

Rush Creek Project, FERC Project No. 1389

AQ 3 – Water Temperature
Draft Technical Study Report

August 2024



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List of Acronyms

°C	degrees Celsius
°F	degrees Fahrenheit
FERC	Federal Energy Regulatory Commission
SCE	Southern California Edison
TSP	Technical Study Plan
TSR	Technical Study Report

1 INTRODUCTION

This Technical Study Report (TSR) describes the methods and results associated with implementation of the AQ 3 – Water Temperature Technical Study Plan (TSP) for the Rush Creek Project (Project). The Water Temperature TSP was included in Southern California Edison’s (SCE) Revised Study Plan¹ and was approved by the Federal Energy Regulatory Commission (FERC) on October 26, 2022, as part of Study Plan Determination. Specifically, this report describes the methods and results of the Water Quality TSP.

2 STUDY OBJECTIVES

- Characterize existing water temperature and meteorological conditions in Project-affected stream segments.
- Characterize existing water temperature information (profiles) in Project reservoirs and Silver Lake. This was collected as part of the AQ 4 – Water Quality TSP.
- Qualitatively assess the potential effects of increased air temperature due to global warming on water temperatures over the term of the new FERC license.

3 STUDY IMPLEMENTATION

Study elements described in the AQ-3 – TSP were initiated in 2022 and completed in 2023. Study elements that have been completed, that are outstanding, and any deviations or proposed modifications to the AQ-3 – TSP are discussed below.

3.1 STUDY ELEMENTS COMPLETED

All study elements were completed.

3.2 VARIANCES FROM THE A3-TSP

There were no variances. SCE collected additional (early) water temperature data at the lower elevation water temperature sites in 2022 prior to the AQ3-TSP required data collection in 2023. This was an addition to the AQ3-TSP that was agreed to by SCE with stakeholder concurrence before study plan determination. Also, Water temperature loggers at the upper elevation sites were installed in 2023 when access (snow conditions) allowed.

3.3 OUTSTANDING STUDY ELEMENTS

There are no outstanding study elements.

¹ SCE filed a Proposed Study Plan on May 26, 2022 (SCE 2022a). Four comment letters were filed on the Proposed Study Plan; and six study plans were revised. Therefore, SCE filed a Revised Study Plan on September 23, 2022 (SCE 2022b). FERC subsequently issued a Study Plan Determination on October 26, 2022, approving all study plans for the Rush Creek Project (FERC 2022).

4 STUDY AREA AND STUDY SITES

- The study area for characterization of water temperature includes Project-affected stream segments and Reversed Creek. Water temperature sampling locations are identified in Table AQ 3-1 and Map AQ 3-1.
- The study area also includes the Project reservoirs (Gem Lake, Agnew Lake) and Silver Lake (see AQ 4 – Water Quality TSP).
- For all study sites, including those within the Ansel Adams Wilderness, water temperature logger installations were removed at the end of the study period.

5 STUDY APPROACH

- Water temperature and meteorological conditions were collected in Project-affected stream segments and in Reversed Creek as identified in Table AQ 3-1 and Map AQ 3-1 from May 15 to October 15, 2023, at the high elevation sites (>7,300 feet; powerhouse elevation) and from May 15 to December 1, 2023, at the lower elevation sites (\leq 7,300 feet), weather and access permitting.
 - Installed and maintained redundant water temperature probes at nine locations in Project-affected stream segments and one location in Reversed Creek.
 - Obtained meteorological station data (relative humidity, wind speed, solar radiation, air temperature) from three existing locations (Gem Pass, June Mountain Summit, and near Rush Creek Powerhouse).²
 - Downloaded data approximately bi-monthly from the water temperature probes.
- In addition, SCE collected water temperature data at select locations from May 15 to December 1, 2022 (early data collection). The early data collection in 2022 was initiated by SCE prior to FERC’s formal study plan determination on October 26, 2022. Specifically, temperature data were collected at the seven lower elevation sites (\leq 7,300 feet) (Table AQ 3-1 and Map AQ 3-1) and SCE utilized the current U.S. Forest Service meteorological station near the Rush Creek Powerhouse to obtain 2022 air temperature data.
- Summarized temperature and meteorological data, including depiction of seasonal patterns and daily averages, minimums, and maximums as a function of time and location in Project-affected stream segments and aquatic species requirements (e.g., Moyle 2002).

² Gem Pass (CA Dept of Water Resource; 2014 to Present) <https://cdec.water.ca.gov/webgis/?appid=cdecstation&sta=GEM>; June Mountain Summit (SCE, Bishop; 2012 to Present) <https://cdec.water.ca.gov/webgis/?appid=cdecstation&sta=JMS>; Rush Creek Powerhouse (US Forest Service; 2005 to Present) <https://cdec.water.ca.gov/webgis/?appid=cdecstation&sta=RSH>.

- Coordinated with the AQ 4 – Water Quality TSP to obtain water temperature profiles from Gem Lake, Agnew Lake, and Silver Lake.
- Qualitatively evaluated global warming and how future air temperatures may affect water temperature over the anticipated term of the new FERC license (30–50 years) using available literature predictions from the Cal-adapt.org website (<https://cal-adapt.org/>; funding and oversight by the California Energy Commission).

6 STUDY RESULTS

6.1 WATER TEMPERATURE

6.1.1 Streams

At the lower elevation stream monitoring sites water temperature was collected early May through December 1 or later in both 2022 and 2023 (Table AQ 3-2). At the high elevation sites water temperature probes were installed in 2023 when access to the sites was possible (early June below Gem Lake and mid-July above Gem Lake).

Water temperature at each of the stream reach locations was cold (< 20 degrees Celsius [$^{\circ}\text{C}$]) and suitable for coldwater salmonids (e.g., Moyle 2002) (Figure AQ 3-1; Appendix A). The warmest season was late July through mid-September. The warmest location was Rush Creek upstream of Grant Lake (RC13.7) with a maximum daily average water temperature of 19°C in 2022 and a maximum of 15°C in 2023 (wet water year). Reverse Creek (RVC 0.26) was the coldest valley floor water temperature sampling location (maximum daily average of 13°C in 2022 and 11.5°C in 2023). Rush Creek powerhouse tailrace (RC Powerhouse) maximum average daily temperature was 17.7°C in 2022 and $<14^{\circ}\text{C}$ in 2023. The high elevation sites were typically below 13°C in 2023 and likely below approximately 16°C in 2023 (data were not collected, but temperatures would have been less than occurred at Rush Creek RC17.6). Monthly average, minimum, maximum temperatures for each location, including individual figures for each site (15-minute and daily average) are provided in Appendix A.

6.1.2 Lakes

Silver Lake was sampled monthly June through October. Agnew and Gem lakes were sampled monthly July through October. Agnew and Gem lakes were not accessible until July due to snow conditions on the access trails.

The reservoirs were typically stratified in the deeper locations (SL-1, GL-1, AL-1), although stratification in Silver Lake was relatively weak (limited temperature difference between the surface and the lake bottom) (Figures AQ 3-2 through AQ 3-6). Lake water temperatures were cold (< 20°C , suitable for cold water salmonids) with the maximum water temperature in the epilimnions $<15^{\circ}\text{C}$. The hypolimnion of Gem Lake was particularly cold, $\sim 4^{\circ}\text{C}$, and deep (~ 300 meters) at sampling location SL-1 (deeper portion of the lake).

6.2 METEOROLOGICAL CONDITIONS

Available meteorological station data (relative humidity, wind speed, solar radiation, air temperature) from three existing locations (Gem Pass, June Mountain Summit, and near Rush Creek Powerhouse)³ were downloaded into an electronic database (Excel). Air temperature at the meteorological stations is shown in Figure AQ 3-7. The Rush Creek Powerhouse location shows summer air temperature typically ranges -5 to 25°C with a mean annual air temperature of 9.8°C.

6.3 CLIMATE CHANGE AIR TEMPERATURE

Projected air temperature from climate change was obtained from available literature predictions from the Cal-adapt.org website which provides projections of future climate change conditions based on 10 climate change models rather than relying on the output from a single model. Climate change models are subject to uncertainty and are only the best approximations of future climate conditions. A source of uncertainty in future climate projections is greenhouse gas emissions and projected climate conditions may not prove to be accurate if the actual emissions differ from the assumptions used in a climate model to make the projections. Herein we used climate model predictions for the medium representative concentration pathway (RCP 4.5) greenhouse gas emissions (Pierce et al. 2018). It is important to note that there is a range in possible future outcomes from the climate change models. While global warming will affect air and water temperature, this analysis does not attempt to predict actual future changes at the Project. Therefore, the analysis should be viewed as a general guide for the potential of changes in air and water temperatures that may result from global warming.

Based on the information from the Cal-Adapt website, future air temperature (annual average) in the June Lake area could increase⁴ 1.4 – 3.1°C (2.2°C average), mid-century (2035 – 2064) for the medium greenhouse gas emission scenario compared to modeled baseline conditions (1961 – 1990). Table AQ 3-3 and Figure AQ 3-8 present a snapshot of annual average annual maximum and minimum air temperature for the two 30-year time periods (historical baseline and mid-century).

To estimate potential water temperature changes resulting from air temperature changes, we created a June through September (2022 - 2023) water temperature versus air temperature and flow multiple regression for Rush Creek below Silver Lake. This regression was then used to qualitatively estimate the potential effect of air temperature change on future stream temperatures.

³ Gem Pass (CA Dept of Water Resource; 2014 to Present) <https://cdec.water.ca.gov/webgis/?appid=cdecstation&sta=GEM>; June Mountain Summit (SCE, Bishop; 2012 to Present) <https://cdec.water.ca.gov/webgis/?appid=cdecstation&sta=JMS>; Rush Creek Powerhouse (US Forest Service; 2005 to Present) <https://cdec.water.ca.gov/webgis/?appid=cdecstation&sta=RSH>.

⁴ Change from baseline = Modeled future value - Modeled historical value based on the medium or high emissions representative concentration pathways (RCPs)

Figure AQ 3-9 show results from the Excel multiple regression of Rush Creek water temperature below Silver Lake with daily average air temperature and flow from June through September 2022 / 2023.⁵ Under existing Project operations, 1°C daily average air temperature typically increases water temperature by 0.34°C at this location. Based on the potential air temperature change from the Cal-Adapt website the correlating mid-century water temperature change may range between 0.5 to 1.1°C or an average of 0.8°C.

7 REFERENCES

- FERC (Federal Energy Regulatory Commission). 2022. Rush Creek Hydroelectric Project (FERC Project No. 1389). Study Plan Determination. October.
- Moyle, P. 2002. Inland fishes of California. University of California Press, Berkeley. 502 pp.
- Peirce, D.W., J.F. Kalansky, and D.R. Cayan. 2018. Climate, Drought, and Sea Level Rise Scenarios for California's Fourth Climate Change Assessment. Division of Climate, Atmospheric Sciences, and Physical Oceanography, Scripps Institution of Oceanography, La Jolla, California.
- SCE (Southern California Edison Company). 2022a. Rush Creek Hydroelectric Project (FERC Project No. 1389) Proposed Study Plan. May.
- . 2022b. Rush Creek Hydroelectric Project (FERC Project No. 1389) Revised Study Plan. September.

⁵ Multiple regression results: Water Temperature (°C) = 9.80653 + -0.01402 * Flow (cfs) + 0.33676 * Air Temperature (°C); Adjusted R² = 0.83; Observations 244; P-values for the intercept, flow coefficient, and air temperature coefficients were 6.5E-71, 1.4E-79, and 6.4E-47, respectively.

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TABLES

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Table AQ 3-1. Water Temperature Sampling Locations

Stream Segment Name	Segment Length (miles) / River Mile (RM)	Sampling Location River Mile / Site ID	Sampling Dates
Rush Creek			
Waugh Lake	1.51 (RM 22.24–23.75)	RM 23.4 / RC23.4	May 15–Oct 15, 2023
Rush Creek Below Rush Meadows Dam	1.83 (RM 20.41–22.24)	RM 21.65 / RC21.65	May 15–Oct 15, 2023
Gem Lake	0.93 (RM 19.48–20.41)	GL-1 (mid-lake) GL-2 (near the dam) [Sampled as part of AQ 4 – Water Quality TSP]	Jun, Jul, Aug, Sep, Oct 2023
Rush Creek Below Gem Dam	0.30 (RM 19.18–19.48)	RM 19.25 / RC19.25	May 15–Oct 15, 2023
Agnew Lake	0.58 (RM 18.60–19.18)	AL-1 (mid-lake) [Sampled as part of AQ 4 – Water Quality TSP]	Jun, Jul, Aug, Sep, Oct 2023
Rush Creek Below Agnew Dam	0.40 (RM 18.2–18.60)	RM 18.55 / RC18.55	May 15–Oct 15, 2023
Rush Creek Horsetail Falls	0.54 (RM 17.66–18.2)	—	—
Rush Creek Powerhouse Tailrace	—	PHTR	May 15–Dec 1, 2023
Reversed Creek	—	100–200 feet upstream of the confluence with South Rush Creek / RVC0.26	May 15–Dec 1, 2023
Rush Creek Above Silver Lake	0.94 (RM 16.72–17.66)	RM 17.15 / RC17.15 RM 17.6 / RC17.6	May 15–Dec 1, 2023
Silver Lake	0.83 (RM 15.89–16.72)	SL-1 (mid-lake) SL-2 (near outlet) [Sampled as part of AQ 4 – Water Quality TSP]	Jun, Jul, Aug, Sep, Oct 2023
Rush Creek Below Silver Lake	2.69 (RM 13.20–15.89)	RM 15.6 / RC15.6 RM 13.7 / RC13.7 (LADWP gaging station location)	May 15–Dec 1, 2023
South Rush Creek			
South Rush Creek	0.46 (RM 0.0–0.46)	RM 0.15 / SRC0.15	May 15–Dec 1, 2023

Table AQ 3-2. Stream Temperature Probe Install and Removal

Site (Site Abbreviation)	May (Low Elev Install)	June (High Elev Install)	July (High Elev Install)	October (High Elev Removal)	December (Low Elev Removal)
Low Country ≤7,300 feet AMSL May 15 - Dec 1 weather and access permitting.					
RVC0.26 (Reversed Creek)	5/5/2023 5/3/2022	--	--	--	12/4/2023 12/28/2022
SRC0.15 (South Rush Creek)	5/5/2023 5/3/2022	--	--	--	12/4/2023 12/28/2022
RC17.6 (Rush Creek)	5/5/2023 5/3/2022	--	--	--	12/4/2023 12/28/2022
PHTR (Powerhouse tailrace)	5/5/2023 5/3/2022	--	--	--	12/4/2023 12/28/2022
RC17.15 (above Silver Lake)	5/5/2023 5/3/2022	--	--	--	12/4/2023 12/15/2022
RC15.16 (below Silver Lake)	5/3/2022	--	--	--	12/4/2023
RC13.7 (Abv Grant Lk nr gage)	5/5/2023 5/3/2022	--	--	--	12/4/2023 12/15/2022
High Country >7,300 feet AMSL May 15 - Oct 15 weather and access permitting.					
RC18.55 (below Agnew Lake)	--	6/9/2023	--	10/13/2023	--
RC19.25 (Below Gem Lake)	--	6/9/2023	--	10/13/2023	--
RC21.65 (below Waugh Lake)	--	--	7/18/2023	10/18/2023	--
RC23.4 (above Waugh Lake)	--	--	7/18/2023	10/18/2023	--

Table AQ 3-3. Snapshot of Climate Change Air Temperature in the June Lake Area

Period	Emissions Scenario	Average °C (°F)	Range °C (°F)	Average Change °C (°F)	Range Change °C (°F)
Annual Average Maximum Temperature					
Baseline (1961-1990)	Modeled Historical	10.2 (50.4)	10.1 to 10.4 (50.2 to 50.7)	--	--
Mid-Century (2035-2064)	Medium Emissions (RCP 4.5)	12.7 (54.9)	11.4 to 14.1 (52.5 to 57.3)	2.5 (4.5)	1.3 to 3.7 (2.3 to 6.7)
Annual Average Minimum Temperature					
Baseline (1961-1990)	Modeled Historical	-5.7 (21.7)	-6.1 to -5.4 (21 to 22.2)	--	--
Mid-Century (2035-2064)	Medium Emissions (RCP 4.5)	-3.8 (25.2)	-4.7 to -2.9 (23.6 to 26.7)	1.9 (3.5)	1.4 to 2.5 (2.6 to 4.5)
Annual Average Temperature*					
Mid-Century (2035-2064)	Medium Emissions (RCP 4.5)	4.5 (40.1)	3.35 to 5.6 (38.1 to 42)	2.2 (4.0)	1.4 to 3.1 (2.5 to 5.6)

*Estimated as the mean of the annual average maximum and minimum temperatures.

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FIGURES

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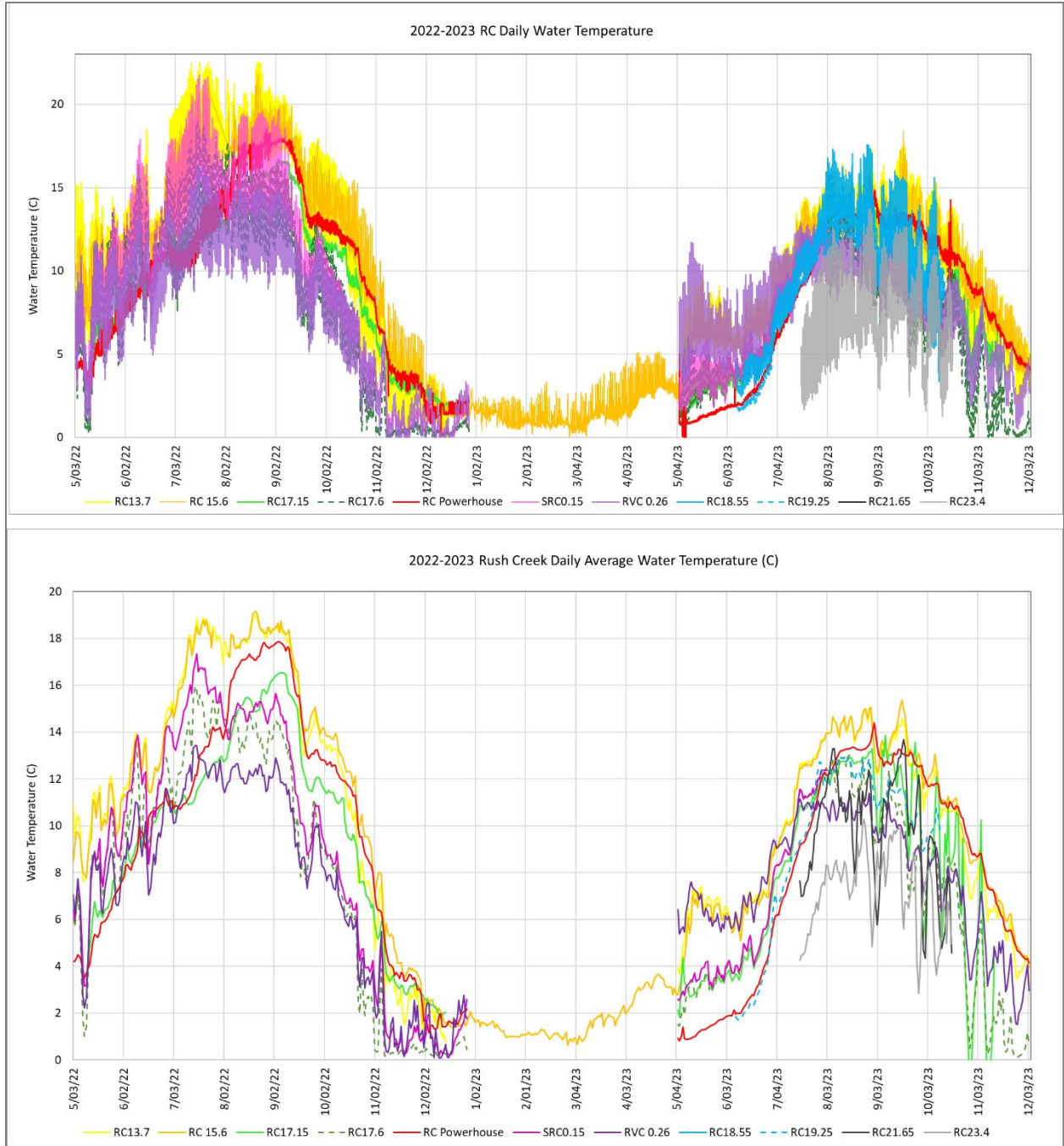


Figure AQ 3-1. Rush Creek and Reversed Creek Daily Average Water Temperature (bottom) and 15-minute Temperature (top).

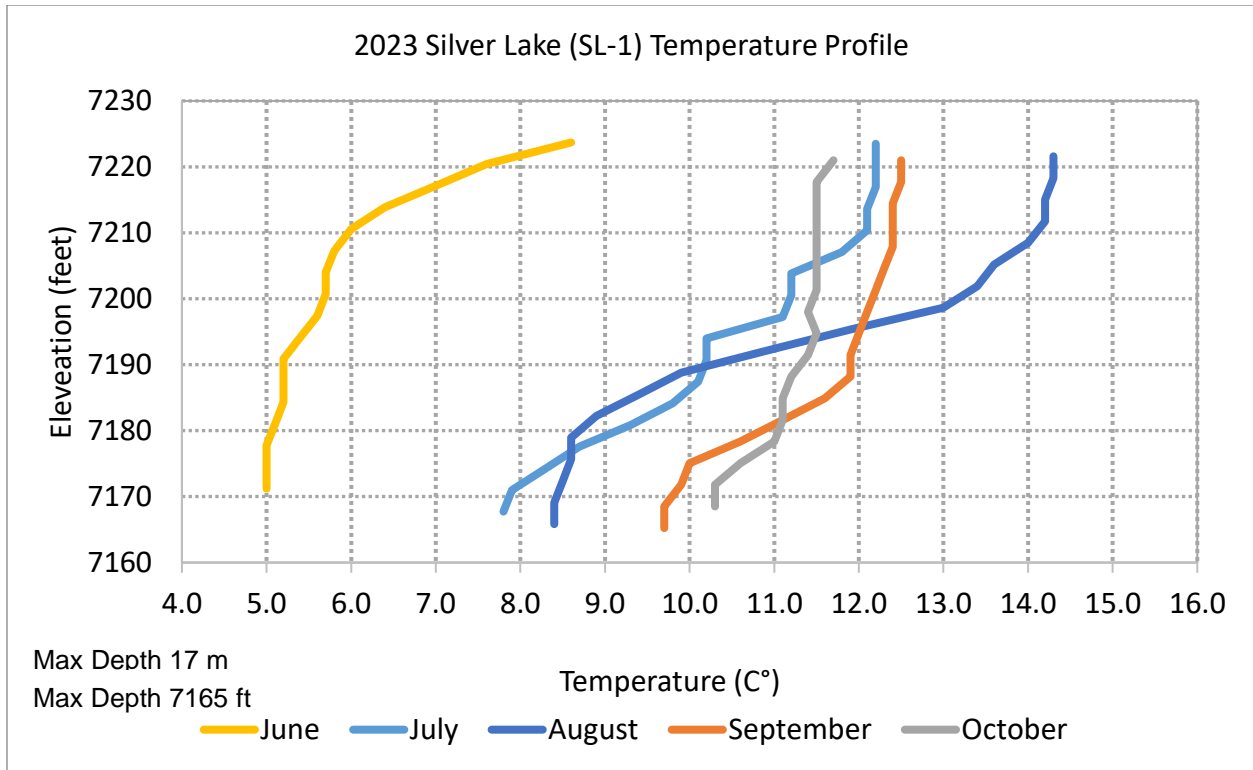


Figure AQ 3-2. Silver Lake SL-1 Water Temperature Data.

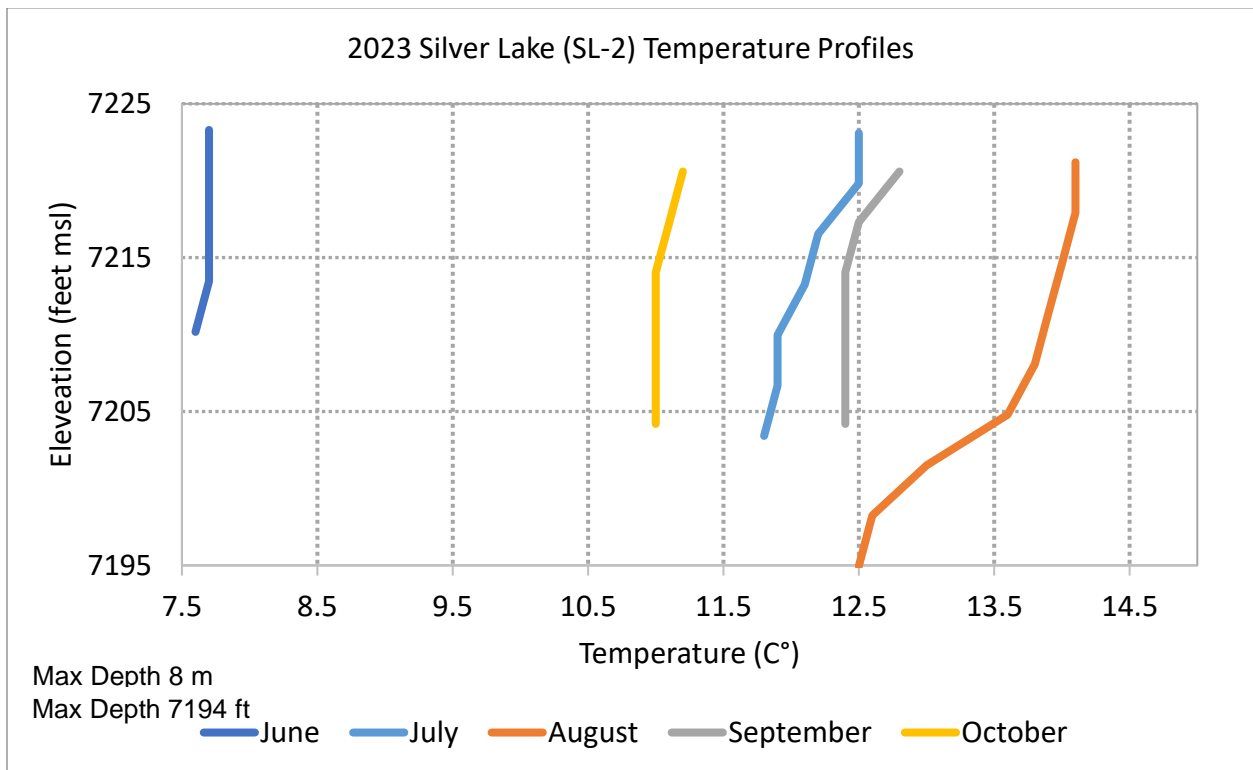


Figure AQ 3-3. Silver Lake SL-2 Water Temperature Data.

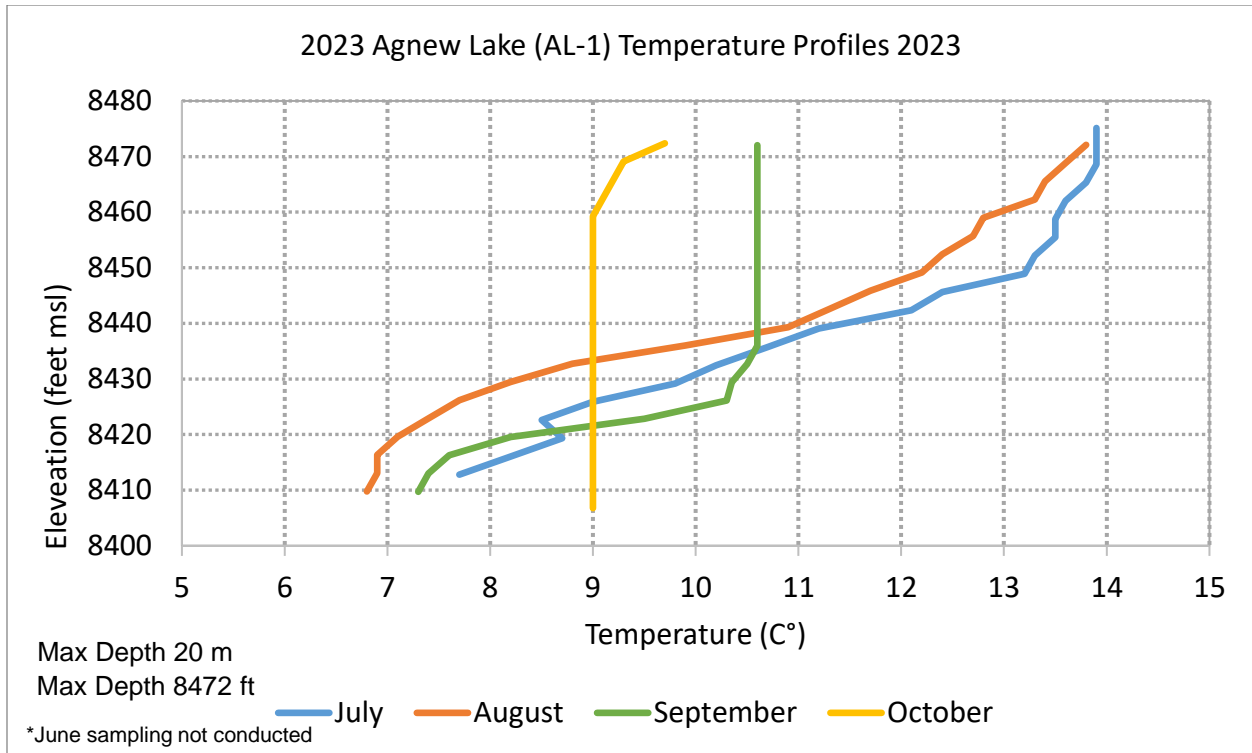


Figure AQ 3-4. Agnew Lake AL-1 Water Temperature Data.

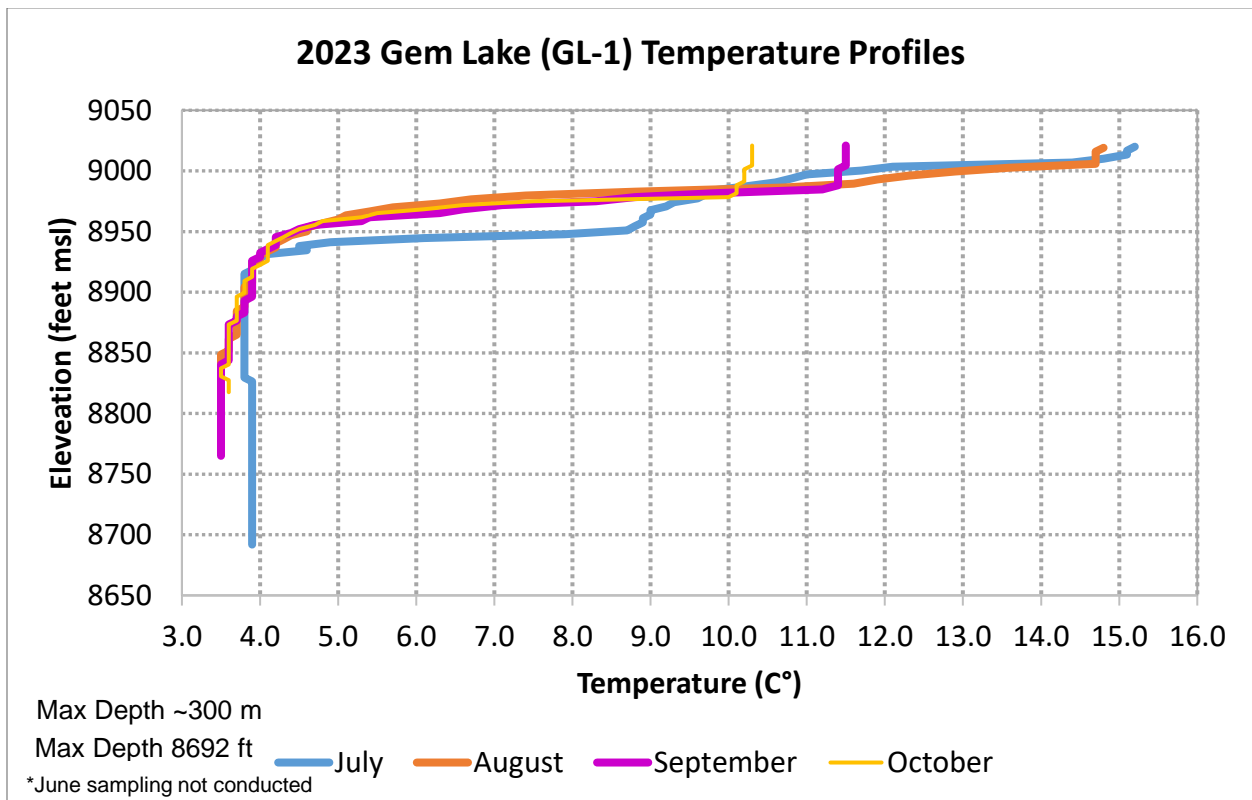


Figure AQ 3-5. Gem Lake GL-1 Water Temperature Data.

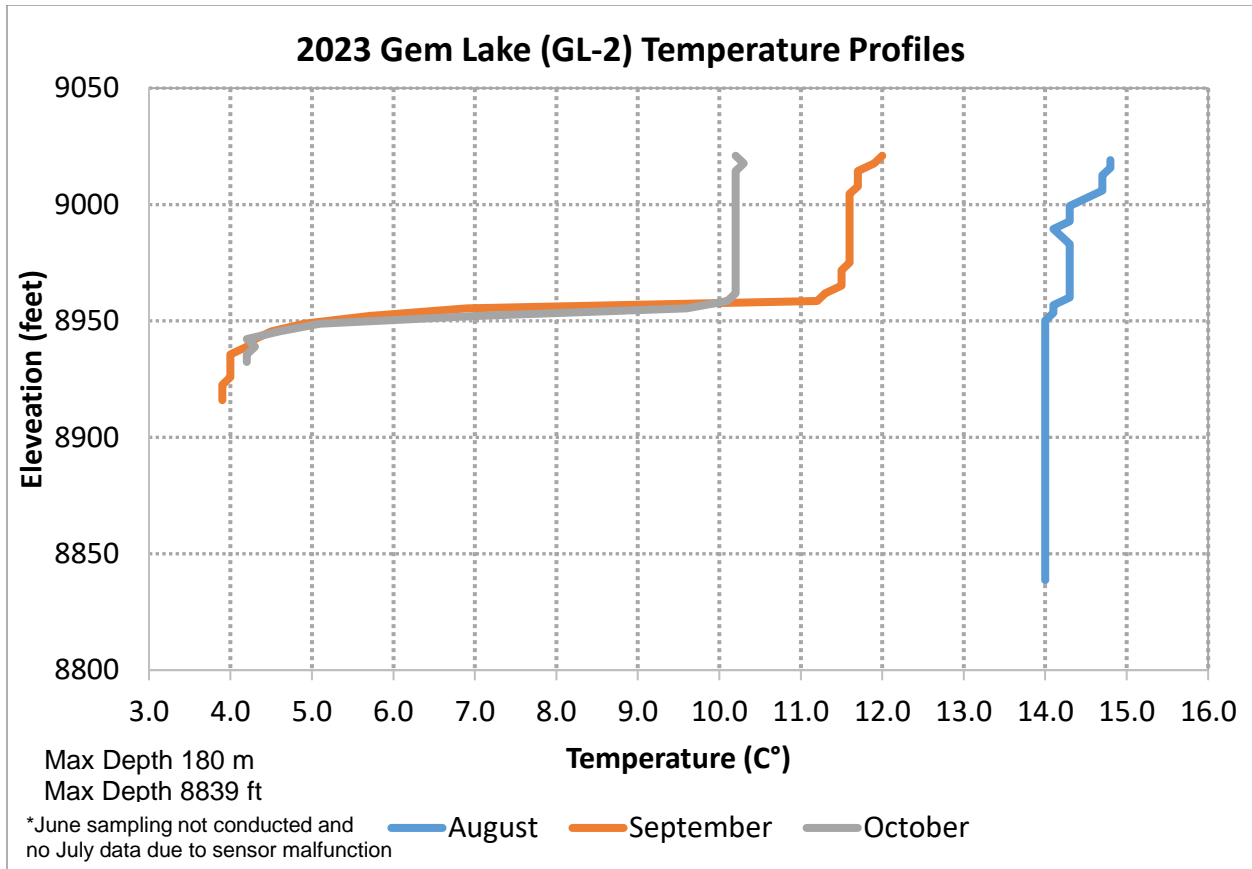
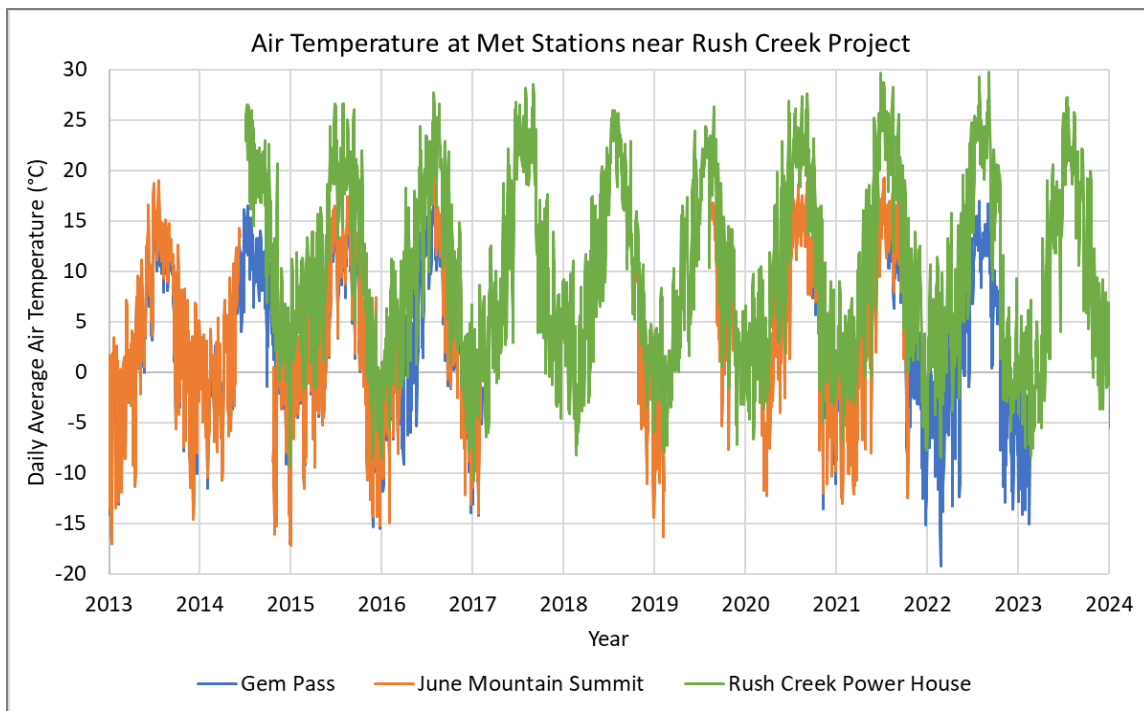
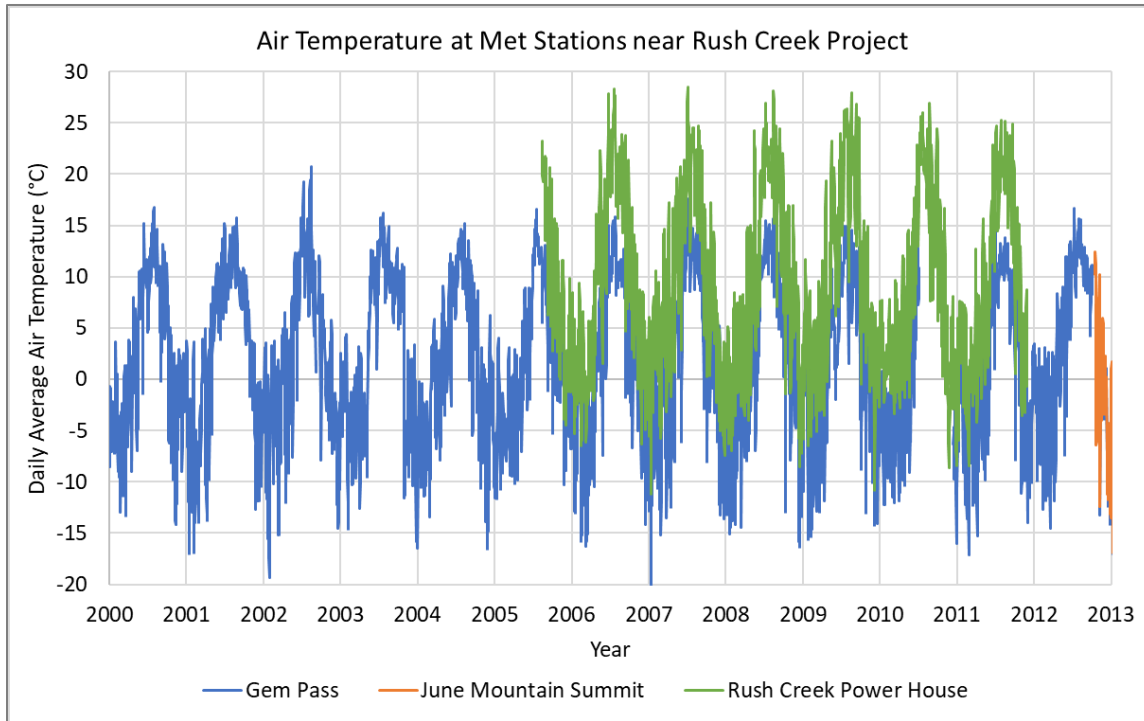


Figure AQ 3-6. Gem Lake GL-2 Water Temperature Data.



Gem Pass (CA Dept of Water Resource; 2014 to Present) <https://cdec.water.ca.gov/webgis/?appid=cdecstation&sta=GEM>; June Mountain Summit (SCE, Bishop; 2012 to Present) <https://cdec.water.ca.gov/webgis/?appid=cdecstation&sta=JMS>; Rush Creek Powerhouse (US Forest Service; 2005 to Present) <https://cdec.water.ca.gov/webgis/?appid=cdecstation&sta=RSH>.

Figure AQ 3-7 Meteorological Station Data (Daily Average Air Temperature) in the Project Area (Gem Pass, June Mountain Summit, and Rush Creek Powerhouse).

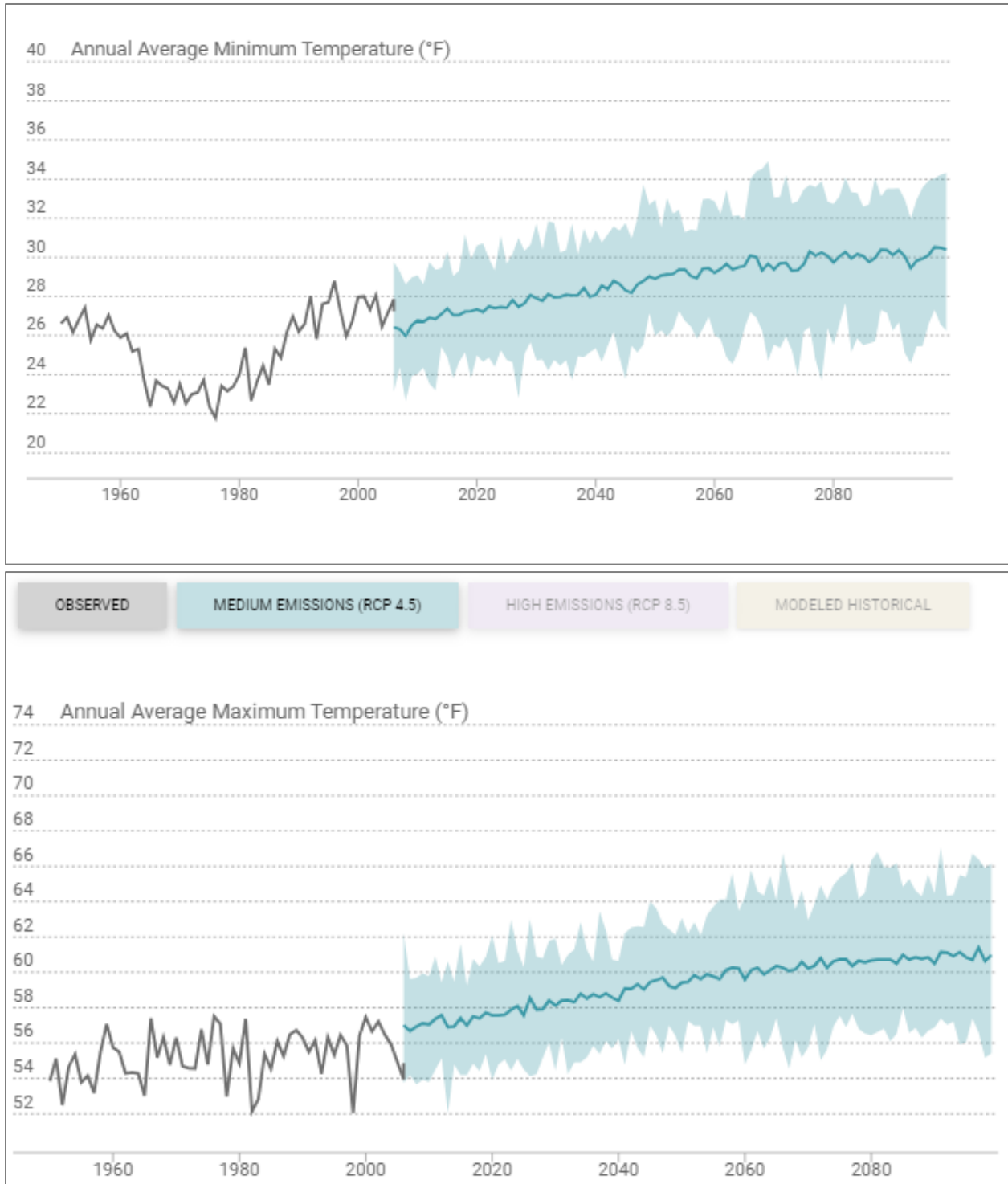


Figure AQ 3-8. Baseline and Modeled Future Air Temperature (annual average maximum, top, and annual average minimum, bottom) for the June Lake Area based on Cal-Adapt (<https://cal-adapt.org/>) Modeling of the Medium Representative Concentration Pathway (RCP) Greenhouse Gas Emission Estimate (4 5).

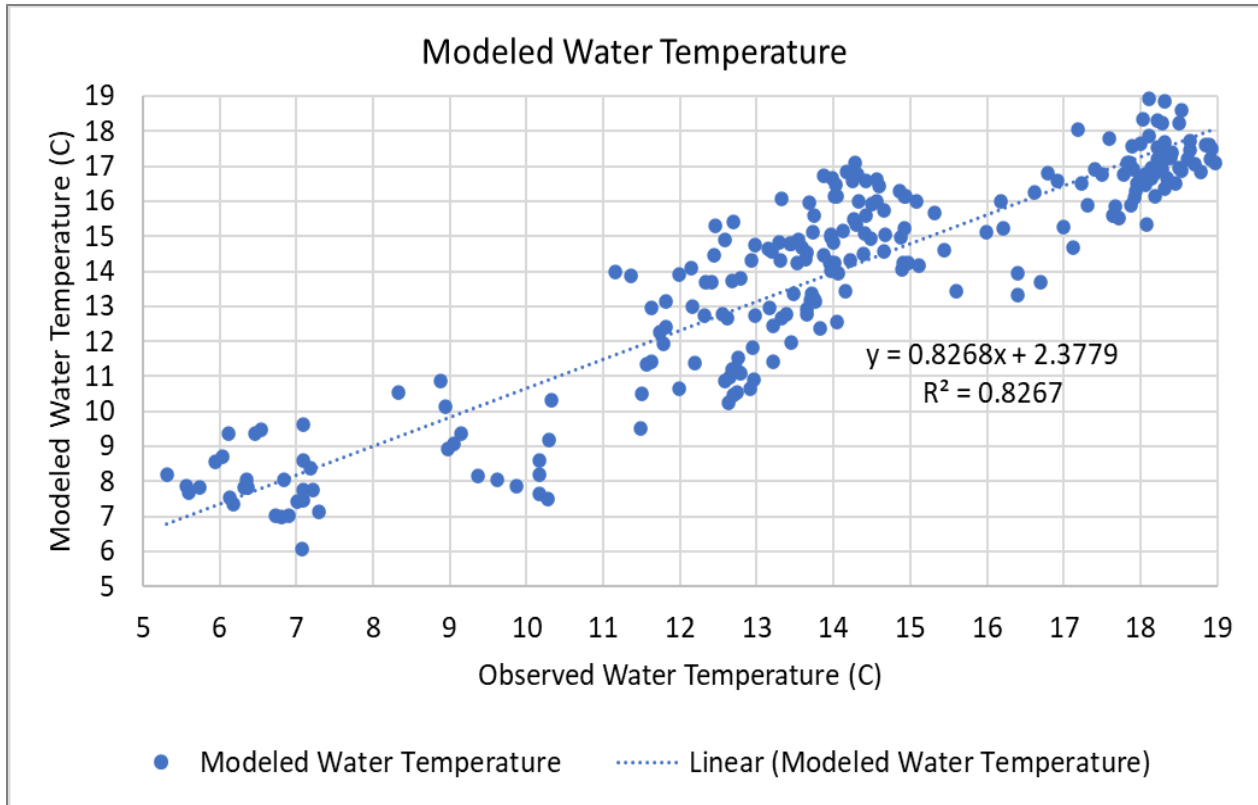
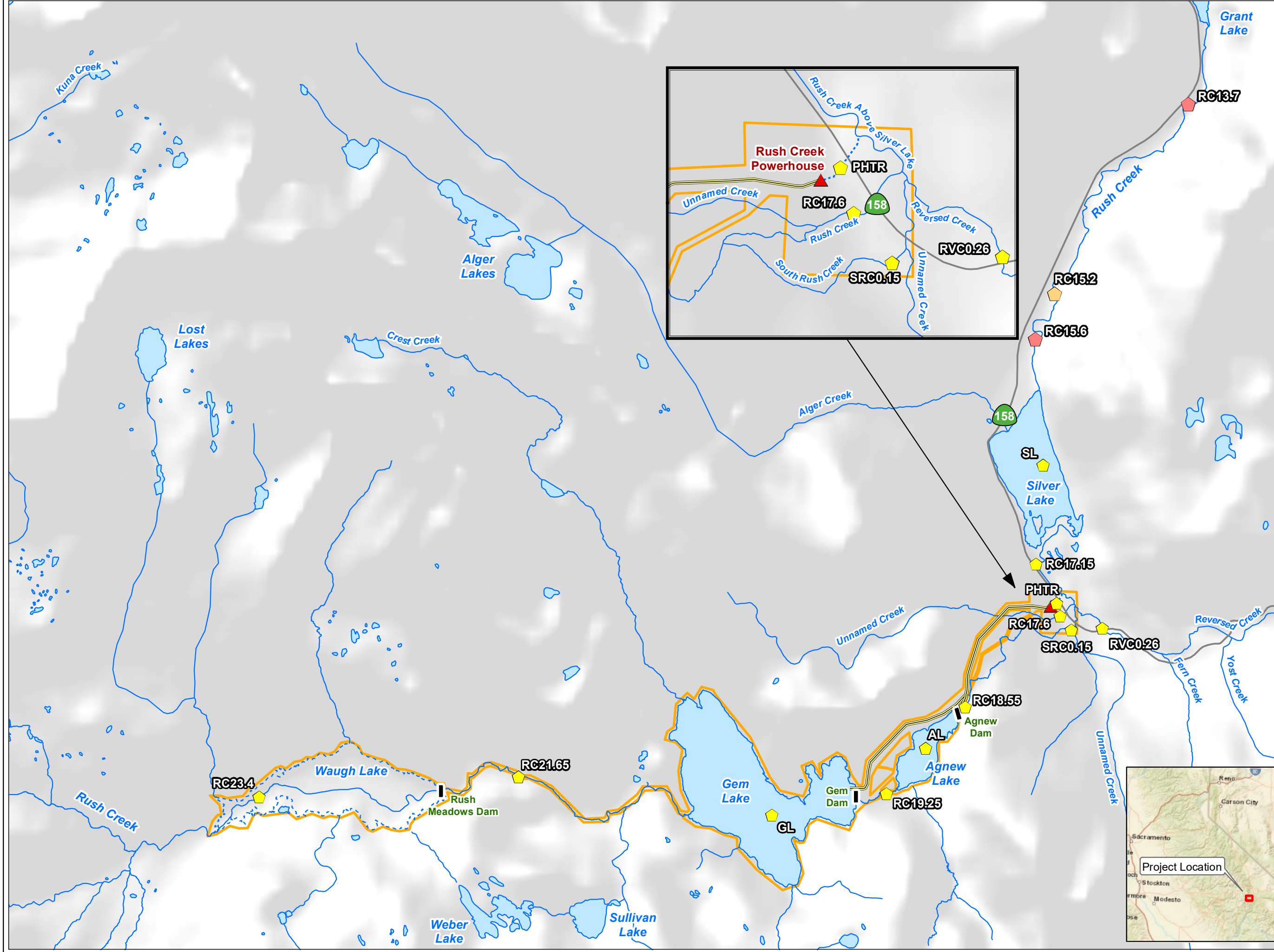


Figure AQ 3-9. Observed Water Temperature at Rush Creek below Silver Lake versus Modeled Water Temperature.

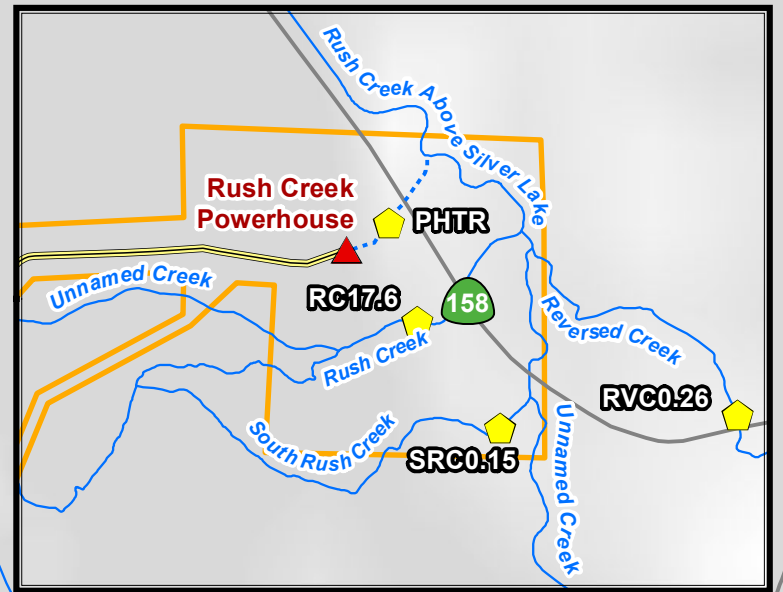
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MAPS

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- SCE Facilities**
- Dam
 - ▲ Powerhouse
 - ▬ Flowline / Penstock
 - ⋯ Tailrace
- Other Features**
- Highway
 - River/Stream
 - ▭ Lake/Reservoir
 - ⋯ Dry Lake/Reservoir
 - ▭ FERC Boundary
- Sampling Locations**
- ◆ Water Temp
 - ◆ Water Quality
 - ◆ Water Temp, Water Quality






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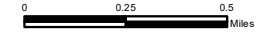
Rush Creek Project (FERC 1389)

Map AQ 3-1

Sampling Locations



Date: 2/6/2024



Projection: UTM Zone 11
Datum: NAD 83

Southern California Edison (SCE) has no reason to believe that there are any inaccuracies or defects with information incorporated in this work and make no representations of any kind, including, but not limited to, the warranties of merchantability or fitness for a particular use, nor are any such warranties to be implied, with respect to the information or data, furnished herein. No part of this map may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording system, except as expressly permitted in writing by SCE.

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APPENDIX A

Stream Water Temperature Figures and Summary Tables

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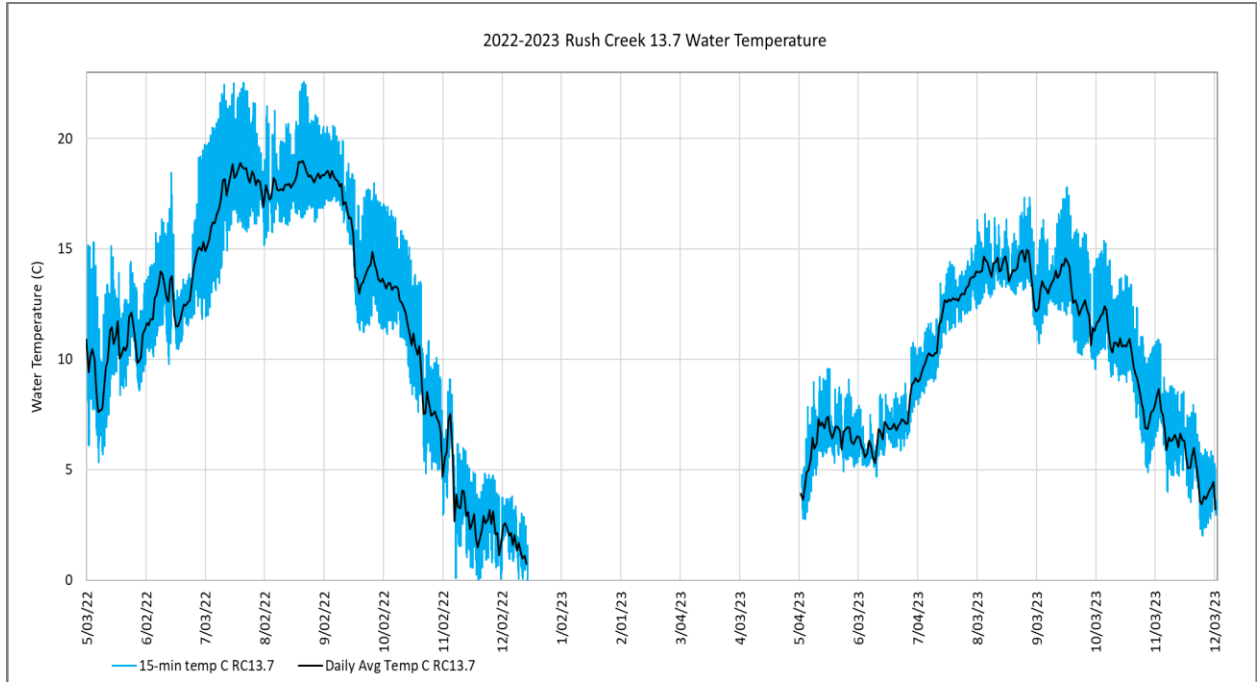


Figure AQ 3 A-1. Rush Creek RM13.7 Water Temperature Data

Table AQ 3 A-1. Rush Creek RC13.7 Water Temperature Data

Month	2022			2023		
	Average (°C)	Minimum 15-min (°C)	Maximum 15-min (°C)	Average (°C)	Minimum 15-min (°C)	Maximum 15-min (°C)
May	10.2	5.3	15.3	6.3	2.8	9.6
June	12.8	9.5	19.2	6.6	4.7	10.6
July	17.4	11.8	22.5	11.3	7.6	15.0
August	18.0	15.2	22.6	14.3	12.3	17.3
September	16.0	11.2	20.6	13.1	10.2	17.8
October	10.9	4.8	17.0	10.2	4.9	15.4
November	3.6	0.0	9.1	6.0	2.0	10.9
December	1.7	0.0	3.8	4.1	2.8	5.8

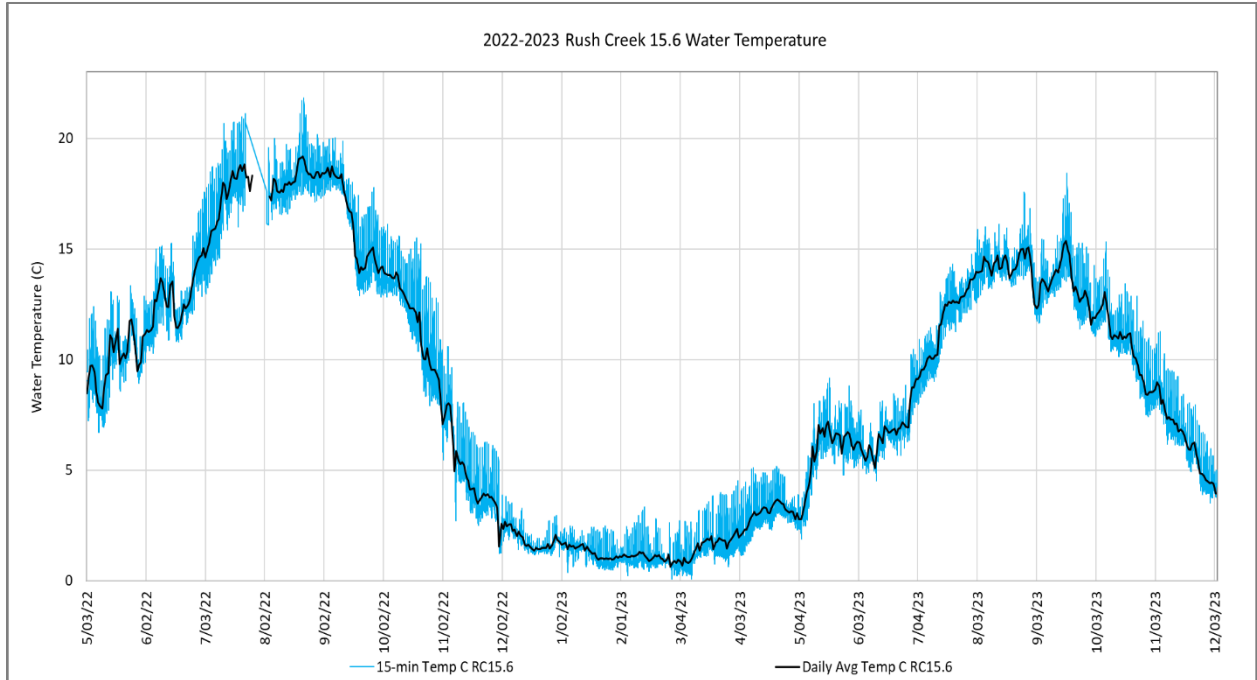


Figure AQ 3 A-2. Rush Creek RM15.6 Water Temperature Data

Table AQ 3 A-2. Rush Creek RM15.6 Water Temperature Data

Month	2022			2023		
	Average (°C)	Minimum 15-min (°C)	Maximum 15-min (°C)	Average (°C)	Minimum 15-min (°C)	Daily Max (°C)
January	--	--	--	1.3	0.4	2.5
February	--	--	--	1.1	0.1	3.3
March	--	--	--	1.4	0.1	4.1
April	--	--	--	3.0	1.1	5.2
May	9.9	6.7	13.3	5.5	1.9	9.2
June	12.6	9.8	16.8	6.4	4.5	10.2
July	16.9	12.8	21.1	11.2	7.5	14.7
August	18.2	16.1	21.8	14.3	12.6	17.6
September	16.4	12.9	20.0	13.5	11.4	18.4
October	12.1	7.9	16.1	10.9	7.4	15.3
November	5.0	2.4	10.6	6.8	3.9	11.2
December	1.9	1.1	3.9	4.3	3.5	6.0

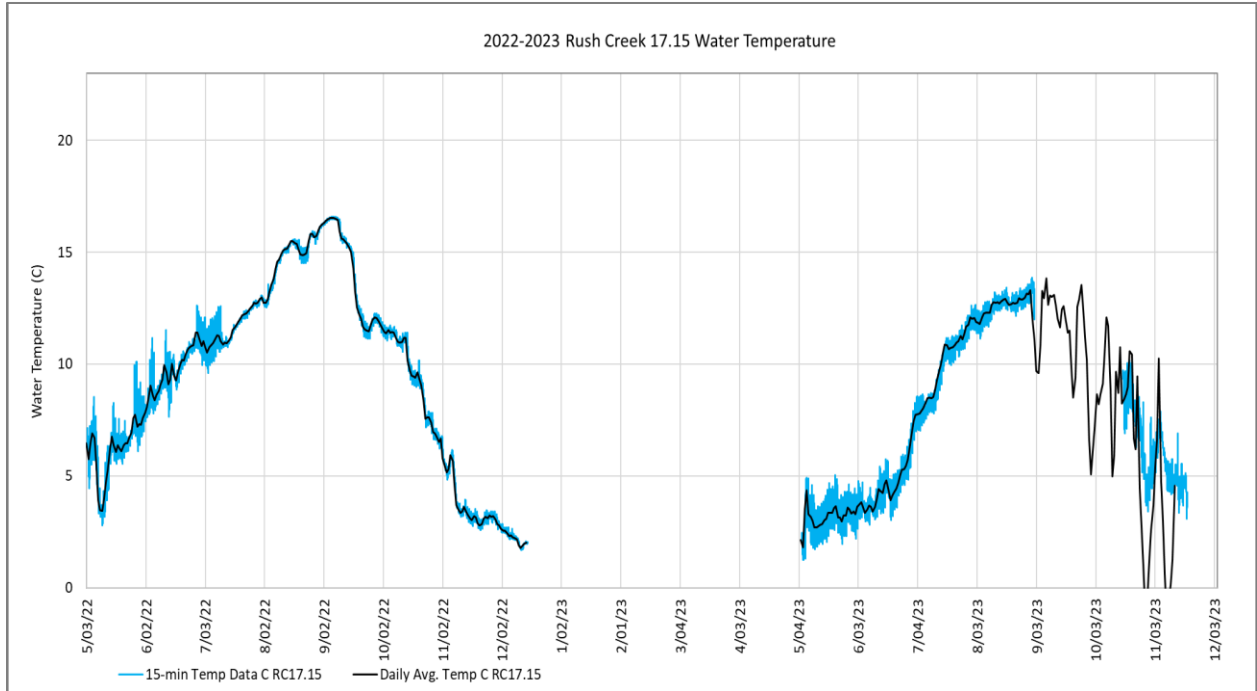


Figure AQ 3 A-3. Rush Creek RM17.15 Water Temperature Data

Table AQ 3 A-3. Rush Creek RM17.15 Water Temperature Data

Month	2022			2023		
	Average (°C)	Minimum 15-min (°C)	Maximum 15-min (°C)	Average (°C)	Minimum 15-min (°C)	Daily Max (°C)
May	6.1	2.8	10.1	3.1	1.3	5.0
June	9.6	7.0	12.6	4.3	2.2	7.4
July	11.6	9.6	13.1	9.6	6.0	12.6
August	14.8	12.5	16.3	12.6	11.1	13.9
September	14.2	11.1	16.6	13.3	12.0	13.7
October	9.7	6.2	12.1	7.3	3.4	10.2
November	3.8	2.6	6.8	5.4	3.1	7.9
December	2.3	1.7	2.9	--	--	0.0

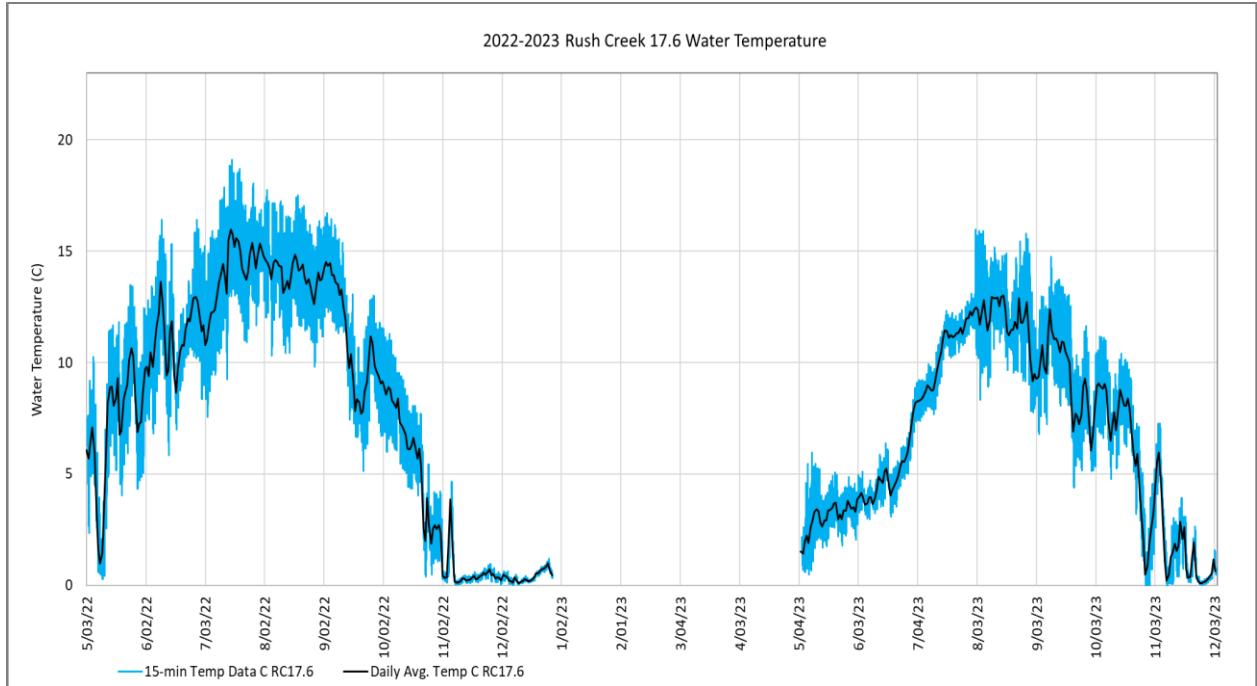


Figure AQ 3 A-4. Rush Creek RM17.6 Water Temperature Data

Table AQ 3 A-4. Rush Creek RM17.6 Water Temperature Data

Month	2022			2023		
	Average (°C)	Minimum 15-min (°C)	Maximum 15-min (°C)	Average (°C)	Minimum 15-min (°C)	Maximum 15-min (°C)
May	6.1	2.8	10.1	3.1	1.3	5.0
June	9.6	7.0	12.6	4.3	2.2	7.4
July	11.6	9.6	13.1	9.6	6.0	12.6
August	14.8	12.5	16.3	12.6	11.1	13.9
September	14.2	11.1	16.6	13.3	12.0	13.7
October	9.7	6.2	12.1	7.3	3.4	10.2
November	3.8	2.6	6.8	5.4	3.1	7.9
December	2.3	1.7	2.9	--	--	--

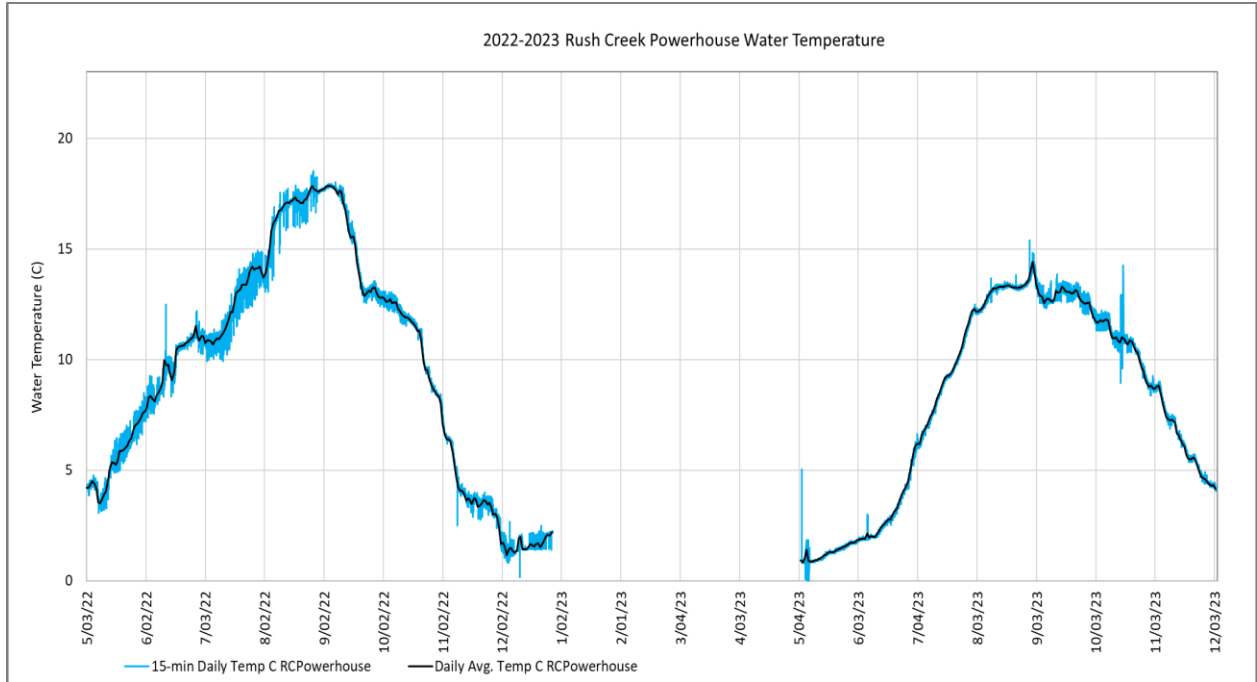


Figure AQ 3 A-5. Rush Creek Powerhouse Tailrace Water Temperature Data

Table AQ 3 A-5. Rush Creek Powerhouse Tailrace Water Temperature Data

Month	2022			2023		
	Average (°C)	Minimum 15-min (°C)	Maximum 15-min (°C)	Average (°C)	Minimum 15-min (°C)	Maximum 15-min (°C)
May	5.3	3.1	8.1	1.2	-0.5	5.0
June	9.6	7.2	12.5	2.7	1.6	5.5
July	12.3	10.0	14.9	8.5	5.2	12.2
August	16.6	13.1	18.5	13.0	12.0	15.4
September	15.5	12.4	18.0	13.0	12.0	14.8
October	11.2	8.2	13.1	10.8	8.4	14.3
November	4.4	2.4	8.4	6.6	4.4	9.3
December	1.6	0.2	2.9	4.3	4.1	4.5

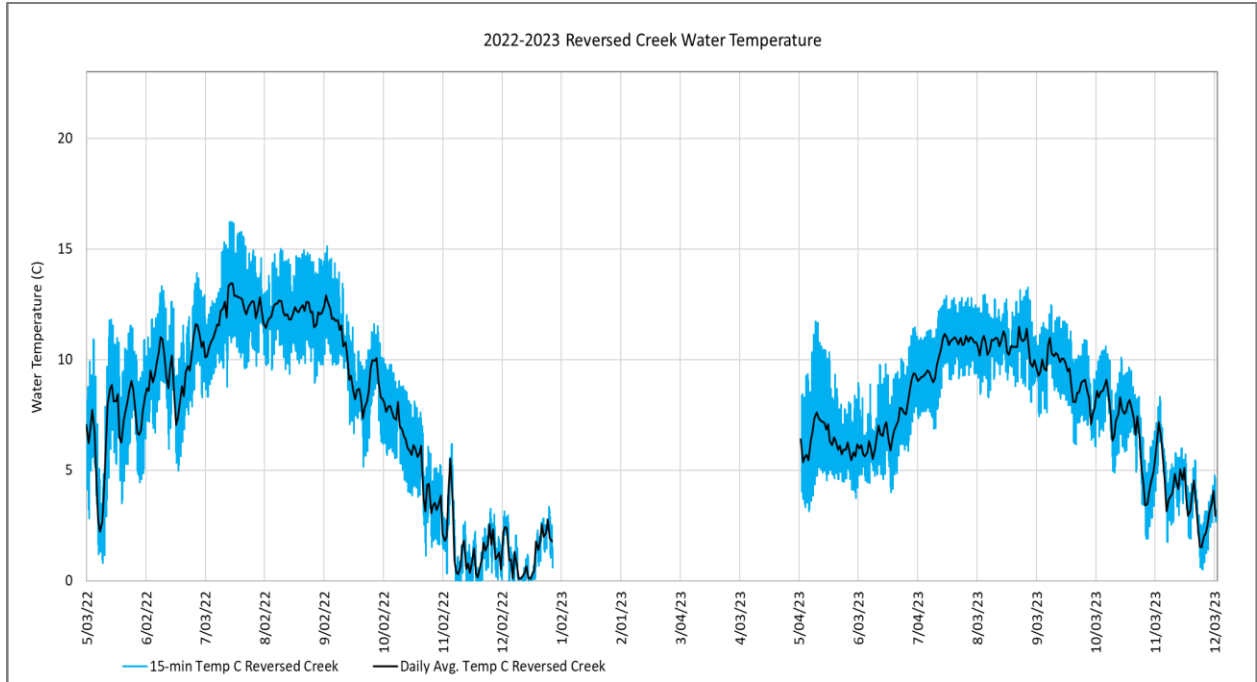


Figure AQ 3 A-6. Reversed Creek RVC0.26 Water Temperature Data

Table AQ 3 A-6. Reversed Creek RVC0.26 Water Temperature Data

Month	2022			2023		
	Average (°C)	Minimum 15-min (°C)	Maximum 15-min (°C)	Average (°C)	Minimum 15-min (°C)	Maximum 15-min (°C)
May	6.8	0.8	11.8	6.4	3.1	11.7
June	9.4	4.9	13.9	6.6	3.7	11.1
July	12.0	8.3	16.2	10.1	6.9	12.9
August	12.1	8.9	15.0	10.7	8.1	13.3
September	10.2	5.2	15.1	9.5	6.2	12.5
October	5.9	1.1	10.1	7.1	1.9	10.6
November	1.6	0.0	6.2	4.0	0.5	8.3
December	1.2	0.0	3.3	3.5	2.4	4.8

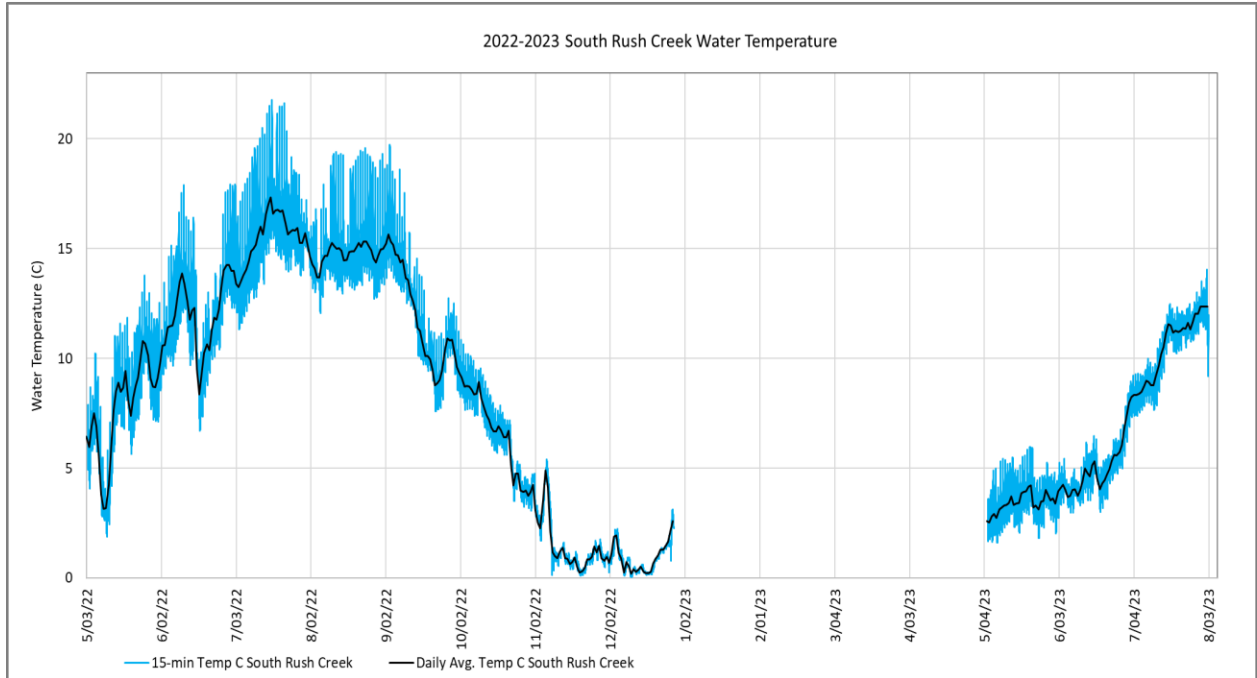


Figure AQ 3 A-7. South Rush Creek SRC0.15 Water Temperature Data

Table AQ 3 A-7. South Rush Creek SRC0.15 Water Temperature Data

Month	2022			2023		
	Average (°C)	Minimum 15-min (°C)	Maximum 15-min (°C)	Average (°C)	Minimum 15-min (°C)	Maximum 15-min (°C)
May	7.6	1.9	13.8	3.4	1.6	6.0
June	11.7	6.7	17.9	4.6	2.0	7.8
July	15.4	11.3	21.8	10.1	6.2	13.5
August	14.8	12.1	19.6	12.0	9.2	14.0
September	12.1	7.6	19.7	--	--	--
October	6.8	3.1	11.2	--	--	--
November	1.6	0.1	5.4	--	--	--
December	0.9	0.1	3.1	--	--	--

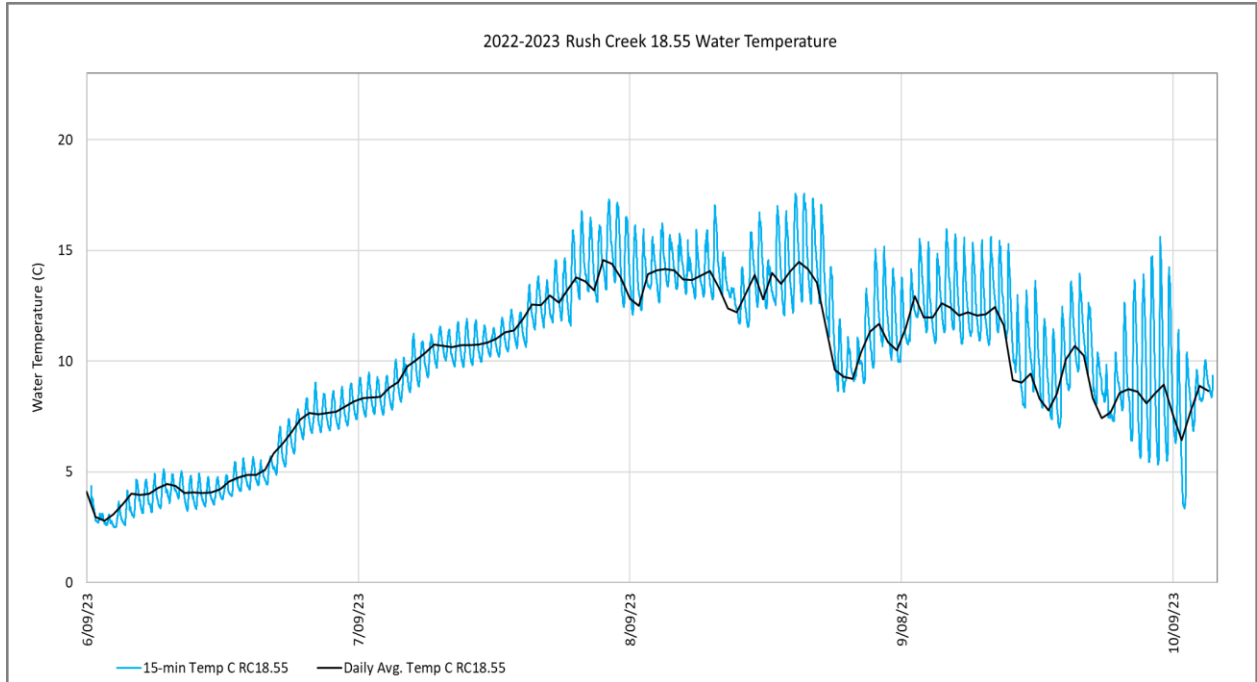


Figure AQ 3 A-8. Rush Creek RM18.55 Water Temperature Data

Table AQ 3 A-8. Rush Creek RM18.55 Water Temperature Data

Month	2023		
	Average (°C)	Minimum 15-min (°C)	Maximum 15-min (°C)
May	--	--	--
June	4.1	2.5	7.0
July	9.6	5.2	14.6
August	14.1	10.6	17.6
September	11.4	7.0	16.0
October	--	--	--
November	--	--	--
December	--	--	--

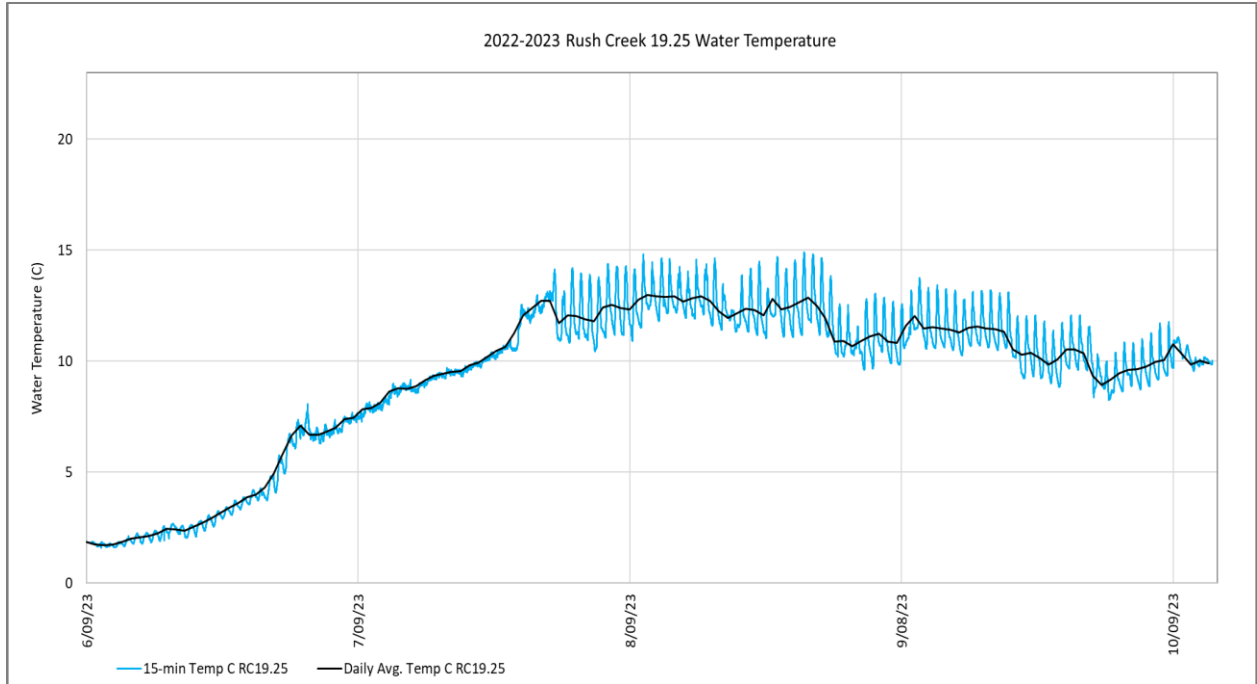


Figure AQ 3 A-9. Rush Creek RM19.25 Water Temperature Data

Table AQ 3 A-9. Rush Creek RM19.25 Water Temperature Data

Month	2023		
	Average (°C)	Minimum 15-min (°C)	Maximum 15-min (°C)
May	--	--	--
June	2.7	1.6	5.8
July	9.0	4.9	14.1
August	12.4	10.4	14.9
September	10.9	8.4	13.7
October	--	--	--
November	--	--	--
December	--	--	--

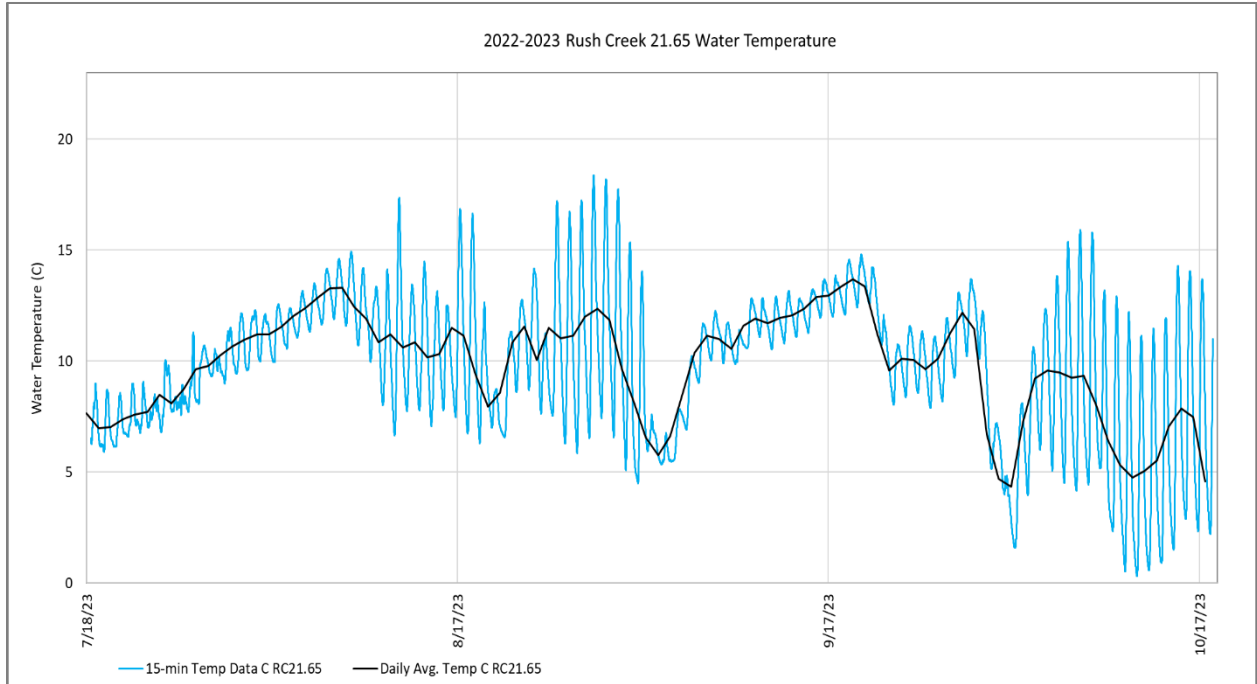


Figure AQ 3 A-10. Rush Creek RM21.65 Water Temperature Data

Table AQ 3 A-10. Rush Creek RM21.65 Water Temperature Data

Month	2023		
	Average (°C)	Minimum 15-min (°C)	Maximum 15-min (°C)
May	--	--	--
June	8.7	5.9	12.3
July	11.2	5.1	18.4
August	10.6	4.5	14.8
September	7.7	1.6	15.9
October	--	--	--
November	--	--	--
December	--	--	--

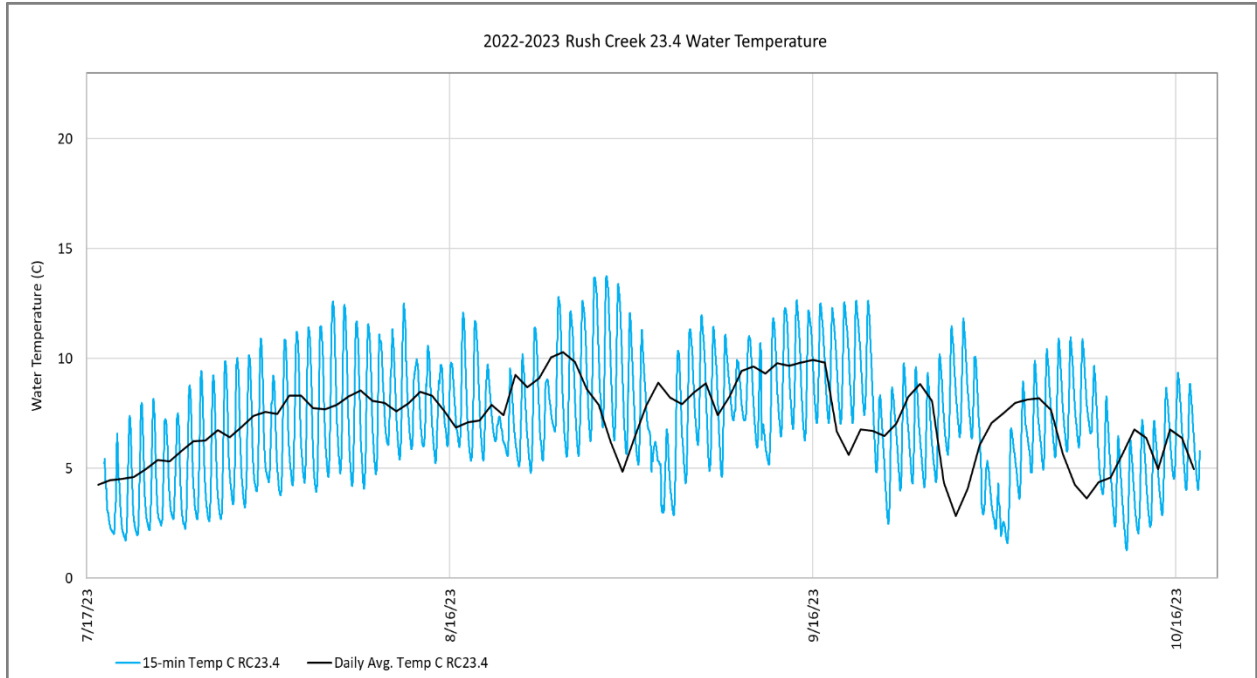


Figure AQ 3 A-11. Rush Creek RM23.4 Water Temperature Data

Table AQ 3 A-11. Rush Creek RM23.4 Water Temperature Data

Month	2023		
	Average (°C)	Minimum 15-min (°C)	Maximum 15-min (°C)
May	--	--	--
June	5.0	1.7	10.9
July	8.1	3.8	13.7
August	7.9	2.5	12.7
September	5.9	1.3	11.0
October	--	--	--
November	--	--	--

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