— BUREAU OF —
RECLAMATION

Water Year 2021 Temperature Management Plan for the Lower American River - Final

U.S. Bureau of Reclamation

June 30, 2021

The following Water Year (WY) 2021 Temperature Management Plan (TMP) for the Lower American River (LAR) has been developed according to the 2020 Record of Decision (ROD) on the Coordinated 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). A Draft TMP was developed by Reclamation and distributed to the American River Group (ARG) for feedback. Comments received on the Draft TMP are attached to this Final Plan.

After reviewing the current hydrological conditions, operations forecast, and Folsom temperature profile, Reclamation, with support from the Water Forum (cbec eco Engineering), ran numerous iCPMM models with varying inputs (inflow, air temperature, shutter deganging at Folsom, etc). The iCPMM temperature results were corroborated, with support from Placer County Water Agency (Cardno), with CE-QUAL-W2 modeling. Based on these various model runs, and given the current number of uncertainties with potential drought actions, inflow projections and operations forecasts, the LAR TMP Goal is to target 71°F at Hazel from June 6, 2021 to October 31, 2021 and target 58°F from November 1, 2021 until winter.

The summer target of 71°F at Hazel (as measured at the American River at Fair Oaks - AFO gage) is what Reclamation expects to be the lowest achievable and sustainable temperature possible this summer. Numerous temperature modeling runs were presented and discussed at the ARG. These discussions are captured in ARG meeting notes which can be accessed here: <https://www.usbr.gov/mp/bdo/american-river-group.html>

The TMP includes deganging of the temperature shutters at Folsom Dam, but does not currently included a potential fall Power Bypass, which Reclamation expects to evaluate later in the summer. 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.

Reclamation recognizes that given the hydrology and Folsom storage conditions for WY 2021, water temperatures are expected to exceed 68°F at Hazel Avenue for most of the summer, and

therefore would exceed the water temperature-threshold described in the 2019 NMFS Biological Opinion on Long-Term Operations of the CVP and SWP. These higher water temperatures are expected to adversely affect oversummering juvenile *O. mykiss* and fall-run Chinook in the Lower American River below Nimbus Dam. The 2019 NMFS Biological Opinion specifies that "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" (2019 NMFS, p 806). The TMP temperature target of 71°F at Hazel is consistent with discussions with the ARG including at the June 3, 2021 ARG ad hoc meeting, where NMFS supported this TMP target.

Reclamation coordinates with USFWS, NMFS, DWR, CDFW, 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, identify disagreements, and elevate issues to the Directors of the Agencies for resolution.

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ATTACHMENTS

NMFS Feedback on Draft Temperature Management Plan for the Lower American River

June 16, 2021

NMFS Feedback on Draft Temperature Management Plan for the Lower American River
June 16, 2021

NMFS appreciates the extensive work done (by Reclamation and by consultants to the Water Forum or Placer County Water Agency) to explore temperature management options for the Water Year (WY) 2021 summer/fall temperature management season. Model variations were run to accommodate changing operations outlooks, alternative temperature targets, and also scenarios with and without a power bypass, and with and without deganging the shutters of the Temperature Control Device (TCD) at Folsom Dam. Key modeling outputs reviewed by NMFS are summarized in Table 1.

Table 1. Overview of key "model packets" for summer 2021 temperature management planning. Each packet includes results from multiple scenarios.

Date	**5/7/21**	**5/25/21**	**6/3/21**	**6/4/21**
Results	Attachment A	Attachment B	Attachment C	Attachment D
Model (Modeler)	iCPMM[1] (Chris Hammersmark, CBEC, for Water Forum)	iCPMM[1] (Chris Hammersmark, CBEC, for Water Forum)	CE-QUAL-W2 (Vanessa Martinez, Cardno, for Placer County Water Agency)	iCPMM[1] (Chris Hammersmark, CBEC, for Water Forum)
Location of water temperature target	Watt	Hazel	Hazel	Hazel
Date of reservoir profile	5/5/21	5/18/21	6/1/21	6/1/21
Release assumptions	Unofficial 90% release projection as discussed with Reclamation on 5/3/21	Unofficial 90% release projection as discussed with Reclamation on 5/25/21	Updated projections provided by Reclamation on 6/1/21	Updated projections provided by Reclamation on 6/1/21
Inflow assumptions (flow)	90% Inflow Projections as provided by SMUD (4/26) and PCWA (5/6)	90% Inflow Projections as provided by SMUD (4/26) and PCWA (5/6)	Updated projections provided by SMUD/PCWA on 6/1/21	Updated projections provided by SMUD/PCWA on 6/1/21
Inflow assumptions (water temperatures)	2014 actual inflow water temperatures	Modeled inflow water temperatures based on 2014 air temperatures and projected 2021 inflows	Modeled inflow water temperatures based on 2014 air temperatures and projected 2021 inflows	Modeled inflow water temperatures based on 2014 air temperatures and projected 2021 inflows

Date	5/7/21	5/25/21	6/3/21	6/4/21
Results	Attachment A	Attachment B	Attachment C	Attachment D
Air temperature assumptions	2014 actual air temperatures	2014 actual air temperatures	2014 actual air temperatures	2014 actual air temperatures
Comments *(see attachments for full scenario details)*	Documents first instance of "custom" ATSP[2] schedules. Summer Watt targets of 74°F, 75°F, 76°F, and 77°F; with and without power bypass in the fall.	Summer Hazel targets of 69°F and 70°F; with and without power bypass in the fall.	Summer Hazel targets of 69°F to 71°F; with and without deganged middle shutters of Folsom TCD.	Summer Hazel target of 71°F; Fall Hazel target of 58°F; with deganged middle shutters of Folsom TCD; with and without power bypass in the fall.

[1] Iterative Coldwater Pool Management Model
[2] Automated Temperature Selection Procedure

Reclamation's Draft Water Year (WY) 2021 Temperature Management Plan (TMP) for the Lower American River (LAR) (LAR TMP) proposes:

> *Based on these various model runs, and given the current number of uncertainties with potential drought actions, inflow projections and operations forecasts, the LAR TMP Goal is to target 71°F at Hazel from June 6, 2021 to October 31, 2021 and target 58°F from November 1, 2021 until winter.*

NMFS acknowledges that given the hydrology and Folsom storage conditions for WY 2021, water temperatures are expected to exceed 68°F at Hazel Avenue for most of the summer, which exceeds the water-temperature-related incidental take limit for the American River in the 2019 NMFS Biological Opinion on Long-term Operations of the CVP and SWP (2019 NMFS BiOp). These higher water temperatures will further impact oversummering juvenile O. mykiss in the Lower American River below Nimbus Dam. The 2019 Proposed Action notes "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."

Given the constraints of the current water year, NMFS supports a temperature management approach that provides the coolest possible water temperature that can be sustained until at least mid-October, at which point seasonal meteorology and (if approved by Reclamation) a power bypass will support cooler water temperatures. Based on the temperature model results reviewed to date (see Attachments A-D), NMFS supports 71°F as the summer 2021target temperature at Hazel Avenue. Additionally, in order to add flexibility to temperature blending of releases at Folsom Dam, NMFS appreciates and supports Reclamation's commitment to degang the middle and bottom shutters of the TCD. NMFS agrees that Reclamation should (in coordination with the American River Group) "continue to review the hydrology and Folsom cold water pool on a bi-weekly timeframe and update this TMP accordingly".

At this time, given the many uncertainties in system-wide operations and meteorology, NMFS offers only very preliminary comments regarding temperature management in October and beyond.

- NMFS encourages further discussion with the American River Group about how to transition to fall temperature management.
- Water temperatures in the 60's and even low 70's in October is expected to cause significant pre-spawn mortality for fall-run Chinook salmon, a key prey item for endangered Southern Resident killer whale.
- Shifting the target by 13 degrees (from 71°F to 58°F) in one day is likely not operationally practicable.
- NMFS urges Reclamation to implement power bypass operations for 4-6 weeks in the fall, potentially to start as early as mid-October. Power bypass may be necessary sooner than mid-October to maintain the 71°F target if, for example, the reservoir layers accessible by the TCD warm faster than modeled.
- The 2019 Proposed Action notes that "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 declared by the Governor of California". Drought emergency (for counties in the American River basin) was declared by the Governor on May 10, 2021[1].

[1] *https://www.gov.ca.gov/wp-content/uploads/2021/05/5.10.2021-Drought-Proclamation.pdf*

DRAFT May iCPMM Temperature Modeling Summary – Preliminary Results for Discussion Purposes
5/7/21

Inputs
The standard inputs for iCPMM have been updated to reflect more recent conditions and are summarized below:

- Folsom Reservoir Temperature Profile collected on 5/5/21
- Unofficial 90% release projection as discussed with Reclamation on 5/3/21
- 90% Inflow Projections as provided by SMUD (4/26) and PCWA (5/6)
- Air Temperatures – 2014 actual air temperatures used, not the warmest recorded but warmer than the standard air temperature time series typically used in iCPMM
- Inflow Water Temperatures – 2014 actual inflow temperatures used. 2014 chosen due to a similar volume/magnitude of projected inflow. 2015 inflow temperatures are significantly warmer, but 2015 has a much lower volume/magnitude of inflow, so not as representative.
- Different inputs will change the model results, but these are reasonably representative for planning purposes.

Temperature Targets
Due to low storage, low volume of anticipated runoff, and low Folsom release rates, water temperatures are projected to be MUCH higher than typical. In fact, the expected temperatures are well above those represented by the standard Automated Temperature Selection Procedure (ATSP). The standard ATSP schedules max out at temperature schedule 78 which represents 72F throughout the summer and fall. As a reminder, the iCPMM model tries to achieve the prescribed temperature target for the reach extending from Nimbus Dam to Watt Ave. In addition, a 1F temperature buffer is included in the scenarios, for example if a temperature of 75F is requested, the model will try to provide a temperature of 74F. This has been the standard practice for the last decade to account for the differences between daily average and weekly average water temperature values.

Custom temperature schedules (TS) were developed for this preliminary analysis.

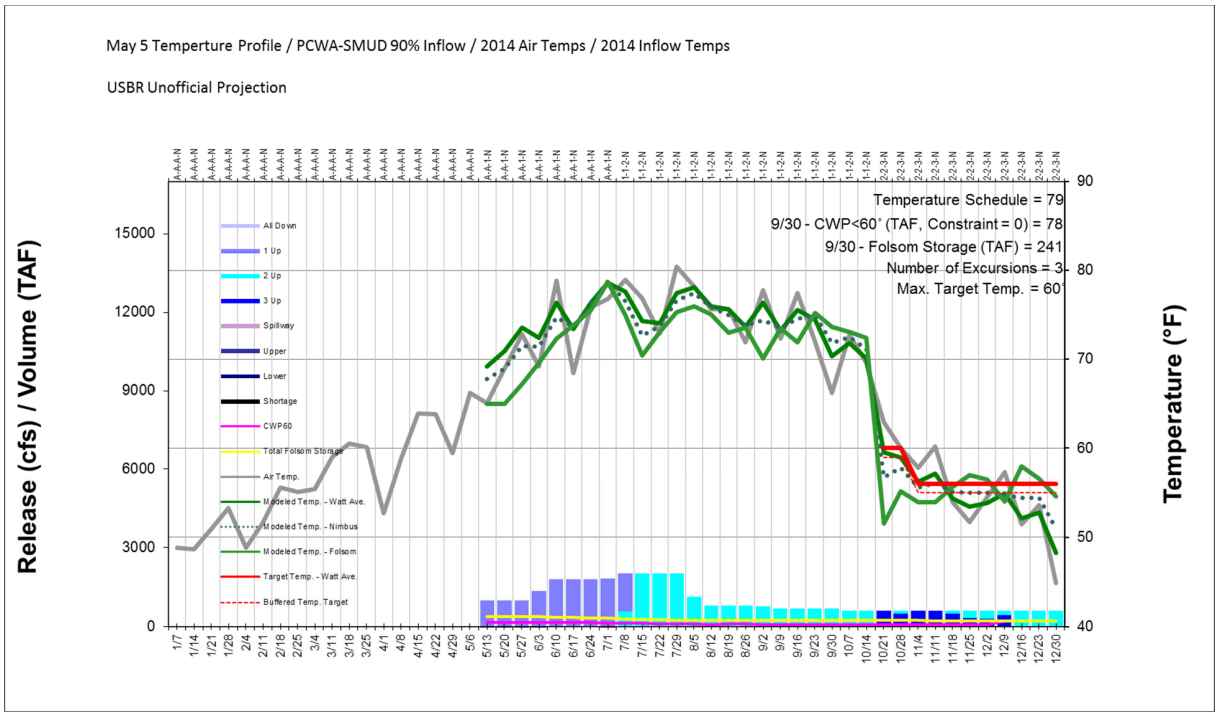
- TS 79 – no temperature target provided through the summer, 60F second half of October, 56F November and December. Prior to the fall, shutters are only pulled due to hydraulic constraints.
- TS 80 – 74F through the summer, 60F second half of October, 56F November and December
- TS 81 – 75F through the summer, 60F second half of October, 56F November and December
- TS 82 – 76F through the summer, 60F second half of October, 56F November and December
- TS 83 – 77F through the summer, 60F second half of October, 56F November and December

Power Bypass
For each of the runs aside from TS 79, a 500 cfs of power bypass (aka river gates or RG) was applied for 4 weeks (10/15-11/11). These results are provided after each of the individual non-power bypass results.

Results Summary
Summary plots for each of the runs are provided below. The Nimbus Dam (aka Hazel Ave.) water temperature representation has been changed to a dotted green line in order to make the plots more visually digestible. When power bypass (aka river gates) is applied it is shown in green to aid in graphical interpretation.

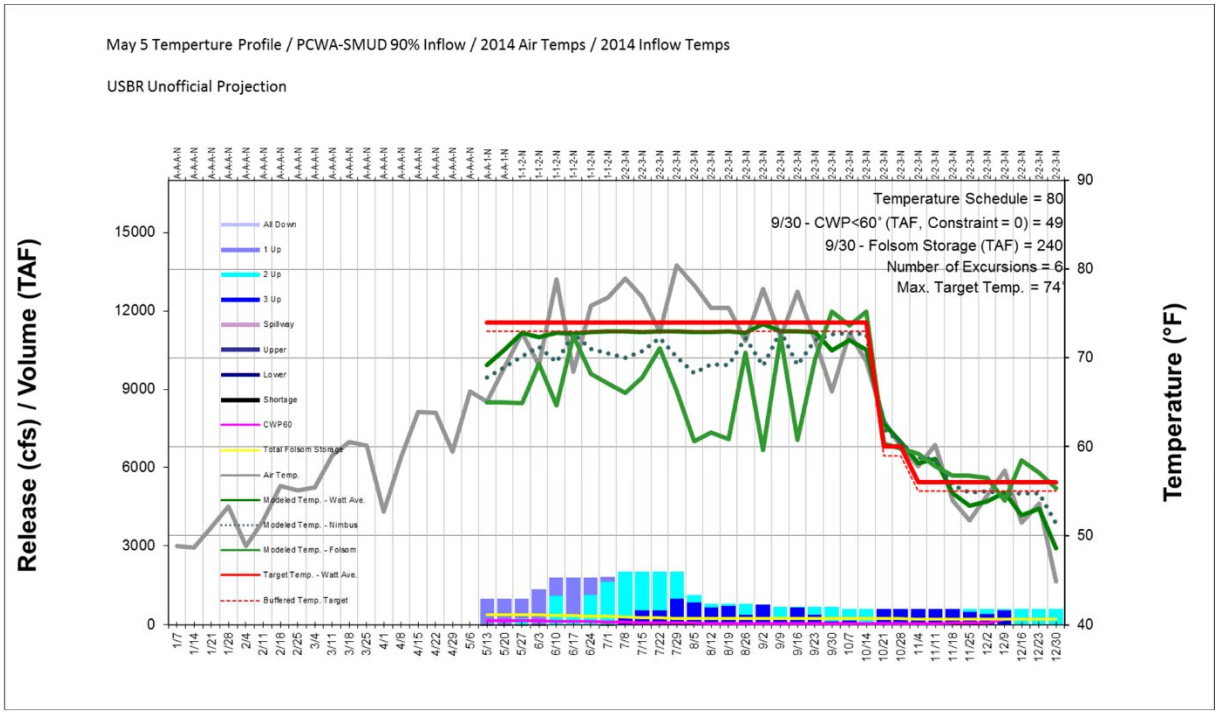
TS 79 – No summer temperature target / 60F 2nd half October / 56F Nov+Dec

- Summer temperatures range from 72-79F.
- Lowest shutters pulled 10/15.
- October target not met at Watt Ave.
- November water temperatures exceed 56F at Watt and Hazel for the first two weeks of November.



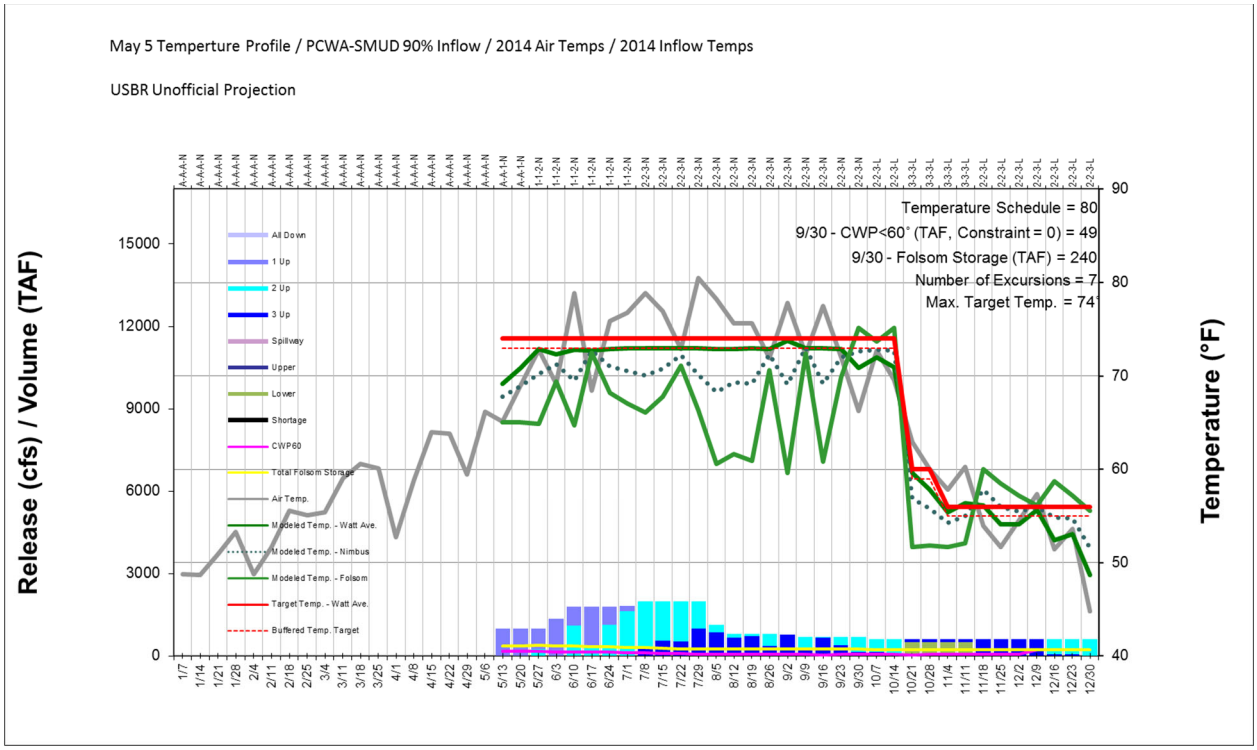
TS 80 – 74F summer / 60F 2nd half October / 56F Nov+Dec

- Able to *almost* meet 74F during summer at Watt Ave. with use of lowest shutter water (starting 7/2). Target is slightly exceeded during one week of summer (9/2).
- Not able to meet Fall temp targets. Hazel meets 56F second half of November.



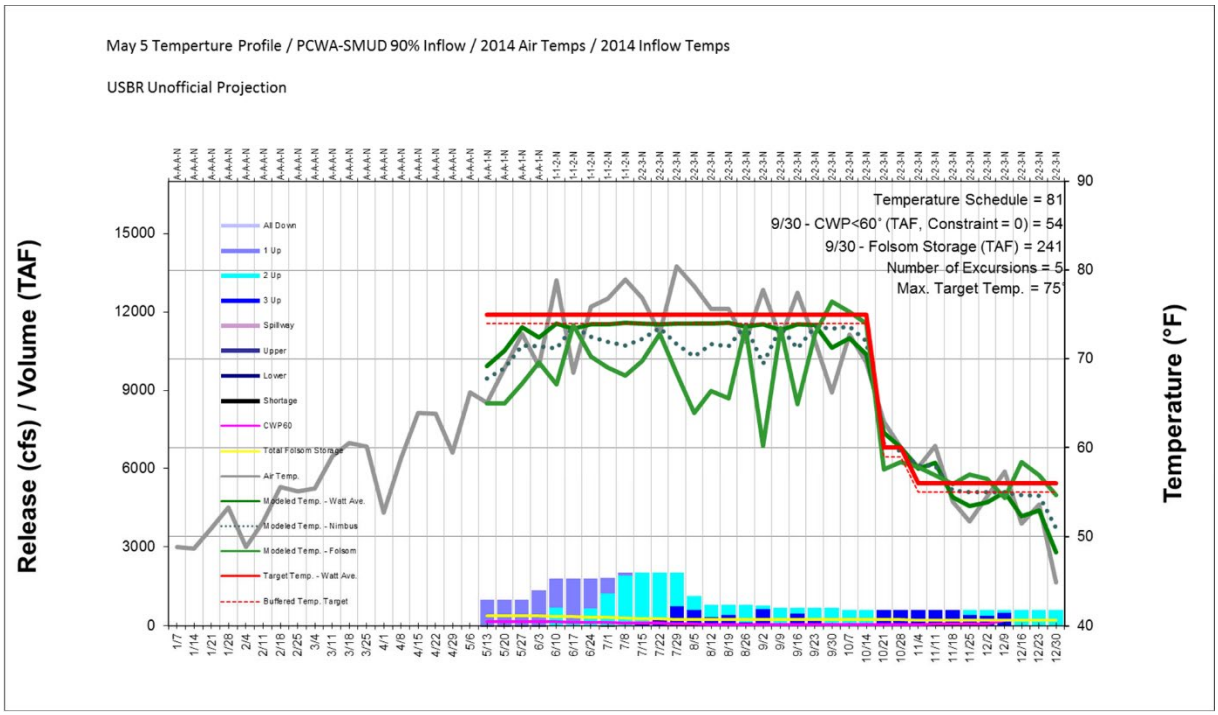
TS 80-PB – 74F summer / 60F 2nd half October / 56F Nov+Dec

- **Power bypass** is applied for 4 weeks (10/15-11/11).
- Able to almost meet 74F during summer at Watt Ave. with use of lowest shutter water (starting 7/2). Target is slightly exceeded during one week of summer.
- Not able to meet Fall temp targets at Watt and Hazel. Cooler October and early November results in warmer temps once bypass is terminated.



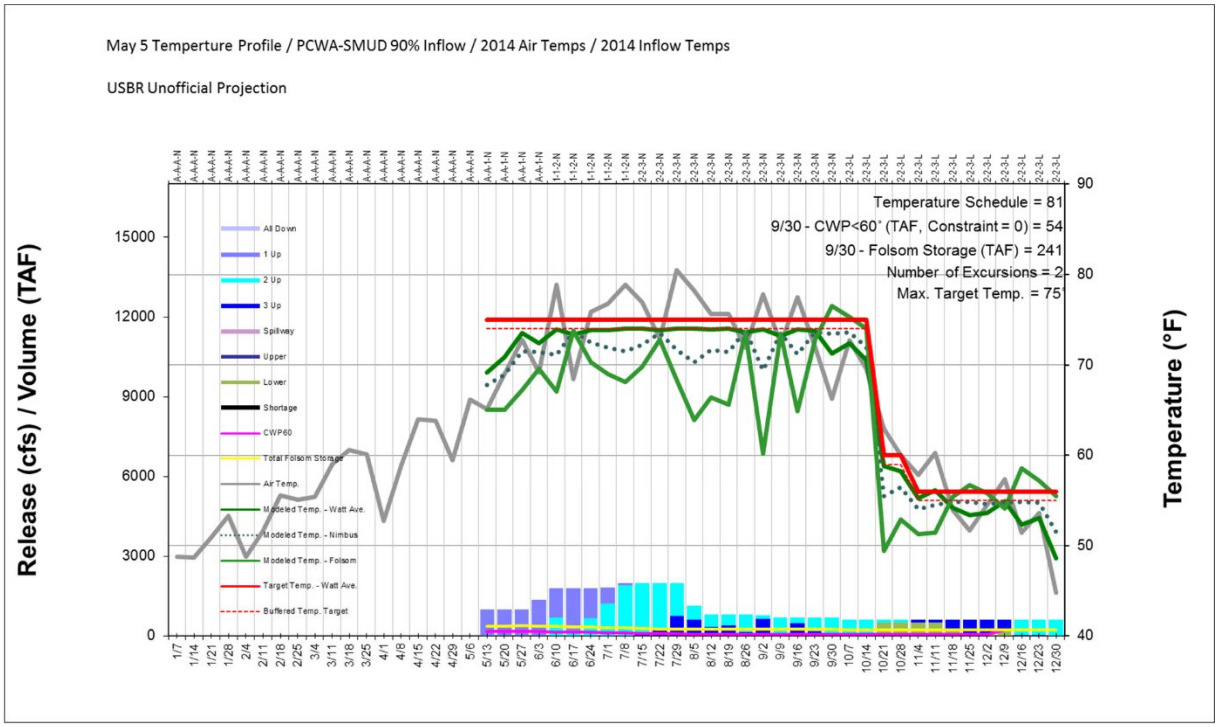
TS 81 – 75F summer / 60F 2nd half October / 56F Nov+Dec

- Able to meet 75F during summer at Watt Ave. with use of lowest shutter water (starting 7/16)
- Not able to meet Fall temp targets. Hazel meets 56F 11/12 and after.



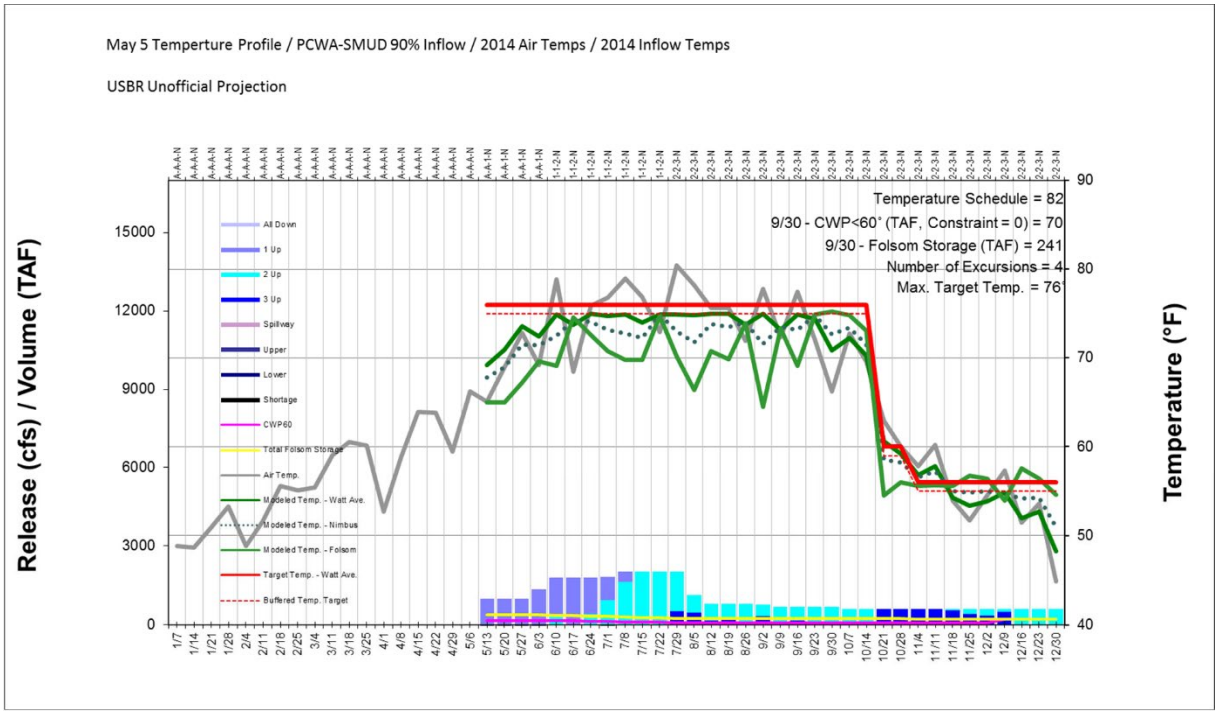
TS 81-PB – 75F summer / 60F 2nd half October / 56F Nov+Dec

- **Power bypass** is applied for 4 weeks (10/15-11/11).
- Able to meet 75F during summer at Watt Ave. with use of lowest shutter water (starting 7/16)
- Fall temp targets met at Hazel Ave., but not at Watt Ave.



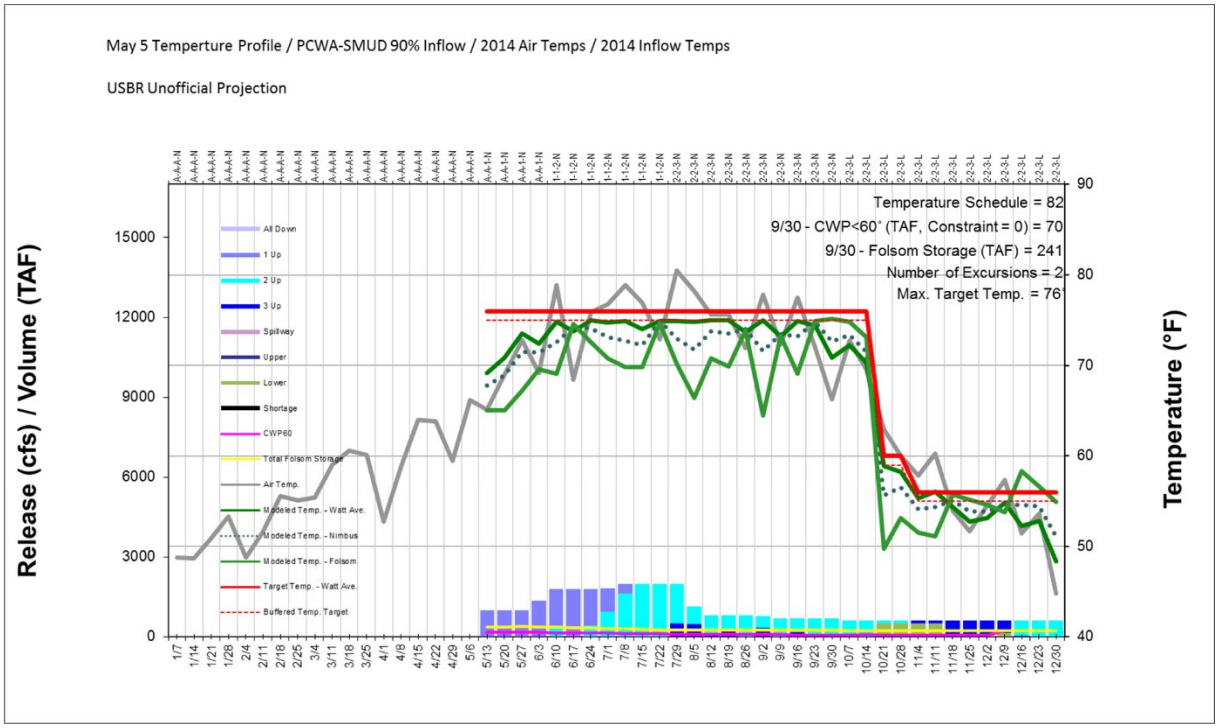
TS 82 – 76F summer / 60F 2nd half October / 56F Nov+Dec

- Able to meet 76F during summer at Watt with limited use of lowest shutter water (starting 7/23),
- Not able to meet Fall temp targets. Hazel meets 56F 11/12 and after.



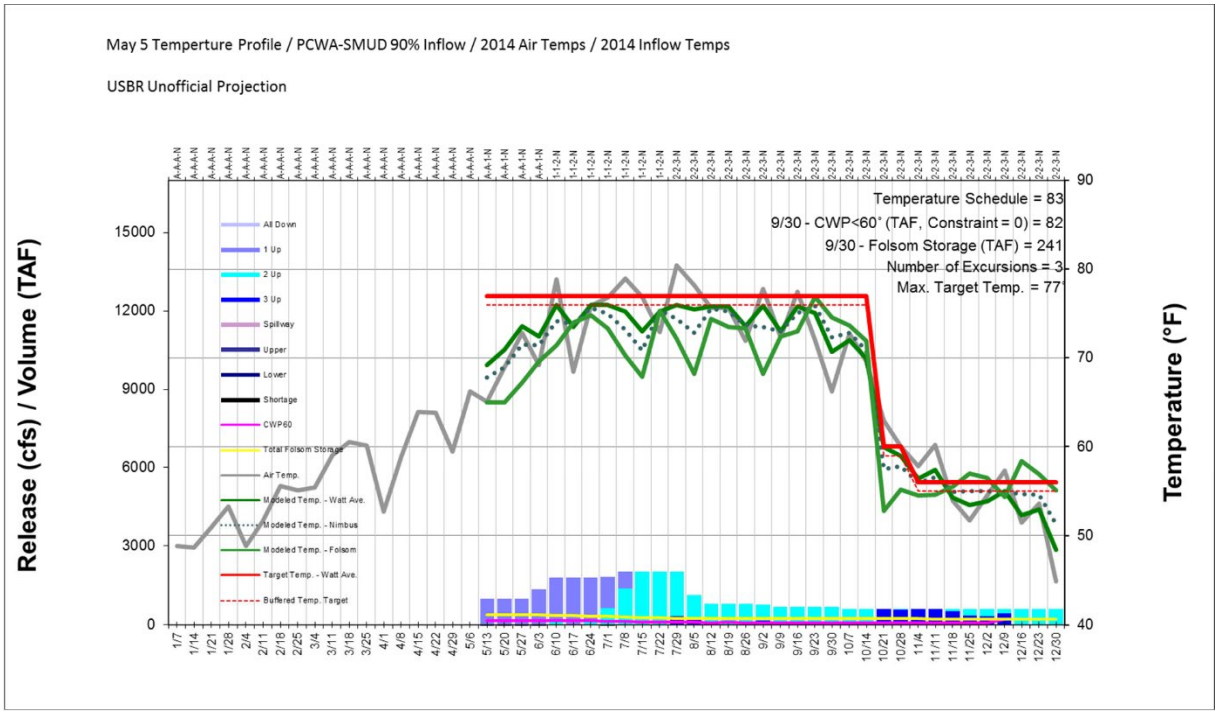
TS 82-PB – 76F summer / 60F 2nd half October / 56F Nov+Dec

- **Power bypass** is applied for 4 weeks (10/15-11/11).
- Able to meet 76F during summer at Watt with limited use of lowest shutter water (starting 7/23),
- Fall temp targets met at Hazel Ave., but not at Watt Ave.



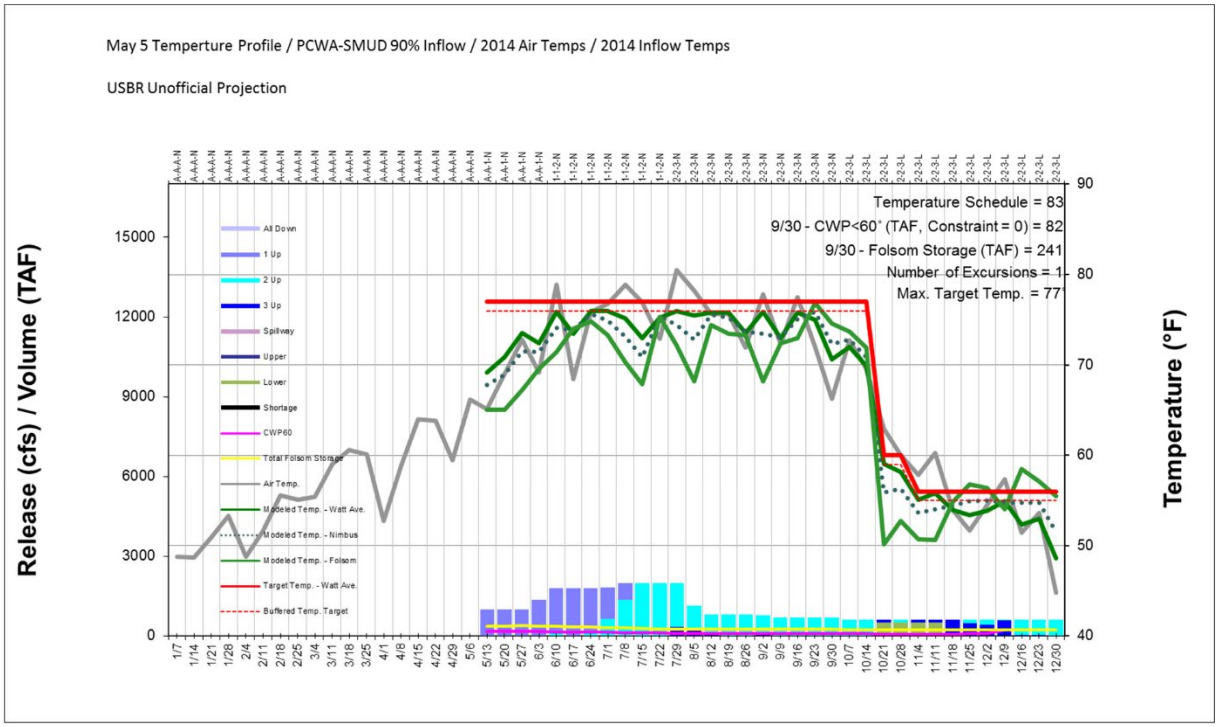
TS 83 – 77F summer / 60F 2nd half October / 56F Nov+Dec

- Able to meet 77F during summer at Watt with limited use of lowest shutter water (as early as 7/23)
- Not able to meet Fall temp targets



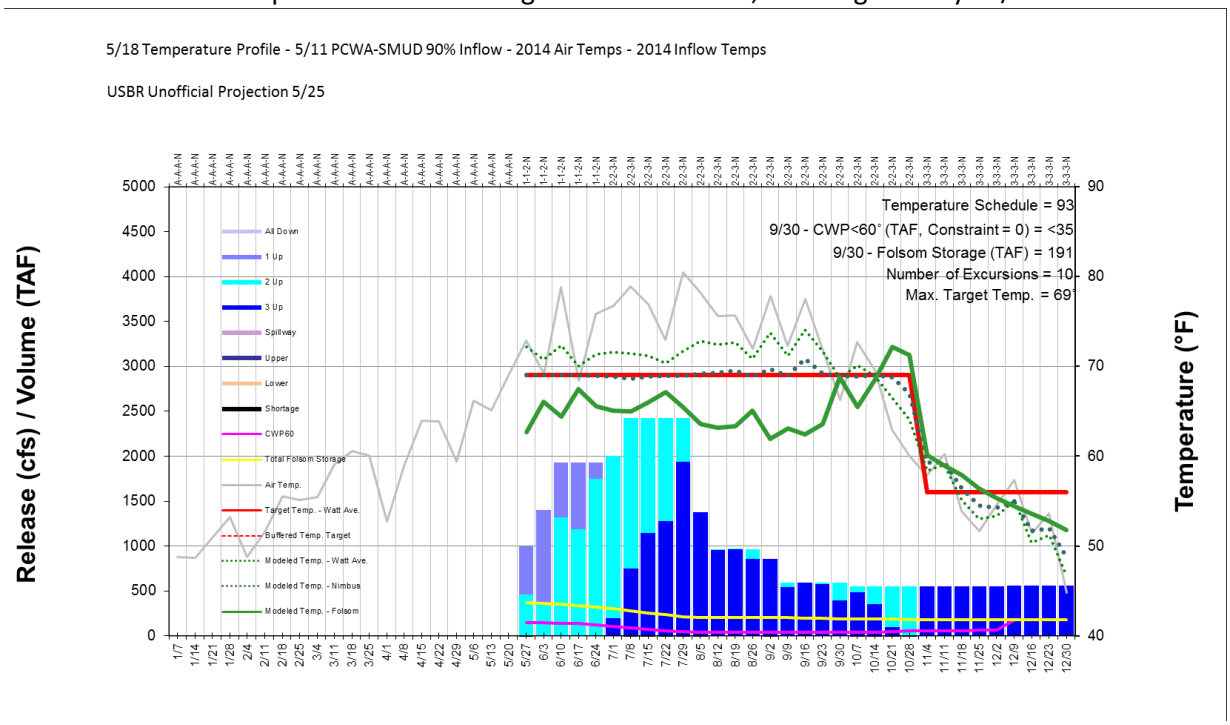
TS 83-PB – 77F summer / 60F 2nd half October / 56F Nov+Dec

- **Power bypass** is applied for 4 weeks (10/15-11/11).
- Able to meet 77F during summer at Watt with limited use of lowest shutter water (7/23-8/5)
- Fall temp targets met at Hazel Ave., but not at Watt Ave.



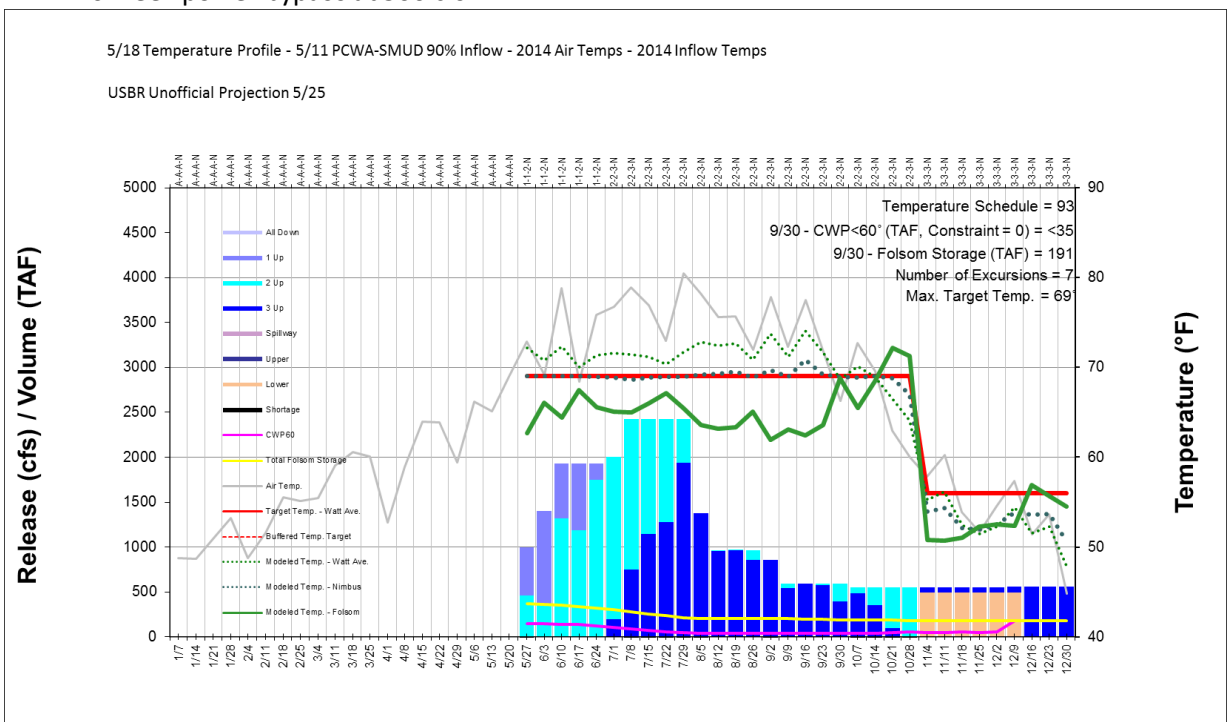
TS 93 – 69F Target through 10/28, then 56F

- Summer temperatures at Hazel met not throughout summer
- November temperatures exceed target for three weeks, reaching ~56F by 11/19



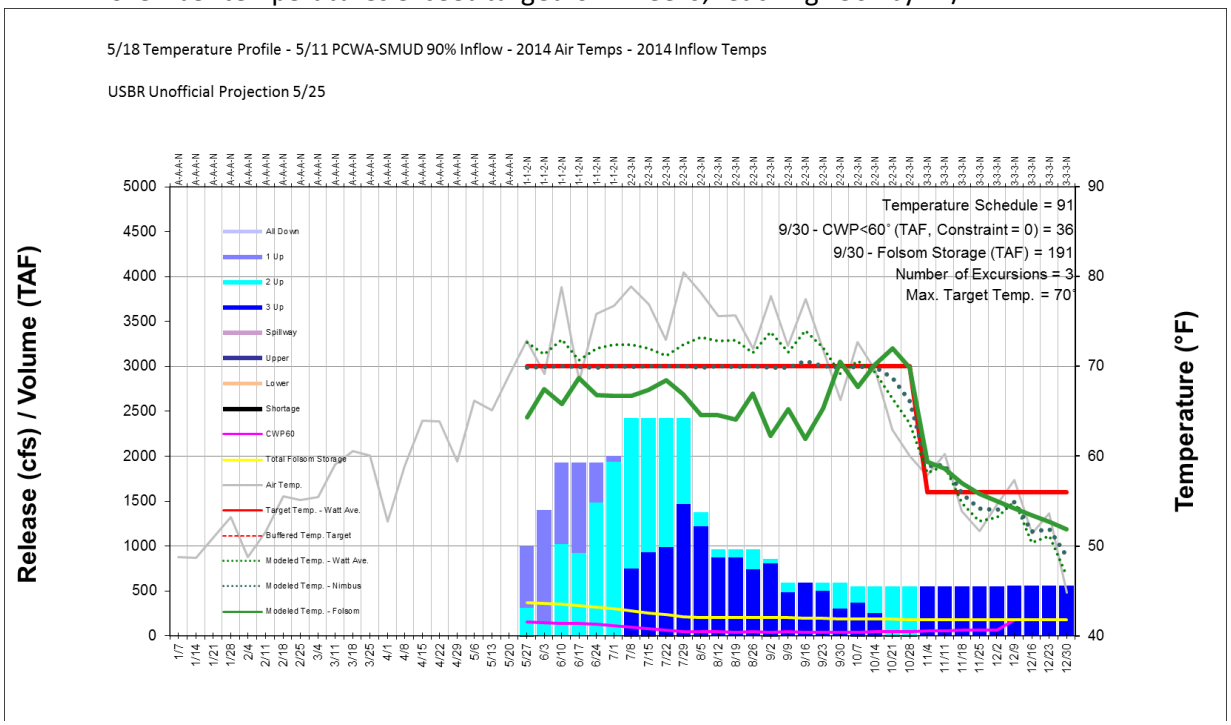
TS 93-PB6 – 69F Target through 10/28, then 56F

- 6 week power bypass at 500 cfs



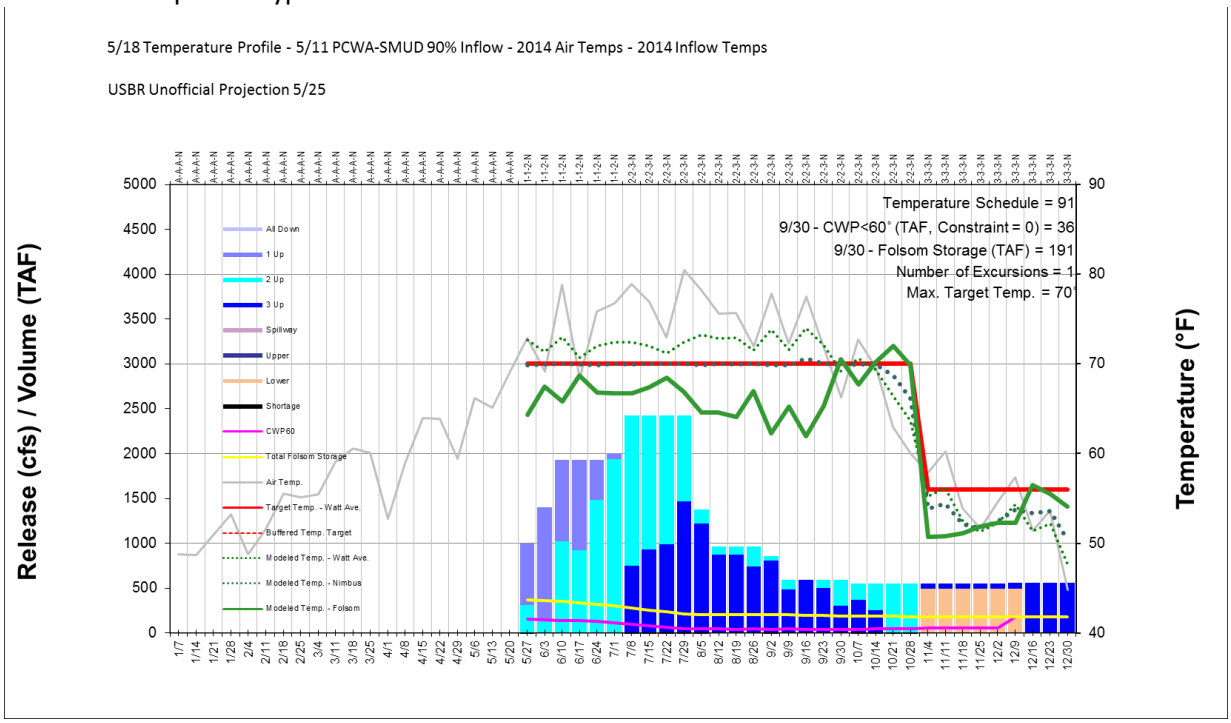
TS 91 – 70F Target through 10/28, then 56F

- Summer temperatures at Hazel met throughout summer, except for 1 minor excursion on 9/16
- November temperatures exceed target for 2 weeks, reaching ~56F by 11/12



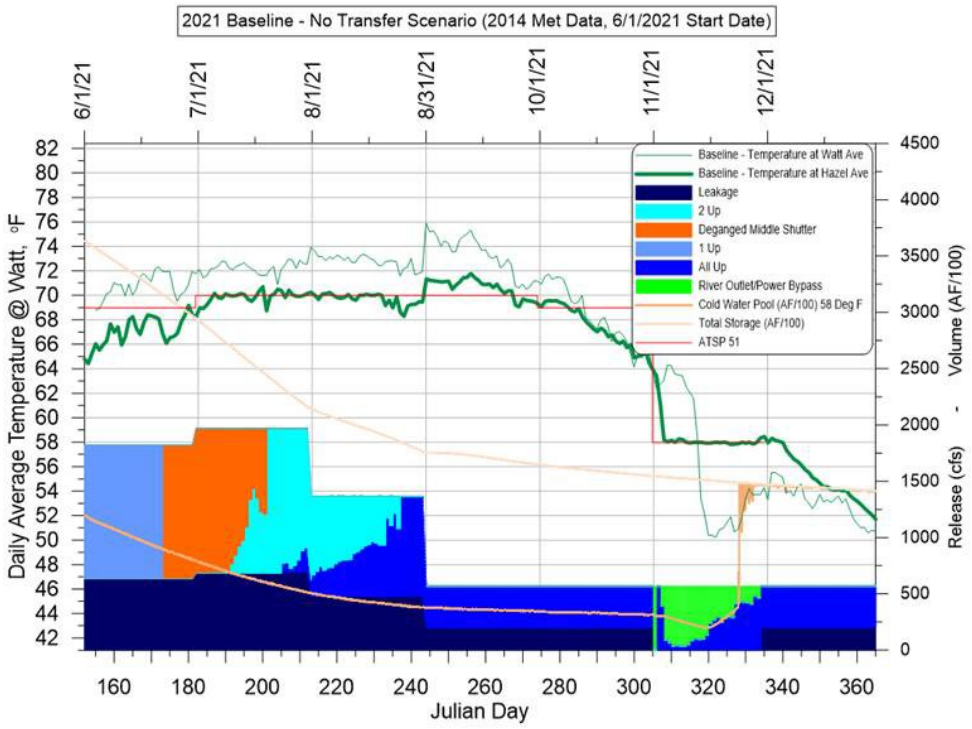
TS 91-PB6 – 70F Target through 10/28, then 56F

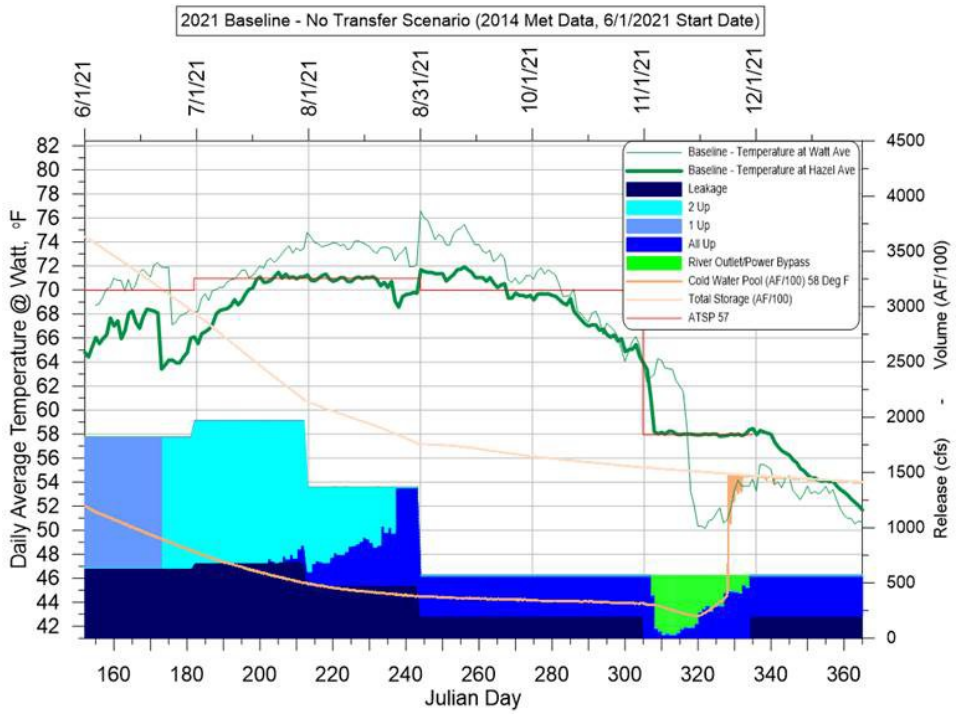
- 6 week power bypass at 500 cfs



6/3/2021 CE-QUAL-W2 Temperature Model Runs for LAR water temperatures
From Vanessa Martinez, Cardno

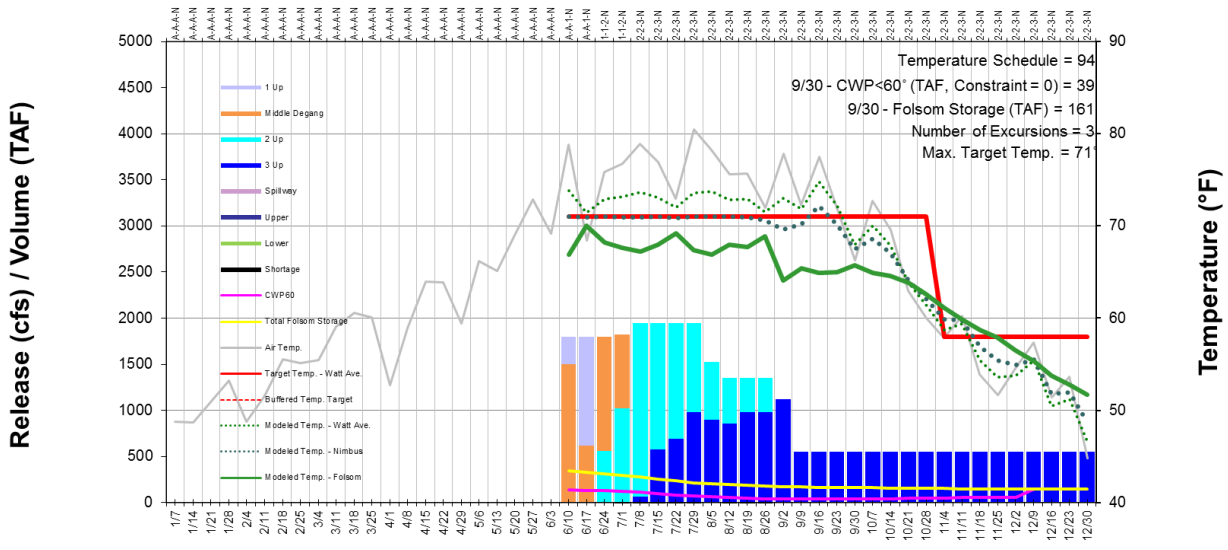
TOP=Model output assuming deganged middle shutter (likely operation)
BOTTOM= Model output assuming non-deganged middle shutter





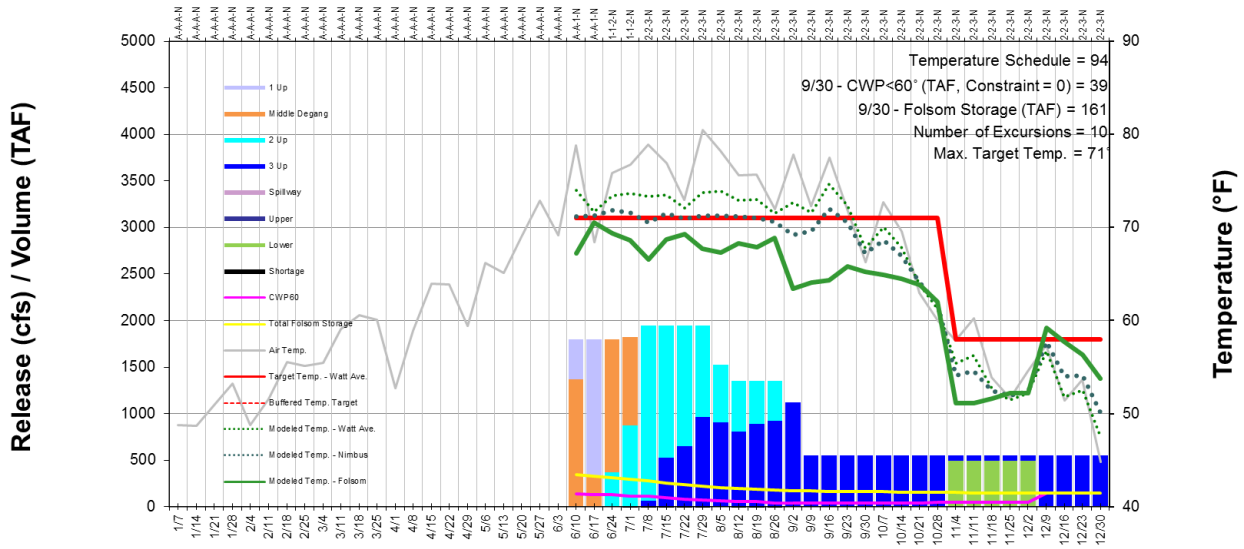
6/1 Temperature Profile - 6/1 PCWA-SMUD 90% Inflow - 2014 Air Temps - PCWA Regression Based Inflow Temps - Middle Shutter Deganged

USBR 6/1 Release Projection



6/1 Temperature Profile - 6/1 PCWA-SMUD 90% Inflow - 2014 Air Temps - PCWA Regression Based Inflow Temps - Middle Shutter Deganged - 5 week 500 cfs Power Bypass

USBR 6/1 Release Projection



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Water Forum Comments on Draft Temperature Management Plan

June 17, 2021

[EXTERNAL] Water Forum - Comments on Draft Temperature Management Plan

Jessica Law <JLaw@waterforum.org>

Thu 6/17/2021 9:05 AM

To: WASHBURN, THUY T <TWashburn@usbr.gov>
Cc: Johnson, Levi E <lejohnson@usbr.gov>; White, Kristin N <knwhite@usbr.gov>; Hammersmark, Chris <c.hammersmark@cbecoeng.com>; Rafael Silberblatt <rsilberblatt@keamswest.com>

2 attachments (1 MB)

Water Forum 2021 Temperature Planning Tech Memo 5-25-21.pdf; 2021 LAR Draft Temp Plan_06102021_CTH.pdf;

Hi Thuy –

Thank you for the opportunity to comment on the draft temperature management plan. Please see below and attached for our feedback.

We appreciate efforts by Reclamation to collaborate with Water Forum, NMFS, CDFW, SWRCB, and other interested parties to discuss and determine the best use of the limited cold-water pool in this Critical water year, consistent with Section 13.3.3.1 of the 2019 NMFS BiOp. As discussed at the ARG meetings, the best science currently available suggests Reclamation should pursue the following management actions to maintain best possible conditions for fish and maintain adequate water supplies:

- **Summer/Early Fall (June 1 – October 15):** Operate to a temperature target not to exceed 71 degrees at Hazel. Since maintaining a consistent temperature is important for fish health, Reclamation should aim for what is achievable based on changes in ambient temperatures and hold the lowest temperature that it is possible to maintain. Reclamation should degang (that is, separate) the middle shutters in June, which will allow for more control over temperature of releases. Reclamation should also evaluate the potential benefits that could be achieved by deganging the lower shutter as well. During this time, Reclamation should also strive to maintain sufficient storage in Folsom to preserve a cold-water pool adequate to support Fall releases as set forth below, and protect water supply for this year and next.
- **Fall (October 15 - November 1):** Operate to reduce temperatures to 60 degrees at Hazel in order to reduce pre-spawn mortality. This may have to be revisited based on conditions and available cold-water pool.
- **Fall/Winter (November 1 – December 31):** Implement a power bypass for 4-6 weeks in the Fall to maintain 56 degrees if possible, but not to exceed 58 degrees, for Fall-Run chinook spawning. Power Bypass will need to be initiated prior to November 1 to account for travel time through Lake Natoma.

As conditions continue to change, Reclamation must take deliberate action to carefully adjust flows to balance storage and maximize benefits for fish**. All releases should be considered for Folsom reservoir storage and lower American River temperatures as the top priority**. Each time the Reclamation issues a new operations outlook and flow pattern, it needs evaluated for temperature impacts. Reclamation provided an updated forecast yesterday afternoon, and given the update, we will review the temperature implications and look forward to discussing at the ARG meeting this afternoon.

Best, Jessica

Jessica Law
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