BUREAU OF RECLAMATION

American River Group

1:30 PM – 3:30 PM
Conference Line: +1 (321) 209-6143; Access Code: 780 506 355#
Webinar: Join Microsoft Teams Meeting

Friday, September 24, 2021

Ad Hoc Meeting Notes

1. Action Items
    a. Thuy Washburn - request kilowatt hour cost for all scenarios including No Bypass and share with the ARG.
2. Introductions
    a. USBR: Spencer Marshall, Brad Hubbard, Ian Smith, Liz Kiteck, Sarah Perrin, Thuy Washburn, John Hannon, Carolyn Bragg, Zarela Guerrero, Drew Loney
    b. NMFS: Barb Byrne
    c. USFWS: Craig Anderson, Paul Cadrett
    d. CDFW: Morgan Kilgour, Duane Linander, Mike Healey, Jason Julienne, Ken Kundargi, Gary Novak, Tracy Grimes, Joel Craven, Emily Fisher, Crystal Rigby
    e. SWRCB: Michael Macon
    f. DWR: Reza Ghasemizadeh
    g. PCWA: Ben Barker, Darin Reintjes
    h. SMUD: Ansel Lundberg
    i. EBMUD: I-Pei Hsiu
    j. WAPA: Mike Prowatzke, Ammon Danielson
    k. Water Forum: Chris Hammersmark
    l. PSMFC: Cory Starr, Logan Day
    m. HDR (for Water Forum): Amanda Ransom, Paul Bratovich
    n. Cardno: Craig Addley, Vanessa Martinez

o. BKS Law Firm: Jennifer Buckman

p. Sacramento Regional County Sanitation District: Lisa Thompson

q. Other: Rod Hall

r. Kearns & West: Rafi Silberblatt, Susan Ellsworth

3. Power Bypass Scenarios Temperature Results

   a. The Water Forum shared the results water temperature modeling completed by Cardno using a CE-QUAL-W2 model for Folsom, a CE-QUAL-W2 model for Lake Natoma, and regression based estimates for water temperatures below Nimbus dam (based on data from 2001-2019). The Lake Natoma CE-QUAL-W2 model was able to capture the travel time of the colder bypass water. The four scenarios modeled were:

      - No power bypass
      - Bypass Scenario A: 10/18 – start at 150 cfs then increase to 350 cfs on 10/25 and run through November.
      - Bypass Scenario B: 10/18 – start at 350 cfs and continue at 350 cfs through November.
      - Bypass Scenario C: 10/11 – start at 150 cfs and increase to 350 cfs on 10/18 and run through November.

      In summary, the following results were noted:

      - The more aggressive power bypass schedules deplete more of the cold water pool. Scenario C, the most aggressive bypass, results in the coolest temperatures through October and the first part of November.
      - All bypass scenarios show an increase in temperatures for late November and early December due largely to a spell of warmer ambient air temperature in the 2014 meteorology used in the modeling.
      - Average travel time for the bypass water is about 5 days, however, some cold water flows beneath the surface and reaches Nimbus Powerhouse in 2-3 days. This means temperature differences can start to be seen in less than a week, though the full effect is still about one week after bypass.
      - Without a bypass, temperatures aren't anticipated to remain below 60° until November 10 (compared to mid- to late October in the bypass scenarios).

4. Spawn Timing

   a. CDFW provided background on spawn timing choice for egg mortality runs to evaluate the bypass scenarios. Two spawning distributions periods were assessed: a single cohort distribution from 2015 and a "super-cohort" distribution based on three years, 2014-2016 (considered representative drought years). The following was noted:

      - Peak fall-run Chinook spawning tends to occur mid-November or later.
      - Spawning timing is affected by in-river temperature.
      - The single cohort distribution (2015) had limited capacity to assess October conditions because few redds were observed that year during October; the combined timing of the "super-cohort" distribution (2014-2016) had more capacity to do so since more redds were observed in October over all years.

- CDFW asked if the ARG felt that using a multi-year distribution was an appropriate method.
    - Members of the ARG agreed that the multi-year data set, encompassing 2014-2016, was best; using just 2015 would be less representative.

5. Survival results and pre-spawn mortality
    a. CDFW and NMFS provided background on egg survival as analyzed via the SacPAS tool, noting the following:
        - There difference in cohort-level survival (for all redds laid for the entire brood year) between the three bypass scenarios is small because most spawning occurs mid-November or later when temperatures are similar across all scenarios.
        - Through-season survival of early redds (e.g., October 13) is poor across all scenarios.
        - Notable benefits to early spawning can be seen in the mid-late October period, wherein Scenario C provides colder water sooner. This also has significant beneficial implications for the hatchery.
        - By October 18, the no power bypass scenario has notably lower survival than any of the bypass scenarios.
        - While early redds may not represent a large portion of the cohort overall, differences between power bypass scenarios are important to the year class because they improve early season survival (and support diversity in life-history timing) and also buffer against possible late-season losses, since late-spawned redds may be dewatered by flow reductions in the winter.
        - CDFW shared a graph charting cumulative percent of fresh spawned females noting that peak spawning has shifted later and the majority of females have spawned before temps are appropriate for incubation. Cooler temps in October supports early spawning females, thereby supporting life history diversity.
        - NMFS noted that the water temperature modeling outputs were modified before being used as inputs to the egg mortality model. For each scenario, water temperatures were set to a steady 56° once the modeled water temperatures dropped to 56° since implementation of the power bypass would not seek to achieve water temperatures below that level.

6. Hatchery concerns
    a. CDFW noted that temperatures affect actions at the hatchery. Steelhead were moved to the Mokelumne River Hatchery due to elevated water temperatures in the American River. They need to be returned as soon as possible, ideally before Nov. 1, when fall-run Chinook eggs are collected. CDFW would prefer not to return steelhead while collecting Chinook eggs. The target temperature for returning steelhead is 60° to avoid thermal shock.
    b. Elevated river temperatures also affect the ability to collect fall-run Chinook eggs. Last year CDFW didn't meet egg collection goals partly because there weren't enough fish available early in the season that were mature enough for spawning. The majority of eggs were collected in the latter half of spawning season, thereby impacting the goal of genetic representation across all spawn timing.

c. In order to use chillers effectively, water temperatures need to be close to egg incubation temperatures.

Questions/Comments:

- USBR asked what percentage of steelhead were lost when moved to the Mokelumne Hatchery.
    - CDFW indicated that 30-40k fish were lost out of approximately 460-470k. It is now hovering near its production goals and needs to minimize further losses.
- NMFS noted that modeled temperatures don't drop below 60° in any scenario until October 25. Bypass Scenarios B & C allow steelhead to return to the hatchery sooner and provide several weeks of better conditions for other hatchery needs. Bypass Scenario A doesn't provide that.
- NMFS asked about differences in the timing of reservoir turnover across all scenarios.
    - Cardno indicated that the timing is similar across all scenarios given that the amount of cold water is tiny when compared to the total volume of the reservoir.

7. Power concerns & cost estimate
    a. USBR provided cost estimates for the three scenarios based on last year's market prices:
        - Bypass Scenario A: $320k
        - Bypass Scenario B: $355k
        - Bypass Scenario C: $412k
    b. USBR noted that it might be more helpful to understand the relative difference in kilowatt hours produced.
        - **[Action Item]:** Thuy Washburn will request kilowatt hour totals for all scenarios including no bypass and share with the ARG.
        - NMFS asked if USBR's estimates should be used in the power bypass proposal or those generated by the CDFW calculator. Should other estimates be included as well?
            - SMUD suggested that estimates from USBR and CDFW would be sufficient.
            - WAPA indicated that it will likely prepare an estimate as well; however, it doesn't anticipate meaningful differences.
        - Kearns & West asked if there are any other power issues that need to be considered.
            - SMUD noted that because it is a partial bypass with one unit still available, USBR can still take advantage of peak time pricing.
                a. USBR indicated that it is difficult to adjust the bypass and a consistent flow through rate is preferred.

8. Discussion
    a. NMFS indicated that Scenario C provides the most benefits early in the season, including cooler temperatures to enable the return of steelhead to the hatchery and to reduce early

pre-spawn mortality. Scenario A is problematic as temperatures don't drop to 60° until almost November. Scenario B would be second choice.

b. CDFW concurred that Scenario C is their preferred choice particularly with hatchery operations in mind.

c. USBR proposed an alternate Scenario whereby the bypass would begin on 10/11 at 150cfs and remain there for two weeks before increasing to 350cfs on 10/25 in order to help hold fish without encouraging early spawning.

    - CDFW re-iterated support for Scenario C noting their misgivings about trying to delay spawning and expressing concern about returning hatchery steelhead as soon as possible.

d. USFWS asked how operations would be tracked in the event the modeling is off.

    - USBR indicated it will continue taking profiles and if there are issues, an ad-hoc ARG meeting can be held to explore changing the plan.

e. USBR recommended proposing both Scenarios B & C and then explaining the benefits of C, recognizing that management will need to make a decision at that point.

f. CDFW noted that it provided a cost estimate of the value of fish last year (500 fish = more than $500k) and will include that again this year.

g. NMFS asked if there is interest among the ARG in reviewing the proposal before submission on Oct 1.

    - USBR confirmed that an October 1 submission should provide sufficient time for consideration.

    - SMUD indicated that receiving a copy after submission is fine.

h. NMFS asked if it is OK to say that ARG members who participated in the 9/24 call support the proposal

    - USBR indicates that is seems appropriate to say the ARG supports the proposal.

    - There were no objections to this characterization.

9. Next Meeting:

    a. Regular ARG: October 21, 1:30-3:30

2021 Power Bypass Scenarios Simulated with Conservative (warm) 2014 Meteorological Conditions

Table 1: Power Bypass Scenarios

Start of bypass at Folsom Dam	**No Bypass**	**Bypass A**	**Bypass B**	**Bypass C**
N/A	No bypass	No bypass	No bypass	No bypass
11-Oct	No bypass	No bypass	No bypass	150 cfs bypass
18-Oct	No bypass	150 cfs bypass	350 cfs bypass	350 cfs bypass
25-Oct	No bypass	350 cfs bypass	350 cfs bypass	350 cfs bypass
November	No bypass	350 cfs bypass	350 cfs bypass	350 cfs bypass

Scenarios were simulated with:

- Folsom Reservoir CE-QUAL-W2 model to simulate Folsom Res. release temperatures,
- Lake Natoma CE-QUAL-W2 model to simulate Hazel Ave temperatures and to get moreprecise estimates of travel time through Lake Natoma, and
- monthly regression equations to simulate water temperature at downstream locations(e.g., Watt Ave.)

2014 Meteorological Conditions Compared to Other Years

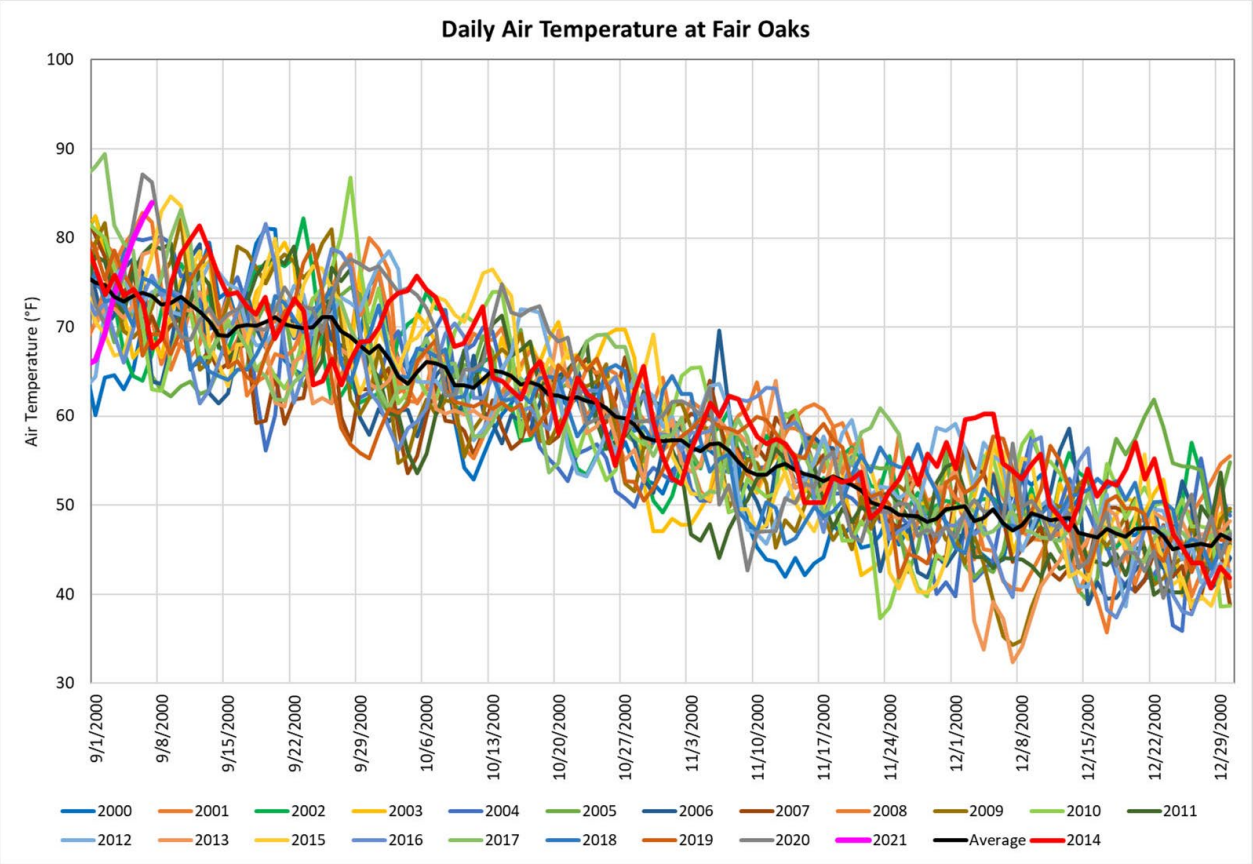

Figure 1: Daily Air Temperatures at Fair Oaks September through December in °F.

2014 Meteorological Conditions Compared to Other Years

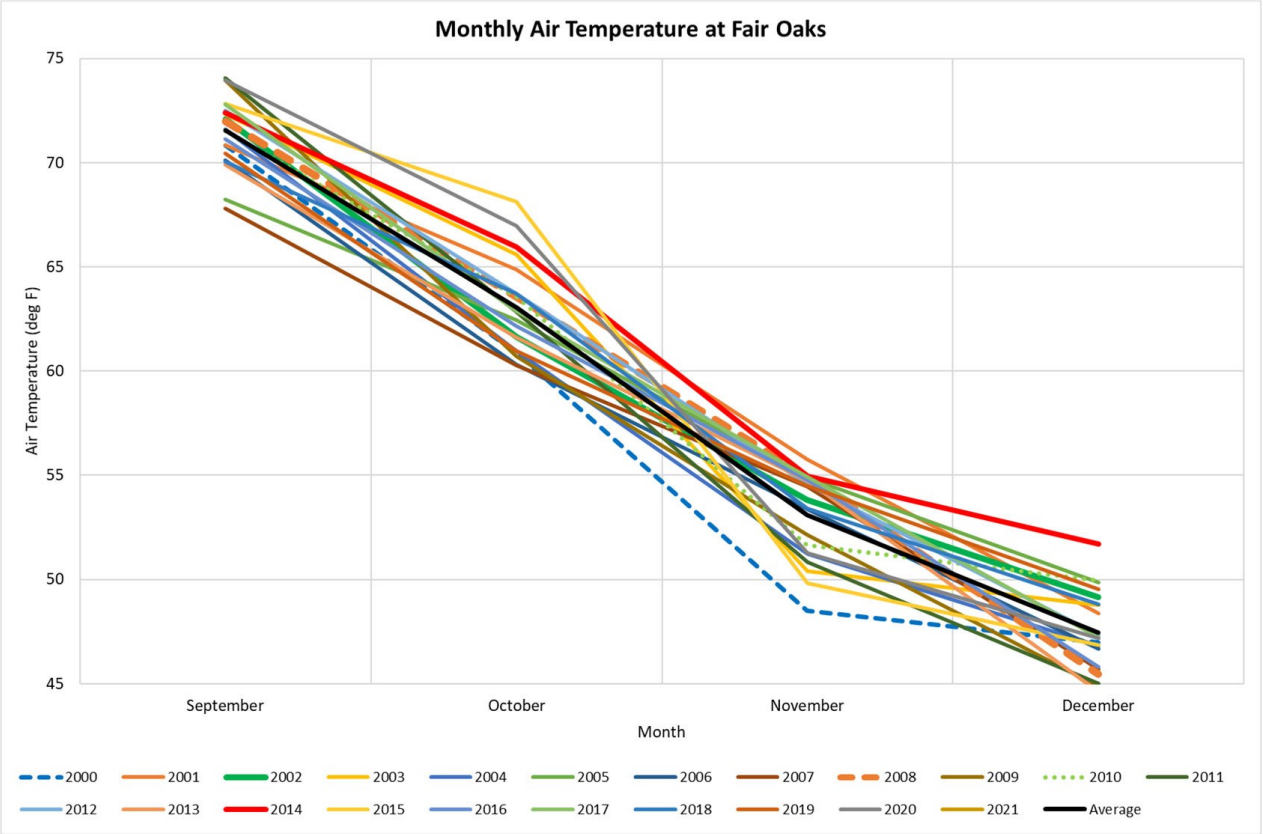

Figure 2: Monthly Air Temperatures at Fair Oaks September through December in °F.

Illustration of Predicted Remaining Folsom Reservoir Coldwater Pool Mid-November (11/16/2021)

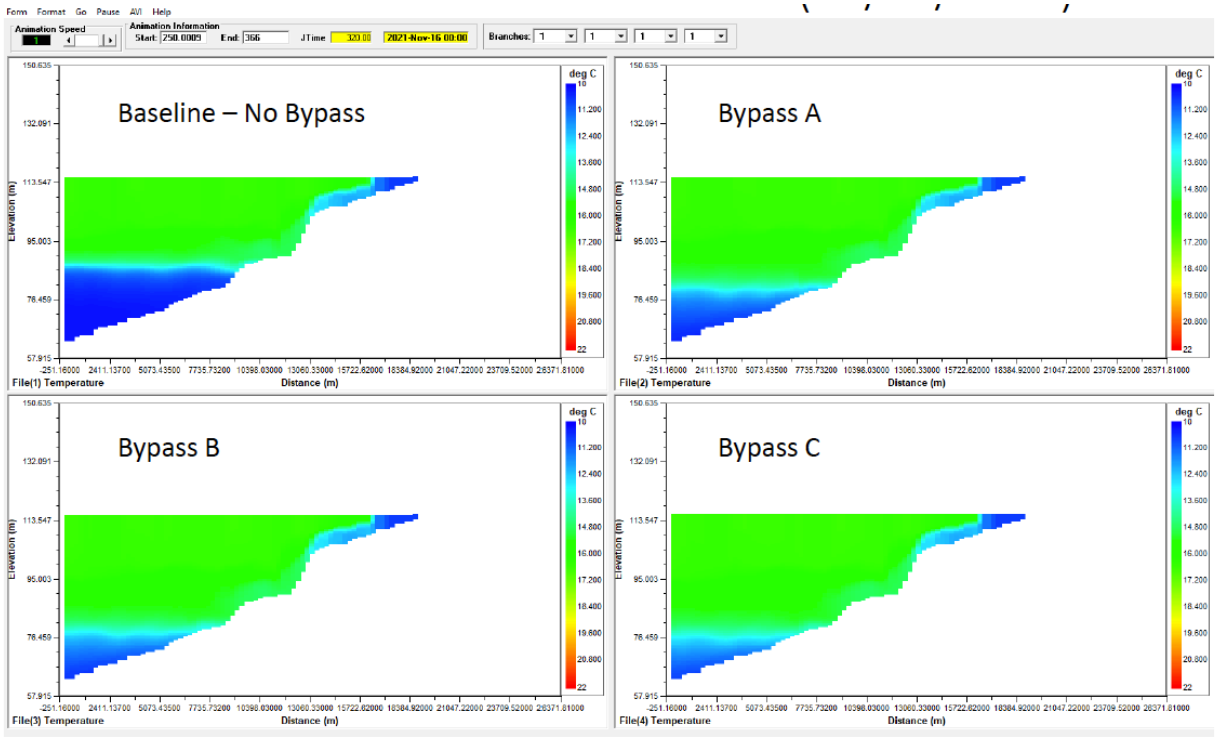

Figure 3: Remaining Folsom Reservoir Coldwater Pool for Baseline and All Bypass Scenarios.

Summary Results for Scenarios at Hazel Avenue

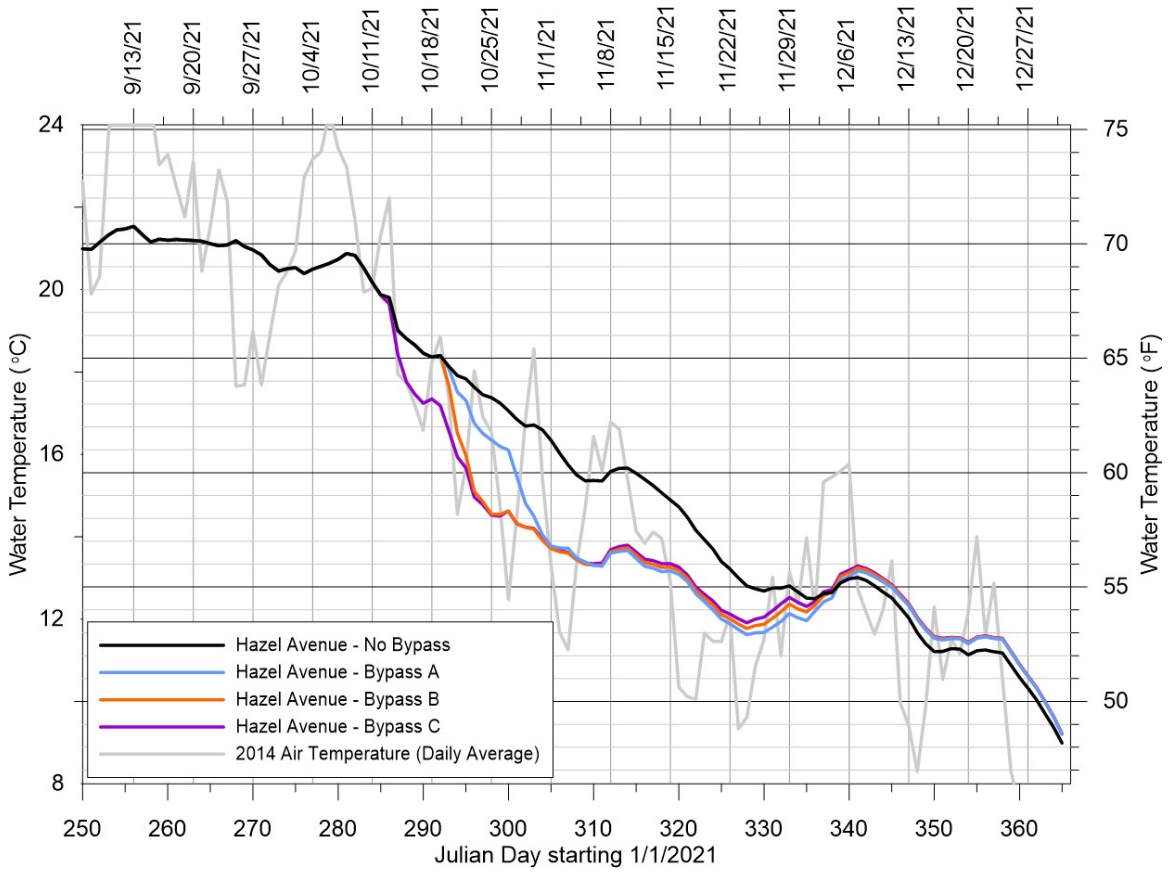

Figure 4: Water temperatures at Hazel Ave. for Baseline and all Scenarios.

Summary Results for Scenarios at Watt Avenue

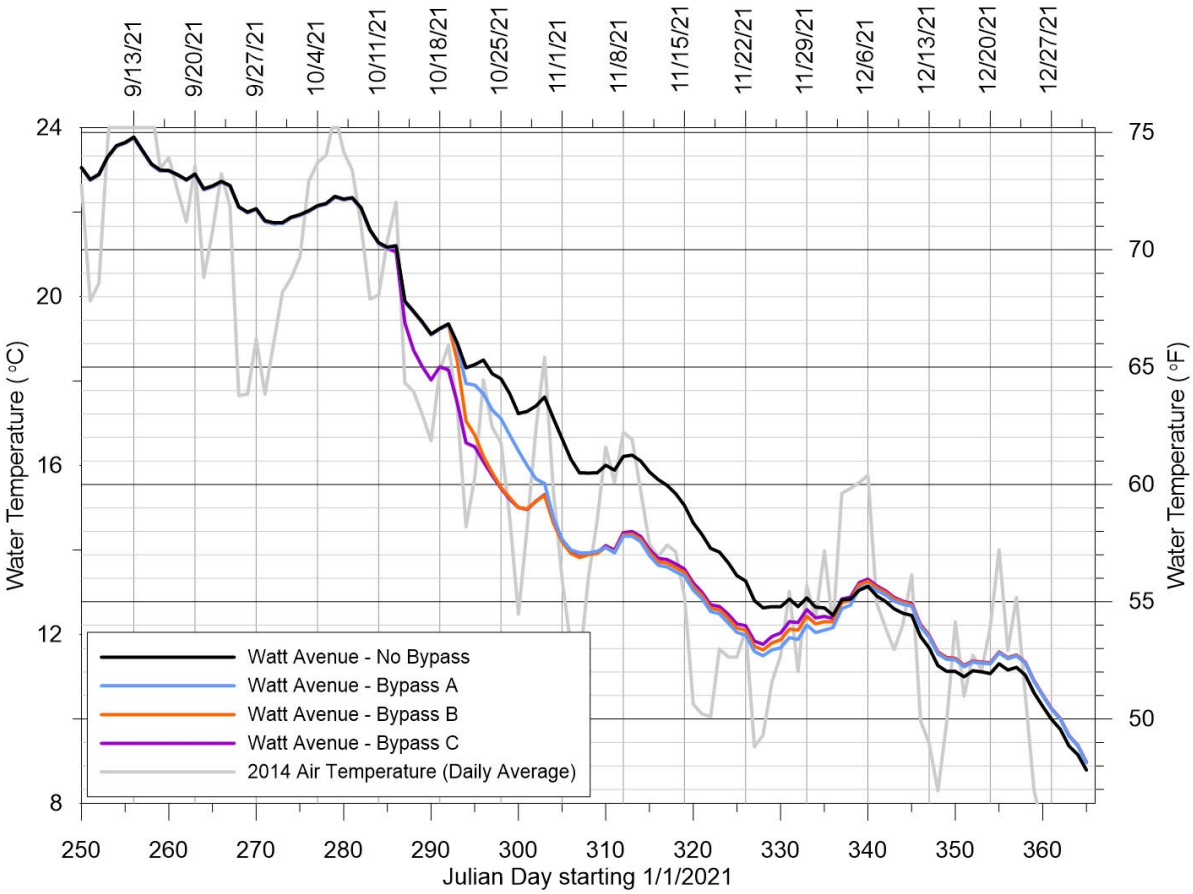

Figure 5: Water Temperatures at Watt Ave. for Baseline and All Scenarios

No Bypass Scenario – Modeled Temperature at Various Locations on LAR

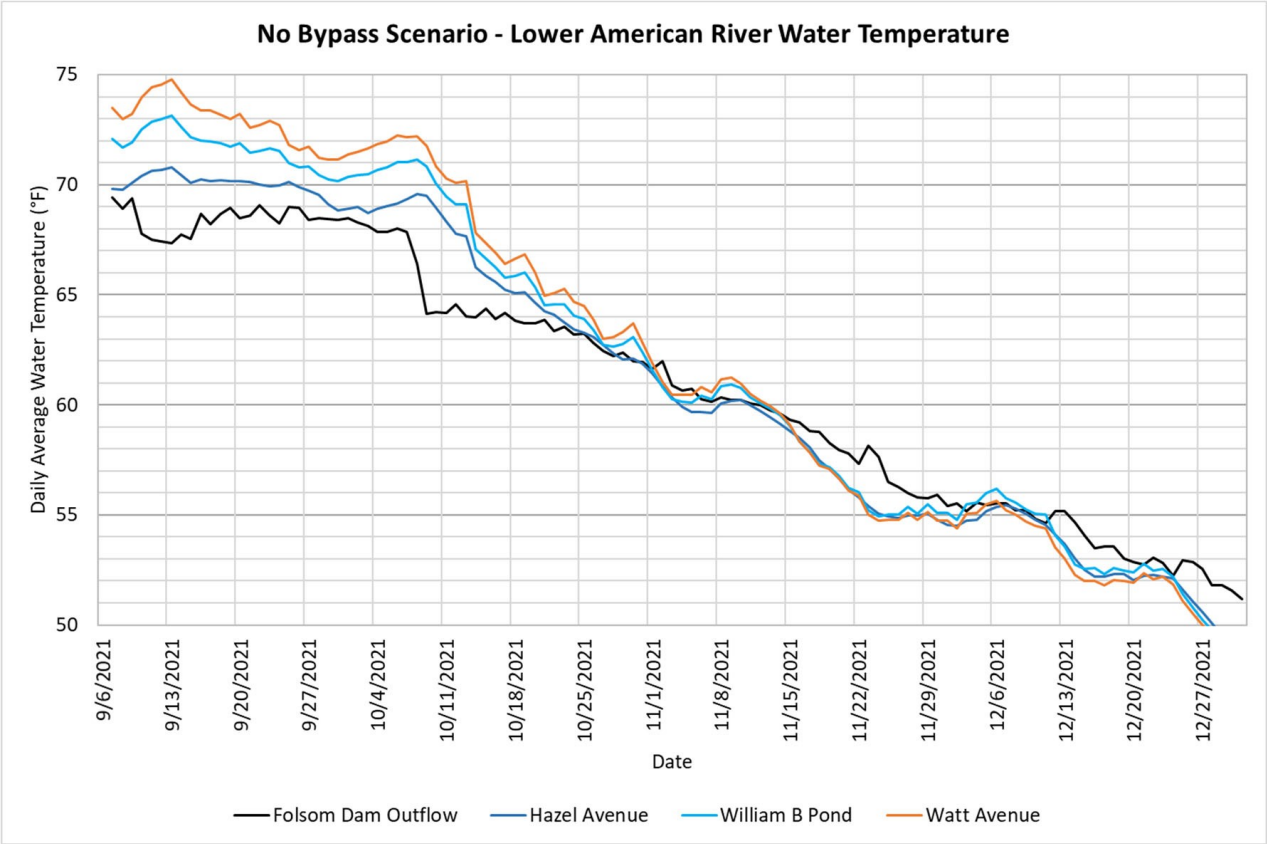

Figure 6: Daily Average Water Temperatures for No Bypass at Various Locations.

No Bypass Scenario

Thin green line is water temperature at Watt Ave Thicker green line is water temperature at Hazel Ave.

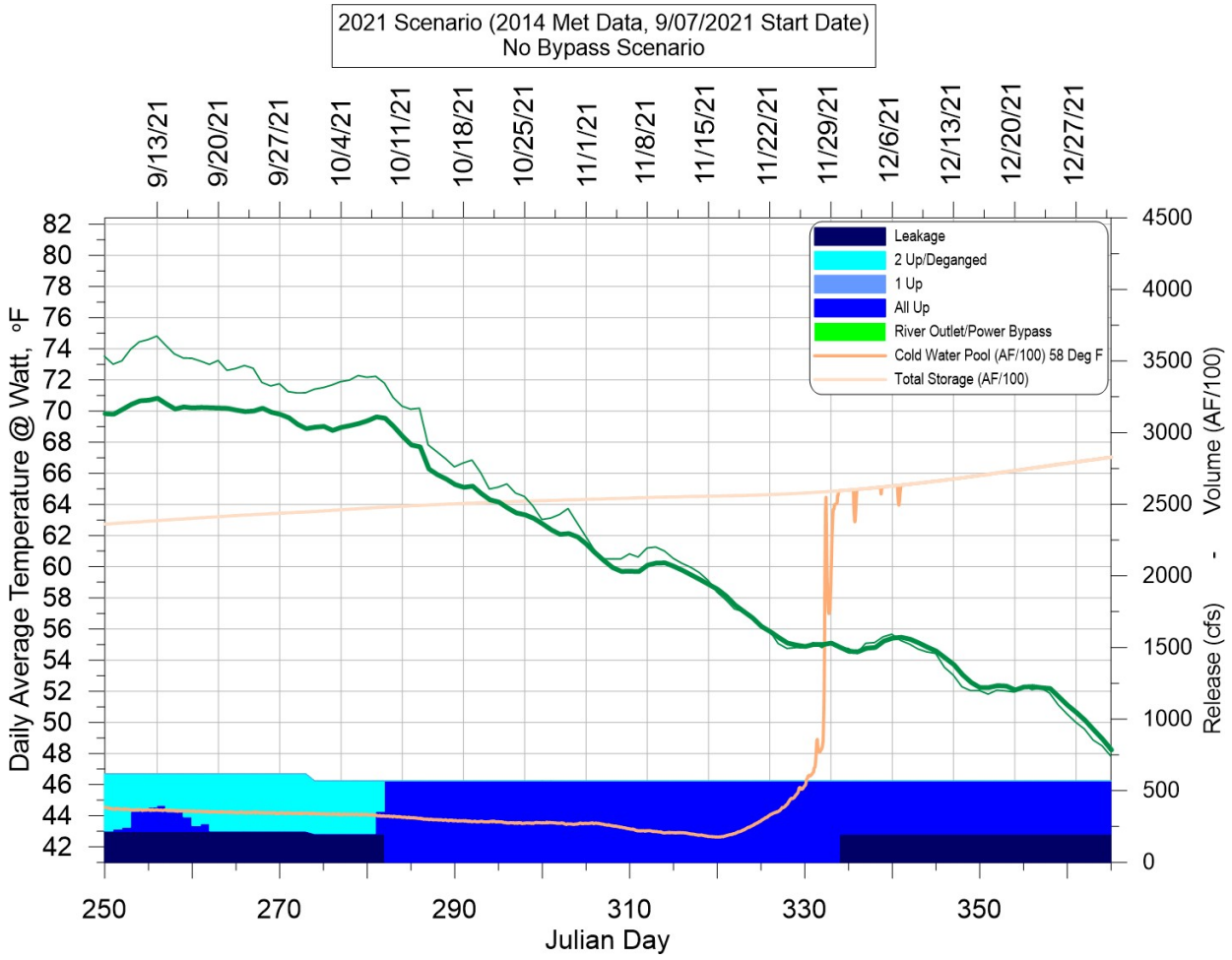

Figure 7: Daily Average Water Temperatures at Watt Ave. with No Bypass.

Bypass A Scenario – Modeled Temperature at Various Locations on LAR

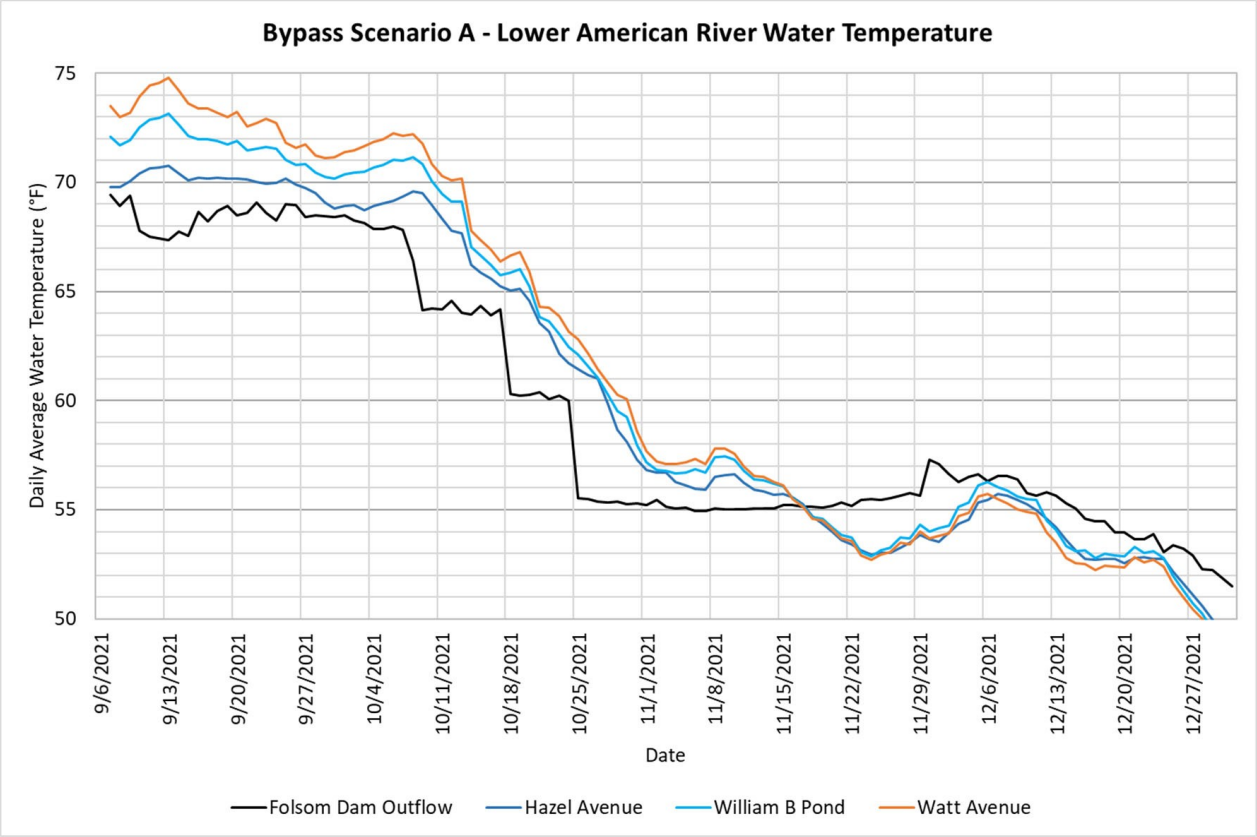

Figure 8: Daily Average Water Temperatures at Various Locations for Bypass Scenario A.

Bypass A Scenario

Thin green line is water temperature at Watt Ave Thicker green line is water temperature at Hazel Ave.

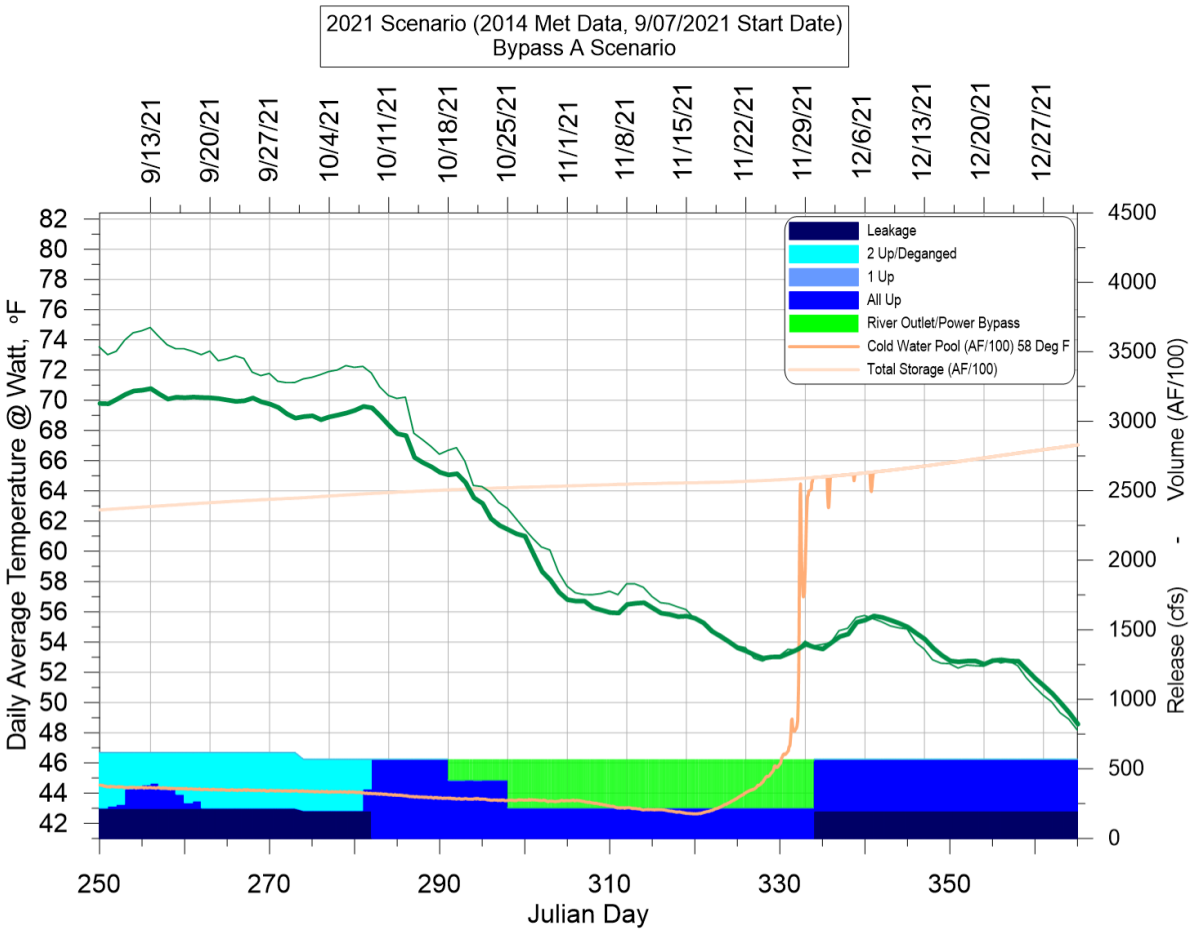

Figure 9: Daily Average Water Temperatures at Watt Ave. for Bypass Scenario A.

Bypass B Scenario – Modeled Temperature at Various Locations on LAR

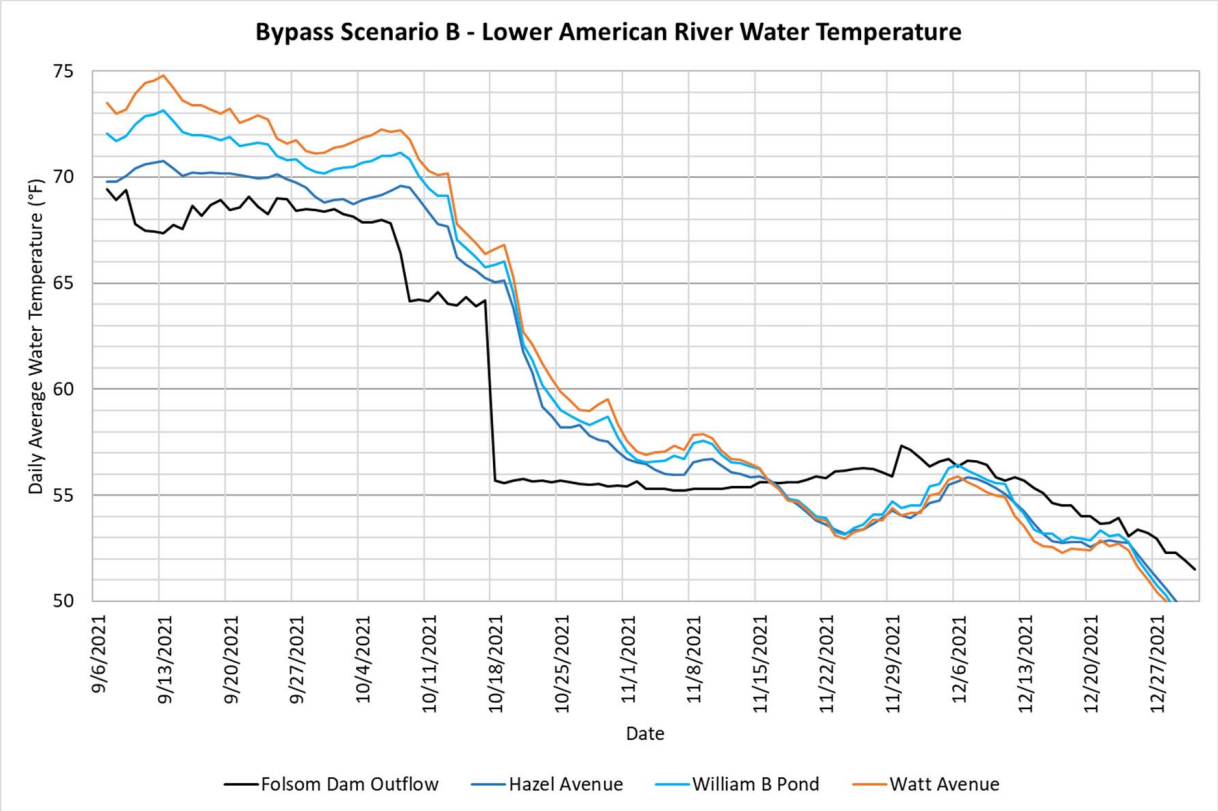

Figure 10: Daily Average Water Temperatures at Various Locations for Bypass Scenario B.

Bypass B Scenario

Thin green line is water temperature at Watt Ave Thicker green line is water temperature at Hazel Ave.

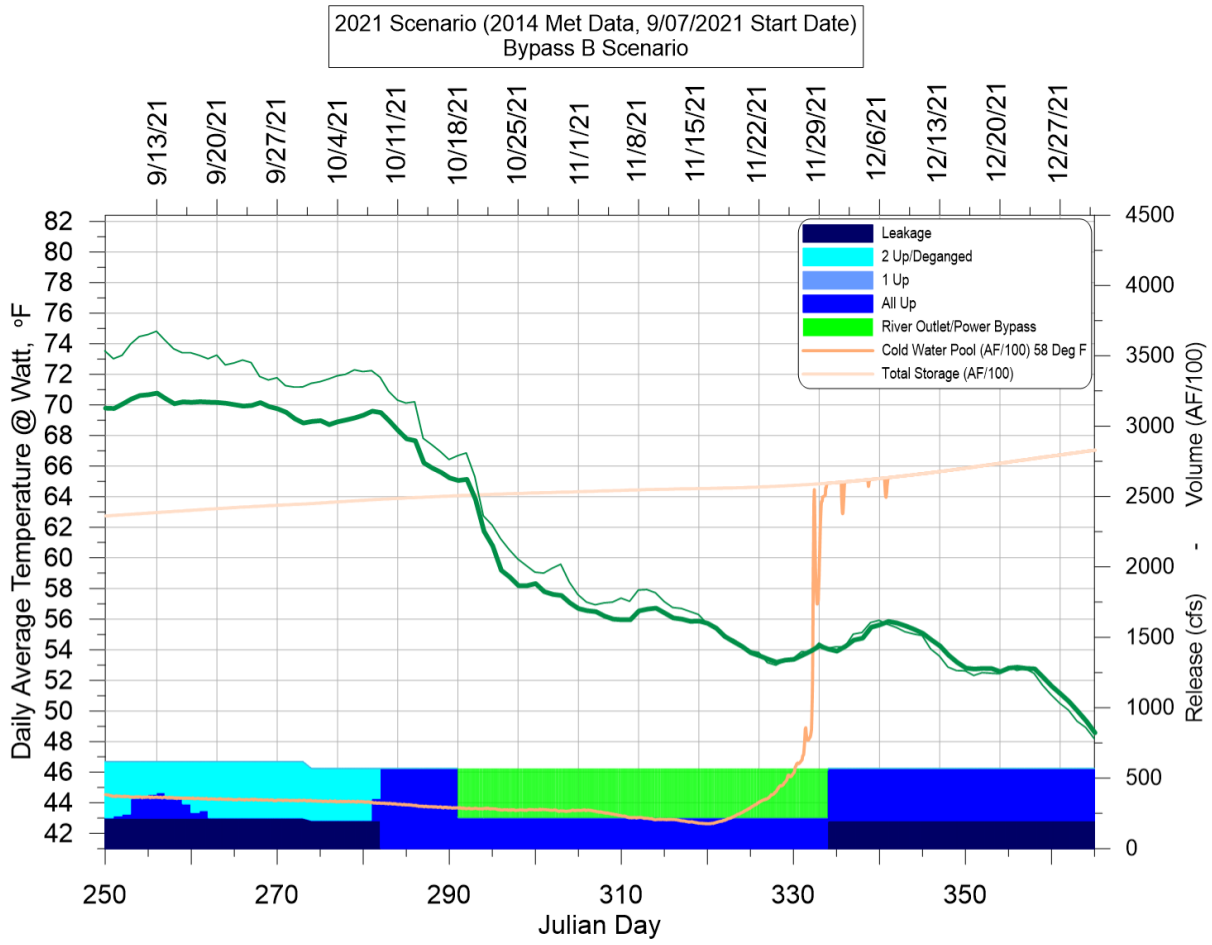

Figure 11: Daily Average Water Temperatures at Watt Ave. for Bypass Scenario B.

Bypass C Scenario – Modeled Temperature at Various Locations on LAR

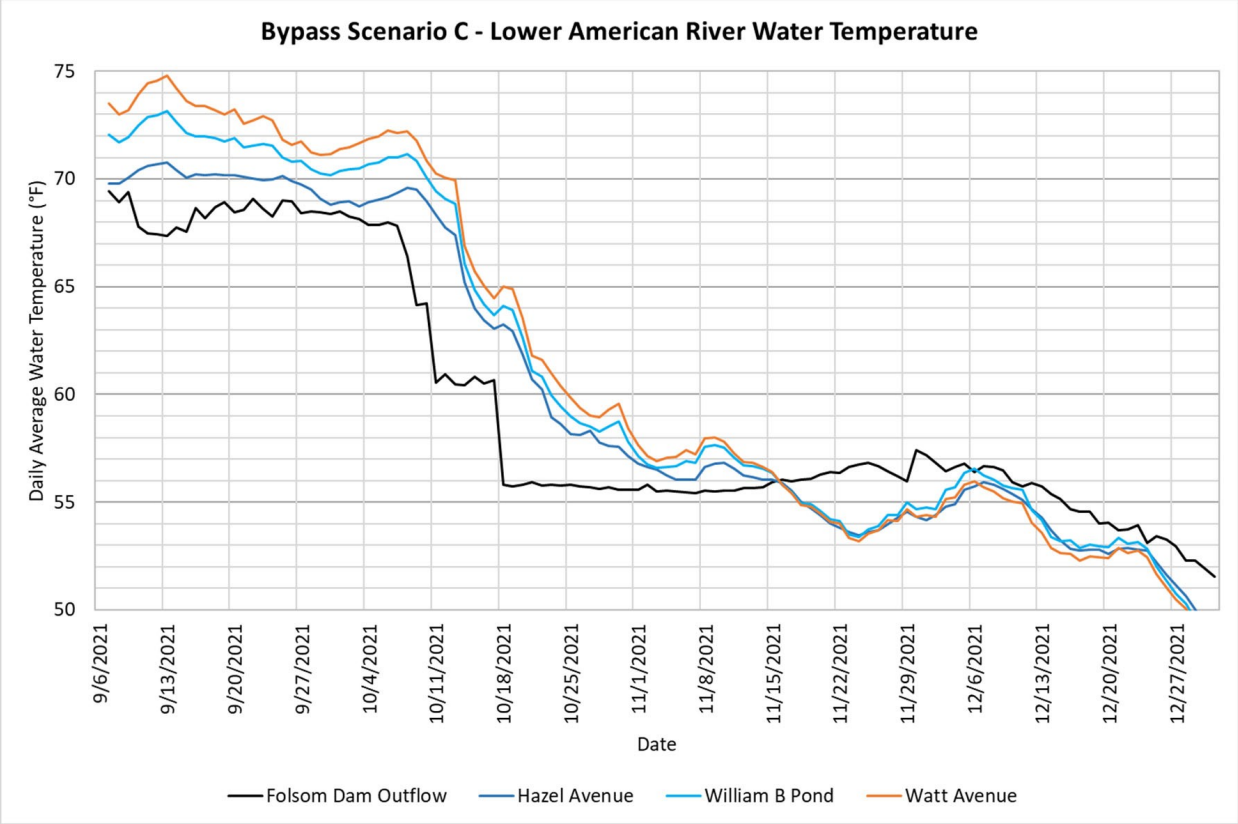

Figure 12: Daily Average Water Temperatures at Various Locations for Bypass Scenario C.

Bypass C Scenario

Thin green line is water temperature at Watt Ave Thicker green line is water temperature at Hazel Ave

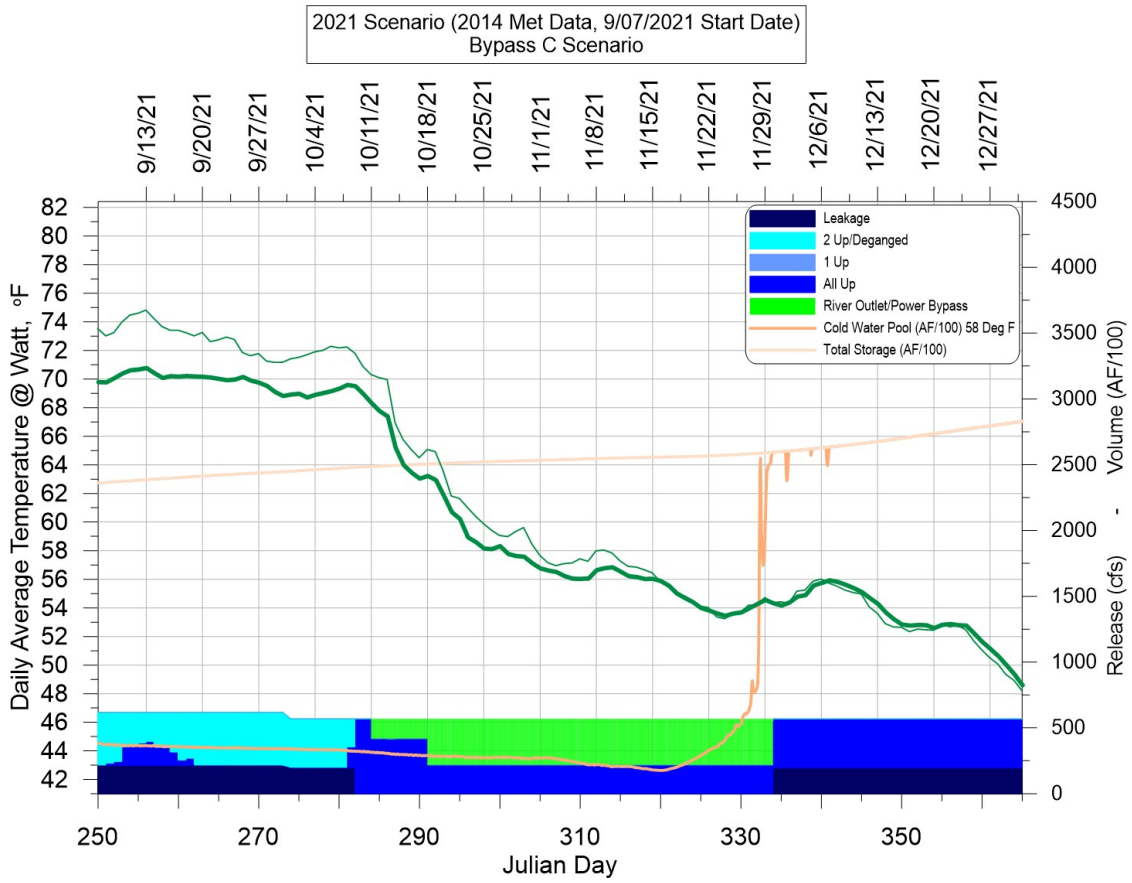

Figure 13: Daily Average Water Temperatures at Watt Ave. for Bypass Scenario C.