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RECLAMATION

American River Group Summary of Activities for Water Year 2022

Central California Area Office, Folsom, CA

Interior Region 10 - California-Great Basin



Mission Statements

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The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

American River Group Summary of Activities for Water Year 2022

Folsom Dam, CA

Interior Region 10- California-Great Basin

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Acronyms and Abbreviations

ARG	American River Group
BiOp	Biological Opinion
cfs	Cubic Feet Per Second
Cramer	Cramer Fish Sciences
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CDFW	California Department of Fish & Wildlife
DWR	Department of Water Resources
CWP	Cold Water Pool
FMS	Flow Management Standard
LAR	Lower American River
MRR	Minimum Release Requirement
NMFS	National Marine Fisheries Service
CNRFC	California Nevada River Forecast Center
Reclamation	U.S. Bureau of Reclamation
RM	River Mile
ROD	Record of Decision
RPA	Reasonable and Prudent Alternative
SWP	State Water Project
SWRCB	State Water Resources Control Board
TAF	Thousand Acre-Feet
USFWS	U.S. Fish & Wildlife Service
WOMT	Water Operations Management Team
WY	Water-Year

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Chapter 1 – Introduction and Background

1.1 Introduction

The Water Year (WY) 2022 Summary of Activities serves to summarize biological information, and operational discussions and decisions for the lower American River (LAR). Additionally, it serves to document implementation of Alternative 1 (Preferred Alternative) as described in the Final Environmental Impact Study and as analyzed in the 2019 National Marine Fisheries Service (NMFS) Biological Opinion (BiOp) (NMFS 2019), adopted in the February 2020 Record of Decision (ROD) for the Coordinated Long-Term Operations of the Central Valley Project (CVP) and State Water Project (SWP) during WY 2022 (October 1, 2021 – September 30, 2022).

1.2 American River Geographic Orientation

The American River is located in California’s Central Valley. It is the second largest tributary to the Sacramento River below Shasta Dam. The North, Middle, and South forks of the American River originate in the Sierra Nevada range and flow into Folsom Reservoir, approximately 25 miles east of the City of Sacramento, California. Folsom Dam and Reservoir, as well as Nimbus Dam, and Lake Natoma are features of the CVP operated by the U.S Bureau of Reclamation (Reclamation). The LAR reach begins at Nimbus Dam, approximately river mile (RM) 23, and continues downstream until its confluence with the Sacramento River. Figure 1 illustrates the LAR and surrounding features.

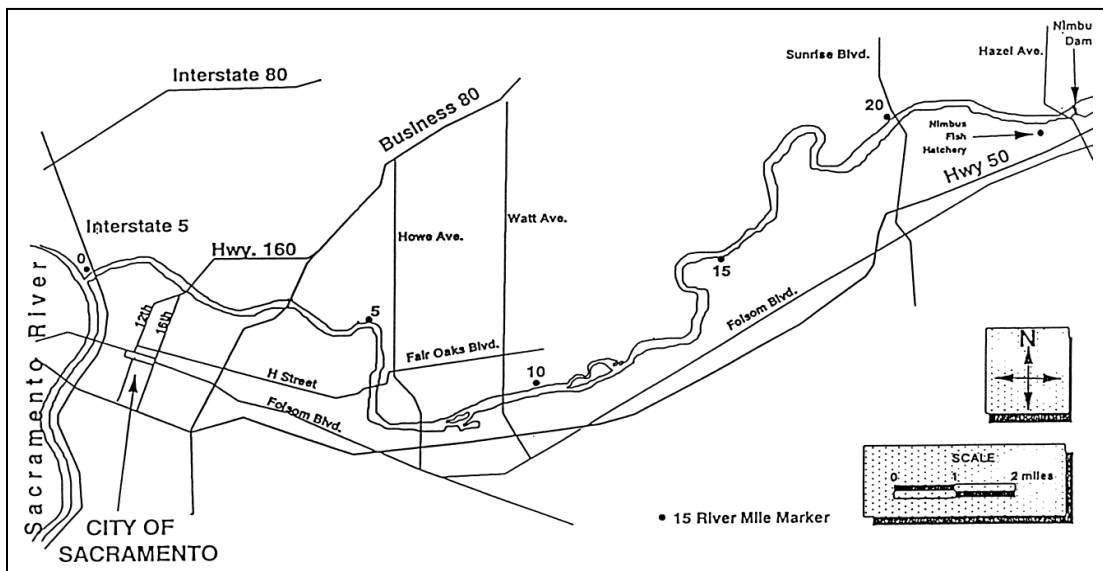


Figure 1. The Lower American River between Nimbus Dam and the Sacramento River.

1.3 Lower American River Historical Background

The LAR provides water supply for urban and agricultural uses, flood control, fish and wildlife protection, recreational opportunities, hydroelectric power generation, and contributes to water quality conditions in the Sacramento-San Joaquin Delta. Reclamation is responsible for operating the Folsom/Nimbus Dam complex to meet local and downstream water demands, regulatory requirements, and fish habitat needs. The regulating facilities of the Folsom/Nimbus Dam complex include Folsom Dam, Reservoir and Powerplant; Nimbus Dam and Powerplant, and Lake Natoma. Releases from Folsom Dam are re-regulated approximately seven miles downstream by Nimbus Dam. Nimbus Dam creates Lake Natoma, which serves as a forebay for the diversions to the Folsom South Canal. Additional facilities at Nimbus Dam include the Nimbus Fish Hatchery, which is owned by Reclamation and operated by the California Department of Fish and Wildlife (CDFW).

Reclamation operates Folsom and Nimbus dams under a state water right permit and fish protection requirements that were adopted in 1958 as the State Water Resources Control Board (SWRCB) Decision 893 (D-893). This decision allows flows at the mouth of the American River to fall as low as 250 cubic feet per second (cfs) from January through mid-September, with a minimum of 500 cfs required between mid-September through December 31. The flow operations based on D-893 may not optimize habitat protection given current water rights and fishery conditions. Since 1958, additional SWRCB Decisions and Congressional Acts [i.e. Central Valley Project Improvement Act (CVPIA)], and Endangered Species Act (ESA) requirements have changed the regulatory landscape for the State and Federal Water Projects, including operations on the LAR.

In 1996, Reclamation established a working group to coordinate fishery and operational requirements for the LAR, known as the American River Group (ARG). The ARG brings together stakeholders who have either a legislated or resources-specific interest in the operation of Folsom Dam and Reservoir and the LAR. Reclamation is the lead coordinator of the ARG. The formal members include agencies with trust responsibilities for fisheries resources in the LAR: Reclamation, the U.S. Fish and Wildlife Service (USFWS), NMFS, CDFW and Sacramento Water Forum (Water Forum). Members of the public and other agencies may attend ARG meetings and comment on matters under consideration by the ARG. The ARG convenes monthly or more frequently, if needed, to discuss water operations, fisheries, and other environmental factors. Reclamation considers the information provided by the ARG when making management decisions regarding temperatures and flows necessary to sustain LAR fish resources.

The Water Forum, comprised of local American River stakeholders, has successfully joined together water purveyors, environmentalists, agriculturalists, business leaders, along with city and county governments in Sacramento, El Dorado and Placer counties in an agreement to secure Sacramento region water supply through the year 2030. The Water Forum has promoted operational changes with coequal objectives: “to provide a reliable supply for planned development to the year 2030, and to preserve the Sacramento region’s environmental crown jewel, the lower American River.” The Water Forum, in cooperation with Reclamation, NMFS, USFWS, and CDFW, developed a draft Flow Management Standard (FMS) for the LAR to

potentially improve the conditions of aquatic resources in the LAR. The FMS was designed to improve habitat conditions for fall-run Chinook salmon and steelhead in the LAR by enhancing minimum flows and water temperature, establishing a formal management process, and facilitating coordinated monitoring, and evaluation and reporting (Water Forum 2006).

The FMS was designed to integrate water temperature performance capability for management of the downstream habitat. The NMFS 2009 BiOp (NMFS 2009) also adopted components of the FMS temperature management process. Action II.2 of the NMFS 2009 BiOp states that “The priority for use of the lowest water temperature control shutters at Folsom Dam shall be to achieve the water temperature requirement for steelhead, and thereafter may also be used to provide cold water for fall-run Chinook salmon spawning.” While NMFS’s priority was temperature management for steelhead due to federal listing status, temperature management for fall-run Chinook salmon was also important. Because water temperature control operations in the LAR are affected by many factors and operational tradeoffs, ideal downstream temperature targets are sometimes infeasible (particularly with multiple years of below normal or dry water year type conditions). These factors include available cold-water resources, Nimbus Dam release schedules, annual hydrology/snowpack, Folsom power penstock shutter management flexibility, power generation, Nimbus Fish Hatchery operations and maintenance, and Delta needs.

The Folsom temperature shutters are structural devices at the Folsom Dam power unit intakes that provide downstream temperature management control. These devices help control the desired downstream temperature by selecting the elevation where water is withdrawn from the reservoir. The Folsom Shutters can be operated such that water from different reservoir elevations is accessed and blended, providing additional temperature management control. Lastly, when temperature operations exhaust the reservoir’s cold water pool (CWP) at the lowest shutter locations, Reclamation has the operational ability to release the coolest water from the river outlets at the lowest elevation outfall in Folsom Dam in effort to achieve targeted temperatures in the LAR to the extent physically controllable. Releases from the river outlets cannot be used to generate power and thus this operation is referred to as a “power bypass”.

1.4 Transition to February 2020 ROD

In 2009, NOAA Fisheries issued a BiOp to Reclamation that included an RPA to address the effects of the proposed action considered in the 2009 BiOp and how that action could be implemented in a manner that would avoid the likelihood of jeopardy to listed species or adverse modification of critical habitat. On April 7, 2011, NOAA Fisheries provided an RPA amendment (NMFS 2011), which, consistent with the Delta Stewardship Council’s Independent Review Panel (DSC 2010), corrected errors in the 2009 RPA and provided clarification.

On August 2, 2016, Reclamation, the federal action agency, and the California Department of Water Resources (DWR), the applicant, jointly requested the reinitiation of ESA consultation with the USFWS and NOAA Fisheries on the coordinated long-term operation of the CVP and SWP. NOAA Fisheries accepted the reinitiation request on August 17, 2016. On January 31, 2019, Reclamation transmitted their Biological Assessment (BA) to NOAA Fisheries and a revised BA (Reclamation 2019b) was submitted on October 21, 2019.

NOAA Fisheries finalized and issued its BiOp on the coordinated operations of the CVP and SWP on October 21, 2019. NOAA Fisheries concluded that Reclamation’s proposed operations will not jeopardize threatened or endangered species, or destroy or adversely modify designated critical habitats.

The Bureau of Reclamation signed a ROD on February 18, 2020 to implement the preferred alternative as described in the Final EIS for the Reinitiation of Consultation on the Coordinated Long-Term Operation (ROC on LTO) of the CVP and SWP and evaluated in the 2019 USFWS and NMFS BiOps (Reclamation 2020; USFWS 2019).

1.5 2021 Re-initiation of Consultation on the Coordinated Long-Term Operations of the Central Valley Project and State Water Project

On September 30, 2021, Reclamation and DWR requested reinitiation of ESA Section 7 consultation with USFWS and NMFS. USFWS and NMFS agreed on October 1. Reinitiation of consultation under the ESA was requested due to anticipated modifications to the Proposed Action that may cause effects to ESA-listed species or designated critical habitat not analyzed in the 2019 USFWS and NMFS BiOps. A new BiOp is expected to be completed in 2024 with the goals of supporting species viability, protecting life history diversity, supporting operational flexibility, providing regulatory certainty, supporting science and monitoring, and creating a single, adaptable, coordinated operation for the CVP and SWP.

Chapter 2 – February 2020 ROD

2.1 Summary of February 2020 ROD

Implementation of the February 2020 ROD began on February 19, 2020. The February 2020 ROD for American River operations includes commitments regarding flows and water temperature objectives, with some conservation measures related to habitat restoration and hatchery management (Table 1). Reclamation proposed to adopt the minimum flow schedule or Minimum Release Requirement (MRR) and approach developed by the Water Forum in 2017-2018 (Water Forum 2017). This approach also includes implementation of redd dewatering protective adjustments that restrict changes in the MRR between December and June and, under certain conditions, a spring pulse flow. Reclamation also proposed to continue summer and fall temperature management for the LAR.

Table 1. Components of the Proposed Action related to the American River system per Table 4-7 in Chapter 4 of the 2019 Biological Assessment.

Component	Page #
Seasonal Operations	4-23
2017 Flow Management Standard Releases and “Planning Minimum”	4-23
American River Pulse Flows	4-23
Spawning and Rearing Habitat Restoration	4-23
Nimbus Hatchery Genetic Management Plans	4-23
Drought Temperature Management	4-23
Yellow-billed Cuckoo Surveys	4-23

An overview of American River operations under the February 2020 ROD specific to the 2017 FMS planning minimum and spring pulse flow is provided in Attachment A. An overview of American River operations under the February 2020 ROD specific to water temperature management is provided in Attachment B. American River operations under the 2020 ROD continue to be coordinated through the ARG.

The following non-flow components of the February 2020 ROD are not discussed in this report as they have not been standing topics of discussion at ARG meetings during WY 2021.

- Spawning and Rearing Habitat Restoration
- Hatchery Genetics Management Plans (HGMPs)
- Drought Temperature Management
 - Reclamation did degang the shutters of the Temperature Control Device during WY 2021, which allowed for the alternative shutter configurations proposed in

this component of the 2020 ROD. Shutter configurations were reported out at the monthly ARG meetings.

- Yellow-billed Cuckoo Surveys

Chapter 3 – ARG Discussion Topics

The following section outlines ARG discussion topics from the October 2021 through September 2022 monthly meetings. Meeting notes and supplemental ARG documents were made available to the ARG members and posted to the ARG Technical Group website¹. The ARG distribution list is maintained by the Central California Area Office (CCAO) Resources Management Division.

3.1 Monthly Discussion Topics

- Lower American River Fisheries Monitoring
 - The status of current and future fisheries monitoring activities were provided by Reclamation, NMFS, USFWS, CDFW, Cramer Fish Sciences (Cramer), and Pacific States Marine Fisheries Commission (PSMFC) (see Chapter 5).
- American River System Reservoir Operations
 - Monthly reservoir operations and hydraulic forecast updates provided by Central Valley Operations (CVO), Sacramento Municipal Utility District (SMUD), and Placer County Water Agency (PCWA).
- Water Operations and Water Quality
 - Reservoir storage, CWP volume, flows measured at Fair Oaks gauge on the LAR, current temperature modeling results and water temperatures measured at Nimbus Dam, Fair Oaks gage, and Watt Avenue (see Chapter 4).
 - February 2020 ROD 2017 Flow Management Standard Releases and Folsom Planning Minimum
 - The 2017 FMS in the February 2020 ROD was finalized in December 2018 and incorporated into the Proposed Action for ROC on LTO of the CVP and SWP. The 2017 FMS in the February 2020 ROD includes a minimum release requirement (MRR) with flows ranging from 500 to 2,000 cfs based on time of year and annual hydrology. The flow schedule is intended to improve CWP and habitat conditions for steelhead and fall-run Chinook salmon. Specific flows are determined using the American River and Sacramento River indices intended to define the current and recent hydrology.
 - The 2017 FMS in the February 2020 ROD includes an end-of-December storage planning minimum that aims to improve water supply reliability and help manage water temperatures in the LAR. The objective of incorporating the planning minimum into the forecasting process is to provide releases of salmonid-suitable

¹ The ARG Technical Team webpage can be found here: <https://www.usbr.gov/mp/bdo/american-river-group.html>

temperatures to the LAR and reliable deliveries to American River water agencies that are dependent on deliveries or releases from Folsom Reservoir.

- Spring Pulse Flows
 - The 2017 FMS in the February 2020 ROD includes a pulse flow component of about a four-week duration during March and April. This requires supplementing normal operational releases from Folsom Dam under certain conditions. Accommodations may be made for additional requests for spring pulse flows by re-shaping previously planned releases. The intent of the spring pulse flow is to provide a juvenile salmonid emigration cue before relatively low flow conditions and unsuitable thermal conditions occur later in spring.
- Temperature Management Plan
 - Reclamation will prepare a draft Temperature Management Plan by May 15 for the summer through fall water temperature management season using the best available information and decision support tools. The draft plan will contain: (1) forecasts of hydrology and storage; and (2) a modeling run or runs, using these forecasts, demonstrating what temperature compliance schedule can be attained. Reclamation will use an iterative approach, varying shutter configurations, with the objective to attain the best possible water temperature schedule for the compliance point at Watt Avenue Bridge (AWB2).

3.2 Other Discussion Topics

Central Valley Project Improvement Act (CVPIA)

In 2022, Reclamation provided funding through the CVPIA to the Sacramento Water Forum for salmonid habitat restoration projects on the lower American River at Nimbus Basin and lower Sailor Bar in Rancho Cordova, California. The State of California provided additional funding. The projects created a new side channel along the south side of the river at lower Sailor Bar and enhanced the existing Upper Sunrise Side Channel (Figure 2) and the Nimbus Basin Side Channel (Figure 3). The projects placed approximately 41,000 cubic yards of gravel to replace natural recruitment and maintain and increase spawning habitat.

Mobilization of construction equipment for the Lower Sailor Bar Restoration Project started on August 1, 2022. The construction was completed on September 30, 2022. The Lower Sailor Bar Restoration Project consisted of the following:

- 3 spawning riffles (13.5 acres)
- 37,000 cubic yards of spawning gravel
- 2,500 feet of side channel (4.9 acres)

² Temperature data for the compliance point at Watt Avenue Bridge (AWB) can be found here: <https://cdec.water.ca.gov/webgis/?appid=cdecstation&sta=AWB>

- Approx. 80 woody habitat structures
- Seeding
- Willow planting
- Onsite borrow

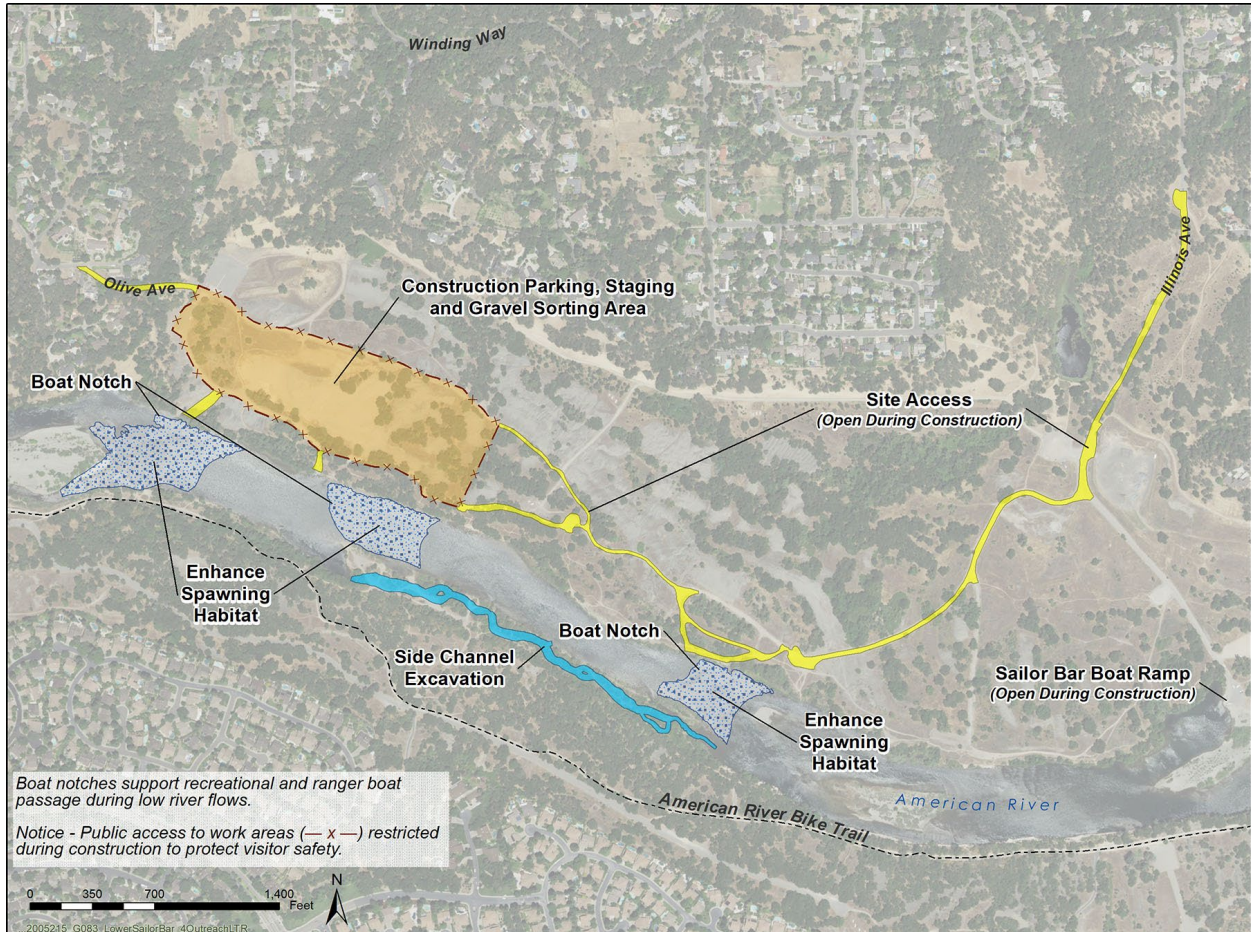


Figure 2. Lower Sailor Bar restoration area. Previous restoration work here occurred in 2010 and 2012.

Mobilization of construction equipment for the Nimbus Basin Restoration Project started on September 6, 2022. The construction was completed on October 7, 2022. The Nimbus Basin Restoration Project consisted of the following:

- 1 spawning riffle (3.7 acres)
- 4,200 cubic yards of spawning gravel
- 800 feet of side channels and floodplain grading (2.5 acres)
- 30 repurposed woody habitat structures

- Seeding
- Willow planting
- Offsite borrow

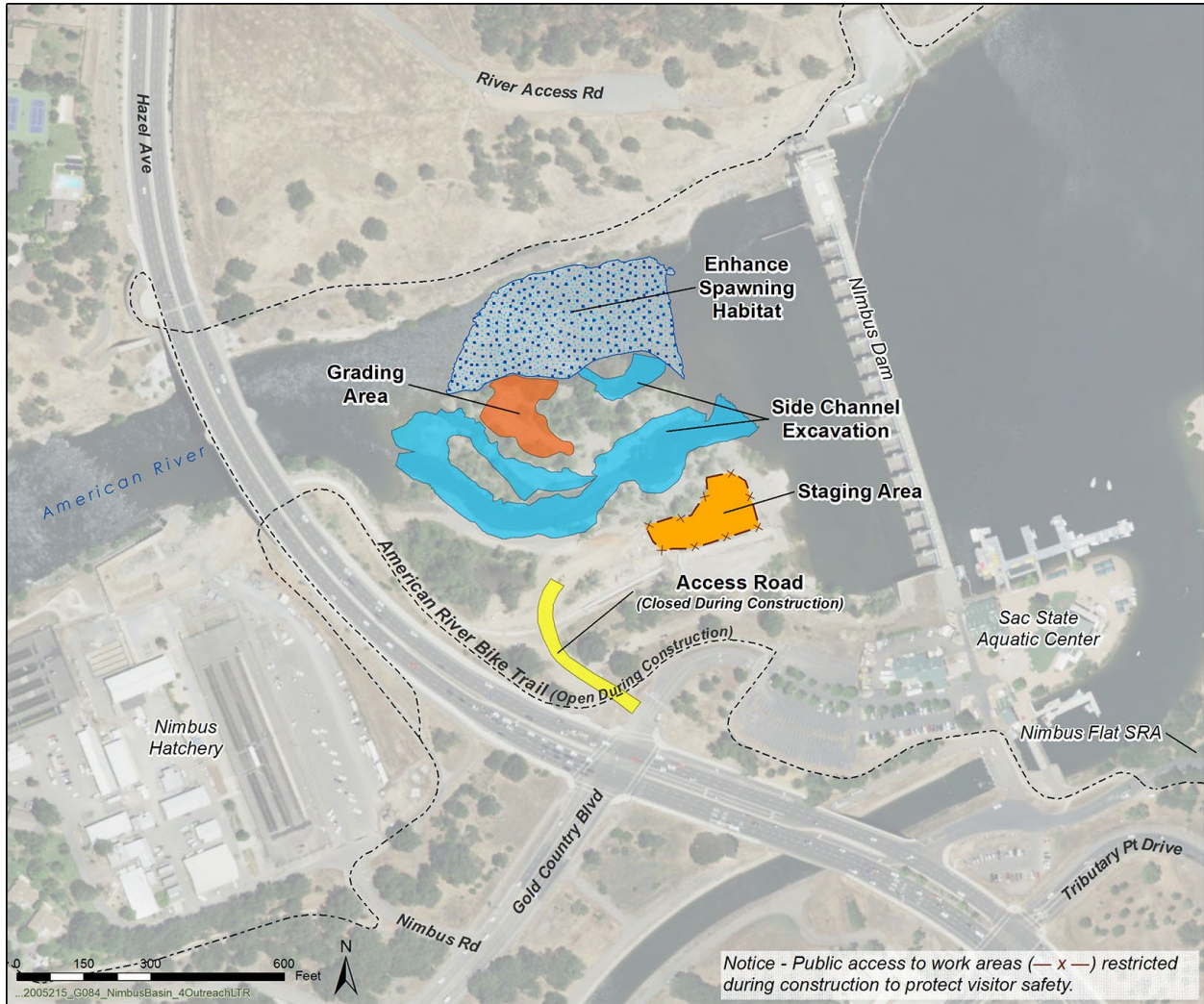


Figure 3. Nimbus Basin restoration area. Previous restoration work here occurred in 2014.



Figure 4. Aerial view of completed project at Lower Sailor Bar, September 30, 2022. The two side channels can be seen on the south side of the river and the three lighter colored areas are the gravel placements.



Figure 5. Completed project at Nimbus Basin, October 22, 2022. Salmon can be seen holding along the upstream part of the riffle (small black areas).

- Power Bypass proposals
 - Group discussed power bypass options to achieve cooler fall temperatures for spawning fall-run Chinook salmon. A power bypass was approved by Reclamation for implementation during fall 2021. Another power bypass was discussed and proposed for fall 2022 and was also approved by Reclamation. The implementation of that power bypass began in October 2022 and thus occurred during WY 2023 (see Section 4.3).
- ARG Presentations
 - Folsom Dam Temperature Shutters (6/23/2022) – Thuy Washburn, hydraulic engineer, Central Valley Operations Office, Reclamation; narrated slideshow with live-action video demonstrates a "ganging" process of the shutter's panels being connected back together after being deganged in 2021 to conserve the CWP in Folsom Lake for fishery benefits along the lower American River.

Chapter 4 – Water Operations Summary

4.1 General Water Year Conditions and Operations

The 40-30-30 index for the Sacramento Valley was ultimately characterized as “critical” for WY 2022, based on the May 50% exceedance forecast. American River operations were dominated by storage conservation operations from late December 2021 through September 2022.

4.2 Hydrologic Conditions – American River

Watershed runoff in California is typically driven by winter precipitation and spring snow-melt runoff and quantified as a late spring through summer inflow volume (April through July volume, in addition to a water year total volume). The American River watershed spring/summer forecasted inflow volume is fundamental in operational planning. This runoff forecast is updated routinely by the DWR and the National Weather Service California Nevada River Forecast Center (CNRFC), where uncertainty is represented by percent runoff exceedances. The February 2022 initial unimpaired runoff 90% exceedance (conservative) forecast volume for April – July 2022 by DWR in their Bulletin 120 was 630 thousand Acre-Feet (TAF).. The actual full natural flow volume April – July in 2022 was 737 TAF. The final WY 2022 actual inflow to Folsom volume October – September was 1,879 AF).³ Table 2 provides precipitation data and characteristics for November to May of WY 2022. Because operational planning is significantly influenced by future forecasts, these uncertainties and eventually modified decisions are translated into the performance and efficiency of the system-wide operation.

Table 2. 2022 Water Year Northern Sierra precipitation, American River Basin snowpack, and Sacramento Valley Index statistics by November 2021 through May 2022 (DWR Bulletin 120).

Water Year 2022	Northern Sierra 8- Station Precipitation (Cumulative inches through month) ⁴	Sacramento Valley Index (40-30-30 Index 50% Exceedance; year type) ⁵
November	3.10	NA
December	14.40	6.5; Dry
January	1.3	75; Below Normal
February	.40	6.2; Dry
March	1.30	4.8; Critical

³ <https://cdec.water.ca.gov/dynamicapp/QueryMonthly?&s=AMF>

⁴ <https://cdec.water.ca.gov/reportapp/javareports?name=8STATIONHIST>

⁵ <http://cdec4gov.water.ca.gov/reportapp/javareports?name=WSI>

Water Year 2022	Northern Sierra 8- Station Precipitation (Cumulative inches through month) ⁴	Sacramento Valley Index (40-30-30 Index 50% Exceedance; year type) ⁵
April	6.10	4.2; Critical
May	.60	4.5; Critical

4.3 Operations – Lower American River

Operational decisions on the LAR are balanced with local, CVP and SWP system-wide multi-purpose objectives including those that are planned and unplanned. Many factors contribute to operational actions including, but not limited to: flood protection, forecasted inflows, facility maintenance schedules, physical/mechanical facility limitations, upstream operations, minimum in-stream flow criteria, downstream Delta regulatory requirements, Delta exports, power generation, recreation, fish hatchery accommodations, water temperature management capabilities and others. In addition, uncertain, or unplanned, events may also influence real-time operation decisions (e.g. additional flow reduction for debris removal prior to fish weir and picket installation for the Nimbus Fish Hatchery). Planned operational targets are regularly updated in late winter through early summer (depending on hydrologic conditions) on Reclamation’s website (<http://www.usbr.gov/mp/cvo/>).

Key factors that influenced WY 2022 LAR operations:

- Minimum flow rate/FMS: WY 2022 was a critical water year and there were no flood control releases required.
- LAR Flow Reduction Discussions: In addition to the monthly ARG meetings, several ARG calls were scheduled to discuss specifically the potential reduction of LAR flows due to current hydrologic conditions and poor outlooks. ARG members provided redd dewatering information to help understand potential redd dewatering impacts with LAR flow reductions. These discussions weighed the risk of reducing flows to increase storage and minimizing risk of redd impacts due to increased or fluctuating flows needed for flood management.
- Reservoir Storage: Reservoir storage peaked on June 11, 2022 at 864.89.78 TAF.
- Temperature Management Plan (TMP): Based on various iCPMM and CE-QUAL-W2 modelling runs and given the current number of uncertainties with potential drought actions, inflow projections and operations forecasts, the LAR TMP goal was to target 66°F at Hazel (as measured at the American River at Fair Oaks - AFO gauge; see Figure 6) from June 1, 2022 to October 10, 2022 and target 62°F from October 11, 2022 until October 31, 2022. Starting November 1, 2022, the temperature target 60 degree through December 31, 2022.
- Folsom Power Bypass⁶: On October 1, 2022, NMFS, with the support of USFWS and CDFW, transmitted modeling results (for water temperature and associated egg survival)

⁶ Although the 2022 Folsom Power Bypass occurred in Water-Year 2023, it is captured here for continuity of operations.

in support of a recommendation that Reclamation implement a 500 cfs power bypass at Folsom Dam beginning October 20, 2022 and to continue until (a) 56°F (at Hazel Avenue) can be maintained without a power bypass, or (b) reservoir conditions (due to depletion of the cold water pool or destratification) are such that the power bypass no longer provides cooler releases.

Modeling results were provided on October 1, 2022 for six scenarios. Specifically, water temperature and egg survival were modeled for No Bypass, October 20 Bypass, and October 29 Bypass scenarios with total Folsom releases of either 900 cfs or 1,300 cfs. All bypass scenarios assumed a power bypass of 500 cfs. Because the fish agencies expect that total Folsom releases will be nearer 1,300 cfs than 900 cfs, only the results from the 1,300 cfs release scenarios are described below.

On October 7, 2022, NMFS, with the support of USFWS and CDFW, presented a proposal for a fall 2022 Folsom power bypass, which recommended that Reclamation implement a 500 cfs power bypass at Folsom Dam beginning 10/20/2022 and to continue until (a) 56°F (at Hazel Avenue) can be maintained without a power bypass, or (b) reservoir conditions (due to depletion of the CWP or destratification) are such that the power bypass no longer provides cooler releases. The proposal contains a bypass scenario that would access Folsom's CWP below the power unit penstocks to reduce LAR water temperatures to benefit rearing steelhead and spawning fall-run Chinook salmon. NMFS acknowledged Reclamation's expectation to implement the 1,326 cfs Minimum Release Requirement (MRR) as a 1,300 cfs minimum release.

The proposal draws upon numerous Folsom power bypass and LAR temperature management discussions held at the monthly and ad hoc ARG meetings over the previous several months, as well as two supporting documents – an excel spreadsheet of Chinook egg survival modeling results and a PowerPoint of water temperature modeling results. The Proposal was expected to improve water temperature conditions to (a) reduce pre-spawn mortality for fall-run Chinook salmon, (b) reduce fall-run Chinook salmon egg mortality in October and much of November, (c) provide more suitable temperatures for hatchery operations, and (d) provide less stressful rearing conditions for juvenile Central Valley steelhead.

On October 11, 2022, NMFS provided to Reclamation a word document that provides a results overview with additional background information on the egg survival modeling approach.

After review, Reclamation recommended approving a modified power bypass schedule that looks at warmer temperature objectives intended to better extend the available cold water while keeping the same biological objectives of the original proposal. This modified power bypass recommends (a) a power bypass start date of October 20, 2022 that will target 62°F (at Hazel Avenue) with a bypass flow starting at 100 cfs and increasing 100 cfs per day thereafter not to exceed 500 cfs; (b) starting October 29, targeting water temperatures of 60°F at Hazel Avenue and utilizing the bypass as needed not to exceed 500 cfs; (c) beginning November 1, managing operations, including use of the bypass not to exceed 500 cfs, to reduce water temperatures and working towards a target of 56°F and continue as proposed by the fish agencies' original proposal.

On October 18, 2022, the Regional Director approved the modified power bypass schedule.

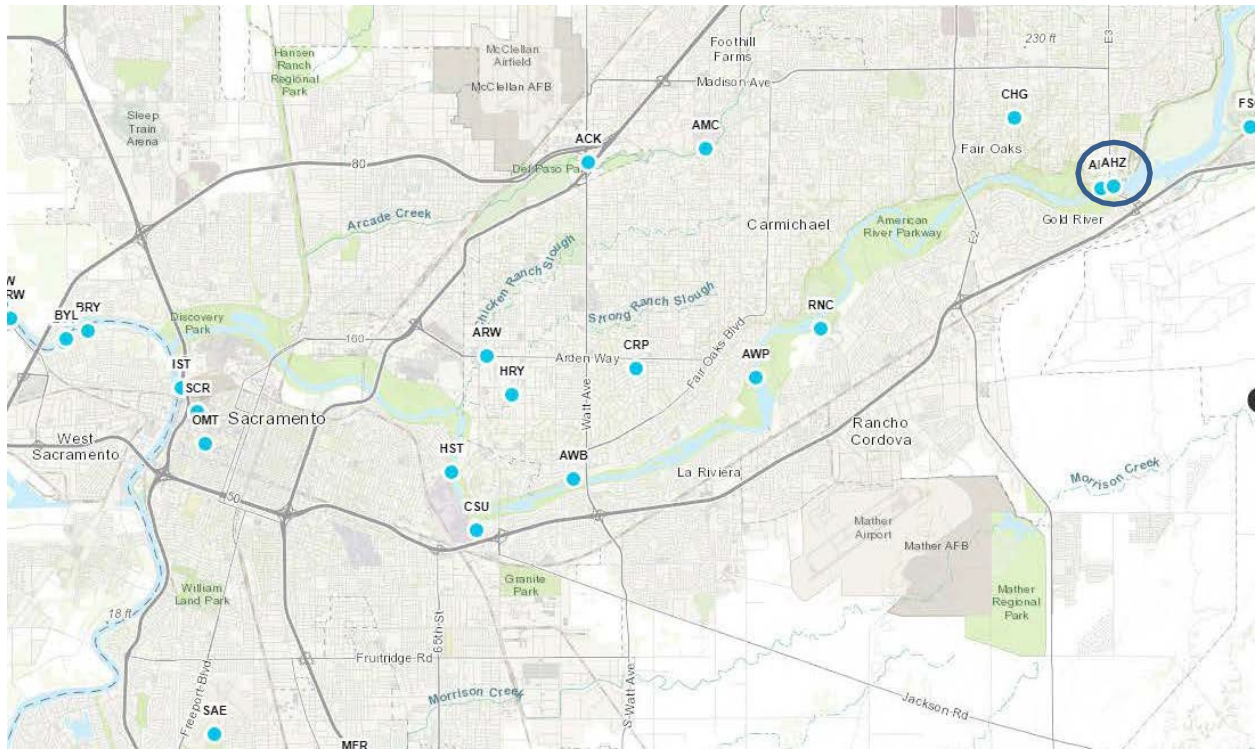


Figure 6. Location of water temperature monitoring station (AFO) at American River at Fair Oaks.

Table 3. Historical Conditions (2001- 2021) Folsom Reservoir Cold Water Pool dynamics.

Year	End of May Storage (TAF)	End of May	All Upper Shutters Lowered by	End of September Storage (TAF)	End of September	Watt Avenue Target (°F)
		CWP Volume < 58°F (TAF)			CWP Volume < 60°F (TAF)	
2001	696	275	30 Mar	368	30	65-71
2002	822	455	04 Mar	510	50	65-69
2003	962	640	02 Apr	658	135	65-67
2004	635	300	05 Mar	376	30	69
2005	959	705	15 Mar	652	140	65
2006	928	670	29 Mar	639	125	65
2007	787	355	21 Mar	323	30	68

Year	End of May Storage (TAF)	End of May CWP Volume < 58°F (TAF)	All Upper Shutters Lowered by	End of September Storage (TAF)	End of September CWP Volume < 60°F (TAF)	Watt Avenue Target (°F)
2008	617	250	None Lowered	270	25	69-70
2009	933	550	12 Mar	412	60	67
2010	905	580	14 Apr	624	130	66
2011	880 (960- July)	590	28 Mar	740	180	65
2012	926	536	29 Mar	450	60	65-66
2013	734	277	15 Apr	361	50	69
2014	548	200	None Lowered	345	35	70
2015	576	256	None Lowered	174	39	75
2016	826	421	23 Mar	306	27	68
2017	937	558	2 June	664	85	65
2018	955	622	28 Mar	467	56	66
2019	935	605	26 Mar 5 Jun (unit 1 returned to service)	714	89	65
2020	790	366	21 Apr	423	60	68
2021	361	117	None Lowered	230	34	71 (at AFO)
2022	865	461	May 6	345	45	66 (at AFO)

From April through November, Reclamation collects temperature profile data in Folsom Reservoir twice a month (essentially every two weeks). For December through March, temperature profiles are taken one time per month at all six locations. The temperature profile data are used to model reservoir and downstream temperatures throughout the temperature

control season. This allows Reclamation to determine feasible temperature objectives on the Lower American River. The temperature model is run for every new profile to be able to either confirm that the temperature objectives are still feasible or determine that a change to the temperature plan needs to be made. The temperature compliance location is at Watt Ave for May through October and shifts to the Hazel Ave Bridge location for November. However, during this critical year, the compliance location was moved to Hazel Ave Bridge.

4.4 WY 2022 Operations Under February 2020 ROD

4.4.1 2017 Flow Management Standard Releases and Planning Minimum

The February 2020 ROD is designed to provide minimum required flows for all steelhead life stages, as specified by the 2017 FMS Minimum Release Requirement (MRR). These MRRs are measured as total releases at Nimbus Dam. The 2017 FMS uses two hydrological indices to determine the MRR: American River Index (ARI) and Sacramento Index (SRI). The prescribed flows are minimums only, and do not preclude Reclamation from making higher releases.

Storage and flood control conditions for Folsom Lake are illustrated in Figure 7, which also includes inflow to Folsom Lake and releases at Nimbus Dam for October 2021 through October 2022. Folsom storage at the end of September was 345 TAF.

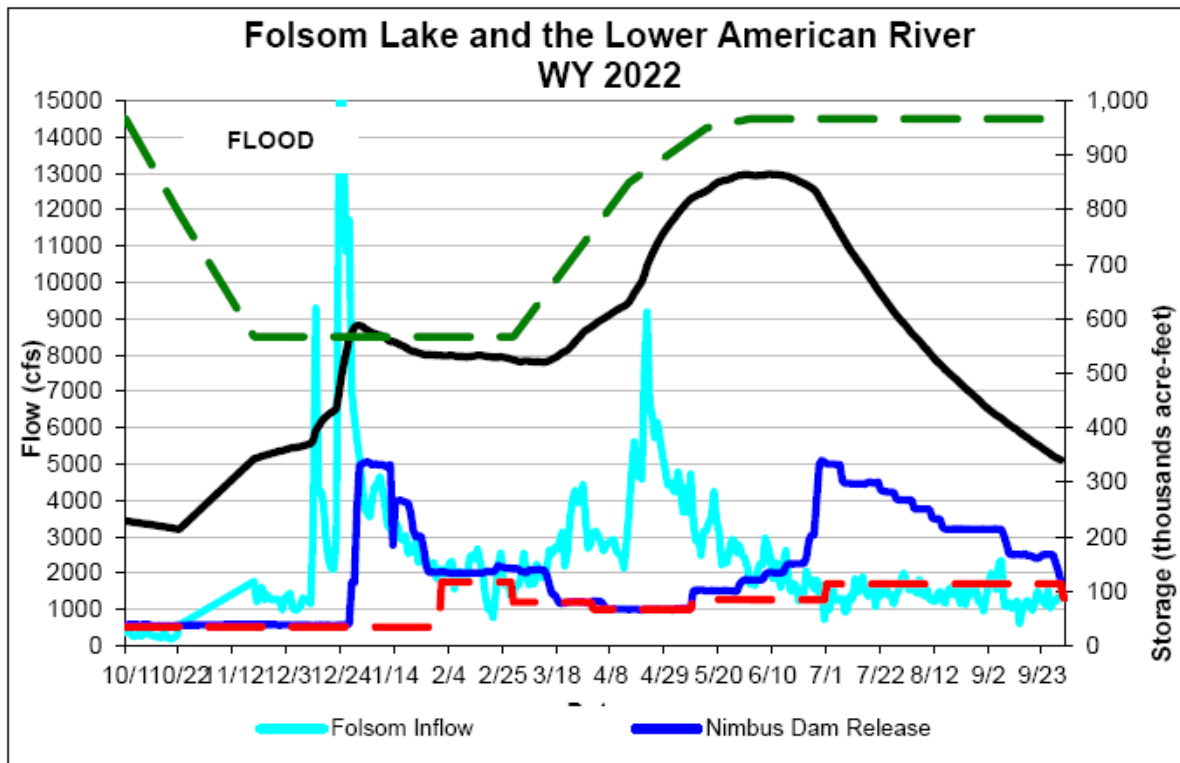


Figure 7. Summary of WY 2022 Folsom Reservoir Storage and Flow Releases from Nimbus Dam to the Lower American River.

The Nimbus Dam releases to the LAR and the prescribed MRRs for WY 2022 are shown in Figure 8.

Table 4 contains a summary of operational release changes from Nimbus Dam. Factors in making flow management adjustments included flood control, storage conservation, fall-run Chinook salmon spawning needs, Delta needs and salinity management and picket installation below Nimbus Dam.

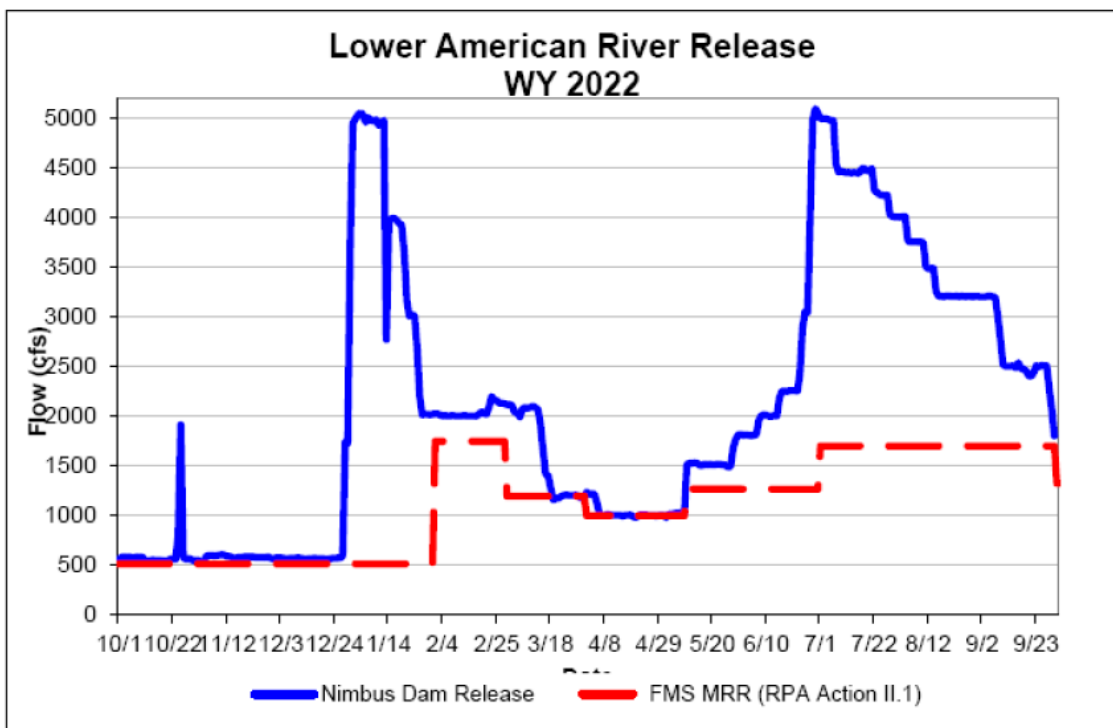


Figure 8. Summary of WY 2021 Nimbus Dam Releases to the Lower American River Releases.

Table 4. Reclamation’s WY 2021 Release Changes at Nimbus Dam.

Start Date	Release	To (cfs)	Comment
10/24/2021	Increase	900 (from 550)	High side flows into Lake Natoma on 10/23 and 10/24 resulted Lake Natoma to go into Reservoir Management mode. These are the actions that were taken to keep Lake Natoma manageable

Start Date	Release	To (cfs)	Comment
10/25/2021	Increase	2000	High side flows into Lake Natoma on 10/23 and 10/24 resulted Lake Natoma to go into Reservoir Management mode. These are the actions that were taken to keep Lake Natoma manageable
10/25/2021	Increase	2500	High side flows into Lake Natoma on 10/23 and 10/24 resulted Lake Natoma to go into Reservoir Management mode. These are the actions that were taken to keep Lake Natoma manageable
10/25/2021	Decrease	1000	Lake Natoma Reservoir Management
10/26/2021	Decrease	550	Lake Natoma Reservoir Management
12/28/2021	Increase	1750	Folsom Storage Management
12/30/2021	Increase	5000	Folsom Storage Management
1/13/2022	Decrease	2000	Reducing flows for the Rotary Screw Trap installation
1/13/2022	Increase	4000	
1/20/2022	Decrease	3500	Folsom Storage Management
1/21/2022	Decrease	3000	Folsom Storage Management
1/25/2022	Decrease	2500	Folsom Storage Management
1/26/2022	Decrease	2000	Folsom Storage Management
3/14/2022	Decrease	1750	Conserve Storage
3/15/2022	Decrease	1500	Conserve Storage
3/16/2022	Decrease	1250	Conserve Storage
3/18/2022	Decrease	1200	Conserve Storage
4/5/2022	Decrease	1100	Conserve Storage
4/6/2022	Decrease	1000	Conserve Storage
5/10/2022	Increase	1500	Delta Salinity
5/28/2022	Increase	1750	Delta Salinity
6/7/2022	Increase	2000	Delta Salinity
6/15/2022	Increase	2250	Delta Salinity
6/23/2022	Increase	2500	Delta Salinity
6/24/2022	Increase	3000	Delta Salinity
6/27/2022	Increase	4500	Delta Salinity
6/28/2022	Increase	5000	Delta Salinity
7/7/2022	Decrease	4500	Conserve Storage
7/22/2022	Decrease	4250	Conserve Storage
7/28/2022	Decrease	4000	Conserve Storage
8/4/2022	Decrease	3750	Conserve Storage
8/11/2022	Decrease	3500	Conserve Storage
8/15/2022	Decrease	3250	Conserve Storage
9/8/2022	Decrease	3000	Conserve Storage
9/9/2022	Decrease	2750	Conserve Storage
9/10/2022	Decrease	2500	Conserve Storage
9/28/2022	Decrease	2250	Conserve Storage
9/29/2022	Decrease	2000	Conserve Storage
9/30/2022	Decrease	1750	Conserve Storage

*Denotes release changes that occurred after WY 2022 for continuity of operations

4.4.2 Spring Pulse Flows

Spring pulse flows were not required or implemented in Water Year 2022 as part of the February 2020 ROD.

4.4.3 Temperature Management Plan

The Temperature Management Plan (TMP) component in the February 2020 ROD is designed to provide suitable temperatures to support over-summer rearing steelhead in the LAR from May 15 through October 31. Figure 9 is a summary of Reclamation's water temperature operations, from October 2021 through November 2022, at the Watt Avenue Bridge (~RM 9) temperature compliance point. Each year, available water resources and conditions are assessed to develop a temperature management plan. The iCPMM tool is used to generate temperature modeling results which are one component that guides the decision making for the TMP. Model runs incorporate the latest operation's forecast (inflow, outflow and storage) and iteratively select a temperature target based on available resources and a pre-determined habitat balance between steelhead and fall-run Chinook salmon. The selected plan is provided to ARG for comments and recommendations. After the ARG review of the TMP, Reclamation reviews the comments and determines the final plan. The plan is reviewed for potential updates every month based on the latest hydrology and CWP conditions.

Reclamation presented a finalized Temperature Management Plan (TMP) to ARG in June of 2022. Reclamation has modeled conditions using iCPMM which also support the outcome of the CE-QUAL-W2 models that were discussed with ARG stakeholders. The temperature objective in the TMP is to achieve a maximum temperature (mean daily) target at Hazel of 66°F from June 1, 2022 through October 20, 2022. Between June and October, there were only 3 days in August that exceeded 66°F at Hazel (Aug 25: 66.4°F, Aug 26: 66.3°F, and Aug 27: 66.1°F). The average for each month's temperature at Hazel are: June at 60.3°F, July at 63.4°F, August at 64.5°F, September at 65.4°F, and October at 64.4°F.

The 2017 FMS under the February 2020 ROD includes a temperature management strategy that acknowledges resource needs for the protection of fall-run Chinook salmon spawning. The goal is to achieve cooler water temperatures in October, depending on the availability of remaining CWP resources, and continue through November until active water temperature management is no longer necessary. The onset of seasonal fall cooling in most years occurs in mid-November due to ambient air temperature cooling and decreased day length. As a result, in many years, active temperature management continues after the October 31 end date of the juvenile steelhead temperature management period. After November, cooling the river to temperatures suitable for fall-run Chinook salmon spawning is typically accomplished by raising the lower shutter and releasing water through Folsom Dam's power units. In some years, Reclamation may release water from the lower river outlet gates at a cost to power generation for additional river cooling. A summary of WY 2022 temperature shutter and power penstock blending operations, including power bypass, is provided in Table 5.

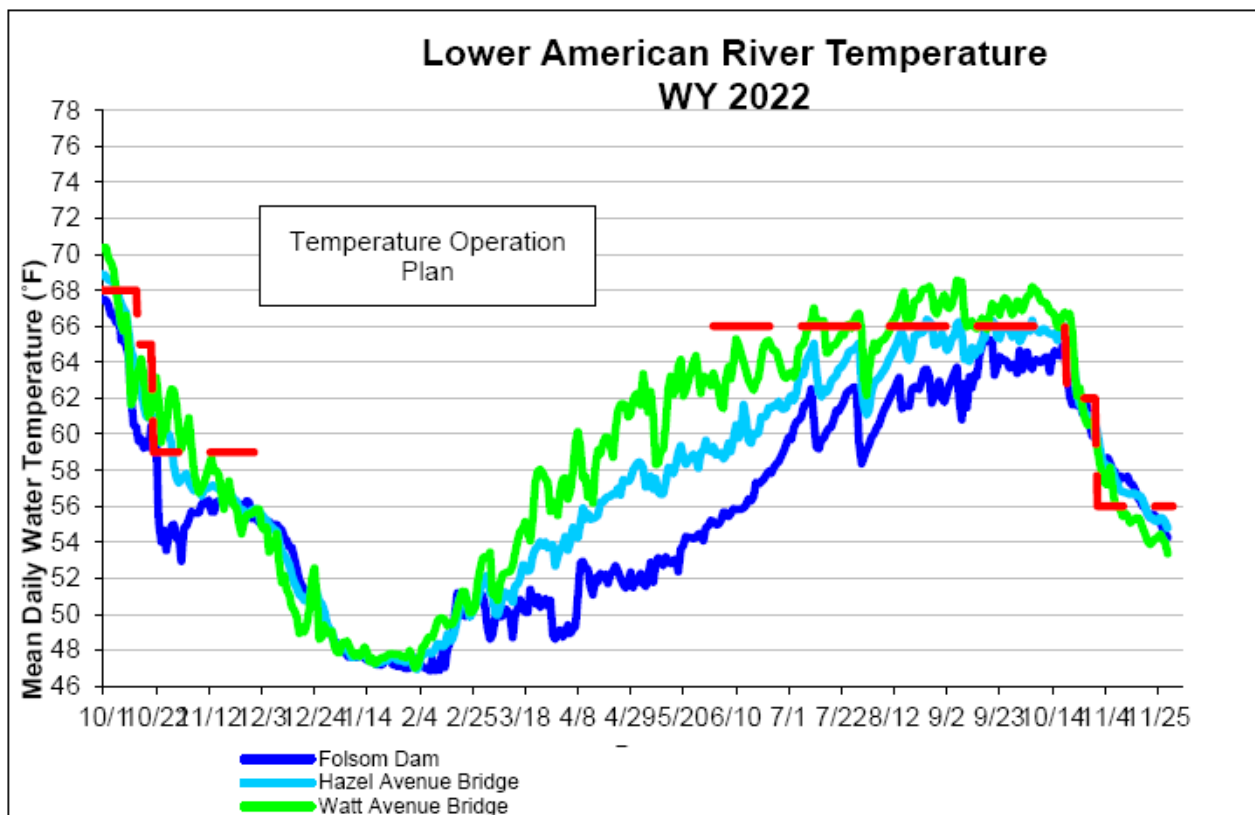


Figure 9. Summary of WY 2022 Water Temperatures in the Lower American River.

Table 5. List of Folsom Dam temperature shutter and power penstock blending operations taken to meet downstream temperature requirements.

Date	Operation									
10/13/2021	Set shutters on Unit 3 and Unit 2 to configuration 4 Status after change: Upper Gates - all up Middle Gates - all up Lower Gates - all up									
10/25/2021 10/26/2021	Please make the following power bypass releases from the lower outlet tubes: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Date</th> <th>Time</th> <th>cfs</th> </tr> </thead> <tbody> <tr> <td>10/25/21</td> <td>0100</td> <td>250</td> </tr> <tr> <td>10/26/21</td> <td>0100</td> <td>350</td> </tr> </tbody> </table>	Date	Time	cfs	10/25/21	0100	250	10/26/21	0100	350
Date	Time	cfs								
10/25/21	0100	250								
10/26/21	0100	350								
11/26/2021	Please make the following power bypass releases from the lower outlet tubes asap today: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Date</th> <th>From (cfs)</th> <th>To (cfs)</th> </tr> </thead> <tbody> <tr> <td>11/26/21</td> <td>350</td> <td>250</td> </tr> </tbody> </table>	Date	From (cfs)	To (cfs)	11/26/21	350	250			
Date	From (cfs)	To (cfs)								
11/26/21	350	250								

Date	Operation
11/27/2021	Please make the following power bypass releases from the lower outlet tubes asap today: Date From (cfs) To (cfs) 11/27/21 250 0
11/28/2021	Please make the following power bypass releases from the lower outlet tubes asap today: Date From (cfs) To (cfs) 11/28/21 0 200
12/3/2021	Please make the following power bypass releases from the lower outlet tubes asap today: Date From (cfs) To (cfs) 11/28/21 200 100
12/5/2021	Please make the following power bypass releases from the lower outlet tubes asap today: Date From (cfs) To (cfs) 12/5/21 100 0
1/28/2022	Please set Unit 1 in configuration 1 (TOP/MID/BOTTOM) all down Folsom shutter status after changes: Top Shutters: Units 1- lowered, 2, & 3 - raised Middle Shutters: Units 1- lowered, 2, & 3 - raised Bottom Shutters: Units 1- lowered, 2, & 3 - raised
2/10/2022	Please raise the top shutters on Unit 1. This will result in Unit 1 at configuration 2 (Top raised, Mid and Bottom down) Folsom shutter status after changes: Top Shutters: Units 1, 2, & 3 - raised Middle Shutters: Units 1- lowered, 2, & 3 - raised Bottom Shutters: Units 1- lowered, 2, & 3 - raised
2/14/2022 2/15/2022	Monday, 02/14/2022, please place Unit 3 to Configuration 2 (Top raised, Mid and Bottom down). Tuesday, 02/15/2022, please place Unit 2 to Configuration 2 (Top raised, Mid and Bottom down). Folsom shutter status after changes: Top Shutters: Units 1, 2, & 3 - raised Middle Shutters: Units 1, 2, & 3 - lowered Bottom Shutters: Units 1, 2, & 3 - lowered All Units (1,2, and 3) will be at Configuration 2

Date	Operation
4/8/2022	<p>Please place Unit 1 to Configuration 1 (Top, Mid and Bottom down)</p> <p>Folsom shutter status after changes: Top Shutters: Units 1 - lowered, Unit 2 - one set (1/3) of the lower panels are down, Unit 3 - raised Middle Shutters: Units 1, 2 & 3 - lowered, Bottom Shutters: Units 1, 2, & 3 - lowered</p>
5/3/2022 5/6/2022	<p>Tuesday, 5/3/2022, Unit 2 was placed into Configuration 1 (Top, Mid and Bottom down).</p> <p>Friday, 5/6/2022, Unit 3 was placed into Configuration 1 (Top, Mid and Bottom down).</p> <p>Folsom shutter status after changes: Top Shutters: Units 1, 2, & 3 - lowered Middle Shutters: Units 1, 2, & 3 - lowered Bottom Shutters: Units 1, 2, & 3 - lowered</p> <p>All Units (1,2, and 3) are in Configuration 1</p>
7/7/2022	<p>Please raise Unit 3 top set of shutters, this will place Unit 3 into Configuration 2 (Top raised, Mid and Bottom down).</p> <p>Folsom shutter status after changes: Top Shutters: Unit 3 tops raised, and Units 2 & 3 - lowered Middle Shutters: Units 1, 2, & 3 - lowered Bottom Shutters: Units 1, 2, & 3 - lowered</p> <p>Unit 3 in Configuration 2 and Units 1 and 2 are in Configuration 1</p>
7/11/2022	<p>Please raise Unit 3 top set of shutters, this will place Unit 3 into Configuration 2 (Top raised, Mid and Bottom down).</p> <p>Folsom shutter status after changes: Top Shutters: Unit 3 raised, and Units 1 & 2 - lowered Middle Shutters: Units 1, 2, & 3 - lowered Bottom Shutters: Units 1, 2, & 3 - lowered</p> <p>Unit 3 in Configuration 2 and Units 1 and 2 are in Configuration 1</p>

Date	Operation
7/29/2022	<p>Please raise Unit 1 top set of shutters, this will place Unit 1 into Configuration 2 (Top raised, Mid and Bottom down).</p> <p>Folsom shutter status after changes: Top Shutters: Unit 1, and 3 - raised, and Units 2 - lowered Middle Shutters: Units 1, 2, & 3 - lowered Bottom Shutters: Units 1, 2, & 3 - lowered</p> <p>Unit 1 and 3 in Configuration 2 and Units 2 are in Configuration 1 Comment: Top Shutter Elevation Constraint</p>
8/15/2022	<p>Please raise Unit 1 middle set of shutters, this will place Unit 1 into Configuration 3 (Top and middle raised, and Bottom down).</p> <p>Folsom shutter status after changes: Top Shutters: Unit 1, and 3 - raised, and Units 2 - lowered Middle Shutters: Units 1 - raised, and unit 2, & 3 - lowered Bottom Shutters: Units 1, 2, & 3 - lowered</p> <p>Unit 1 in Configuration 3 and Unit 3 in Configuration 2 and Units 2 in Configuration 1</p>
8/31/2022	<p>Please raise Unit 3 middle set of shutters, this will place Unit 3 into Configuration 3 (Top and middle raised, and Bottom down).</p> <p>Folsom shutter status after changes: Top Shutters: Unit 1, and 3 - raised, and Units 2 - lowered Middle Shutters: Units 1, and 3 - raised, and unit 2 - lowered Bottom Shutters: Units 1, 2, & 3 - lowered</p> <p>Unit 1 & Unit 3 in Configuration 3 and Units 2 in Configuration 1</p>
9/7/2022	<p>Please raise Unit 3 bottom set of shutters after 1000 hour, this will place Unit 3 into Configuration 4 (Top, Middle, and Bottom raised).</p> <p>Folsom shutter status after changes: Top Shutters: Unit 1, 2, and 3 - raised Middle Shutters: Units 1, 2, and 3 - raised Bottom Shutters: Units 1, 2 lowered and Unit 3 - raised</p> <p>Unit 1 & Unit 2 in Configuration 3 and Units 3 in Configuration 4</p>

Date	Operation												
10/19/2022	<p>Please raise Units 1 and 2 bottom sets of shutters, this will place Units 1 and 2 into Configuration 4 (Top, Middle, and Bottom raised).</p> <p>Folsom shutter status after changes: Top Shutters: Unit 1, 2, and 3 - raised Middle Shutters: Units 1, 2, and 3 - raised Bottom Shutters: Units 1, 2, and 3 - raised</p> <p>Unit 1, Unit 2, and Unit 3 in Configuration 4</p>												
10/20/2022 10/21/2022 10/22/2022	<p>Please make the following power bypass releases from the lower outlet tubes:</p> <table border="1" data-bbox="418 737 946 863"> <thead> <tr> <th>Date</th> <th>Time</th> <th>cfs</th> </tr> </thead> <tbody> <tr> <td>10/20/22</td> <td>0800</td> <td>100</td> </tr> <tr> <td>10/21/22</td> <td>0800</td> <td>200</td> </tr> <tr> <td>10/22/22</td> <td>0800</td> <td>300</td> </tr> </tbody> </table> <p>Please maintain 300 cfs power bypass until further notice. Note: Implement Power Bypass to target 62 degree at AFO, approved by RD</p>	Date	Time	cfs	10/20/22	0800	100	10/21/22	0800	200	10/22/22	0800	300
Date	Time	cfs											
10/20/22	0800	100											
10/21/22	0800	200											
10/22/22	0800	300											
10/29/2022 10/30/2022	<p>Please make the following power bypass releases from the lower outlet tubes:</p> <table border="1" data-bbox="418 1113 946 1205"> <thead> <tr> <th>Date</th> <th>Time</th> <th>cfs</th> </tr> </thead> <tbody> <tr> <td>10/29/22</td> <td>0800</td> <td>400</td> </tr> <tr> <td>10/30/22</td> <td>0800</td> <td>500</td> </tr> </tbody> </table> <p>Please maintain 500 cfs power bypass until further notice.</p>	Date	Time	cfs	10/29/22	0800	400	10/30/22	0800	500			
Date	Time	cfs											
10/29/22	0800	400											
10/30/22	0800	500											
11/21/2022	<p>Please make the following power bypass releases from the lower outlet tubes:</p> <table border="1" data-bbox="418 1383 1027 1476"> <thead> <tr> <th>Date</th> <th>Time</th> <th>From (cfs)</th> <th>To (cfs)</th> </tr> </thead> <tbody> <tr> <td>11/21/22</td> <td>1200</td> <td>500</td> <td>400</td> </tr> </tbody> </table>	Date	Time	From (cfs)	To (cfs)	11/21/22	1200	500	400				
Date	Time	From (cfs)	To (cfs)										
11/21/22	1200	500	400										
11/22/22	<p>Please make the following power bypass releases from the lower outlet tubes:</p> <table border="1" data-bbox="418 1623 984 1682"> <thead> <tr> <th>Date</th> <th>Time</th> <th>From (cfs)</th> <th>To (cfs)</th> </tr> </thead> <tbody> <tr> <td>11/22/22</td> <td>200</td> <td>400</td> <td>200</td> </tr> </tbody> </table>	Date	Time	From (cfs)	To (cfs)	11/22/22	200	400	200				
Date	Time	From (cfs)	To (cfs)										
11/22/22	200	400	200										

Date	Operation								
11/23/2022	Starting today, November 23, 2022, please cancel all bypass releases from the lower outlet tubes:								
	<table border="1"> <thead> <tr> <th data-bbox="415 369 516 394">Date</th> <th data-bbox="522 369 639 394">Time</th> <th data-bbox="646 369 737 394">From (cfs)</th> <th data-bbox="743 369 850 394">To (cfs)</th> </tr> </thead> <tbody> <tr> <td data-bbox="415 403 516 428">11/23/22</td> <td data-bbox="522 403 639 428">1200</td> <td data-bbox="646 403 737 428">200</td> <td data-bbox="743 403 850 428">0</td> </tr> </tbody> </table>	Date	Time	From (cfs)	To (cfs)	11/23/22	1200	200	0
Date	Time	From (cfs)	To (cfs)						
11/23/22	1200	200	0						

4.5 Summary of American River Operations to Meet Delta Requirements

In the spring, Nimbus Dam (as measured at the AFO⁷ gage on the LAR) releases are held steady until flows are needed to support instream demands on the mainstem Sacramento River, Delta Outflow and other requirements. CVP releases for Delta Outflow requirements are balanced between Shasta Reservoir and Folsom Reservoir. Shasta Reservoir and Folsom Reservoir are relied upon to meet in-river water temperature control requirements below Keswick Dam and Nimbus Dam later in the season, and both reservoirs need to substantially fill in the spring to fully meet these requirements. Therefore, releases must be carefully balanced to manage storage in each reservoir. An overarching goal for Reclamation when operating the CVP is to fill both reservoirs as much as possible by the end of the flood control season (end of May) while meeting all other authorized project purposes.

A multi-year drought has strained California’s water supply. This has put an increased demand on Shasta Reservoir and Folsom Reservoir for meeting water demands. During drought, reservoir releases are limited to conserve storage. However, requirements must still be met for fish habitat needs and for other downstream demands, which include seasonal water supply needs, water rights requirements, regulatory requirements and biological considerations.

In 2022, Shasta Reservoir was unable to provide the needed volume of water for meeting these requirements in the Sacramento – San Joaquin Delta and therefore Folsom Reservoir, while in drought conditions, was relied upon for support. Folsom Reservoir is one of the smallest CVP reservoirs with one of the highest refill potentials. It is also closer in proximity to the Delta, meaning reservoir releases reach the Delta faster than releases from Shasta Reservoir.

⁷ Temperature data for the Fair Oaks (AFO) gage can be found here: <https://cdec.water.ca.gov/webgis/?appid=cdecstation&sta=AFO>

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Chapter 5 – Lower American River Biological Monitoring

The monitoring activities described below are currently being implemented on the LAR and include actions which: represent requirements in the NMFS 2009 BiOp, NMFS 2019 BiOp, or 2020 ROD; assist Reclamation in implementing operations pursuant to the NMFS 2009 BiOp, NMFS 2019 BiOp, or 2020 ROD; provide supplemental information; or meet CVPIA specific requirements.

5.1 Monitoring Activities

5.1.1 Steelhead Spawning Surveys

Reclamation contracted with Cramer Fish Sciences (CFS) to conduct bi-weekly steelhead redd surveys. Redd surveys were conducted from Nimbus Dam to Watt Avenue, with the addition of surveys at Paradise Beach every other survey period, covering 18 river miles (Figure 10) (CFS 2022). Surveys began on January 12, 2022 and continued through April 7, 2022. No steelhead redds were observed on the final survey. From January 12 to April 7, 2022, a total of 247 new, clear salmonid and Pacific lamprey (*Entosphenus tridentatus*) redds were observed. When possible, redds were assigned to species based on observations of adults of these species within proximity of the redds. Of the 247 new redds, 29 were positively identified in the field as steelhead, and 89 as Pacific Lamprey. Of the remaining redds, 129 redds were initially classified as “unknown” because no fish were observed on the redd. Categorization by Discriminant Function Analysis (DFA) led to designation of 58 unknown redds as steelhead, for a total of 87 steelhead redds. The remaining 71 unknown redds were classified as Pacific lamprey.

Figure 11 shows the 2022 steelhead redd locations (following DFA) and their corresponding discovery dates by survey week. Overall, 81% of steelhead redds during the 2022 surveys were observed at gravel augmentation sites, which is the highest percentage observed since CFS began performing surveys in 2015. The highest redd density (28% of all redds) occurred in the Ancil Hoffman gravel augmentation project, implemented in fall 2021. The percentage of steelhead redds observed at gravel augmentation sites had previously ranged from 11% to 50% since 2015. Surveyed redds were recorded from a raft, or on foot and plotted using geographic positioning system (GPS) and biometric equipment. Bi-weekly reports summarizing the findings of the steelhead spawning survey were sent to NMFS and survey data were also reported at the monthly ARG meeting.

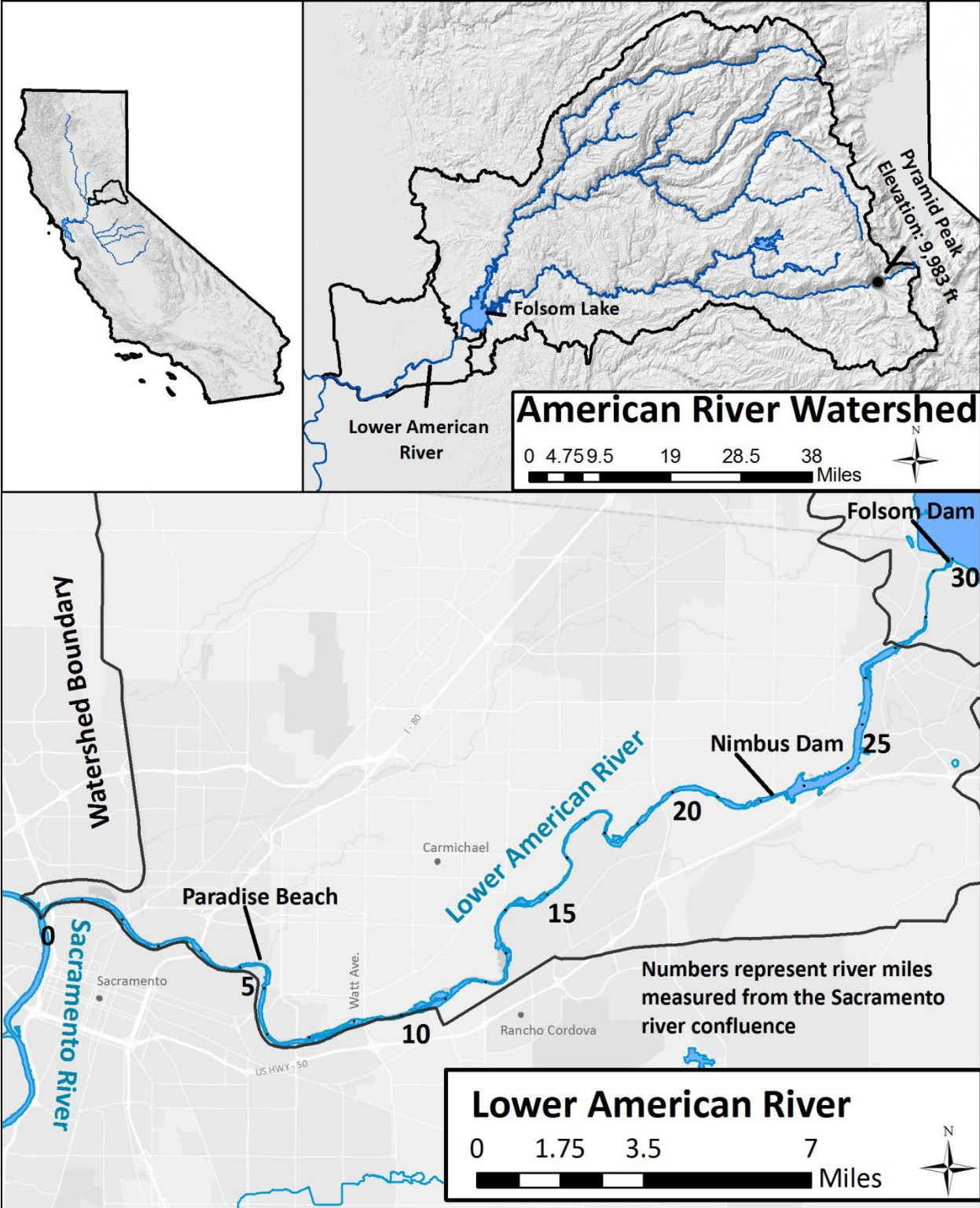


Figure 10. American River steelhead spawning survey reach.

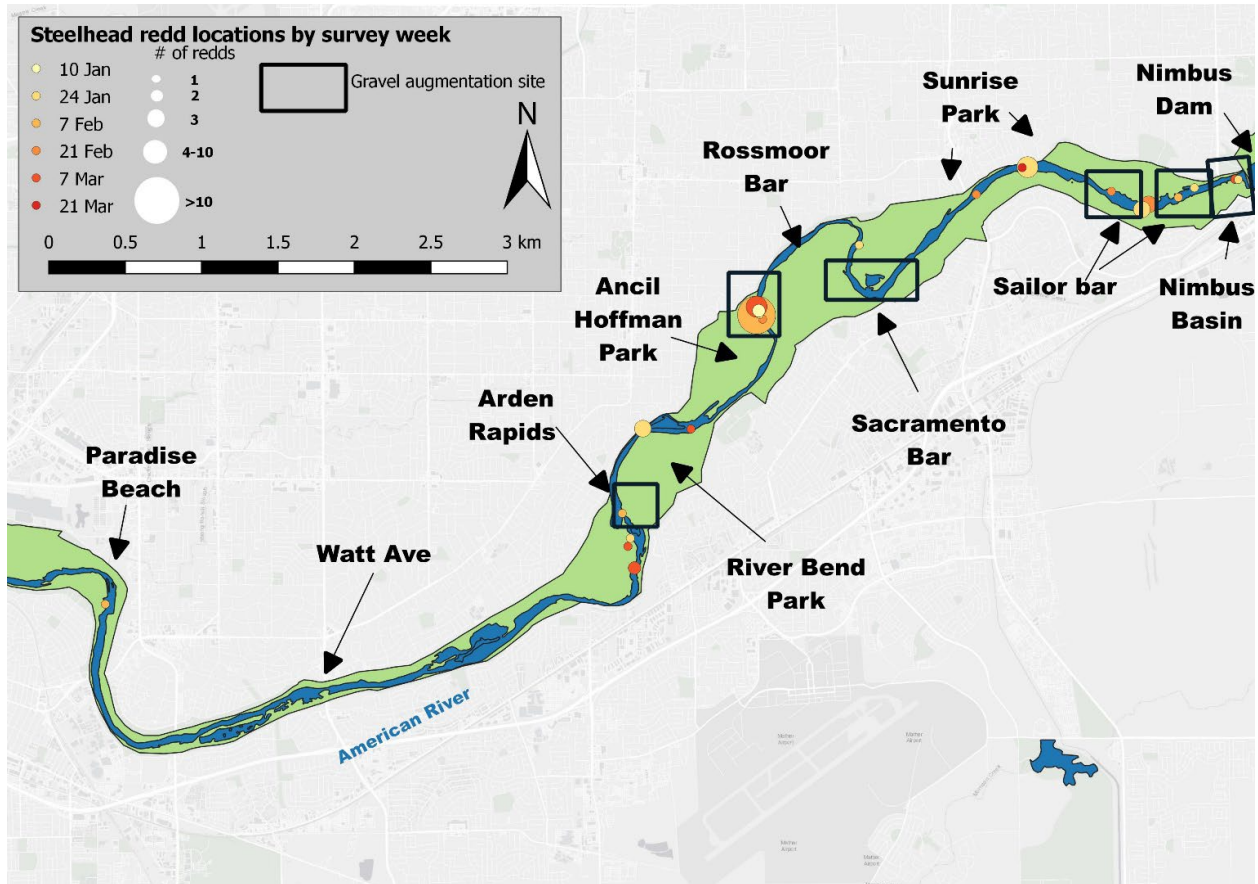


Figure 11. American River steelhead redd distribution and timing in 2022.

5.1.2 Stranding and Isolation Pool Monitoring

Reclamation monitors flow fluctuations in the LAR to assess and reduce dewatering of salmonid redds and stranding and isolation of juvenile salmonids. Habitat evaluations have identified several locations where isolation of salmonids and other fish species have been observed in the past coinciding with the reduction or fluctuation of flows.

LAR stranding surveys were performed on 26 – 28 January, and on 17 – 19, 21 and 25 March 2022 between Nimbus Dam and Paradise Beach (Figure 12). When juvenile salmonids were observed, the approximate number and size of fish in the isolated pool were recorded, along with species identification, when possible. Water temperature, dissolved oxygen (DO), and turbidity were recorded in isolated pools that contained stranded juvenile salmonids. A GPS polygon outlining the stranding pool was also recorded to estimate pool area. Survey crews looked for new stranding pools and revisited previous stranding locations during each survey. All fish were captured with a beach seine or dip net. All fish captured in the isolated pools were released back into the main channel with assistance from CDFW. Occasionally some juveniles could not be captured due to dense vegetation, large cobble etc. In these cases, fish numbers were estimated visually. If the salmonids were captured with a beach seine or dip net they were identified to species. Table 6 summarizes salmonids captured,

with steelhead numbers in parentheses. In cases where fish were observed but could not be captured they generally could not be accurately identified to species.

Table 6. Summary of stranded juvenile salmonids on the Lower American River observed during stranding surveys that occurred 17-21 March and 25 2022.

Date	Location (river mile)	# of pools	Species rescued- Chinook	Species Rescued- Steelhead	Total Pool area (m2)
17-21 Mar	Upper Sunrise Side Channel (21)	9	2474	8164	419
17-21 Mar	Lower Sunrise side channel (21)	1	6	0	13
17-21 Mar	Lower River Bend side channel, Arden Rapids (13)	2	4	0	207
17-21 Mar	William B. Pond Recreation area (13)	1	330	0	787
25-Mar	Upper River Bend (14)	1	314	0	322
N/A	Total	14	3128	8164	1748

No stranded juvenile salmonids were observed during the 26 - 28 January and 5 – 7 April stranding surveys. A total of five unique locations were stranded with juvenile salmonids between 17 – 25 March, covering an estimated area of 1,748 m2. Within these stranding pools, 11,292 juvenile salmonids were observed; 8,164 of these were steelhead (~72%, Table 6). Other fish species observed in pools included Sacramento pikeminnow (*Ptychocheilus grandis*), Sacramento sucker (*Catostomus occidentalis*), Three-spined Stickleback (*Gasterosteus aculeatus*), Golden Shiner (*Notemigonus crysoleucas*), Western Mosquitofish (*Gambusia affinis*), Bluegill (*Lepomis macrochirus*), and Tule Perch (*Hysterothorax traskii*). CDFW staff assisted CFS in rescuing all 11,292 salmonids from these isolated pools.

Stranding pools within the upper Sunrise side channel alone contained a combined total of 10,638 juvenile salmonids (94% of season total). All stranded steelhead (8,164, 72% of all stranded salmonids) were stranded in the upper Sunrise side channel (Table 6). On the lower Sunrise side channel island there were 6 juvenile Chinook Salmon observed and rescued. A stranding pool in Upper Riverbend park contained 314 juvenile Chinook salmon that were observed and rescued (6% of all salmonids). In the lower Riverbend side channel restoration area there were a total of 4 stranded juvenile Chinook Salmon observed and rescued. A stranding pool adjacent to William B. Pond recreation area contained 330 juvenile Chinook Salmon that were observed and rescued; 6% of all salmonids (Figure 12).

All of the juvenile salmonid stranding occurred following a flow reduction of 800 cfs between 10 – 17 March (Figure 12; Table 6). Flows did not decrease further prior to the rescue event on 25 March; additional stranding likely occurred due to increasing ambient temperature and, subsequently, water evaporation.

Average temperatures in stranding pools at two locations reached levels considered stressful for juvenile salmonids. Seven of the nine pools in the upper Sunrise side channel measured greater than 16°C (Table 7). One pool containing 307 stranded steelhead was measured at 18.3°C, and the highest temperature recorded with steelhead present was 22.6°C (Table 7). Both pools in the lower Riverbend side channel had low DO conditions (2.1-4.7 mg/l), although water temperatures were not at stressful levels (11.7-12.2°C; Table 7).

No additional stranding surveys were conducted after 7 April because flows on the LAR were not further reduced from early April through the end of May.

Table 7. Summary of environmental data in the observed stranding pools containing stranded juvenile salmonids March 17-21 and March 25, 2022. Numbers reported are averages across the pools observed within each location. Bolded numbers indicate stressful conditions for juvenile salmonids (USEPA 2003).

Date	Location (river mile)	# of Pools	Average Temperature (°C)	Average DO (mg/L)	Average Turbidity (NTU)
17-21 Mar	Upper Sunrise Side Channel (21)	9	18	7.6	1.8
17-21 Mar	Lower Sunrise side channel (21)	1	15.4	5.5	NA ¹
17-21 Mar	Lower River Bend side channel, Arden Rapids (13)	2	12	3.4	1.6
17-21 Mar	William B. Pond Recreation area (13)	1	17.3	7.7	2
25-Mar	Upper River Bend (14)	1	13.9	9.1	1.8

¹Stranding pool disturbed before turbidity was taken

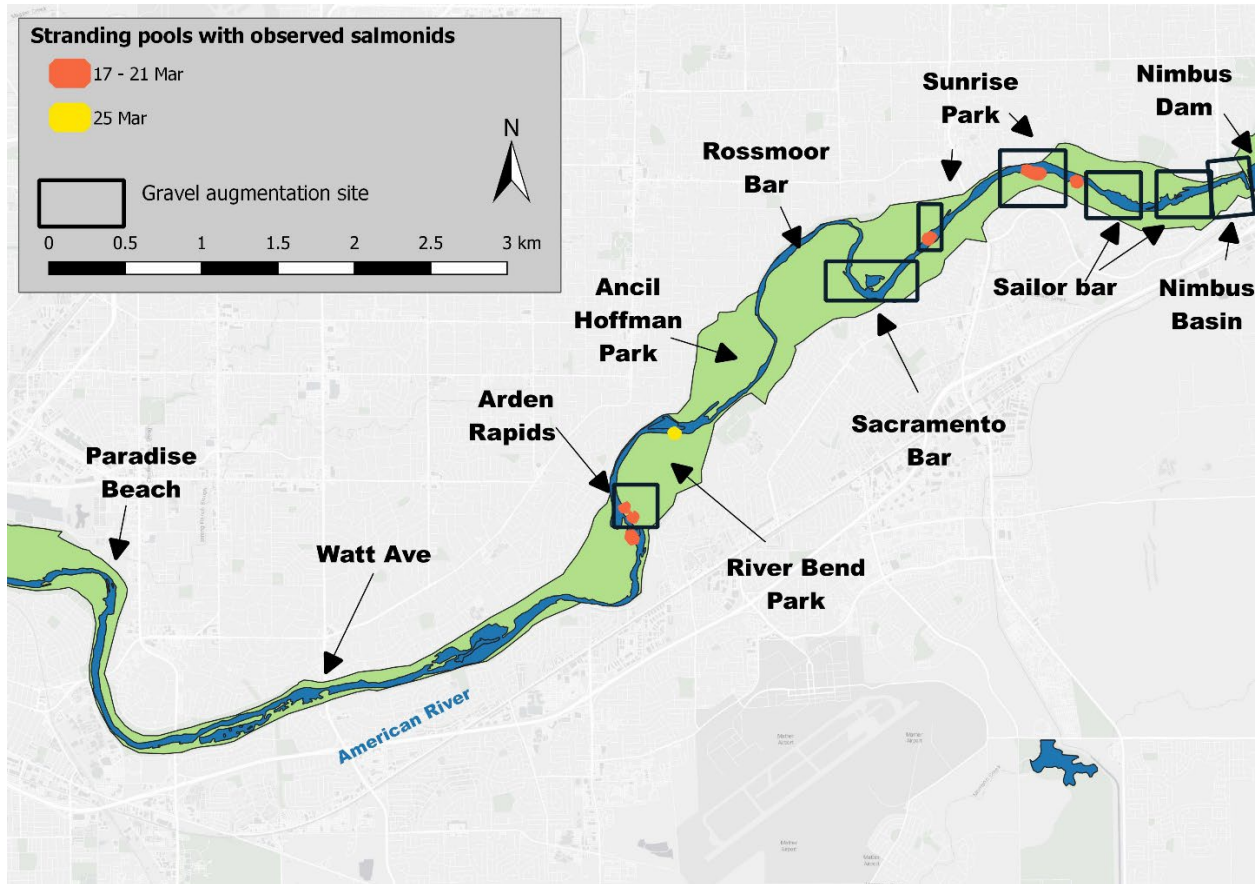


Figure 12. Locations of stranding areas with juvenile salmonids on the Lower American identified 17 - 21 March, and 25 March 2022. No stranding with juvenile salmonids was observed 26 – 28 January or 5 – 7 April.

5.1.3 Steelhead Redd Dewatering

During stranding surveys, steelhead redds were monitored for dewatering. No steelhead redds were dewatered during 2022 flow reductions.

5.1.4 Rotary Screw Trap

LAR rotary screw trap (RST) operations in 2022 were part of a collaborative effort by the USFWS' Comprehensive Assessment and Monitoring Program (CAMP), PSMFC, and CDFW, and results are reported annually. The primary objectives of the trapping operations are:

1. To collect fork length and weight data for juvenile salmonids;
2. To collect data that can be used to estimate the passage of juvenile fall-run Chinook salmon;⁸ and

⁸ Passage estimates were created using a mark-recapture spline model in the CAMP RST platform.

- To quantify raw catch of winter-, spring-, and late fall- runs of Chinook salmon and steelhead/rainbow trout.

Sampling for the 2022 survey season began on January 15 and ended on June 1 with 120 days of sampling during the 138 day season. Two 8-foot diameter RSTs were deployed into the north channel of the Watt Avenue trapping site in a side-by-side configuration. Total catch for the season included 31,583 unmarked Chinook salmon, 404 unmarked *O. mykiss*, and 2,820 lamprey.

Chinook catch timing and fork lengths from the Watt Avenue RSTs are summarized in Figure 14 and Figure 15.

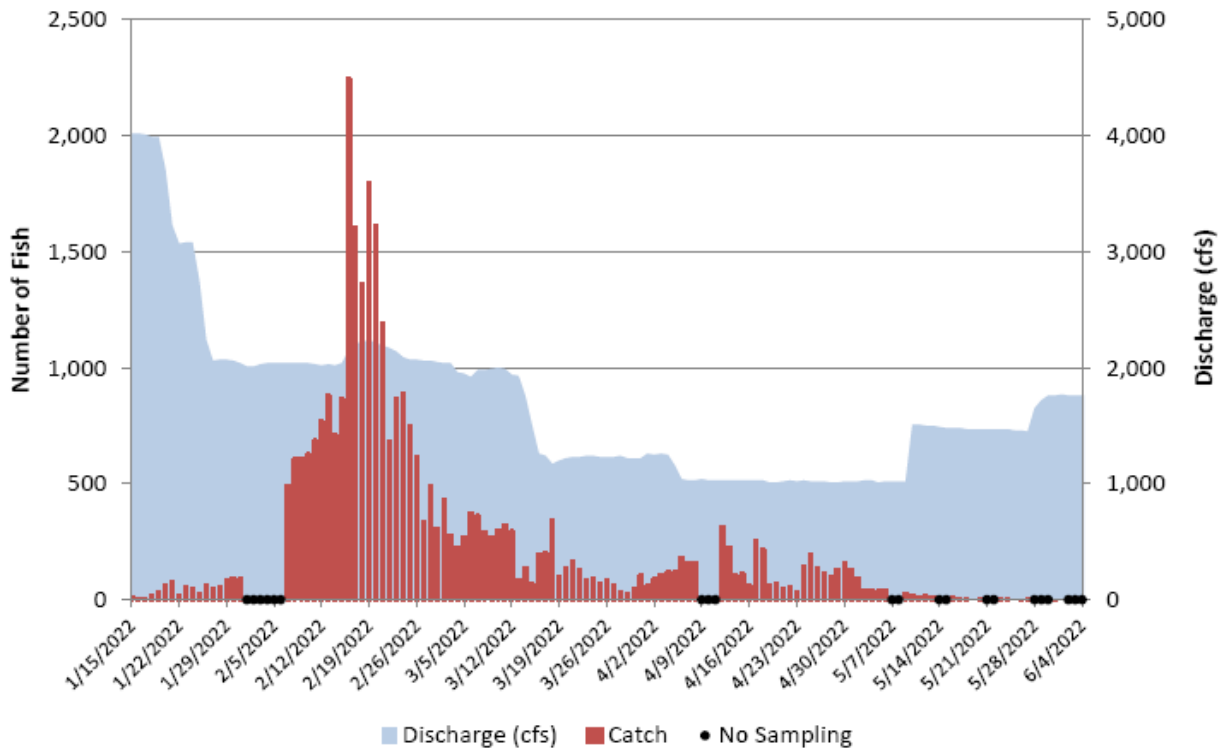


Figure 13: Daily catch of unmarked Chinook salmon and daily average discharge at Fair Oaks during the 2022 lower American River rotary screw trap survey season.

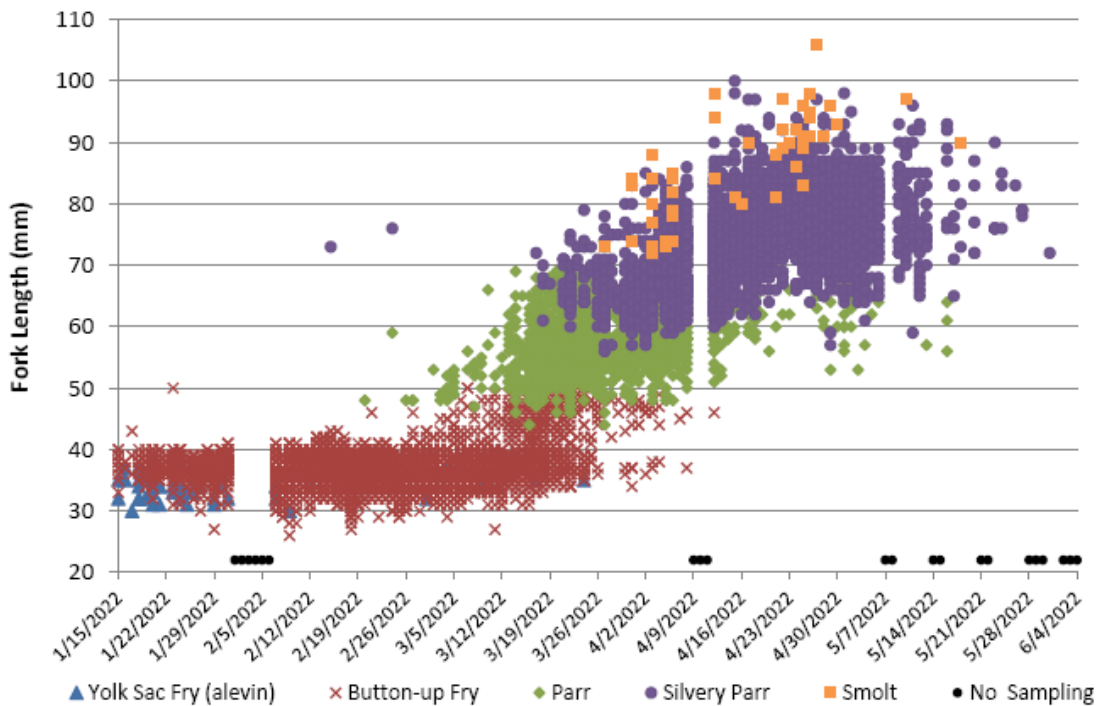


Figure 14: Daily fork length distribution by life stage of unmarked Chinook salmon measured during the 2022 lower American River rotary screw trap survey season.

5.1.5 Chinook Escapement Surveys

CDFW conducted the Brood Year 2021 LAR Fall-Run Chinook salmon Escapement Survey over 12 survey periods from October 18, 2021, to January 5, 2022 (CDFW 2022). The 13.5-mile stretch of river from the Nimbus Dam downstream to Watt Avenue, was divided into six sections and surveyed once during each survey week for salmon carcasses. The objectives of the escapement survey are to:

1. Estimate the size of the fall-run Chinook salmon escapement in the LAR;
2. Determine the ratio of adults to grilse, as well as the sex ratios of adults and grilse;
3. Determine the degree of female pre-spawn mortality; and
4. Collect coded-wire tags (CWT) to investigate the number and origin of hatchery-reared fall-run Chinook salmon using spawning habitat in the LAR.

The Brood Year 2021 LAR fall-run Chinook salmon in-river escapement estimate is 11,232. In addition to the in-river estimate, 11,075 Chinook salmon were trapped at the Nimbus Fish Hatchery for spawning purposes but were not included in the in-river escapement estimate. The carcass crew processed 16 carcasses in the rock channel entrance to the new fish ladder to the Nimbus Hatchery, 160 carcasses in Nimbus Basin, 4,347 carcasses in the area from below the old Nimbus Hatchery Weir

location to El Manto Dr. access, 642 carcasses in the area extending from El Manto Dr. access to River Bend Park, and 84 carcasses in the area from River Bend Park to Watt Ave. access.

Coded wire tagged carcasses (adipose fin clipped) comprised 16% of the total carcasses observed. Adipose fins were intact for 77% of carcasses and presence or absence of an adipose fin could not be determined for 7% of carcasses due to an advanced level of decomposition. Preliminary coded wire tag data revealed that approximately 57% originated from the Nimbus Fish Hatchery, 32% were from the Mokelumne River Fish Hatchery, 2% were from the Feather River Fish Hatchery, and 2% were from the Merced River Hatchery. Coded wire tags were either not recovered or unreadable for 49 (7%) of the adipose fin-clipped carcasses processed.

After carcasses were counted and processed by CDFW, Cramer Fish Sciences collected genetic samples and otoliths from approximately 956 Chinook salmon carcasses to gather migratory information and to assess spawning success at gravel augmentation sites.

5.1.6 Other Monitoring

Additional project specific fisheries monitoring is being conducted to evaluate spawning and rearing habitat restoration projects. This monitoring includes river-wide Chinook salmon redd surveys, ground-based redd and juvenile salmonid snorkel surveys at project sites, an assessment of juvenile use of various types of habitat structure, environmental DNA monitoring to assess presence and distribution of Chinook salmon and steelhead, temperature and dissolved oxygen monitoring, and comparisons of habitat availability before and after restoration implementation. A structured decision-making process is being used to determine future project types and identify monitoring needs.

References

- California Department of Fish and Wildlife (CDFW). 2021. 2020 Lower American River Fall-run Chinook salmon Escapement Survey, 2020-2021.
- California Department of Water Resources (DWR). 2021. California Department of Water Resources, Bulletin 120. <https://cdec.water.ca.gov/snow/bulletin120/>
- Cramer Fish Sciences (Cramer). 2021 Steelhead (*Oncorhynchus mykiss*) Spawning and Stranding Surveys, Central Valley Project, American River, California.
- Delta Stewardship Council (DSC). 2010. Report of the 2010 Independent Review Panel (IRP) on the Reasonable and Prudent Alternative (RPA) Actions Affecting the Operations Criteria And Plan (OCAP) for State/Federal Water Operations. https://www.noaa.gov/sites/default/files/atoms/files/2019-04-22_workshop_OCAP_2010_IRP_RPA_Final_Report_121310.pdf
- National Marine Fisheries Service (NMFS). 2009. Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project. NMFS, Southwest Region. <https://www.fisheries.noaa.gov/resource/document/biological-opinion-and-conference-opinion-long-term-operations-central-valley>
- _____. 2011. 2011 Amendments to the National Marine Fisheries Service Long-Term Operations of the Central Valley Project and State Water Project Reasonable and Prudent Alternative. NMFS, Southwest Region. <https://www.fisheries.noaa.gov/resource/document/biological-opinion-and-conference-opinion-long-term-operations-central-valley>
- _____. 2019. Biological Opinion on Long-Term Operation of the Central Valley Project and State Water Project. NMFS, West Coast Region. <https://repository.library.noaa.gov/view/noaa/22046>
- _____. 2019. Final Biological Assessment: Reinitiation of Consultation on the Coordinated Long-Term Operation of the Central Valley Project and State Water Project. October 21, 2019.
- _____. 2020. Record of Decision (ROD). Reinitiation of Consultation on the Coordinated Long-Term Modified Operations of the Central Valley Project and State Water Project. https://www.usbr.gov/mp/nepa/nepa_project_details.php?Project_ID=39181
- U.S. Fish & Wildlife Service (USFWS). 2019. Biological Opinion for the Reinitiation of Consultation on the Coordinated Operations of the Central Valley Project and State Water Project, October 2019. <https://www.fws.gov/sfbaydelta/cvp-swp/index.htm>
- Water Forum. 2006. Draft: Lower American River Flow Management Standard.
- _____. 2017. Lower American River Modified Flow Management Standard.

Attachment A - American River 2017 Flow Management Standard, Planning Minimum & Spring Pulse Flow Guidance Document

GUIDANCE DOCUMENT

LTO 013

American River 2017 Flow Management Standard, Planning Minimum & Spring Pulse Flow

LTO Implementation

October 7, 2021

I. PURPOSE

This document provides implementation guidance on the American River 2017 Modified Flow Management Standard (MFMS) approach proposed by the Water Forum in 2017 and as excerpted and summarized in the document titled “The 2017 Flow Management Standard Minimum Release Requirement” dated March 2020 (Attachment 1). Attachment 1 includes descriptions and directions for calculating the minimum reservoir releases throughout the year as proposed in the 2017 MFMS. Additional aspects to consider while implementing the attached include river temperature considerations and protocols, guidance regarding reservoir storage, and the rationale and methods for developing the standards. The scope of guidance includes the deliverables, schedule, and processes of the American River Group (ARG) Technical Team to implement the FMS as analyzed in the Proposed Action; develop and implement the Planning Minimum; and implement the Spring Pulse Flow when applicable. The primary deliverables are ARG meeting notes and handouts that include a monthly summary, and more frequent summary if needed, of the system-wide hydrologic, operational, regulatory requirement compliance, flood control, and temperature data related to the implementation and objectives of the FMS, Planning Minimum and Spring Pulse Flow and associated implementation plans. ARG feedback on these topics will be solicited, discussed and considered by Reclamation. Reclamation intends to work with the Water Forum in collaboration on determining and implementing an appropriate planning minimum and will confer with the California Department of Fish and Wildlife (CDFW), the US Fish and Wildlife Service (USFWS), and NMFS on planning minimum discussions.

2017 FMS, Planning Minimum & Spring Pulse Flow

This section provides the applicable verbatim language for American River Division 2017 FMS, Planning Minimum and Spring Pulse Flow.

Erratum:

- Section: “4.10.4.1 Seasonal Operations” of the BA
 - Corrected language: Reclamation proposes to follow the 2017 Flow Management Standard, which includes a pulse flow event at some time during the period extending from March 15 to April 15 by supplementing normal operational releases from Folsom Dam under certain conditions when no such flow event has occurred between the preceding February 1 and March 15 timeframe.

II. Proposed Action:

4.10.2 American River Division [...]

Reclamation proposes to meet water rights, contracts and agreements that are both specific to the American River Division as well as those that apply to the entire CVP, including the Delta Division. For lower American River flows (below Nimbus Dam), Reclamation proposes to adopt the minimum flow schedule and approach proposed by the Water Forum in 2017 in the document titled “Lower American River – Standards for Minimum Flows” dated December 2018. Flows range from 500 to 2000 cfs based on time of year and annual hydrology. The flow schedule is intended to improve cold water pool and habitat conditions for Steelhead and Fall-Run Chinook Salmon. Specific flows are determined using an index intended to define the current and recent hydrology. Although Reclamation has assumed the index proposed by the Water Forum in 2017 for the purposes of modeling and analysis within this biological assessment, Reclamation intends to continue discussions with the Water Forum to ensure the index used for implementation is appropriate to meet the intended objectives under continuously changing hydrology.

Reclamation proposes to work together with the American River water agencies to define an appropriate amount of storage in Folsom Reservoir that represents the lower bound for typical forecasting processes at the end of calendar year (the “planning minimum”). The planning minimum brings Reclamation's forecasting process together with potential local actions that either increase Folsom storage or reduce demand out of Folsom Reservoir. The implementation of a planning minimum allows Reclamation to work with the American River Group to identify conditions when local water actions may be necessary to ensure storage is adequate for diversion from the municipal water intake at Folsom Dam and/or the extreme hydrology presents a risk that needs to be properly communicated to the public and surrounding communities. This planning minimum will be a single value (or potentially a series of values for different hydrologic year types) to be used for each year’s forecasting process into the future. The objective of incorporating the planning minimum into the forecasting process is to provide releases of salmonid-suitable temperatures to the lower American River and reliable deliveries (using the existing water supply intakes and conveyance systems) to American River water agencies that are dependent on deliveries or releases from Folsom Reservoir.

This planning minimum was defined in 2019 and will be continuously evaluated between Reclamation and the Water Forum throughout implementation.

Reclamation expects infrequent scenarios where the forecasted storage may fall below the “planning minimum” due to a variety of circumstances and causes. In those instances, Reclamation and the American River water agencies will develop a list of potential off-ramp actions that may be taken to either improve forecasted storage or decrease demand on Folsom Reservoir. In its forecasting process for guiding seasonal operations, Reclamation will plan to maintain or exceed the planning minimum at the end of the calendar year. Reclamation has no legal liability should it fall below the planning minimum. When Reclamation estimates, using the forecasting process, that it would not be able to maintain Folsom Reservoir storage at or above the planning minimum for that year type (such as in extreme hydrologic conditions) or unexpected events cause the storage level to be at risk, American River water agencies would coordinate with Reclamation to identify and implement appropriate actions to improve

forecasted storage conditions, and the American River water agencies would work together to educate the public on the actions that have been agreed upon and implemented and the reasons and basis for them. If potential changes to Folsom Dam operations would have impacts on other aspects of the CVP and SWP or the entire integrated system, Reclamation will meet and discuss these potential changes and impacts with water contractors.

Reclamation will continue to work with the American River Group, a group that includes federal, state, and local agencies, water users, and NGOs, to coordinate spring pulse flow timing and communicate upcoming releases.

Reclamation would ramp down to the revised minimum flows from Folsom Reservoir as soon as possible in the fall and maintain these flows, where possible.

4.10.4.1 Seasonal Operations

In the winter and spring, flood control releases typically dominate the flow regime in the American River Division. Flood control operations occur to safely pass large storm events without exceeding the identified downstream levee capacity. This includes making dry-weather releases to ensure that the maximum storage adheres to the flood control elevation identified in the applicable Water Control Manual.

As part of implementing the 2017 Flow Management Standard, Reclamation proposes redd dewatering protective adjustments to limit potential redd dewatering due to reductions in the minimum release during the January through May period. Redd dewatering protective adjustments should limit the amount of dewatering due to a reduction of the minimum release, not the actual river release, and, as such, would not always minimize dewatering impacts to the same extent. In January and February, there is a Chinook Salmon redd dewatering protective adjustment, and in February through May there is a Steelhead redd dewatering protective adjustment.

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

Spring releases will be controlled by flood control requirements or, in drier hydrology, Delta requirements and water supply. Reclamation proposes to operate Folsom Dam in a manner designed to maximize capture of the spring runoff to fill as close to full as possible. Reclamation proposes to follow the 2017 Flow Management Standard, which includes a pulse flow event at some time during the period extending from March 15 to April 15 by supplementing normal operational releases from Folsom Dam under certain conditions when no such flow event has occurred between the preceding February 1 and March 1 timeframe. In addition to the pulse flow under the 2017 Flow Management Standard, to the extent feasible, Reclamation proposes to accommodate additional requests for spring pulse flows by re-shaping previously planned releases; however, these requests will not be accommodated in times when they may compromise temperature operations later in the year. This spring pulse flow provides a juvenile salmonid emigration cue before relatively low flow conditions and associated unsuitable thermal conditions later in the spring, and downstream in the lower Sacramento River.

Reclamation proposes to continue to make summer releases for instream temperature control, Delta outflow, and exports, typically above the planning minimum flows. By late October, it is typical for Folsom Reservoir to have depleted the cold water pool. The primary way to provide additional instream cooling is to release water from the lower outlet works. This operation bypasses the power penstocks and has a significant impact on power generation. In order to optimize power generation, Reclamation proposes to limit power bypass operations solely to respond to emergency or unexpected events or during extreme drought years when a drought emergency has been declared by the Governor of California.

Reclamation will ramp down releases in the American River below Nimbus Dam as follows in Table 4-12 below.

Table 4-12. American River Ramping Rates

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

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

Appendix C –

C.7 DECISION MAKING

Nothing in this Charter modifies the rights and responsibilities of the Participants. Decisions shall be made consistent with the authorizing legislation and the regulations and policies under the federal and state Endangered Species Acts, as appropriate.

Reclamation and DWR shall retain sole discretion for:

- Water Operations of the CVP and SWP, including Allocations, under Reclamation Law and the State Water Project, as appropriate
- Agency Appropriations (budget requests, fund alignment, contracting, etc.)
- Section 7 Action Agency and Applicant (consultation)

- Coordination and cooperation with PWAs as required by Contracts and Agreements

CDFW, FWS, and NMFS shall retain sole discretion for:

- Consultation under Section 7 of the federal ESA and California Fish and Game Code, as appropriate and the associated Incidental Take Statements/Permits
- Agency Appropriations

NMFS ITS:

13.3.3.2 Take Anticipated from Flow Management

Flow fluctuations in the lower American River may result in steelhead redd dewatering and isolation. Redd dewatering can affect salmonid eggs and alevins by impairing development and causing direct mortality due to desiccation, insufficient oxygen levels, waste metabolite toxicity, and thermal stress. Flow fluctuations are also reasonably expected to result in the stranding of juvenile CCV steelhead in isolated pools where desiccation, insufficient oxygen levels, thermal stress, or predation would lead to mortality.

The flow regime of a water body is defined by its flow magnitude, timing, duration, frequency, and rate of change. Literature reviews have shown that useable habitat and fish abundance, diversity, and demographic rates can decline in response to both elevated and reduced flow magnitude. Because of the causal relationship of flow magnitude, timing, duration, frequency, and rate of change to survival within and between life stages, flow may be used as a surrogate for the amount or extent of take for listed salmonids.

The ecological surrogate to define the amount or extent of take for CCV steelhead egg-to-fry is the extent of egg habitat that is dewatered and exposed to the stressors from lower flows from January through May.

The ecological surrogate to define the amount or extent of take of CCV steelhead juvenile life stages is the ramping rate that results in isolation. Take will be exceeded if flow decreases occur at a rate greater than the ramping rates described in the proposed action, with the exception of flood control or emergency conditions.

The ecological surrogate to define the amount or extent of take of CCV steelhead egg-to-fry life stage from redd scouring is flow magnitude and rate created by releases from Nimbus Dam during egg incubation (i.e., January through May). Take will be exceeded if flows are higher than 50,000 cfs in the American River during January to May with the exception of flood control or emergency conditions.

RPM 3: Reclamation shall minimize the impact of the amount or extent of incidental take of listed species during operations of the American Division.

1. Seasonal operational decisions that affect water temperature and river flows shall be coordinated through the American River Group.

III. DELIVERABLES

Deliverables resulting from this effort follow the coordination described in Appendix C of the Proposed Action and include regularly scheduled and ad hoc ARG meeting notes and handouts that include a summaries of the system-wide fisheries, hydrologic, operational, regulatory requirement compliance, flood control, and temperature-related data that may affect implementation of the FMS as analyzed in the Proposed Action, planning minimum and spring pulse flow. Additional items will be included as needed related to any ad hoc ARG meeting. A sample ARG monthly and ad hoc meeting agenda (BOX 1) is attached that describes the expected meeting topics and contents for the meeting notes. Section IV A and B herein describe the processes to achieve the deliverables.

IV. PROCESS

A. American River Group

Reclamation will convene and facilitate ARG monthly meetings and ad hoc meetings, as needed, to include:

- meeting scheduling and coordination,
- agenda development and distribution,
- coordinate preparation of monthly meeting handout materials,
- take notes, and
- posting notes and reports (including annual reports) online

Reclamation established a working group to coordinate fishery and operational requirements for the lower American River (LAR), known as the ARG, in 1996. Reclamation is the lead coordinator of the ARG, bringing together those who have either a legislated or resource-specific interest in the operation of Folsom Dam and Reservoir, and the LAR. The formal members include Reclamation which has responsibility for water operations of the Central Valley Project, the Water Forum which has interests in Folsom Reservoir water operations, and agencies with public trust responsibilities for fisheries resources in the LAR which include USFWS, NMFS, and CDFW. Members of the public and other agencies may attend ARG meetings and comment on matters under consideration by the ARG. The ARG meetings include discussion of water operations, fisheries, and other environmental concerns and to share operational and biological information with the goal of improving the technical understanding of LAR temperature needs and operational constraints and considerations. Reclamation considers the provided information when making operational and management decisions regarding temperatures and flows necessary to sustain fish resources in the LAR. In addition, temperature is a factor that may impact FMS implementation, the planning minimum and spring pulse flow. Temperature Management is acknowledged here and will be developed in a separate guidance document.

The ARG will provide input on, among other items, Reclamation's monthly forecasting and outlooks, projected end-of-year Folsom storage compared to the planning minimum, ramping rates, monthly minimum release requirements (MRR), spring pulse flow, proposed monthly

operations and potential impacts. Release discussions are expected to consider both near-term and long-term perspectives, risks, and tradeoffs. MRR provides a minimum flow value, not a maximum, and real-time conditions will dictate operations. The general steps of this process are as follows:

1. Prior to the ARG meetings, Reclamation will send to ARG a meeting agenda along with other supporting meeting materials (including temperature management updates, potential spring pulse flow and exceedance outlooks).
2. At the ARG meetings, ARG will review available hydrological and biological information along with exceedance outlooks and the details associated with the calculations of the MRR (adjusted MRR, if applicable) and potential spring pulse flow for FMS implementation.¹
3. ARG feedback will be solicited, discussed, and considered by Reclamation.
4. ARG Meeting notes will be generated, and a draft distributed to the ARG for review and comment before final notes are posted online along with pertinent meeting materials.
5. Reclamation, at monthly meetings, will provide updates on previous monthly FMS implementation for monthly operations (and how it relates to the planning minimum, redd dewatering², temperature management, ramping rates, spring pulse flows, etc.). ARG meeting notes will be made available to the Water Operations Management Team (WOMT).

B. ARG Ad-hoc meetings.

The formal members of the ARG conduct ad hoc meetings to discuss regularly occurring Folsom Reservoir operations that do not conform to the time step of the monthly ARG meeting or require discussion beyond the time allotted for the monthly ARG meeting. The purpose of these meetings is the same as the monthly ARG meetings. This information is then used to make recommendations to avoid and minimize impacts to fisheries resources based on real-time operations, consistent with Reclamation's need to balance other project purposes. Annual Folsom Reservoir operations identified in the USBR PA Section 4.10.4.1 Seasonal Operations that may require additional meetings and associated meeting timeframes include but are not limited to the following:

1. Flood Control Operations, August – May: Dry weather releases to ensure that the maximum storage adheres to the flood control elevation identified in the applicable Water Control Manual. Although, 2017 FMS redd dewatering protective

¹ Reclamation proposes to use the combined Sacramento Index (in the month of January) and American River Index (all other months) approach specified in the 2017 FMS. The Planning Minimum for WY21-WY23 is 300 TAF.

² Reclamation intends to implement redd dewatering protective adjustments. These adjustments are modifications to the MRRs based on hydrology and potential dewatering impacts to Chinook salmon redds in January – February and steelhead redds in February – March. These protective adjustments are built into the 2017 FMS.

adjustments would theoretically limit the amount of dewatering due to a reduction of the minimum release, the impact of flow reduction from actual river releases for flood control elevation or other purposes would not result in reduction of dewatering impacts to the same extent. These changes in releases for flood control regularly occur between monthly ARG meetings and may require discussion to develop releases strategies, to the extent possible, to releases to minimize redd dewatering, fish stranding, and other flow related fisheries impacts while meeting other Folsom Reservoir purposes.

2. Downstream Regulatory Requirements, September – June: Folsom Reservoir operations require releases for Delta regulatory requirements and other downstream needs that are above the 2017 FMS as analyzed in the Proposed Action. These changes in releases regularly occur between monthly ARG meetings and may require discussion to develop releases strategies, to the extent possible, to minimize redd dewatering, fish stranding, and other flow related fisheries impacts while meeting other Folsom Reservoir purposes.
3. Spring Pulse Planning, February – May: Spring pulses under the 2017 FMS as analyzed in the Proposed Action may require discussion and planning outside of the time allotted for monthly ARG meetings. Spring pulse planning should prioritize real-time empirical fisheries data and account for real time Folsom Reservoir operations to meet system-wide regulatory requirements to optimize benefits of spring pulse flows while also considering modeled or other information. This planning should be initiated in February and continue through May in conjunction with other potential ARG ad-hoc discussions.
4. Temperature Management, April – November: Temperature management for juvenile steelhead rearing and fall-run Chinook salmon spawning, egg incubation and fry emergence affects Folsom Reservoir release operations. Further discussion of temperature management implementation is contained in the ARG Temperature Management Guidance Document.

C. Folsom Planning Minimum

Reclamation and the Water Forum worked to develop an initial planning minimum (end of December Folsom Storage) of 300 TAF for Water Years 2021-2023 that is considered by Reclamation for monthly forecasting purposes. The Water Forum will provide input on, among other items, Reclamation's monthly forecasting and outlooks, projected end of year Folsom storage compared to the planning minimum and potential local actions that either increase forecasted Folsom storage or reduce demand out of Folsom Reservoir, if needed. Reclamation/Water Forum coordination and communication is detailed in the March 2021 MOU for Coordination of Communication and Information-Sharing Activities Related to the Lower American River Operations.

D. Change Orders

Reclamation operators coordinate the daily operation of Folsom and Nimbus Dams. Changes to releases in LAR operations require at least 48 hours prior notice to any desired releases. However, under conditions of urgent need with appropriate coordination with ARG and the fisheries agencies, Reclamation may make release changes as quickly as real-time. Reclamation intends to continue to provide change order information via email to the ARG.

E. Water Operations Management Team

After the ARG provides input on Reclamation operations under the FMS, at monthly ARG meetings or otherwise, and Reclamation has captured previous months operations, Reclamation will provide this information to WOMT and make notes and other pertinent material available from the corresponding ARG monthly meetings.

F. Updates to Guidance Document

In addition, it is expected that as this guidance is being implemented there will be necessary revisions to the document to provide further clarification and refinement. Reclamation and DWR, with technical assistance from the USFWS, NMFS, and CDFW, commit to reviewing this implementation guidance following each water year, at a minimum, to identify and incorporate any necessary revisions.

BOX 1: AMERICAN RIVER GROUP AGENDA

Date

Roster

Agency, Office, Name, Alternate(s)

Topics

1. Introductions
2. Presentation (if applicable)
3. Housekeeping
4. Fisheries Update
 - a. CDFW
 - b. CFS
 - c. PSMFC
5. Operations Forecast
 - a. SMUD
 - b. PCWA
6. Central Valley Operations
 - a. Operations review and outlook (storage conditions and releases)
 - b. Temperature management
7. Discussion
8. Recommendation(s)
9. Decision(s)
10. Review Action Items
11. Next Meeting Scheduling

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ATTACHMENT 1

The 2017 Flow Management Standard Minimum Release Requirement

MARCH 2020 (as amended)

The 2017 Flow Management Standard Minimum Release Requirement

In response to the 2012-2016 drought, uncertainty about Reclamation operations with the implementation of the Water Fix, observations during operations for the 2007 Flow Management Standard (FMS), and NMFS's directive for improved American River water temperature management in its 2009 Biological Opinion, and 2011 amendments, for the CVP's operations, the Water Forum developed the 2017 FMS to provide improved American River water supply reliability and water temperature management for fisheries. Among the elements of the 2017 FMS was a revised approach for determining the Minimum Release Requirement (MRR) from Nimbus Dam. This document summarizes the determination of the MRR.

1 Hydrological Indices

The 2017 FMS uses two hydrological indices to determine the MRR. Those two indices are described below.

1.1 Sacramento River Index

The Sacramento River Index (SRI), published by DWR at the start of each month from December through May, is a forecast of total water year unimpaired flow volume from the Sacramento River above Bend Bridge, Feather River at Oroville, Yuba River near Smartsville, and the American River below Folsom. Forecasted 99%, 90%, 75%, 50%, 25%, and 10% exceedance probability volumes are computed for each forecast. The 2006 FMS used the 75% exceedance SRI to determine January and February minimum release requirements; the 75% exceedance SRI has been retained for use under the 2017 FMS for determining the January MRR. The SRI can be found at <http://cdec.water.ca.gov/reportapp/javareports?name=WSI>. Historical SRI values can be found in the MRR Calculator on the "Hist_SRI" worksheet.

1.2 American River Index

To determine the February through December MRRs, the Water Forum wanted to use a water supply index that was publicly available, published each year, updated monthly, and that would reflect the overall water availability of the American River watershed. After considering other available indices, the Water Forum developed the American River Index (ARI), based on the B120 unimpaired water year forecasts. Historical Bulletin 120s for the American River at Folsom can be found in the MRR Calculator on the "Hist_B120" worksheet. DWR also publishes the Bulletin 120 at <http://cdec.water.ca.gov/snow/bulletin120/index.html>.

The ARI is a measure of the unimpaired inflow to Folsom Reservoir minus the amount of "spill" water that could not be captured at Folsom Reservoir (unimpaired runoff minus spill flows). The ARI is based on the median B120 forecasted unimpaired American River flow at Folsom for the water year, published on February 1, March 1, April 1, and May 1. Flood releases for the water year prior to the B120 publication are subtracted from the water year forecast; winter and spring storage is typically restricted by the flood reservation space, and any water that is released for

flood management purposes is not available for use in meeting either water supply or flow requirements.

For purposes of determining spill volume, releases from the spillway and from the river gates between October 1 and the forecast data are added up. Note that only releases from the river gates for avoiding reservoir spills, not releases used for temperature control in the fall or other discretionary releases should be considered. The CDEC timeseries for Folsom Reservoir sensor 85 (Discharge, Control Regulating) and 71 (Discharge, Spillway) are used to characterize the flood releases, when storage is within 50,000 acre-feet of the top of conservation (determined by CDEC sensor 94 – Reservoir, Top of Conservation Storage). Historical CDEC data for Folsom Reservoir storage, spillway releases, river outlet releases, and the top of conservation can be found in the MRR Calculator on the “CDEC Data” worksheet.

The MRR Calculator includes the ARI calculation on the “ARI Calculation” worksheet.

2 Minimum Release Requirements

As indicated above, the two hydrologic indices are used to compute the MRR from Nimbus Dam. The inflection points and corresponding index values for the MRR curves were developed through iteration; while the target flows were identified based on biological effects. Each of the curves are described below.

With the release of the first Bulletin 120 in February and each subsequent update, a calculation of the MRRs through the end of December can be made. The final calculation of MRRs for the remainder of the year would be made in May. The MRR Calculator includes calculation of MRRs through the end of the year on the “MRR Forecast” worksheet, with the intent that they are used for operations planning purposes.

2.1 January

As described above, determination of the January MRR uses the 75% exceedance January 1 SRI forecast value. Figure 2-1 shows the January MRR curve.

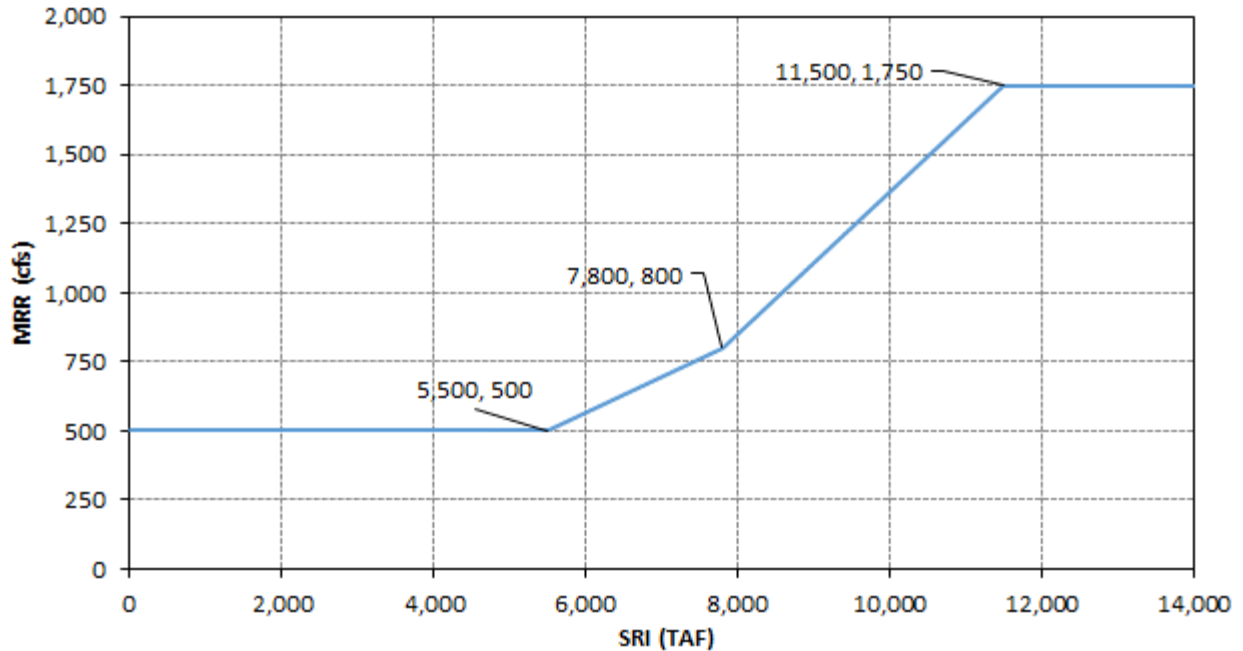


Figure 2-1. January Relationship Between SRI and MRR

Januaries with an SRI of less than 5.5 MAF would have an MRR of 500 cfs, and those with a SRI greater than 11.5 MAF would have an MRR of 1,750 cfs. SRIs between 5.5 MAF and 11.5 MAF would be linearly interpolated as shown in Figure 2-1.

The MRR for January can also be determined by the following formula based on the SRI:

- If $SRI \leq 5,500$ TAF, then $MRR = 500$
- If $5,500 \text{ TAF} < SRI \leq 7,800$ TAF, then $MRR = 0.1304 * SRI - 217$
- If $7,800 \text{ TAF} < SRI \leq 11,500$ TAF, then $MRR = 0.2568 * SRI - 1,203$
- If $SRI > 11,500$ TAF, then $MRR = 1,750$

2.2 February through March

Calculation of the MRR for February through March uses the same relationship between ARI and MRR for both months. The MRR for this period uses the February and March B120 forecast values to determine the ARI. Figure 2-2 shows the February through March MRR curve.

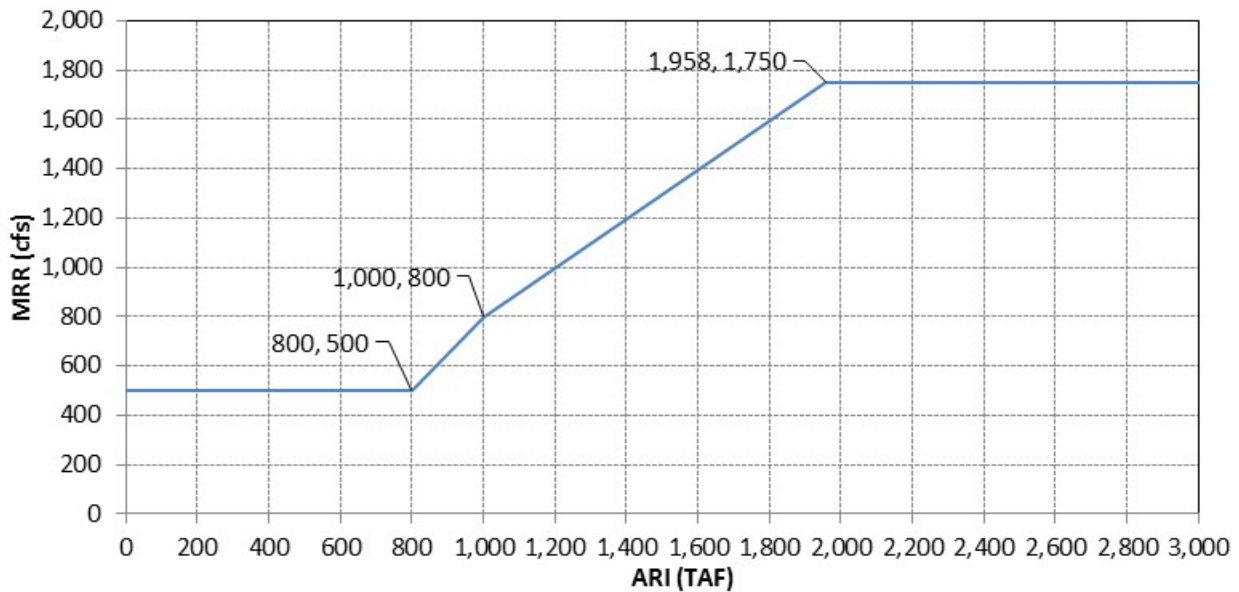


Figure 2-2. February through March Relationship Between ARI and MRR

Years with a February or March ARI less than 800 TAF would have an MRR of 500 cfs, and years with a February or March ARI greater than 1,958 TAF would have an MRR of 1,750 cfs. An ARI of 1,000 TAF would correspond to 800 cfs, and MRRs for years with an ARI between 800 and 1,000 TAF, or between 1,000 and 1,958 TAF, would be linearly interpolated between points, as shown in Figure 2-2.

The MRR for February 1 through March 31 can also be determined by the following formula based on the ARI:

- If $ARI \leq 800$ TAF, then $MRR = 500$
- If $800 \text{ TAF} < ARI \leq 1,000$ TAF, then $MRR = 1.500 * ARI - 700$
- If $1,000 \text{ TAF} < ARI \leq 1,958$ TAF, then $MRR = 0.9918 * ARI - 192$
- If $ARI > 1,958$ TAF, then $MRR = 1,750$

2.3 April through June

Calculation of the MRR for April through June uses the same relationship between ARI and MRR for all three months. The MRR for this period uses the April and May B120 forecast value to determine the ARI. Since the last B120 forecast is made in early May, the May B120-based ARI would also be used for June. Figure 2-3 shows the April through June MRR curve.

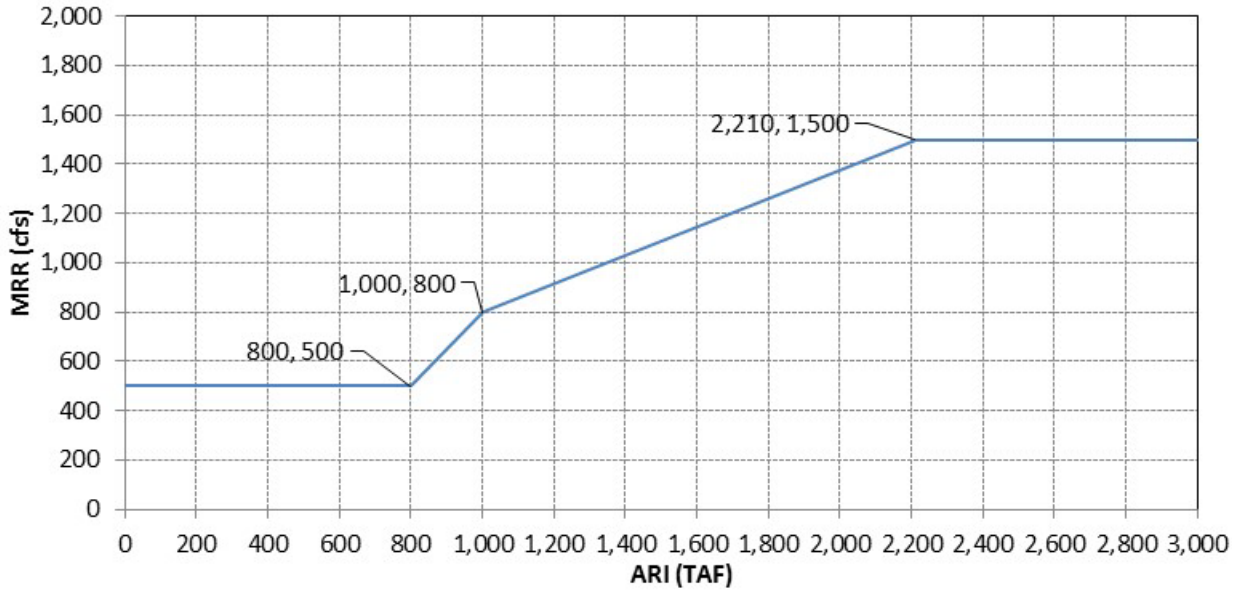


Figure 2-3. April through June Relationship Between ARI and MRR

Years with an April or May ARI less than 800 TAF would have an MRR of 500 cfs, and years with an April or May ARI greater than 2,210 TAF would have an MRR of 1,500 cfs. An ARI of 1,000 TAF would correspond to 800 cfs, and MRRs for years with an ARI between 800 and 1,000 TAF, or between 1,000 and 2,210 TAF, would be linearly interpolated between points, as shown in Figure 2-3.

The MRR for April 1 through June 30 can also be determined by the following formula based on the ARI:

- If $ARI \leq 800$ TAF, then $MRR = 500$
- If $800 \text{ TAF} < ARI \leq 1,000$ TAF, then $MRR = 1.500 * ARI - 700$
- If $1,000 \text{ TAF} < ARI \leq 2,210$ TAF, then $MRR = 0.579 * ARI + 221$
- If $ARI > 2,210$ TAF, then $MRR = 1,500$

2.4 July through September

Calculation of the MRR for July through September uses the same relationship between ARI and MRR for all three months. The MRR for this period uses the ARI computed in early May (or potentially an updated ARI if the B120 is updated after the May forecast). Figure 2-4 shows the July through September MRR curve.

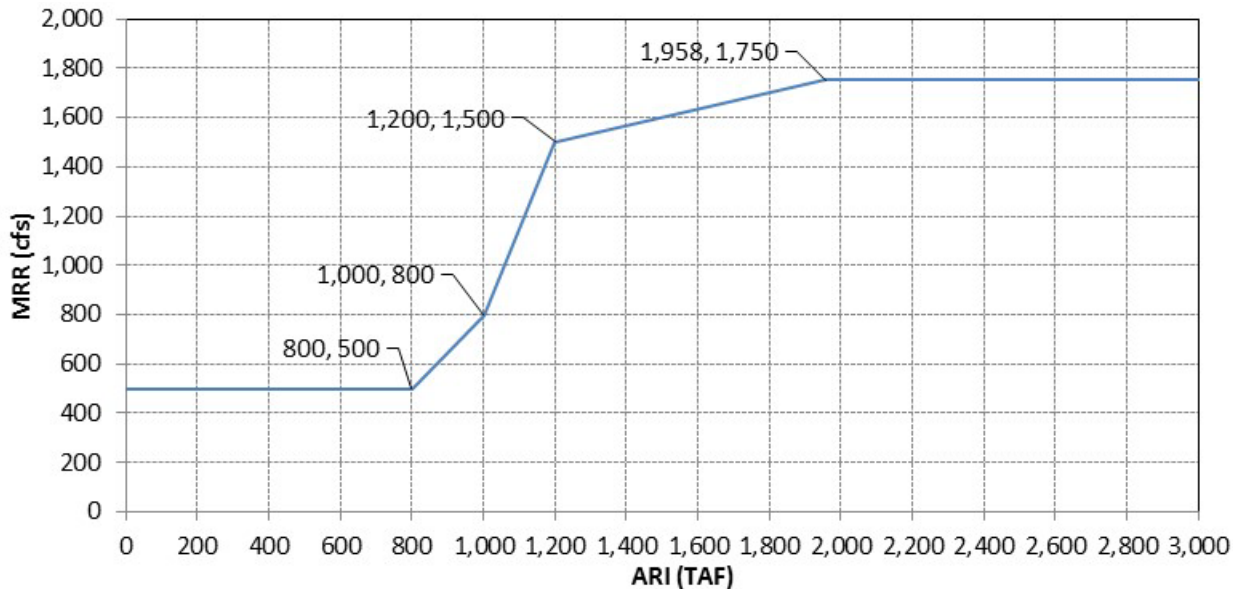


Figure 2-4. July through September Relationship Between ARI and MRR

The MRR for July 1 through September 30 can also be determined by the following formula based on the ARI:

- If $ARI \leq 800$ TAF, then $MRR = 500$
- If $800 \text{ TAF} < ARI \leq 1,000$ TAF, then $MRR = 1.500 * ARI - 700$
- If $1,000 \text{ TAF} < ARI \leq 1,200$ TAF, then $MRR = 3.5 * ARI - 2,700$
- If $1,200 \text{ TAF} < ARI \leq 1,958$ TAF, then $MRR = 0.330 * ARI + 1,104$
- If $ARI > 1,958$ TAF, then $MRR = 1,750$

2.5 October

The October MRR is also based on the May ARI value (or potentially an updated ARI if the B120 is updated after the May forecast). The October ARI-MRR relationship is almost identical to the November through December relationship (see below), except the MRR is capped at 1,500 cfs rather than 2,000 cfs. Figure 2-5 shows the October ARI-MRR relationship.

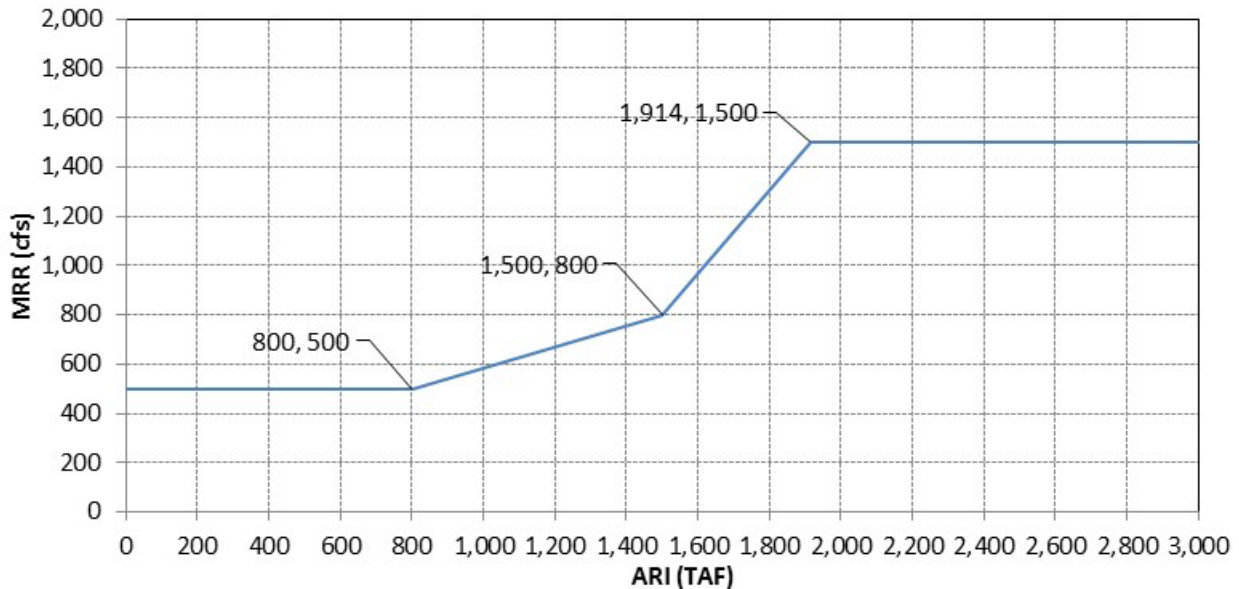


Figure 3.2-5. October Relationship Between ARI and MRR

The MRR for October 1 through October 30 can also be determined by the following formula based on the ARI:

- If $ARI \leq 800$ TAF, then $MRR = 500$
- If $800 \text{ TAF} < ARI \leq 1,500$ TAF, then $MRR = 0.429 * ARI + 157$
- If $1,500 \text{ TAF} < ARI \leq 1,914$ TAF, then $MRR = 1.690 * ARI - 1,735$
- If $ARI > 1,705$ TAF, then $MRR = 1,500$

2.6 November through December

Calculation of the MRR for November through December uses the same relationship between ARI and MRR for both months. The MRR for this period uses the ARI computed in early May (or potentially an updated ARI if the B120 is updated after the May forecast). Figure 2-6 shows the November through December MRR curve.

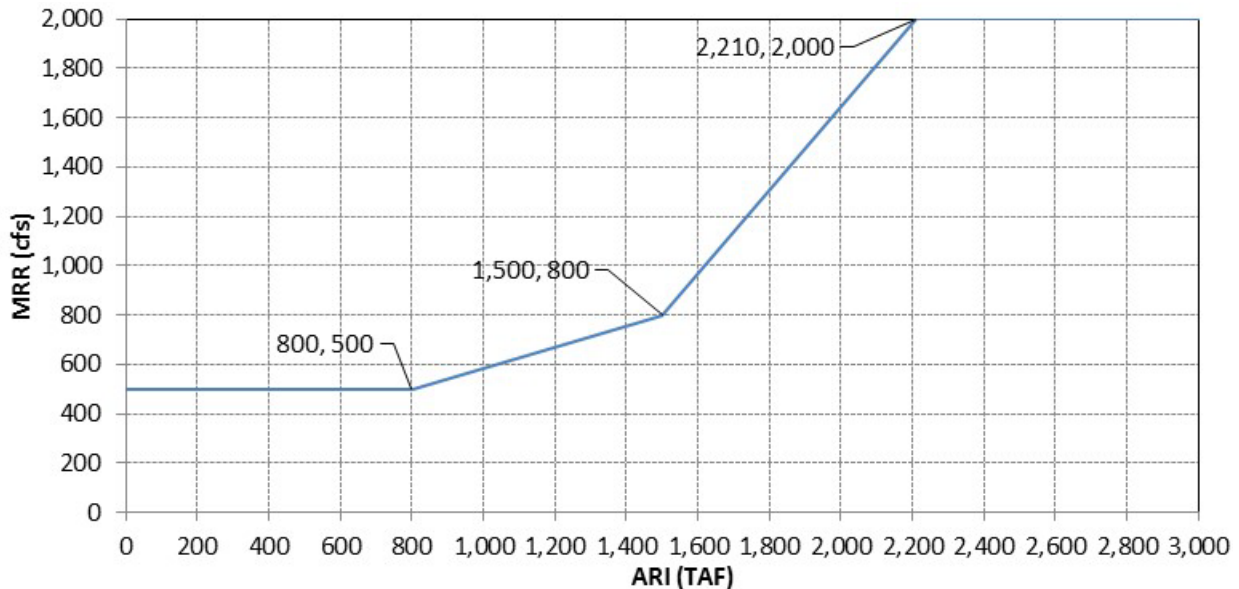


Figure 2-6. November through December Relationship Between ARI and MRR

The MRR for November 1 through December 31 can also be determined by the following formula based on the ARI:

- If $ARI \leq 800$ TAF, then $MRR = 500$
- If $800 \text{ TAF} < ARI \leq 1,500$ TAF, then $MRR = 0.429 * ARI + 157$
- If $1,500 \text{ TAF} < ARI \leq 2,210$ TAF, then $MRR = 1.690 * ARI - 1,735$
- If $ARI > 2,210$ TAF, then $MRR = 2,000$

3 Redd Dewatering Protective Adjustments

The 2017 FMS also includes Redd Dewatering Protective Adjustments (RDPA) to ensure reductions in MRR do not result in dewatering of fall-run Chinook salmon or steelhead redds. The RDPA would restrict changes in the MRR between December and June, but would not affect releases above the MRR.

3.1 Fall-Run Chinook Salmon

The fall-run Chinook salmon RDPA affect winter MRRs in two ways: there is a restriction on increases in MRR for January, and in decreases in MRR for January and February.

3.1.1 Restriction on Increasing the January MRR from the December MRR

In recognition of the uncertainty of the January SRI forecast, the 2017 FMS precludes increases in MRR from December to January. Fall-run Chinook redds are constructed in October through December, and the fall-run Chinook fry emerge through February. Rather than have a condition where a January-forecasted SRI resulted in an increase in MRR, only to see a decrease in MRR with the February B120 forecast, the 2017 FMS only allows for reductions in the January MRR

from the December MRR. The fall-run Chinook salmon RDPA limiting flow increases is included in the MRR calculator on the MRR Forecast worksheet as part of the January calculation.

3.1.2 Restrictions on Reductions in the January and February MRR from December MRR

The fall-run Chinook salmon RDPA would restrict MRR reductions from the December MRR for January and February. If the SRI-based MRR for January, or the ARI-based MRR for February was less than 70% of the December MRR, the January or February MRR could not be less than 70% of the December MRR. If the SRI- or ARI-based MRR was higher, then it would be used. The fall-run Chinook salmon RDPA limiting flow reductions is included in the MRR calculator on the MRR Forecast worksheet as part of the January and February calculations.

3.2 Steelhead

The steelhead RDPA restrict MRR reductions from February and March, through the end of June. Table 3-1 shows the steelhead RDPA-based MRR for February through May.

Table 3-1. Steelhead RDPA-based MRR for February through May

MRRJan or MRRFeb (cfs)	Steelhead RDPA-Based MRR for February-May (cfs)
≤700	500
800	520
900	580
1,000	640
1,100	710
1,200	780
1,300	840
1,400	950
1,500	1,030
1,600	1,100
1,700	1,180
1,800	1,250

The ARI- and fall-run Chinook RDPA-based MRR for February and March are compared to the steelhead RDPA-based MRR in Table 3-1, using the final, RDPA-based January or February MRR as a basis. Steelhead RDPA for January and February MRR values between those in the table would be linearly interpolated. The maximum MRR in January through May is 1,750 cfs, but 1,800 cfs is included in the table as a maximum value. If the ARI-based MRR is less than the steelhead-RDPA-based MRR, the RDPA-based MRR controls operations. Otherwise, the ARI-based MRR remains in effect. This procedure would be repeated in March, but after March, the RDPA-based MRR determined in March would remain the minimum MRR through the end of May.

The Steelhead RDPA calculation is included in the MRR Calculator on the “MRR Forecast” worksheet as part of the February, March, April, and May calculations.

4 Spring Pulse Flow

The 2017 FMS includes a spring pulse flow intended to provide an outmigration cue for juvenile salmonid emigration before relatively low water flow and associated challenging thermal conditions occur later in the spring, and downstream in the lower Sacramento River.

The spring pulse would occur in years that the MRR for March (determined by the March Bulletin 120) was between 1,000 cfs and 1,500 cfs, and Nimbus releases had not exceeded the maximum pulse flow rate for at least two consecutive days between February 1 and March 15.

A pulse flow would occur between March 15 and April 15. The peak flow of the pulse flow would be 3 times the current MRR, but no higher than 4,000 cfs, and would last for two days. Following two days at the peak flow, Nimbus releases would be decreased at no more than 500 cfs per day and no more than 100 cfs per hour. Changes in Nimbus releases would occur at night, if possible.

In years with a pulse flow, the daily MRR for April 1 through June 30 would be reduced evenly by the volume of the pulse flow and downramp. The MRR calculator includes a calculation of maximum pulse flow as part of the March calculation.

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Attachment B - American River Temperature Management Plan Guidance Document

GUIDANCE DOCUMENT

American River Temperature Management Plan

LTO Implementation

March 23, 2020

I. PURPOSE

This document provides implementation guidance on the American River Temperature Management Plan pursuant to 4.10.4.2 and 4.10.4.3 of the U.S. Bureau of Reclamation's (Reclamation) Proposed Action and NOAA's National Marine Fisheries Service's (NMFS) Biological Opinion and Incidental Take Statements (ITS). The scope of guidance includes the deliverables, schedule, and processes to develop and implement the Temperature Management Plan. The primary deliverables are American River Group (ARG) meeting notes and handouts that include a monthly summary of the hydrologic, operational, and temperature data related to Folsom cold water pool management; and draft/final Temperature Management Plans.

II. Temperature Management

This section provides the applicable verbatim language for American River Division Temperature Management

Proposed Action:

4.10.4.1 Seasonal Operations

[...]

Reclamation proposes to continue to make summer releases for instream temperature control, Delta outflow, and exports, typically above the planning minimum flows. By late October, it is typical for Folsom Reservoir to have depleted the cold water pool. The primary way to provide additional instream cooling is to release water from the lower outlet works. This operation bypasses the power penstocks and has a significant impact on power generation. In order to optimize power generation, Reclamation proposes to limit power bypass operations solely to respond to emergency or unexpected events or during extreme drought years when a drought emergency has been declared by the Governor of California.

4.10.4.2 Temperature Management

Reclamation proposes to prepare a draft Temperature Management Plan by May 15 for the summer through fall temperature management season using the best available (as determined by Reclamation) decision support tools. The information provided by the Operations Forecast will be used in the development of the Temperature Plan. The draft plan will contain: (1) forecasts of hydrology and storage; and (2) a modeling run or runs, using these forecasts, demonstrating what temperature compliance schedule can be attained. Reclamation will use an iterative approach, varying shutter configurations, with the objective to attain the best possible temperature schedule for the compliance point at Watt Avenue Bridge. The draft plan will be shared with the

American River Group before finalization and may be updated monthly based on system conditions.

Reclamation proposes to manage the Folsom/Nimbus Dam complex and the water temperature control shutters at Folsom Dam to maintain a daily average water temperature of 65°F (or other temperature as determined by the temperature modeling) or lower at Watt Avenue Bridge from May 15 through October 31, to provide suitable conditions for juvenile Steelhead rearing in the lower American River. If the temperature is exceeded for 3 consecutive days, Reclamation will notify NMFS and outline steps being taken to bring the water temperature back into compliance. During the May 15 to October 31 period, if the Temperature Plan defined temperature requirement cannot be met because of limited cold water availability in Folsom Reservoir, then the target daily average water temperature at Watt Avenue may be increased incrementally (i.e., no more than 1°F every 12 hours) to as high as 68°F. The priority for use of the lowest water temperature control shutters at Folsom Dam shall be to achieve the water temperature requirement for listed species (i.e., Steelhead), and thereafter may also be used to provide cold water for Fall-Run Chinook salmon spawning.

4.10.4.3 Conservation Measures

Reclamation and DWR are proposing conservation measures to avoid and minimize or compensate for CVP and SWP project effects, including take, on the species under review in this biological assessment as well as contribute to the recovery and enhancement of species and their habitats. These conservation measures include non-flow actions that benefit listed species without impacting water supply or other beneficial uses. Actions could be implemented in part or fully through agreements and cost share with the State of California and potentially under the Voluntary Agreement alternative under the State Water Resources Control Board update to the Bay-Delta Water Quality Control Plan. [...]

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

NMFS ITS:

13.3.3 American River Division

Reclamation's proposed action in the American River Division will create stressors of water temperature and flow that is reasonably expected to result in take of CCV steelhead.

Surrogates are used for this Division because, as described in the Opinion, it is not practical to accurately quantify and monitor the amount of individuals that are expected to be taken due to the co-occurrence of non-listed steelhead from the Nimbus Hatchery Program in the American River. Surrogates may also be used due to the variability in the population size at any given time of exposure to the stressors of water temperatures outside of the optimal temperature range of the species, lack of quantification for what optimal water flow are for the species in the American River, the annual variations in the timing of various parts of the species' life cycle, and variation in how individual fish use habitat within the American River. Because of the causal relationship of flow magnitude, timing, duration, frequency, and rate of change to survival within and

between life stages, flow can be used as a surrogate for the amount or extent of take for salmonids.

13.3.3.1 Take Anticipated from Water Temperature Effects

Suboptimal water temperatures in the American River are expected to result in reduced survival during egg-to-fry life stage and reduced growth for the juvenile rearing and smolt emigration life stages for CCV steelhead as described in the Opinion.

The ecological surrogate to define the amount or extent of take in the American River is both the magnitude and frequency of suboptimal water temperature in the reach from Nimbus Dam to Watt Avenue.

The CCV steelhead egg-to-fry life stage occurs December through May, and temperatures above 54°F create suboptimal conditions for this life stage. A small proportion of CCV steelhead eggs will still be in redds during May and potentially exposed to water temperatures that will reasonably be expected to result in egg mortality. The extent of take is all redds exposed to temperatures above 54°F in the vicinity of Watt Avenue December 1 through May 31. Take of CCV steelhead during the egg-to-fry life stage during these months is expected to be minimal because of the small proportion of eggs or alevins still incubating in the month of May.

CCV steelhead juveniles can survive and grow at water temperatures of 45 to 66°F. Reduced survival is anticipated at temperatures at or above 68°F. The ecological surrogate to define the amount or extent of take of CCV steelhead juvenile life stage is daily average temperature at Watt Avenue May 15 to October 31. The anticipated level of take will be exceeded if temperatures at Watt Avenue exceed 68°F from May 15 to October 31 for more than seven consecutive days unless it is a critical year based on the Sacramento Valley index or a year following one or more critical years³¹. In critical years, and years immediately after a critical year, anticipated level of take is exceeded if temperature exceeds 68°F at Hazel Avenue.

RPM 3: Reclamation shall minimize the impact of the amount or extent of incidental take of listed species during operations of the American Division.

1. Seasonal operational decisions that affect water temperature and river flows shall be coordinated through the American River Group.

III. DELIVERABLES

Deliverables resulting from this effort follow the coordination described in Appendix C of the Proposed Action and include ARG meeting notes and handouts that include a monthly summary of the hydrologic, operational, and temperature data related to Folsom cold water pool management; and draft/final Temperature Management Plans. A sample ARG monthly meeting agenda (BOX 1) is attached that describes the expected meeting topics and contents for the meeting notes. Section IV herein describes the processes to achieve the deliverables:

³¹ In a critical year, or year following critical year, Reclamation will meet with NMFS, FWS, CDFW, and the SWRCB to discuss and determine the best use of the limited cold water pool for that year.

IV. PROCESS

Reclamation will convene and facilitate ARG monthly meetings or more frequently, as needed, to include:

- meeting scheduling and coordination,
- agenda development and distribution,
- coordinate preparation of monthly meeting handout materials,
- take notes, and
- posting notes and reports (including annual reports) online

A. American River Group

Reclamation established a working group to coordinate fishery and operational requirements for the lower American River (LAR), known as the American River Group (ARG), in 1996. Reclamation is the lead coordinator of the ARG, bringing together those who have either a legislated or resources-specific interest in the operation of Folsom Dam and Reservoir, and the LAR. The formal members include agencies with responsibilities for fisheries resources in the LAR: Reclamation, the U.S. Fish and Wildlife Service (USFWS), NMFS, CDFW, and Sacramento Area Water Forum (Water Forum). Members of the public and other agencies may attend ARG meetings and comment on matters under consideration by the ARG. The ARG convenes monthly or more frequently, if needed, to discuss water operations, fisheries, and other environmental concerns and to share operational and biological information with the goal of improving the technical understanding of LAR temperature needs and operational constraints and considerations. Reclamation considers the provided information when making management decisions regarding temperatures and flows necessary to sustain fish resources in the LAR. In addition, the Flow Management Standard (FMS) and Spring pulse flow shaping are factors that may impact temperature management. FMS and Spring pulse flow shaping are acknowledged here and will be developed in separate guidance document.

The ARG will provide input on the draft Temperature Management Plan, which Reclamation will provide by May 15 of each year. Temperature Management Plans are to be developed with the best available decision making support tools, currently, currently ATSP and iCPMM models. The ARG will also provide input on monthly updates to the temperature management plan developed by Reclamation throughout the temperature management season. The general steps of this process are as follows:

1. Beginning with the May ARG meeting, Reclamation will provide the draft Temperature Management Plan (May) or updated Temperature Management Plans depending on conditions (June – October) along with other supporting monthly meeting materials.
2. At the ARG meeting, ARG will review available hydrologic and biological information along with the draft or updated Temperature Management Plans and provide feedback to Reclamation.

3. ARG Meeting notes will be generated, and a draft distributed to the ARG for review and comment before final notes are posted online along with pertinent meeting materials.
4. Reclamation will develop a Final Temperature Management Plan considering ARG feedback from the May ARG meeting or provided shortly after the meeting, distribute to the ARG and make available to the Water Operations Management Team (WOMT).

B. Change Orders

Reclamation operators coordinate the daily operation of Folsom and Nimbus Dams. Changes to releases in LAR operations require at least 48 hours prior notice to any desired releases. However, under conditions of urgent need with appropriate coordination with ARG and the fisheries agencies, Reclamation may make release changes as quickly as real time changes. Reclamation intends to continue to provide change order information via email to the ARG.

C. Folsom Temperature Shutter Operations

Reclamation operators work with CCAO Reclamation staff to order changes in Folsom Temperature Shutter Configuration to control the blending of water of different temperatures to ensure certain temperature requirements in the LAR. Changes to the temperature shutter configuration typically require 3-5 days of planning. Temperature shutter operations will be dictated by the Temperature Management Plan and subsequent updates that have been reviewed and commented on by the ARG. In severe or worse droughts, Reclamation will evaluate and consider implementing alternative shutter configurations at Folsom Dam to allow temperature flexibility.

D. Water Operations Management Team

After the ARG provides input on the draft Temperature Management Plan, Reclamation will prepare the Final Temperature Management Plan in May and provide to WOMT and make notes available from the corresponding ARG monthly meetings (April and May). The Temperature Management Plan will be updated monthly, based on system conditions, and in this event, Reclamation will request feedback from ARG and provide any monthly plan updates to the WOMT and make notes available from the corresponding ARG meetings.

E. Updates to Guidance Document

In addition, it is expected that as this guidance is being implemented there will be necessary revisions to the document to provide further clarification and refinement. Reclamation and DWR, with technical assistance from the USFWS, NMFS, and CDFW, commit to reviewing this implementation guidance following each water year, at a minimum, to identify and incorporate any necessary revisions.

BOX 1: AMERICAN RIVER GROUP AGENDA

Date

Roster

Agency, Office, Name, Alternate(s)

Topics

- 12. Introductions
- 13. Presentation (if applicable)
- 14. Fisheries Update
 - a. CDFW
 - b. CFS
 - c. PSMFC
- 15. Operations Forecast
 - a. SMUD
 - b. PCWA
 - c. Central Valley Operations
- 16. Central Valley Operations
 - a. Recap of Previous Month's Operations
 - b. Temperature Management
 - c. Exceedance Forecast
- 17. Discussion
- 18. Review Action Items
- 19. Next Meeting Scheduling

Materials

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Attachment C - Water Year 2022 Temperature Management Plan for the Lower American River



Water Year 2022 Temperature Management Plan for the Lower American River -

U.S. Bureau of Reclamation

June 1, 2022

The following Water Year (WY) 2022 Temperature Management Plan (TMP) for the Lower American River (LAR) has been developed according to the February 18, 2020 Record of Decision (ROD) on the Long-Term Operation of the Central Valley Project (CVP) and State Water Project (SWP). The ROD implements Alternative 1 (the Preferred Alternative) as described in the associated Environmental Impact Statement. Alternative 1 was the Proposed Action consulted upon and analyzed in the Biological Opinions issued in October 2019 by the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS).

In January 2022, the Sacramento Valley Index was classified as Below Normal. Conditions began to deteriorate further in February with a Dry classification and Critical in March and April. As a result, Reclamation implemented a flow minimum release of 1,197 cfs for March, 1,000 cfs for April, and 1,270 cfs for May 2022 using the 90 percent exceedance for determining the Minimum Release Requirement. A series of storms in April 2022 added to the inflows into Folsom and improving reservoir storage conditions. End of May projections for maximum storage at Folsom Reservoir is estimated at 856 Thousand Acre-Feet (TAF), up from around 745 TAF projected in mid April.

Reclamation has modeled conditions using iCPMM which also support the outcome of the CE-QUAL-W2 models that were discussed with ARG stakeholders. April 2022 modeling results indicated a feasible temperature target of 72°F at Watt Avenue Bridge and 69°F at Hazel Ave (as measured at the American River at Fair Oaks - AFO gage). On May 11, 2022 Reclamation suggested to delay the release of the Draft LAR Temperature Management Plan (TMP) until June 1, 2022. In the absence of a May 15, 2022 Draft TMP for review and implementation, Reclamation committed to operating at an upper temperature limit not to exceed 68° F at Hazel Ave. The extension was based on hydrologic changes that had been relatively unpredictable. Reclamation wanted to utilize the May 2022 forecast for modeling which would allow for a better operational response to temperature management through October 15. Updated modeling results in May 2022 showed improvement and resulted in a feasible temperature target of 66°F at Hazel Ave. Based on these various model runs, the LAR TMP goal is 66°F or below at Hazel Ave. from June 1, 2022 to October 31, 2022 and target 58°F from November 1, 2022 until December 31, 2022. The TMP temperature target not to exceed 66°F at Hazel Ave., as agreed upon by NMFS and Reclamation jointly, is consistent with discussions at the May 19, 2022 American River Group (ARG) monthly meeting and the May 25, 2022 ARG Ad-Hoc



meeting. The temperature target not to exceed 66°F at Hazel Ave. is what Reclamation expects to be the lowest achievable and sustainable temperature possible through October 31.

During the March 25, 2022 ARG Ad-Hoc meeting, Reclamation was requested by NMFS to discuss the potential for power bypass during upcoming ARG monthly meetings. Reclamation will continue to review the hydrology and Folsom cold-water pool on a bi-weekly timeframe and update this TMP accordingly. LAR TMP updates will be shared with ARG to seek feedback from the group.

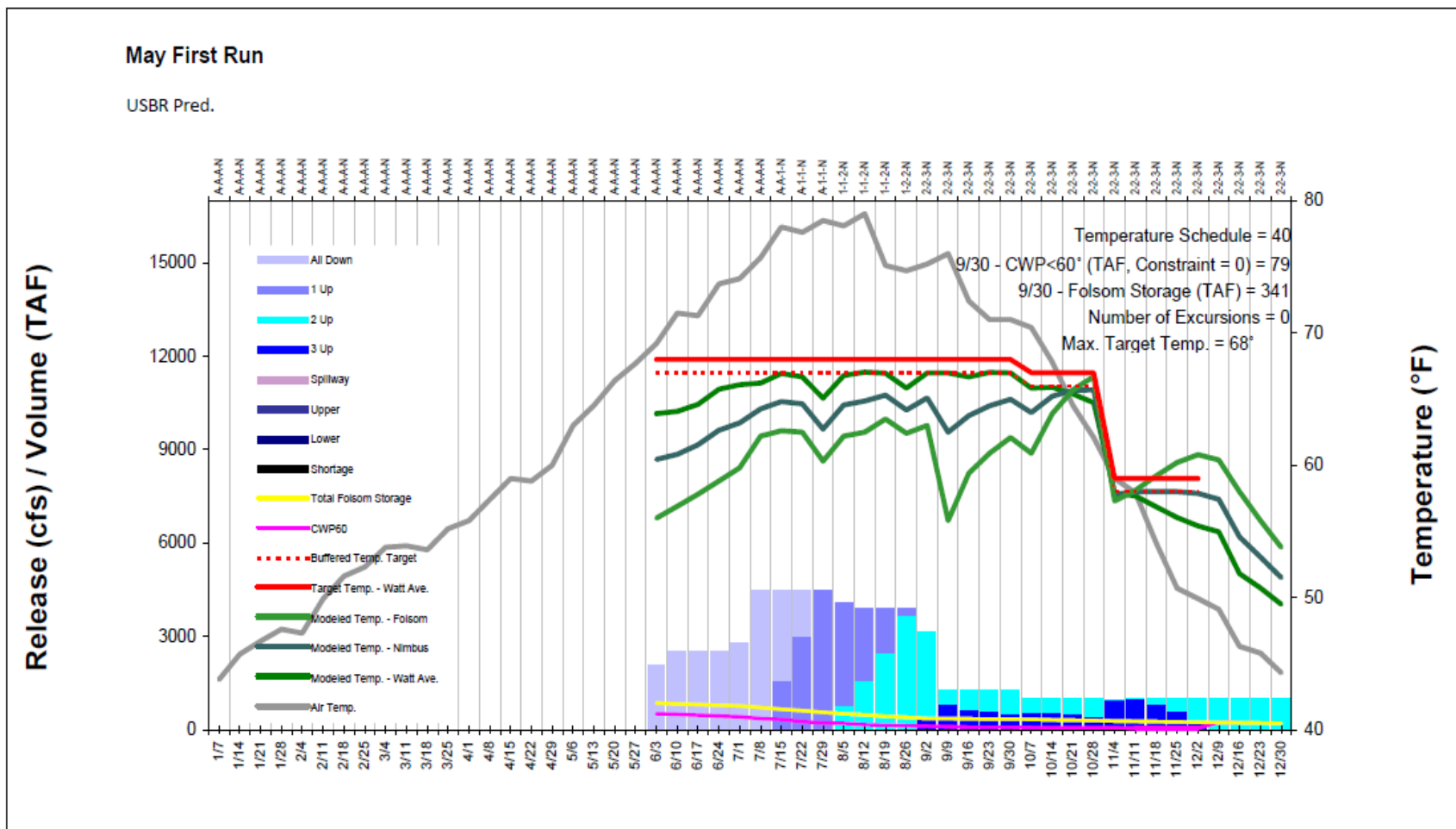
In dry and critical years, the temperature operations target tends to change frequently as reservoir storage and cold water pool volumes decrease. As a result, the TMP may be updated frequently as conditions change.

Reclamation is aware that the water temperature may not be suitable for fall-run Chinook salmon spawning and holding during summer. We continue to consider temperature impacts to salmonids throughout the temperature management season.

Reclamation coordinates with USFWS, NMFS, Department of Water Resources, California Department of Fish and Wildlife, State Board (Agencies) and other American River stakeholders monthly through the ARG. The coordination includes monthly assessments of conditions and potential actions and allows each agency to collaborate on water operations, discuss best available science, and identify actions for current and future discussion, which includes potential elevation of issues to the Directors of the Agencies for resolution.



May 2022 iCPMM Temperature Model Results



this schedule has 68 degrees until Oct 14. Beginning Oct 14 target 65 degrees at Watt



May 2022 CE-QUAL W2 Temperature Model Results

USBR 5/16/22 Inflows/Outflows

2014 Meteorological Data
Operated to Hazel Avenue
66°F July-Sept, 65°F Oct,
58°F Nov

