



2021

# Aquatic Resource Monitoring Report

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## 2021 Notable Events

The following summary of notable events in 2021 is provided to give context to the ongoing monitoring and cooperative Learning By Doing (LBD) effort in Grand County, Colorado. This summary is accompanied by a “Monitoring Year 2021 Snapshot,” which summarizes monitoring results in the Fraser and Colorado River basins. Additional information on monitoring results for the entire LBD cooperative effort area (CEA), are included in the detailed monitoring reports which are linked above.

In 2021, LBD made significant strides in operations, monitoring, and stream restoration efforts, however, elevated stream temperature and sediments remain a challenge. The following is not meant to be exclusive or comprehensive, but to highlight some of the most notable events of 2021 that may have positively impacted water quality.

### *Climate, Hydrology, and Impacts*

- Grand County experienced below average snowpack in 2021. The Colorado Basin River Forecast Center (CBRFC) April 1, 2021, Most Probable Runoff Forecast at Kremmling was 77 percent of average. Forecasts after April 1 and actual runoff volumes in the Upper Colorado River Basin were slightly reduced from April 1 forecasts due to warm temperatures, dry soils, and below average spring precipitation. The actual runoff at Kremmling was 61 percent of average. The highest sub-basin runoff forecast within the LBD CEA was in the Fraser River basin at 91 percent of average, and the lowest was in the Willow Creek basin at 65 percent of average. The runoff into Granby Reservoir was 71 percent of average.
- No wildfires greater than 1000 acres occurred within the CEA in 2021.

### *Coordination Calls*

- 2021 was the seventh consecutive year in which LBD conducted weekly water coordination calls from late May to mid-September. Calls provide a forum to discuss conditions and weekly projected operations, allow LBD partners to be responsive to low flow and high-water temperature conditions through coordination of environmental water releases, and foster communication, relationships, and trust amongst stakeholders.

### *Operations*

- Denver Water’s Moffat Collection System spill bypasses in 2021 totaled approximately 18,900 acre-feet (af) during runoff season including unplanned bypasses in June to mitigate high water temperatures, 348 af from Williams Fork Reservoir to mitigate high water temperatures, and maintenance bypasses totaling 7,104 af for projects at the East Portal and in the Moffat Tunnel
- Northern Water’s Municipal Subdistrict (Subdistrict) Windy Gap voluntary bypasses in 2021 totaled approximately 6,200 af to mitigate high water temperatures.
- River District’s Wolford bypass and release from storage in 2021 totaled approximately 1,150 af to mitigate high water temperatures.

- Release of 5,412 af from the Endangered Fish Pool in Granby Reservoir for the Upper Colorado River Endangered Fish Recovery Program occurred in mid-July due to dry conditions.

### *Restoration Projects*

- In 2021, volunteers planted approximately 1,300 willows as part of LBD's Fraser Flats River Habitat Project. Willow surveys determined that 1,200 willows failed to survive the original planting due to low water tables brought on by drought conditions, shallow placement, and damage from foot traffic. This time, tape was placed on the willow slips at 24" to help ensure that cut ends reach the water table.
- A culvert where Forest Service Road 128 crosses Cabin Creek was a barrier to fish movement, and replacement with an Aquatic Organism Passage (AOP) culvert now allows for fish passage for native Colorado River Cutthroat Trout and amphibians.
- In 2021 CPW contracted Stillwater Sciences to design a state-of-the-art habitat improvement project for the Colorado River on the Kemp-Breeze State Wildlife Area to revitalize river functions that have been slowly lost or degraded over the past several decades. This work positioned the team to proceed with engaging a build contractor and commencing construction in 2022.
- The Colorado River Connectivity Channel Project is a \$30 million project, proposed by Trout Unlimited, Northern Colorado Water Conservancy District Municipal Subdistrict, Grand County, the Upper Colorado River Alliance, and supported by project partner Colorado Parks and Wildlife, will build a natural river channel around Windy Gap Reservoir to improve aquatic habitat in the Fraser and Colorado rivers.

### *Monitoring Programs*

- The Subcommittee developed and executed an extensive [Aquatic Resource Monitoring Plan for 2021](#).
- In 2021, stream temperature monitoring continued for 67 sites within LBD's Cooperative Effort Area (CEA). Of the sites monitored where data was available, 9 and 4 sites exceeded the state temperature thresholds in the Fraser River and Colorado River basins, respectively.
- In 2021, a total of 14 sites within the CEA were sampled utilizing the Modified Wolman Pebble Count Method. Percent embeddedness was also performed at each location. There was an overall increase in fines at most sites, due to the lack of transport due to low runoff that year. In 2021, the spawning bed pebble counts were discontinued because there was limited correlation between this method and core sampling.
- In 2021, macroinvertebrate bioassessments were conducted at 19 sites in the CEA. Of the 19 sites, all but 3 sites on the Colorado River were in attainment with state aquatic life standards. In general, for sites on the Colorado River, macroinvertebrate populations appeared to be relatively healthy, but scores showed that most sites exhibited additional stress as compared to sampling events in previous years.
- In 2021 CPW Aquatics crews conducted standardized fish population monitoring surveys on 28 sites in the LBD cooperative area, including several sites on the Fraser and Colorado rivers. Results of the surveys indicate that 2021 was a dynamic year in terms of ecosystem

stresses resulting from the combination of drought and the 2020 wildfires. In addition, CPW is an active partner in the Colorado River Connectivity Channel (CRCC) project, which will restore river connectivity around Windy Gap Reservoir when built. As part of this effort, CPW is conducting multiple research studies in addition to standard monitoring that will examine the impact of the CRCC.

## MONITORING YEAR 2021 SNAPSHOT

For its ninth consecutive year, Learning By Doing (LBD) continued to monitor the health of aquatic resources within the Colorado, Fraser, and Williams Fork River basins in 2021. A snapshot of the 2021 results is below, followed by individual metric summaries.

Results	Observations	Colorado River Basin, including Williams Fork	Fraser River Basin, including Ranch Creek
<b>Stream Temperature</b>	<p>In 2021 there were 67 sites monitored within LBD’s Cooperative Effort Area (CEA). This area includes sites on the Colorado and Fraser rivers and 19 tributaries. No new monitoring sites were added in 2021. Temperature data were compared to Colorado temperature standards at the monitoring sites. Of the sites monitored where data was available, 9 and 4 sites exceeded the state temperature thresholds in the Fraser River basin and Colorado River basin respectively. Exceedances generally occurred in late July or early August during the hottest months of the year, or during shoulder season in Cold Stream Tier 1 (CSI) streams.</p> <p><a href="#">Click here for full report.</a></p>	<p>Of the data collected at the 17 sites, 13 were in attainment of temperature standards. Compared to 2020, this is an increase of 4 sites in exceedance of temperature standards.</p> <p>Three sites exceeded the state temperature threshold for chronic (7-day) exposure:</p> <ul style="list-style-type: none"> <li>• Colorado River downstream of Byers Canyon (CR-19.8)</li> <li>• Colorado River at Lone Buck (CR-18.4)</li> <li>• Colorado River upstream of Williams Fork (CR-16.7)</li> <li>• Williams Fork upstream of Williams Fork Reservoir (WF-5.5)</li> </ul> <p>One site exceeded the state temperature threshold for acute (1-day) exposure:</p> <ul style="list-style-type: none"> <li>• Williams Fork upstream of Williams Fork Reservoir (WF-5.5)</li> </ul>	<p>Of the data collected at the 30 sites, 20 were in attainment of temperature standards. Compared to 2020, this is an increase of 4 sites in exceedance of temperature standards. Ranch Creek below CR 8315 (RC-4.7), a site that exceeded temperature standards in 2020, was within attainment in 2021.</p> <p>Ten sites exceeded the state temperature threshold for acute (1-day) exposure:</p> <ul style="list-style-type: none"> <li>• Ranch Creek below Meadow Creek (RC-1.1)</li> <li>• Ranch Creek above Quad Ranch (RC-5.8)</li> <li>• Ranch Creek below Quad Ranch (RC-5.1)</li> <li>• Meadow Creek at CR 84 (MC-0.5)</li> <li>• St. Louis Creek (STC-0)</li> <li>• Hurd Creek on County Road 843 (HC-0.5)</li> <li>• Fraser River on Highway 40 GR (FR-3.5)</li> <li>• Fraser River above GSD (FR-1.9)</li> <li>• Fraser river below GSD (FR-1.6)</li> <li>• Fraser River upstream of Windy Gap (FR-0.1)</li> </ul> <p>Seven sites exceeded the state temperature threshold for chronic (7-day) exposure:</p> <ul style="list-style-type: none"> <li>• St. Louis Creek (STC-0)</li> <li>• Fraser River on Highway 40 GR (FR-3.5)</li> <li>• Fraser River above GSD (FR-1.9)</li> <li>• Fraser river below GSD (FR-1.6)</li> <li>• Fraser River upstream of Windy Gap (FR-0.1)</li> <li>• Meadow Creek at CR 84 (MC-0.5)</li> <li>• Ranch Creek below Meadow Creek (RC-1.1)</li> </ul>
<b>Macro-invertebrates</b>	<p>In 2021, bioassessments were conducted at 19 sites in the CEA. Of the 19 sites, all but 3 sites received an attainment for aquatic life use designation through their MMI (v4) scores.<sup>2</sup></p> <p><a href="#">Click here for full report.</a></p>	<p>Of the 7 sites monitored in the Colorado River basin, 3 site were not in attainment with state standards in 2021:</p> <ul style="list-style-type: none"> <li>• Colorado River above the Blue River (CR-1.7)</li> <li>• Colorado River at CR39 Bridge – KB Ditch (CR-9.1)</li> <li>• Colorado River upstream of Windy Gap Reservoir (CR-WGU)</li> </ul> <p>These sites indicated impairment due to approximately 32 point drop in their average MMI scores over the past year. These declines in MMI may have been driven by a combination of:</p> <ul style="list-style-type: none"> <li>• runoff from recently burned areas</li> <li>• nutrient enrichment</li> <li>• stable flows</li> <li>• warmer stream temperatures</li> <li>• increased algal growth</li> </ul> <p>Benthic macroinvertebrate communities appeared to be relatively healthy at the other sites on the Colorado and Williams Fork Rivers. However, most MMI (v4) scores exhibited additional stress compared to sampling events in prior years. Although no sites in the Williams Fork River basin were considered impaired, there was evidence of increased stress downstream from the Williams Fork Reservoir. Site WF-0.5 below Williams Fork Dam near the confluence with the Colorado River showed improvements in macroinvertebrate communities following the stream restoration work completed in this reach of the Kemp Breeze State Wildlife Area in 2019.</p>	<p>Sampling results were similar to those of previous year. Of the 8 sites monitored in the Fraser basin, all were in attainment with state standards in 2021. All sites supported healthy macroinvertebrate populations.</p>

## MONITORING YEAR 2021 SNAPSHOT

Results	Observations	Colorado River Basin, including Williams Fork	Fraser River Basin, including Ranch Creek
<b>Fish</b>	<p>CPW conducted electrofishing surveys again in 2021 to estimate trout populations in the Colorado and Fraser River basins. Data for 2 sites along the Fraser River and one site on the Colorado River is summarized here. CPW currently has reports available for the Colorado River through 2020 and the Fraser River through 2019.</p> <p><a href="#">Click here for full report – Colorado River.</a>  <a href="#">Click here for Fraser River report through 2019.</a> CPW will update these reports to include more recent data in early 2023.</p>	<p>In 2021 CPW collected trout population data on the two-mile reach of the Colorado River beginning just upstream of the Parshall Hole and extending downstream through the Kemp-Breeze State Wildlife Area to the irrigation diversion on the Bureau of Land Management Sunset property. Population estimates (biomass in pounds per surface acre, fish over 14” per surface acre and fish over 6” per mile) are obtained by raft electrofishing using standard mark-recapture methodology.</p> <p>The 2021 surveys produced the largest year-over-year percentage increases in all three population estimates in the history of this data set. Biomass, fish over 14”, and fish per mile increased by 27%, 165%, and 40%, respectively. These unusually sudden increases, particularly in the large fish estimate, suggest that the reach received an influx of fish in 2021 from outside the reach. The most likely explanation is that fish moved either downstream or upstream (or both) into this reach from areas more heavily impacted by sediment inputs from the East Troublesome burn area. If these increases had been produced solely within the reach through reproduction and growth of resident fish, this would have been evident in the years leading up to 2021 in the form of multiple large year-classes with high recruitment and growth, and this was not the case.</p>	<p>At the Kaibab Park survey site in the Town of Granby, 2021 was the first year of fish survey following the Town of Granby diversion structure rebuild (completed in fall of 2020). The trout biomass estimate was the lowest observed in the history of this site, as was the number of sculpin captured. Prior to the rebuild of the diversion structure, the previous structure was a barrier to fish movement, and the pool at the base of it was included in the survey reach, which led to higher population estimates. This large pool no longer exists and trout can now freely move past the structure. The project improved the overall habitat and ecology of the Fraser River, but will probably result in lower trout population estimates on this section in the future. The low sculpin capture is likely explained by the large degree of disturbance that occurred in the river bed during construction, and this is expected to rebound in future years.</p> <p>At the Safeway site in the Town of Fraser, the trout biomass estimate declined for the third consecutive year, which is the first time this has happened in the history of annual sampling at this site, dating back to 2006. However the declines have been minor and the total biomass estimate of 173 pounds per surface acre was still above the long-term average of 155 pounds per acre. Of more concern was the fact that the number of sculpin captured – 56 – was the record lowest number captured at this site, and was less than half of the previous low number captured (122 in 2014), and only 23% of the long-term average of 247 (SD 113). Reasons for this decline are not known; however over the past two years we have observed and had reported more sedimentation runoff events than normal. It is possible that excessive deposition of fine sediment is having a negative impact on sculpin habitat.</p>
<b>Pebble Counts</b>	<p>A total of 14 sites within the CEA were sampled in 2021. Each location received 400 measurements for the pebble count, utilizing the Modified Wolman Pebble Count Method. Percent embeddedness was also performed at each location with 45 to 50 measurements per site. There was an overall increase in substrate less than 64 mm among most sites. However, 13 of 14 sites surveyed had percentages of fine sediment less than 29.3%, which is the threshold set in CDPHE Policy 98-1.</p> <p><a href="#">Click here for full report.</a></p>	<p>Seven sites were assessed along the Colorado River. Sites further upstream have lower percentages of fine sediment and lower percentages embeddedness. Downstream sites showed higher values of embeddedness as well as higher percentages of fine sediment. All sites (except CR-1.7) had increased fines and gravels, likely due to a lack of transport from low runoff in 2021. Notable improvements in sediment transport can be attributed to restoration work on the Williams Fork and Colorado Rivers, evidenced by greater proportions of fines, small gravel, and gravel at site CR-9.1 and decreased proportions of fine sediment at site CR-7.4.</p>	<p>Six sites on the Fraser River and 1 site on Ranch Creek were assessed in this basin. Percent embeddedness generally increased throughout the Fraser River. The notable exception was Ranch Creek, which jumped up to 81.6% embeddedness. The largest changes from last year were an increased proportion of gravel across Fraser River sites and an increased proportion of fine sediment in Ranch Creek. Hillslope inputs potentially contributed gravel to the Fraser River, while an increase in beaver dam complexes trapped more fine sediment in Ranch Creek.</p>
<b>Flushing Flows<sup>1</sup></b>	<p>Spring runoff met Grand County’s recommended flushing flows at 12 out of the 13 sites that were evaluated in the CEA for the 2021 runoff season.</p>	<p>Out of the six sites (CR3, CR4, CR7, Willow Creek, Williams Fork, Blue River), only the Williams Fork reach obtained the recommended flushing flow.</p>	<p>Of the seven sites monitored for flushing flows in the Fraser Basin, three sites are on the Fraser River (F3, F6, F10) and four sites on tributaries to the Fraser (F-VC, F-RC1, F-RC2, F-STL). Six of the seven sites either met or exceeded the flushing flows this year as described in the Grand County Stream Management Plan. Cabin Creek near Fraser did not meet its recommended flushing flow of 40 cfs this year.</p>

**Notes and Citations:**

<sup>1</sup>Recommended in the Grand County Stream Management Plan (2010)

<sup>2</sup>Colorado’s Multi-Metric Index (MMI) version 4.0