

## MEMORANDUM

**TO:** Wild and Scenic Stakeholder Group Monitoring Committee

**FROM:** Bill Hoblitzell, Lotic Hydrological

**DATE:** February 12, 2021

**SUBJECT:** Temperature monitoring data review for 2020 field season

### 1 Season Summary

Lotic Hydrological performed analysis and graphical visualizations for stream temperature monitoring sites associated with BLM-defined Wild and Scenic Management Plan segments 4-7 of the Upper Colorado River. The Wild and Scenic (W&S) Stakeholder Group (SG) monitors various Outstandingly Remarkable Values (ORVs) described in the management plan. Water temperature is an ORV Resource Guide that contributes to the group’s understanding of whether ongoing management frameworks continue to support values and goals tied to recreational fishing and water quality in segments 4-7.

The lower reaches of the Upper Colorado (segments 6 and 7) experienced water temperature conditions that exceeded the state’s chronic water temperature standard for a period beginning in mid-July and ending in early August. This analysis did not perform a regulatory-level assessment using the state’s additional criteria for warming events or other climatic and hydrologic excursions. That assessment level may result in exceedances being disqualified or excused. Accordingly, these results should not be understood as equivalent to a legal standards analysis. Much of this technical memorandum adopts information formatting and language used previously for the SG’s annual monitoring reports in 2018 and 2019.

ORV Resource Guide	Measure/Metric	2020 Status
Water Temperature	Daily Maximum (DM)	No exceedances observed
	Maximum Weekly Average Temperature (MWAT)	<p>Exceedances of the standards are present in the lower portion of the region and on the lower Blue River.</p> <p>Exceedances are <i>likely</i> to meet the regulatory chronic temperature threshold for impairment at No Name even if additional assessment criteria are applied.</p> <p>Exceedances may <i>possibly</i> meet the regulatory threshold at Red Dirt Creek and Dotsero if additional assessment criteria are applied.</p> <p>Blue River shoulder season exceedance appear driven by reservoir flow regulation</p>

Table 1. Resource guide summary for 2020 season.

## 2 Background

### *Stream Temperature Regulatory Framework*

The provisional W&S Resource Guide for water temperature is based on the Colorado Water Quality Control Division's (the Division) standard for segment COUCUC03 covering the Colorado River from the outlet of Lake Granby to the confluence with the Roaring Fork, set biannually in Regulations 31 and 33.<sup>1</sup> The temperature standards framework classification for the segment is Cold Stream Tier 2, with an additional site specific standard providing shoulder season criteria due to the probable presence of Mountain Whitefish spawning and early life stages. Regulations 31 and 33 provide both numeric and narrative guidance, stating that "temperature shall maintain a normal pattern of diurnal and seasonal fluctuations with no abrupt changes and shall have no increase in temperature of a magnitude, rate, and duration deemed deleterious the resident aquatic life."

Table 2 shows the current numeric temperature standards for segment COUCUC03. One site in this review, BL-abvCOR *Blue River above Colorado River Confluence*, is in the CS-1 standards tier. Attainment of chronic temperature standards is based on the maximum of the Weekly Average Temperatures (MWAT), which is defined by taking the maximum of a seven-day moving average of observations. Attainment of the acute temperature standard is based on a Daily Maximum (DM), which is defined as the highest two-hour average water temperature in each 24-hour period. Temperature data are evaluated against numerical standards for chronic (MWAT) and acute (DM) seasonal maxima

Standards Tier	Applicable Months	MWAT (Celsius)	DM (Celsius)
Cold Stream Tier II, CS-2	Jun 1 – Sep 30	18.3	23.9
	Nov 1 – Mar 31	9.0	13.0
	Apr 1 – May 31 & Oct 1 – Oct 31	16.9	21.2
Cold Stream Tier 1, CS-1 (applies to BL-abvCOR site only)	Jun 1 - Sept	17.0	21.7
	Oct – May	9	13

*Table 2. Temperature standards for Colorado River segment COUCUC03, covering the Wild and Scenic management reaches.*

In 2020, the Monitoring Committee compiled water temperature data throughout segments 4-7 from three SG sponsored sites, three USGS sites, and a BLM monitoring site at the mouth of the Blue River. USGS data is hosted in the NWIS system and available via a web service API. W&S and BLM data is hosted in the Colorado Data Sharing Network Ambient Water Quality Monitoring System (CDSN AWQMS) database, also available via a webservice API.

Site ID	Description	Segment	Latitude	Longitude	Operator
09058000	COLORADO RIVER NEAR KREMMLING, CO	4	40.0366	-106.4400	USGS
09060799	COLORADO RIVER AT CATAMOUNT BRIDGE, CO	6	39.8911	-106.8317	USGS
UPCO-SB	Upper Colorado River upstream of State Bridge	6	39.8555	-106.6445	WSSG
UPCO-DOT	Upper Colorado River upstream of Dotsero	6	39.6479	-107.0629	WSSG
UPCO-RD	Upper Colorado River downstream of Red Dirt Creek	6	39.8005	-106.9740	WSSG
09071750	COLORADO RIVER ABOVE GLENWOOD SPRINGS, CO	7	39.5588	-107.2909	USGS
BL-abvCOR	Blue River above Colorado Confluence	NA	40.0333	-106.3924	BLM

*Table 3. Monitoring site location information.*

<sup>1</sup> Colorado Department of Public Health and Environment, Water Quality Control Commission 5 CCR 1002-33

### *2020 Climate and Hydrologic Context*

Water temperature in the Upper Colorado River is strongly influenced by fluctuations in air temperature and streamflow. It is useful to place the seasonal water temperature monitoring within the context of weather and streamflow conditions experienced in the region during 2020. The mean Snow Water Equivalent (SWE) value for NRCS remote snowpack monitoring stations in Colorado Basin headwaters peaked at 17 inches in April 2020--approximately 107% of the 30 year median peak of 15.9 inches.<sup>2</sup> Summer followed with a relatively weak or absent monsoon season that brought very little rain and warm air temperatures. At the statewide level, the National Oceanic and Atmospheric Administration ranked 2020 as Colorado's second-driest and seventh-warmest year ever recorded.<sup>3</sup> Un-regulated tributary streams in the region experienced low flows early in the summer and temperature concerns persisted throughout the Colorado Headwaters region for summer and fall. The Colorado River peaked slightly earlier in the season than average during the first week of June at approximately 4,400 cfs. Flow receded to approximately 900 cfs by the second week of July before downstream water calls resulted in augmented flows that proceeded through August and early September.

## **3 2020 DATA REVIEW**

The 2020 temperature data displays the typical natural downstream warming trend between Kremmling and Glenwood Springs (Figures 1-3). During peak runoff periods, a smaller differential between the most-upstream and downstream sites is observable than later in the summer. The reach gains heat consistently during late summer and early fall periods between Gore Canyon and Red Dirt. The No Name site in Glenwood Canyon is often cooler than upstream sites during early season due to influences from the Eagle River and local tributaries below the Blue River during snowmelt runoff. Once peak flows have subsided and the Eagle and other tributaries provide less cooling influence, this reach (characterized by the monitoring site at No Name 09071750) often faces the most consistent late summer concerns.

No sites exceeded the DM temperature standards in 2020 (Figure 1). Three sites exceeded the MWAT summer temperature standards in 2020: Red Dirt (UPCO-RD), Dotsero (UPCO-DOT), and No Name (09071750) (Figure 2, Figure 3). Blue River above the Colorado River confluence (BL-abvCOR) exceeded the MWAT standard in the last two weeks of May prior to the seasonal standard shift. If the Division's criteria for warming events and other excursion criteria were to be applied, it is probable that the No Name site would still meet the benchmark for regulatory impairment designation. It is possible that the Red Dirt and Dotsero sites would as well.

Water temperature conditions are driven by multiple factors, with air temperature and flow conditions contributing strongly to daily and seasonal patterns. Although a finalized Water Year Summary data report was not yet available at the time of this memo for the USGS Kremmling gauge site (09058000), flow in the W&S segments probably qualifies under the W&S SG Management Plan criteria as a 'dry-typical' year resulting from a near-average snow year followed by the dry/warm summer. Temperature concerns existed for local fisheries on the lower Eagle and Upper Colorado during portions warm season, with the Eagle receiving voluntary closure requests from CPW on some afternoons in August. On the Colorado River, these concerns were more prevalent during the transitional period between the end of snowmelt

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<sup>2</sup>[https://www.nrcs.usda.gov/Internet/WCIS/AWS\\_PLOTS/basinCharts/POR/WTEQ/assocHUCco\\_8/colorado\\_headwaters.html](https://www.nrcs.usda.gov/Internet/WCIS/AWS_PLOTS/basinCharts/POR/WTEQ/assocHUCco_8/colorado_headwaters.html)

<sup>3</sup><https://www.ncdc.noaa.gov/cag/statewide/rankings/5/pcp/202012>

recession and initiation of downstream water calls at Cameo and/or Shoshone that increase flows in the W&S reach. The peak temperatures at all sites occurred in the period from the final week of July to the first week of August. This period also coincided with relatively sustained warm air temperatures, however the peak seasonal air temperatures in 2020 occurred later in mid-August (Figure 4).

### Lower Blue Exceedances

The Blue River had a notable period of standards exceedances in the last two weeks of May (Figure 3, top panel) prior to the shift to summer standards. Although this period is considered a shoulder season and might be excused under the state’s narrative guidance that allow for standards excursions if the natural progression of seasonal patterns is present, the late spring/early summer season temperature concerns in the lower Blue are more likely driven by flow management regimes from Green Mountain Reservoir rather than by naturally warm conditions. During this period, the runoff peak flow on the Blue River was strongly attenuated as both Dillon and Green Mountain Reservoirs fill. In 2020, a natural runoff ascension and recession pattern was practically absent except for a short spike around 6/1/2020, with reservoir operations holding the Blue River approximately at a low and steady 250 cfs until the last week of May (See individual site reports for thermograph/hydrograph comparisons). Operational schedules at Green Mountain are part of a complex coordination of diversion and reservoir infrastructure throughout the Upper Colorado River headwaters.

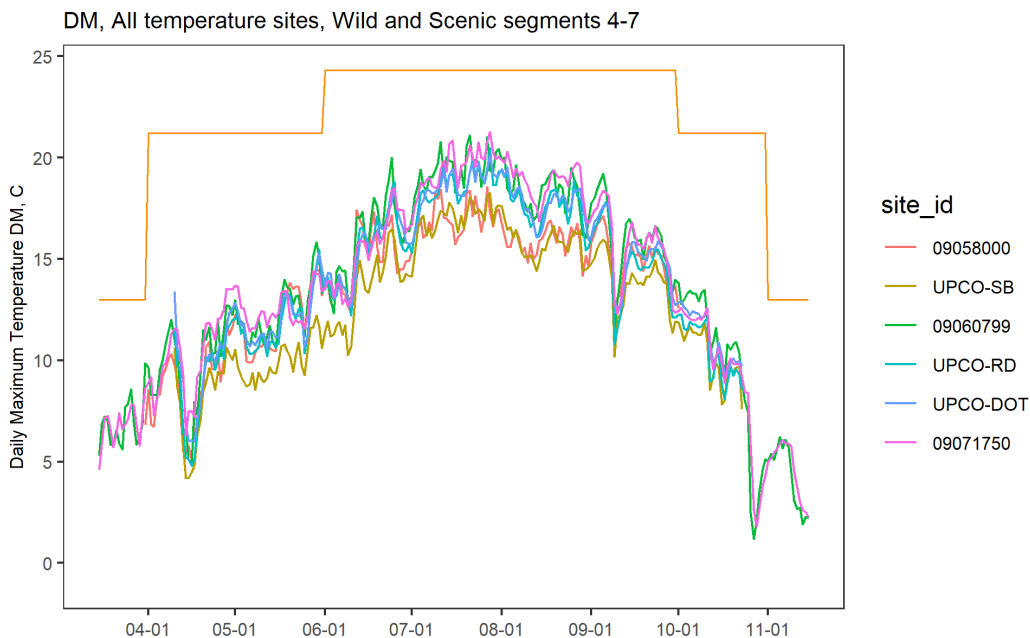


Figure 1. Daily Maximum temperatures (DM) in 2020 and the applicable summer, shoulder, and winter season standards.

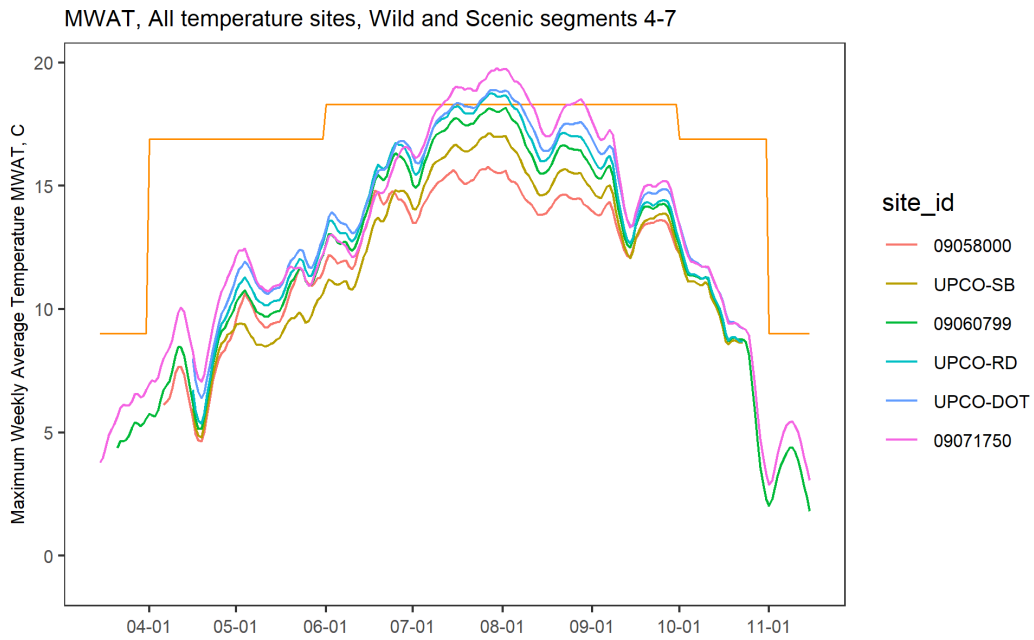


Figure 2. Weekly Average Temperature (WAT) in 2020 and the applicable summer, shoulder, and winter season MWAT standards.

MWAT, All temperature sites, Wild and Scenic segments 4-7

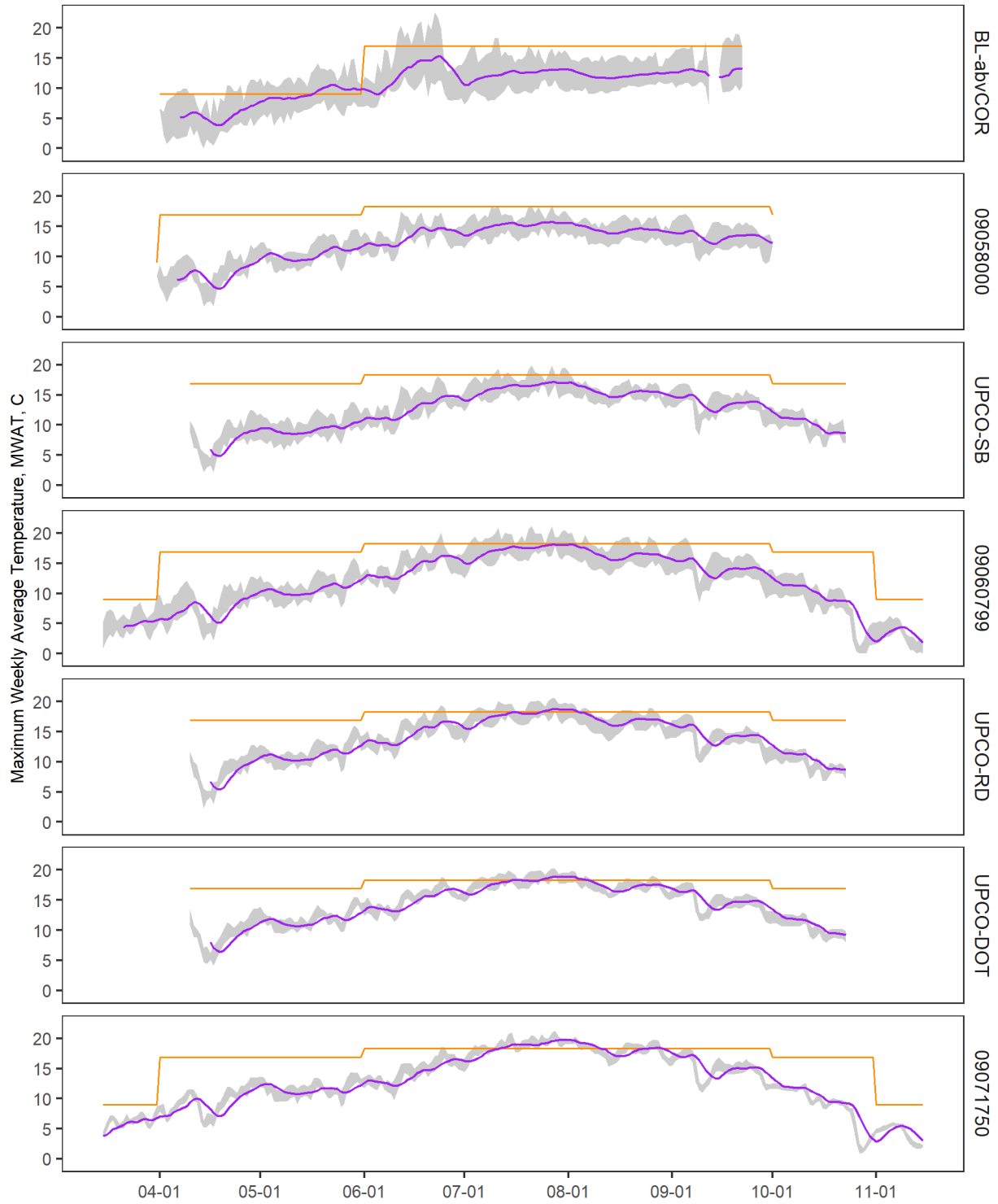


Figure 3. MWAT temperature for all sites in 2020, upstream to down.



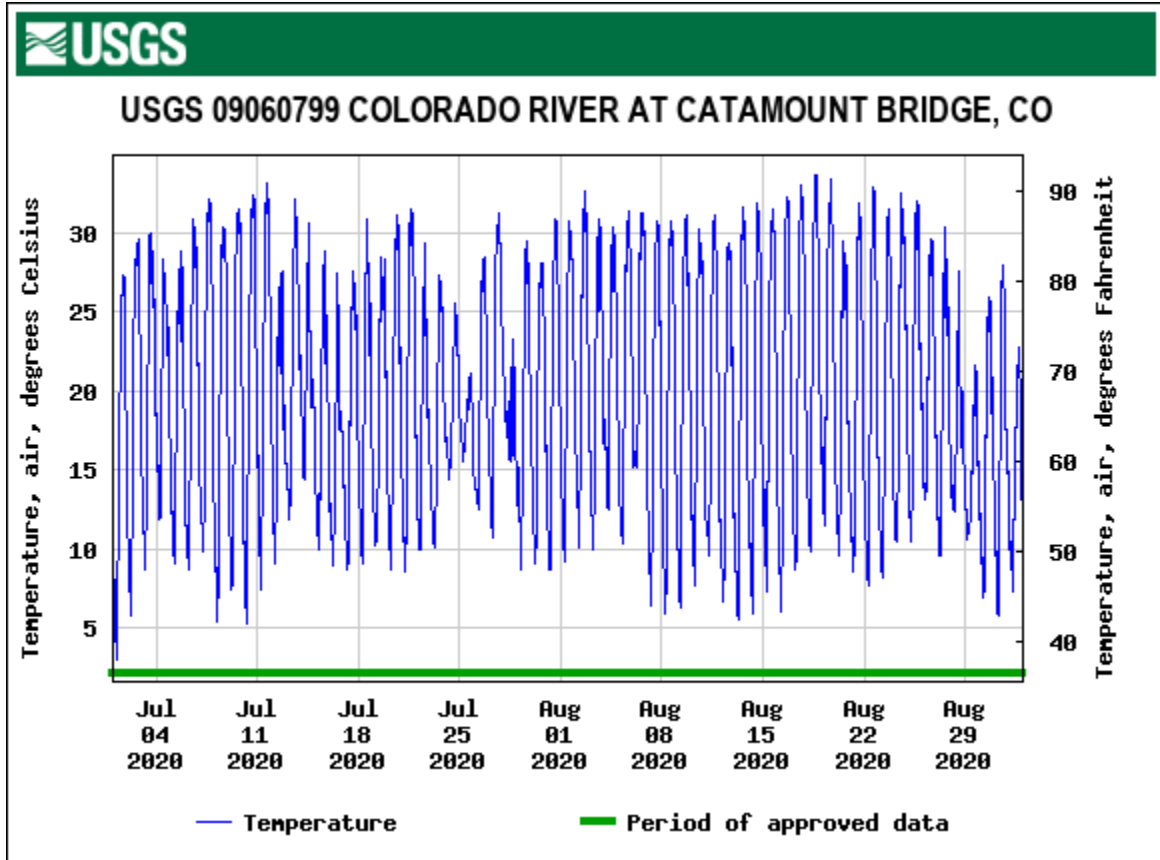


Figure 4. Air temperatures at Catamount during July and August.

**4 ADDITIONAL DELIVERABLES INCLUDED WITH THIS MEMORANDUM**

Individual site analysis reports

Compiled and formatted datasets