocation Issuance [A6]	Unimpaired Runoff Forecast in Final Allocation (TAF)	Final Restoration Allocation (TAF)	Observed Unimpaired Runoff on Sep. 30 (TAF)	Unimpaired Runoff Forecast Error	Allocation Error
2009	Interim Flows			261.5	1,455.379	—	—
2010	Interim Flows			98.2	2,028.706	—	—
2011	Interim Flows			152.4	3,304.824	—	—
2012	Interim Flows			183	831.582	—	—
2013	Interim Flows			65.5	856.626	—	—
2014	Restoration Flows	Mar 3	518	0 [A5]	509.579	+8.421 (+1.6%)	0 [A5]
2015	Restoration Flows	Sep 28	327	0	327.410	-0.410 (-0.1%)	0
2016	Restoration Flows	Sep 30	1300.986	263.295	1,300.986	0 (0%)	0
2017	Restoration Flows	Jul 10	4,444	556.542	4,395.400	+48.600 (+1.1%)	0
2018	Restoration Flows	May 22	1,427	280.258	1,348.979	+78.021 (+5.8%)	+10.503
2019	Restoration Flows	May 20	2,690	556.542	2,734.772	-44.772 (-1.6%)	0
2020	Restoration Flows	June 19	880	202.197	886.025	-6.025 (-0.7%)	-1.345
2021	Restoration Flows	June 25	529	70.919	521.853	+7.147 (+1.4%)	0
2022	Restoration Flows	May 13	1072	232.470	1059.492	+12.508 (+1.2%)	+1.684
2023	Restoration Flows	May 18	4664	557.038	4506.923	+157.077 (+3.5%)	0

[A5] No water was provided under this Critical-High designation due to necessity for Friant Dam to release flows for the Exchange Contract.

[A6] In 2018 with the completion of Version 2.0 of the Restoration Flows Guidelines, the date of final Restoration Allocation issuance was advanced from September 30 to May (or June under dry hydrologic conditions).

Table D2 — History of Restoration Flow Releases

Year	Year Type	Final Restoration Allocation (TAF)	URFs Removed from Allocation (TAF)	URF Exchange Returns (TAF)	Buffer Flows Utilized (TAF)	Restoration Flows Passing Gravelly Ford (TAF) [A7]	Restoration Allocation Utilization (TAF)	Release Error (TAF)
2014	Critical-High	0	0	0	0	0	0	0
2015	Critical-Low	0	0	0	0	0	0	0
2016	Normal-Dry	263.295	*pending*	*pending*	*pending*	*pending*	*pending*	*pending*
2017	Wet	556.542	367.458	0	0	*pending*	*pending*	*pending*
2018	Normal-Dry	280.258	124.791	2.129	0	157.596	280.258	0
2019	Wet	556.542	365.760	0	0	190.666	556.426	-0.116
2020	Dry	202.197	63.502	0.487	0.605	139.517	201.927	+0.270
2021	Critical-High	70.919	0	10.425	0.902	82.247	70.919	0
2022	Normal-Dry	232.470	101.076	3.500	0	135.094	232.670	-0.200
2023	Wet	557.038	373.944	10.167	0	193.263	557.040	-0.002

[A7] Restoration Flows passing Gravelly Ford includes flood flows which were accounted for as meeting the Restoration Flow Schedule at Gravelly Ford.

Appendix E: Unreleased Restoration Flow History

Table E1 — URF Distributions (TAF)

Restoration Year	Gross Volume of URF Sales to Class 1	Gross Volume of URF Sales to Class 2	Net Volume of URF Sales to Class 1	Net Volume of URF Sales to Class 2	Gross Volume of URF put into Exchanges	Net Volume of URF put into Exchanges	Gross Volume of URFs spilled	Gross Total URF
2013	—	—	—	—	12.694	12.694	—	**12.694**
2014	11.219	—	11.219	—	—	—	0.206	**11.425**
2015	—	—	—	—	—	—	—	**0**
2016	70.860	56.959	67.317	54.111	18.947	18.000	—	**146.766**
2017	5.474	364.967	5.200	346.716	2.491	2.366	—	**372.932**
2018	65.249	40.000	61.986	38.000	19.543	18.565	—	**124.792**
2019	—	326.954	—	310.607	16.298	15.482	22.509	**365.761**
2020	43.500	—	41.325	—	20.002	19.697	—	**63.502**
2021	—	—	—	—	—	—	—	**0**
2022	75.178	—	71.419	—	26.951	25.603	—	**102.128**
2023	—	372.048	—	353.446	—	—	—	**372.049**
Total	**271.480**	**1,160.928**	**258.466**	**1,102.880**	**116.926**	**112.407**	**22.715**	**1,572.049**

Table E2 — Expected URF Revenue for the Restoration Fund

Restoration Year	Revenue Generated from URF Sales	Revenue Generated from URF Exchanges	Total URF Revenue
2013	—	—	—
2014	$3,470,650	—	$3,470,650
2015	—	—	—
2016	$9,686,790	—	$9,686,790
2017	$7,038,380	—	$7,038,380
2018	$6,123,858	$494,504	$6,618,362
2019	$6,393,286	$306,680	$6,699,966
2020	$8,922,481	$1,251,630	$10,174,111
2021	—	$525,000	$525,000
2022	$13,488,907	$1,909,267	$15,398,173
2023	$8,129,258	—	$8,129,258
Total	**$63,253,610**	**$4,487,081**	**$67,740,690**

Table E3 — URF Exchanges Returned to the Program (TAF)

Restoration Year	Volume Returned	Notes
2013	—	—
2014	11.425	From 2013 URF Exchange with FID, used for 2014 sales
2015	—	—
2016	—	—
2017	5.474	Returned from San Luis Reservoir, 5.200 net URF sold
2018	2.129	Returned from 2018 DEID exchange
2019	9.000	Returned to SLR from 2019 AEWSD and LTRID exchange, transferred to CVO for San Luis Unit supply
2020	0.487	Returned from FID from 2019 exchange
2021	10.425	Returned from multi-party 2020 exchange
2022	3.500	From 2016 URF Exchange with AEWSD
2023	10.167	3.500 AEWSD, 2.000 FID, 4.667 OCID
Total	**52.607**	

Appendix F: Water Management Goal

Table F1 — Final Friant Water Contract Supply

Contract Year	Class 1 Total Supply 800 TAF		Class 2 Total Supply 1,401.475 TAF	
	Class 1 Declaration	Volume of Class 1 as Uncontrolled Season	Class 2 Residual Declaration	Volume of Class 2 as Uncontrolled Season
2009	100%	—	10%	21%. Including residual allocation is equivalent to 31%
2010	100%	—	10%	32%. With residual allocation is equivalent to 42%
2011	100%	—	5%	38%. With residual allocation is equivalent to 43%
2012	57%	—	0%	0%
2013	62%	—	0%	0%
2014	0%	—	0%	0%
2015	0%	—	0%	0%
2016	75% Residual	12.5% (100 TAF used, mostly in April)	0%	7%
2017	100%	—	3%	30%. UcS through mid-July. With residual allocation equivalent to 33%
2018	88% Residual	11% (88 TAF used April-May)	0%	9%.
2019	100%	—	0%	49%
2020	65%	—	0%	0%
2021	40%	—	0%	0%
2022	35%	—	0%	0%
2023	100%	—	15%	18%. UcS through late-July. With residual allocation equivalent to 33%

Notes

2009: C1/C2 declaration on 6/12/209 was 77/18, increased to 100/10 once SJRRP Interim Flows were scheduled for 10/1/2009 release.

2010: Class 2 declaration changed from 15% to 10%, but this did not impact RWA calculation which uses growing season allocation of 15%.

2011: Class 2 declaration changed from 20% to 5%, but this did not impact RWA calculation which uses growing season allocation of 20%.

2012: Class 1 declaration changed from 50% to 57% on 4/27/2012, but this did not impact RWA calculation which uses growing season allocation of 50%.

2013: Final declaration made 7/15/2013.

2014, 2015: Friant Dam releases to satisfy Exchange Contract at Mendota Pool. 2014 final declaration made 5/13/2014. 2015 final declaration made 2/27/2015.

2016: 12.5% of Class 1 was released as Uncontrolled Season water. Class 1 allocation was reduced from 100% to 87.5% (including UcS) at final allocation on 7/18/2016.

2017: Uncontrolled Season through mid-July. Flood flows 1/42017 – 7/20/2017.

2018: 11% of Class 1 was released as Uncontrolled Season water. Class 1 allocation was reduced from 100% to 99% (including UcS) before final allocation on 9/26/2018.

2019: Uncontrolled season through 7/15/2019. Flood flows 3/15/2019 – 4/5/2019 and 5/21/2023 – 7/10/2019.

2020: Final declaration 6/24/2020.

2021: Class 1 declaration increased from 20% to 25% in November, increased to 40% in December. Late change did not affect apportionment of RWA impact.

2022: Class 1 declaration increased from 30% to 35% in January associated with 2023 flood flows.

2023: Flood flows 1/5/2023 – 2/5/2023 and 3/8/2023 – 7/26/2023.

Table F2 — Additional Water Supply

Restoration Year	Gross Volume of URF Sales to Class 1	Gross Volume of URF Sales to Class 2	Net Volume of URF Sales to Class 1	Net Volume of URF Sales to Class 2	Gross Volume of URF put into Exchanges	Net Volume of URF put into Exchanges	Gross Volume of URFs spilled	Gross Total URF
2013								
2014								
2015								
2016								
2017								
2018	*Table Under Development*							
2019								
2020								
2021								
2022								
2023								
Total								

Table F3 — URF Reconciliation (URF Distribution to incorrect Class) [A8]

Restoration Year	URFs Sales Distributed to Class 1 which should have been Distributed to Class 2	Date Error Extinguished	URFs Sales Distributed to Class 2 which should have been Distributed to Class 1	Date Error Extinguished
2020	0	N/A	0	N/A
2021	0	N/A	0	N/A
2022	0	N/A	0	N/A
2023	0	N/A	0	N/A

[A8] Reconciliation of URFs was instituted in 2020 and will be codified in Restoration Flow Guidelines version 2.2.