2023 Racetrack Creek Surface Water Monitoring Report

NRDP Contract 90022-TO 6

Prepared by the Clark Fork Coalition

Abstract

The purpose of this report is to present the results of seasonal instream flow monitoring associated with the Racetrack Lake water rights acquisition under the Water Management Plan. The Racetrack Lake water right allows for the release of 433 acre feet (AF) of storage or up to 8.33 cubic feet per second (CFS) during July and August. Racetrack Creek is identified as a Priority 1 watershed under Natural Resource Damage Program's (NRDP) Upper Clark Fork Basin Aquatic and Terrestrial Restoration Plans (2019) (Restoration Plans). The goal of this effort is to work with the Racetrack Water Commissioner and water users under this plan to maintain stream gaging structures, calibrate rating tables for these structures and conduct flow measurements to ensure the instream benefits are being maintained through the entire protected reach. This monitoring effort partially implements aquatic flow projects (Group 1 projects) described in section 3.2.1 of the Restoration Plans.

Introduction

In accordance NRDP Contract 90022-TO 6, for the 2023 field season the Clark Fork Coalition (CFC) managed 5 continuous flow and temperature monitoring sites on Racetrack Creek described in Table 1, which were selected by KF2 Consulting (objector's expert under the Water Management Plan). Racetrack Lake is located in the Flint Creek Range about 18 miles southwest of the city of Deer Lodge, MT at an elevation of 7,700 feet and impounds a total of 650 Acre Feet of storage. The Clark Fork Coalition acquired 2/3 of the total storage volume or 433.33 AF from this reservoir in 2011 through funding from the NRDP and Columbia Basin Water Transactions Program. After 10 years of working through the Department of Natural Resources and Conservation (DNRC) change of use process and water user objections, the CFC received a final change of use authorization in 2022 that allows us to protect our portion of Racetrack Lake storage instream. This change of use authorization references a Water Management Plan negotiated between the CFC and the majority of the Racetrack water users. Under this Water Management Plan a Streamflow Monitoring Plan was developed by KF2 Consulting with input by the CFC, water users, and the water commissioner. In order to meet the measurement terms under this plan, the CFC installed 5 stream gaging structures described in table 1 and depicted in figure 1 for the purpose of establishing rating curves from staff gages and stage height loggers that were utilized at these sites.

Site #	Water Source	Location	Rate	Measurement Type(s)
1	Racetrack Lake	Dam Outlet	Continuous	Telemetry utilizing a stage height logger, manual discharge measurements, parshall flume readings
2	Racetrack Creek	At Cement Ditch	Continuous	Staff gage, water level logger, manual discharge measurements, flume
3	Racetrack Creek	Above Berg Diversion	Continuous	Staff gage, water level logger, manual discharge measurements
4	Racetrack Creek	Above Branch Ditch	Continuous	Staff gage, water level logger, manual discharge measurements
5	Racetrack Creek	Frontage Road	Continuous	Staff gage, water level logger, manual discharge measurements

Table 1- Locations of primary monitoring sites managed by the CFC in the upper Clark Fork Basin.

The individual monitoring sites are identified in the map (Figure 1). At each CFC monitoring site, a continuous data logger (HOBO U20L-04) recorded both stream stage and water temperature data 60 minute intervals. The primary purpose of these data collection efforts was to quantify the magnitude and timing of water conditions in Racetrack Creek during the Racetrack Lake release (August 1st-August 27th). Water temperature data was also collected to determine if water temperatures exceeded threshold levels considered sustainable for salmonids.

This report provides a narrative of streamflow and water temperature conditions observed at each of monitoring sites funded by the NRDP.

Methods

At each of the continuously monitored locations, streamflow and water temperature were manually measured every 1-4 weeks between July and August by CFC staff. These measurements were used to develop rating curves for continuous hydrographs. Individual flow measurements were tabulated using a Hach digital flow meter following standards established by the USGS (http://pubs.usgs.gov/wsp/wsp2175/) and from Parshall and Ramp flumes. To assure data reliability, the flow meters were calibrated biweekly throughout the field season and flumes were checked for annually against manual discharge measurements. In accordance with the USGS measurement protocols, no individual velocity measurements in a stream cross section represented more than 10% of the total observed flow.

Stream stage and water temperature data were collected using data loggers that recorded data at 60 minute intervals. HOBO data loggers were used at all sites during the 2023 field season with the exception of the Racetrack Lake Outlet, which utilized a McCrometer/Automata telemetry station.

Stream stage data from the HOBO's loggers were correlated to flow by developing a stage-discharge rating curve for each site. The rating curves were produced by plotting the flow measurement data against the stage data and calculating a power function from the plotted data. Using the equation from

the rating curves, river flow data was extrapolated to develop a continuous hydrograph for each site. Although the locations of monitoring sites typically remain the same from season to season, small changes to a stream's cross sectional geometry (caused by natural morphological processes) may significantly impact the accuracy of previous years rating curves. Because of this, new rating curves were generated at all of the sites for the 2023 data.

The hydrographs and thermographs contained in appendix A were constructed from the extrapolated flow data and water temperature recordings from the data loggers. Streamflow data represents daily averages; maximum daily water temperature represents the highest individual daily reading. Meteorological data was retrieved from the US Bureau of Reclamation's AgriMet database (https://www.usbr.gov/main/agrihydro.html).

Results

Streamflow and water temperature graphs for the 2023 monitoring season are provided in Appendix A, Figures 1-7.

Analysis & Conclusions

During the 2023 field season, Racetrack Creek followed a flow pattern that was similar to other area streams. After a typical snowmelt driven runoff, natural flows on Racetrack Creek began a recession toward irrigation influenced baseflow levels in early July.

Releases from Racetrack Lake started on August 1st and extended until August 27th. The CFC telemetry station at the outlet of the dam was activated on July 16th to track outflows from the reservoir, which averaged 12.98 CFS during the course of the release with 8.33 CFS allocated for instream flow. According to the Water Commissioner Record, there was 32" overflow, 450" for the creek and 45" shrink for total release rate of 527" or 13.18 CFS. The Water Commissioner made 9 trips to the reservoir (every 3 days on average) to perform adjustments to the outflow.

Flows just below the Cement Ditch POD averaged 7.67 cfs during the release and fell to ~0 CFS within 2 days of the end of the release, remaining depressed until fall precipitation augmented flows on Racetrack Creek. Flows at all sites increased during and after rain events throughout the release. The two highest precipitation days delivered approximately 0.4 and 0.21 inches of rain in Deer Lodge on August 6th and 22nd respectively. Flows were also monitored Above Berg Diversion, Above Branch Diversion and at the Frontage Road to meet measurement conditions of the DNRC and the Water Management Plan with the Racetrack Water Users.

Water temperatures remained low at the Frontage Road site (12-18 degrees C) during the release, while water temperatures at our station in the Clark Fork River just downstream of the Racetrack Creek confluence (Huey Long) averaged 16 to 24 degrees C during the release, which speaks to the high quality of the Racetrack Creek instream flow entering the Clark Fork River.

Appendix A

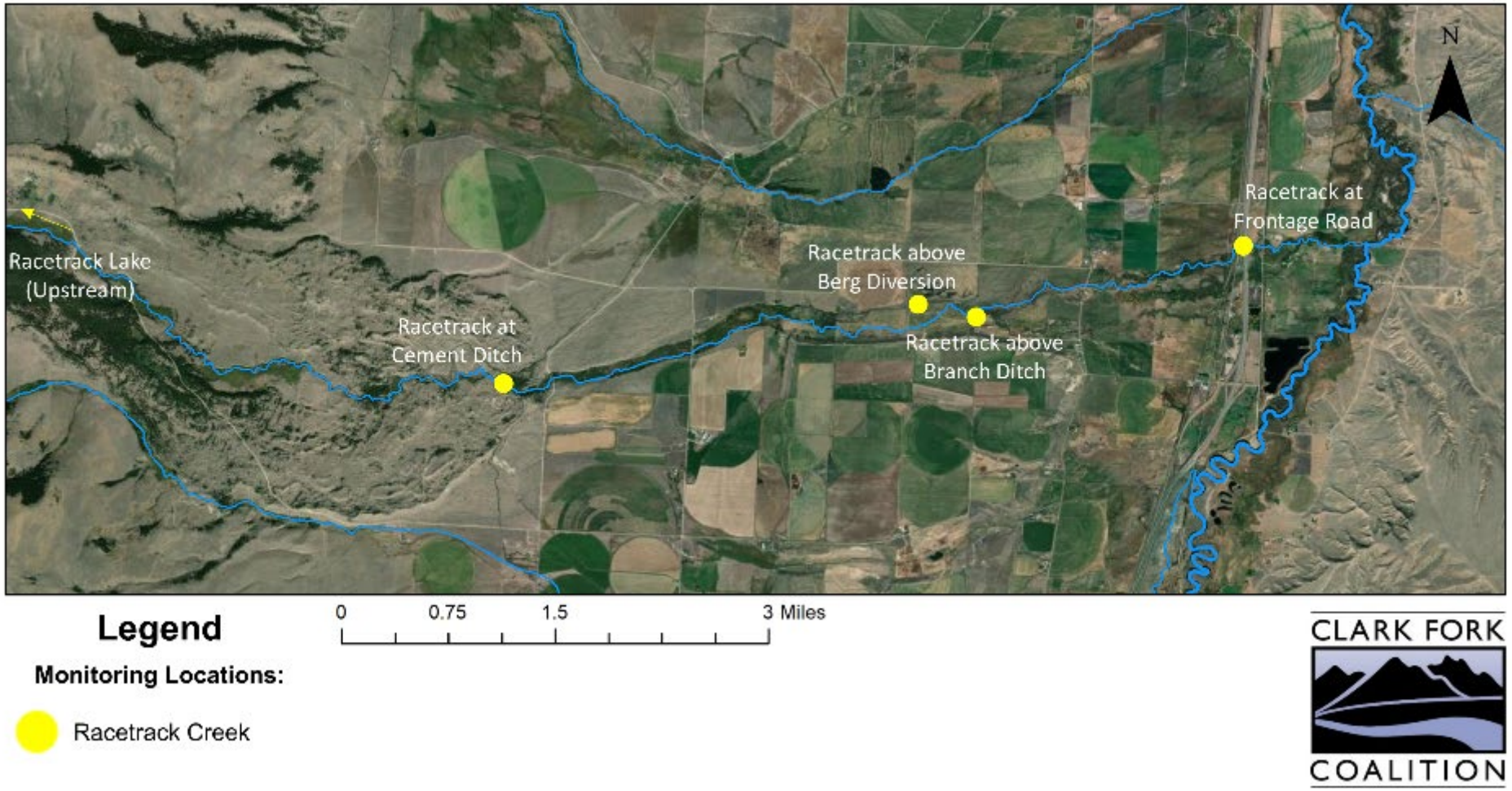

Figure 1: Map of 2023 monitoring locations

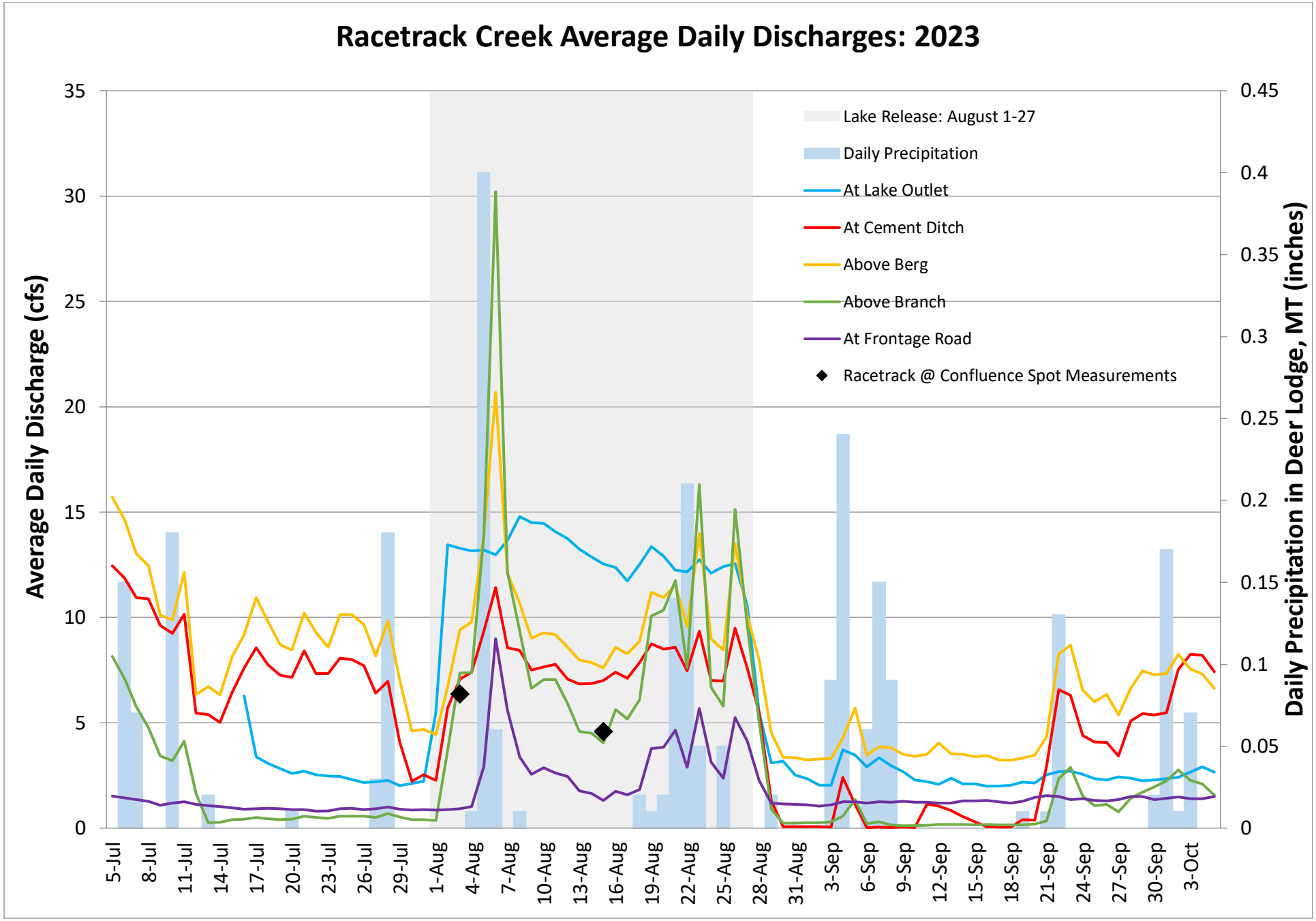

Figure 2: Racetrack Creek average daily hydrographs for the 2023 irrigation season.

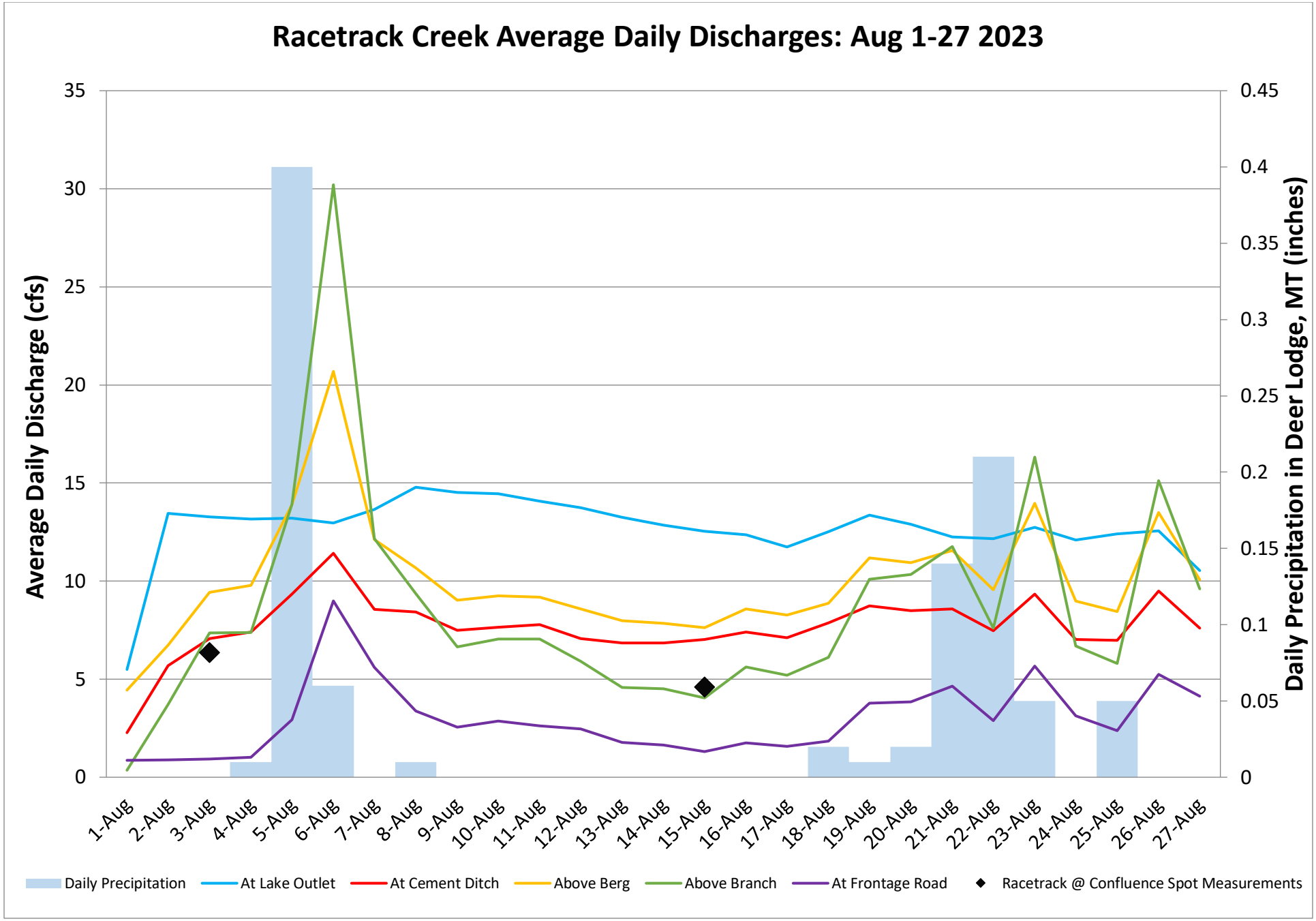

Figure 3: Racetrack Creek average daily hydrographs during the Racetrack Lake release from Aug 1-August 27.

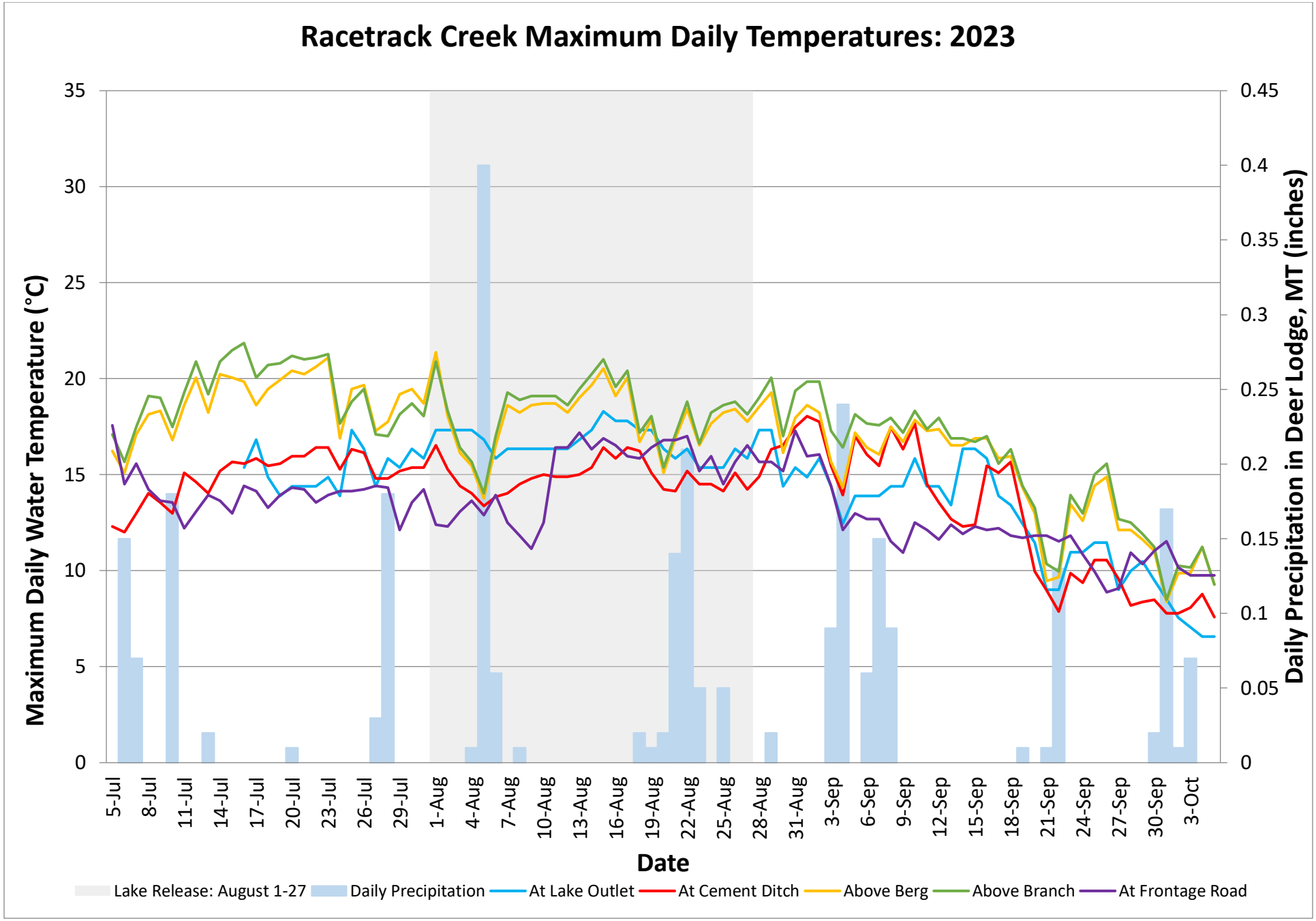

Figure 4: Racetrack Creek maximum daily thermographs for the 2023 irrigation season.

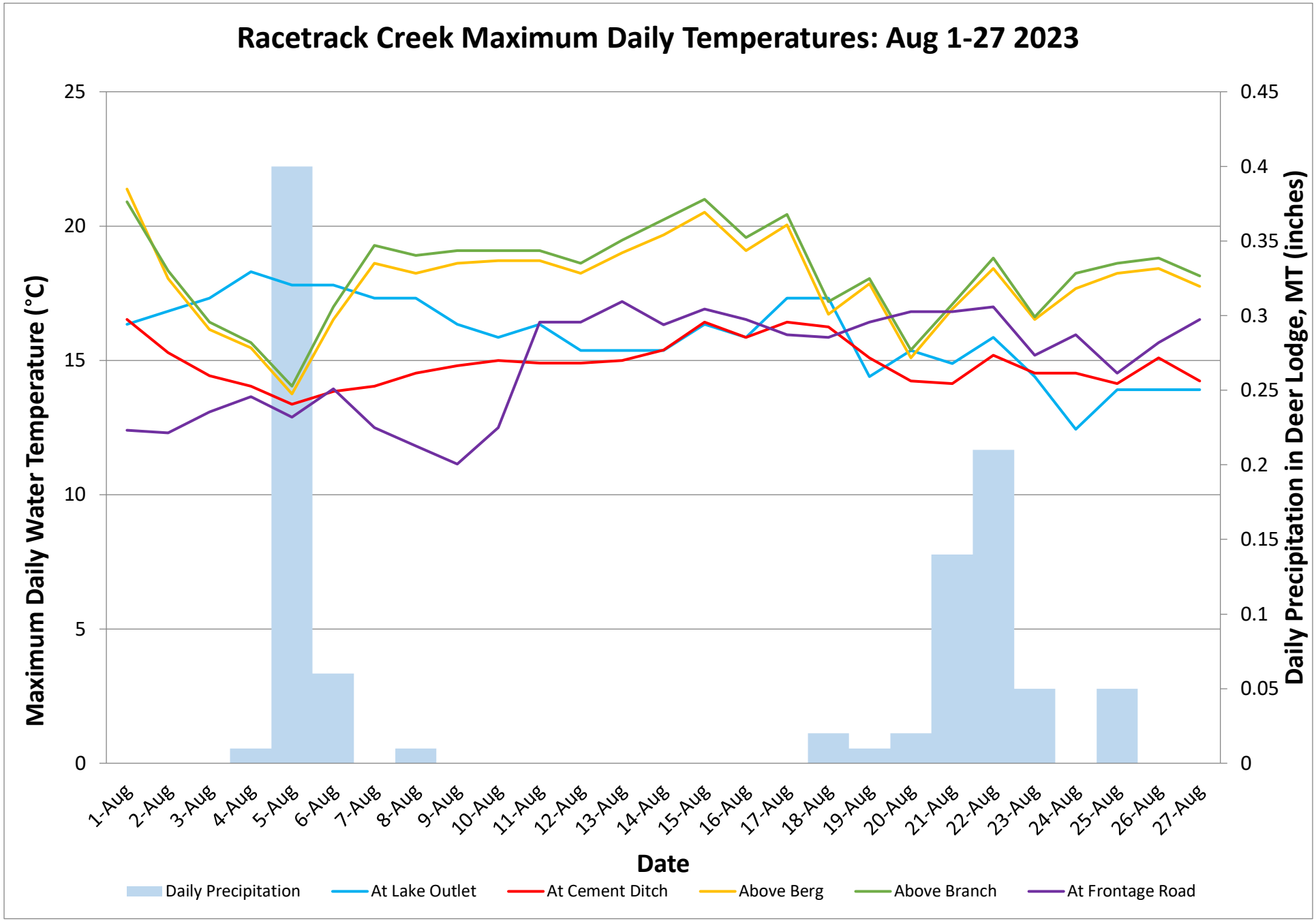

Figure 5: Racetrack Creek maximum daily thermographs during the Racetrack Lake release from August 1-27.

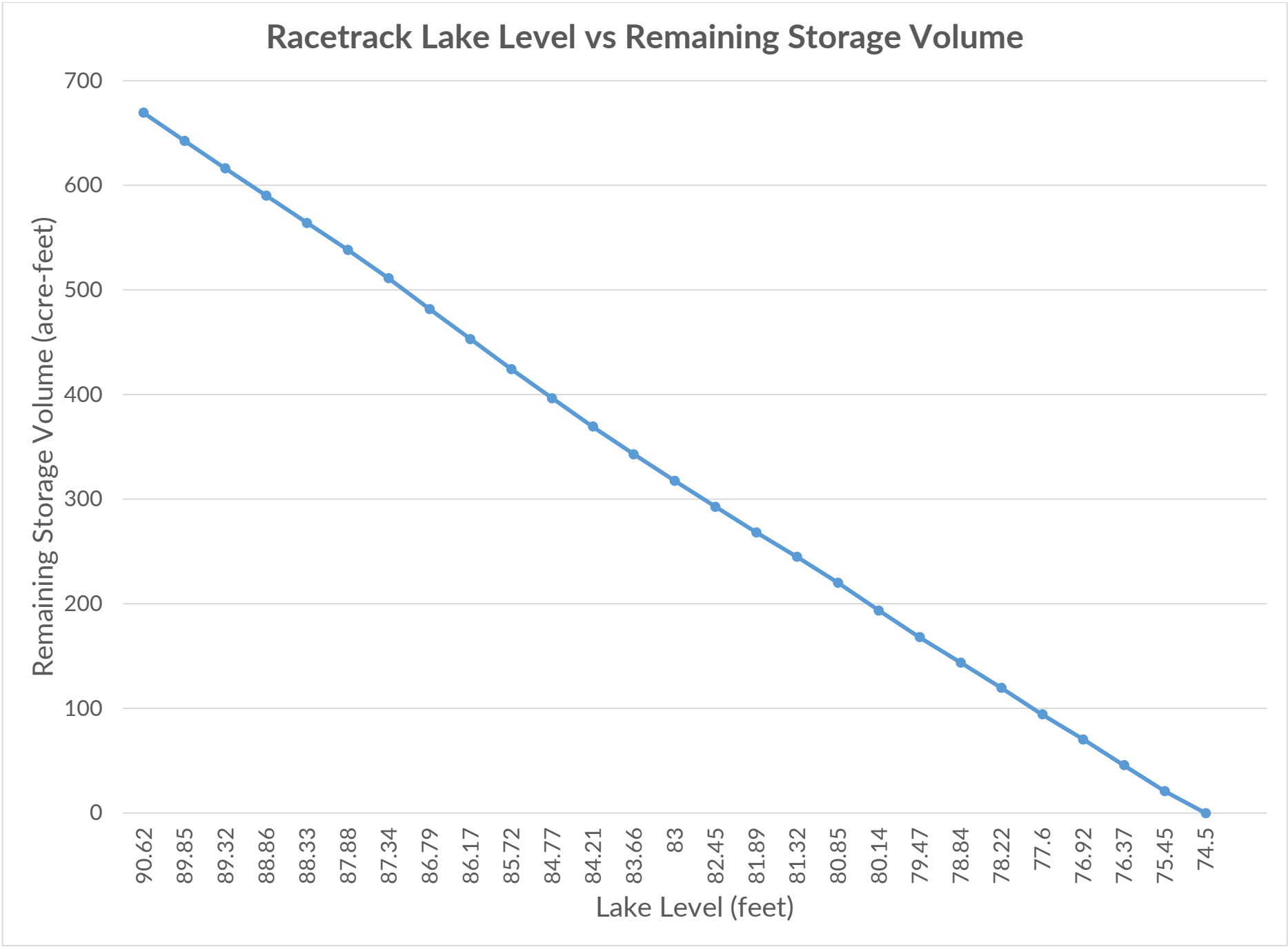

Figure 6: Racetrack Lake level (feet) vs remaining storage volume (acre-feet).

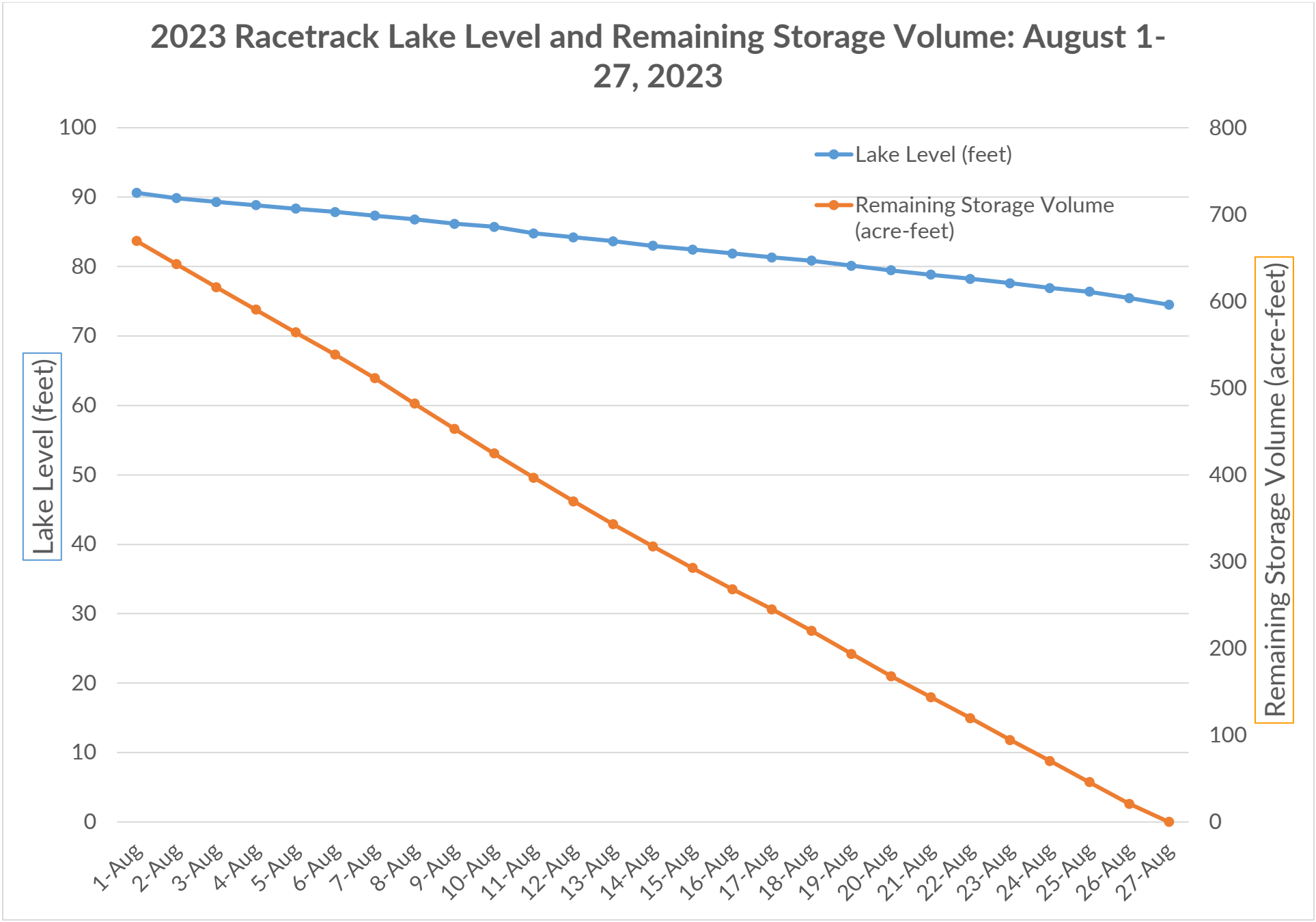

Figure 7: Racetrack Lake level (feet) and remaining storage volume (acre-feet) over the 2023 Racetrack Lake release time period (August 1-27).