2013 Slate River Water Sampling: Macroinvertebrate & E. coli Final Report

Prepared For:
Colorado Healthy Rivers Fund Grants
Attn: Chris Sturm
Colorado Water Conservation Board

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Colorado Healthy Rivers Fund: Task B. Slate River Water Quality Monitoring

Background

The Coal Creek Watershed Coalition (CCWC) is a nonprofit organization whose mission is "to maintain, restore and enhance the environmental integrity of Crested Butte's local watersheds to ensure those local watersheds and habitats are of the highest possible quality necessary to support wildlife, aquatic life, and human life." The CCWC, established in 2003, collaborates with stakeholders to improve water quality and environmental health in the Coal Creek and Upper Slate River watersheds.

The Upper Slate River (USR) Watershed is located near Crested Butte in southwestern, Colorado. The watershed drains approximately 34 square miles on the east side of the Ruby Mountain Range, in Gunnison County. The USR Watershed contains roughly 71 miles of rivers and streams (perennial, intermittent and ephemeral; Figure 1).

Currently, CCWC is creating a watershed plan for the USR Watershed. During the early phases of the watershed planning process, it became apparent that the watershed lacked data to characterize macroinvertebrate (MI) communities and *E. coli* concentrations. To address these data gaps, CCWC applied for funding to collect baseline MI and E. coli data in a two-stage effort. In 2011, baseline samples were collected from selected locations in the Upper Slate River Watershed. In 2013 the original locations were resampled along with additional sites to further improve the baseline characterization. This report is intended to satisfy the reporting requirements associated with the 2012 Colorado Healthy Rivers Fund grant that supported the monitoring activities completed in 2013. The USR Watershed Plan includes a summary of all MI and *E. coli* data collected to date.

Data Collection and Analysis

Macroinvertebrate Sample Collection: July 29, 2013:

On July 29, 2013 MI samples were collected from 9 locations according to the protocol established by the National Aquatic Monitoring Center (NAMC; Figure 1). The NAMC protocol is suitable for calculating Multi-Metric Index (MMI) scores. MMI scores are the criteria used by CDPHE to assess attainment of aquatic life use standards. The NAMC protocol was followed by trained field technicians. The MI sample were collected from eight randomly selected subsample locations on a 500 foot transect. Macroinvertebrates were sampled from a 0.74 square meter area. Transects were sampled from downstream to upstream to prevent disturbance to potential subsample locations. Following collection and preservation, with ethanol, the samples were sent to the Utah State University Bug Lab. The lab analyzed the MI samples to genus level according to the methods outlined by NAMC. A duplicate sample was collected from SR-7. The relative percent difference (RPD) between the duplicate and original sample was less than 10 percent. The RPD is suitable and suggests that both field and lab methods were consistently applied.

Table 1. MMI scores for macroinvertebrate samples collected from the USR Watershed on July 29, 2013

Monitoring Location	Location Description	MMI Score	Attains Aquatic Life Criteria
SR-4	Slate River above Pittsburg Mine	74.3	Yes
POV-3	Mainstem of Poverty Gulch below Confluence with Baxter Creek	58.4	Yes
SR-6	Slate River below Poverty Gulch, above Wetland	79.6	Yes
SR-7	Slate River above Oh-Be-Joyful Creek and Campground	76.6	Yes
SR-7 dup	Duplicate sample collected at SR-7	70.2	NA
SR-7b	Slate River above Oh-Be-Joyful Creek and OBJ Road Ford	65.1	Yes
SR-7a	Slate River above Oh-Be-Joyful Creek and below Campground	75.3	Yes
OBJ-4	Oh-Be-Joyful Creek at Mouth, above Slate River	81.7	Yes
SR-8	Slate River below Oh-Be-Joyful Creek and Campground	62.7	Yes
SR-9	Slate River above Coal Creek	37.0	No

The most upstream sample was collected from SR-4, the Slate River above the Pittsburg Mine and Poverty Gulch. The MMI score at this location was 74.3, which readily met the attainment threshold of 50 for mountain sites (Table 1). Poverty Gulch was sampled at POV-3 and the MMI score, 58.4, met the aquatic life criteria (Table 1). Oh-Be-Joyful Creek was sampled near the mouth at OBJ-4. Oh-Be-Joyful Creek reported the highest MMI score, 81.7, measured in the USR Watershed and readily satisfied the aquatic life criteria (Table 2).

Based on the 2013 data, it appears that MI communities have successfully recovered in areas where substantial channel changes have occurred. At SR-6, the Slate River below Poverty Gulch, the MMI score was 79.6 (Table 2). An incipient channel has formed in this area following a large sediment deposition event(s) that likely occurred in 2008. Likewise the MI communities in the Slate River near the Oh-Be-Joyful Campground, sampled at SR-7, SR-7a, SR-7b and SR-8, appeared robust and readily met the aquatic life criteria (Table 1). In 2010, the Slate River abandoned a large meander bend above the campground. A new channel was scoured through a forested area.

The MMI scores measured on July 29, 2013 met the aquatic life criteria at all sites except SR-9, the Slate River above Coal Creek (Table 1). At SR-9, the Slate River is an over-wide, shallow channel with large gravel bars that lack riparian vegetation in areas immediately adjacent to the channel. The channel substrate, primarily gravel and cobbles that are often angular, in this section may limit interstitial space, which is where many MI reside. The over-wide channel, gravel bars and reduced stability of this reach limit the establishment of riparian vegetation (Alpine Eco, 2012). Riparian vegetation supplies food and provides shade to regulate water temperature. Physical factors, rather than water chemistry, may play a larger role in limiting MI communities in the Slate River above Coal Creek. Sites with elevated metal concentrations such as OBJ-4 and SR-8(AEC, 2011), had higher MMI scores which may also suggest that the decline in the MI community in the Slate River above Coal Creek is attributed, at least in part, to physical factors (Table 1).

The current Monitoring and Evaluation List (M&E List) includes COGUUG08, the Slate River from the confluence with Coal Creek to the confluence with the East River, for aquatic life. The MI sample that initiated the listing was collected approximately 1,000 feet downstream of SR-9. The physical limitations of the Slate River, discussed above, extend into this area. Additional sample collection should occur in this portion of the Slate River and near the mouth of Coal Creek to determine the extent and potential causes of aquatic life impairment.

***E. coli* Sample Collection: August 12, 2013:**

On August 12, 2013 *E. coli* samples were collected from 12 locations in the USR Watershed (Figure 1). Field technicians followed standard collection protocols for *E. coli* sample collection. The National Park Service provided in-kind laboratory space and supplies to complete sample analysis using EPA Method 1603 (EPA, 2009). Sample collection and analysis was completed within the holding times outlined in Method 1603. The control samples, a small volume of deionized water used to determine whether contamination occurs in the lab, did not support *E. coli* growth and the *E. coli* concentrations were 0 colonies per 100 milliliters (col/100 mL). The *E. coli* concentration measured in the duplicate sample collected from SR-6 exceeded the concentration of the original sample SR-6 with concentrations of 32 and 126 col/100 mL, respectively (Table 2). The *E. coli* concentration of the duplicate sample was the highest concentration measured during the sample event (Table 2). The *E. coli* concentration of the duplicate suggests that some form of contamination was introduced to the duplicate sample collected from SR-6. The control results indicate this contamination did not occur in laboratory. The *E. coli* concentrations of the other samples do not suggest that ambient conditions in the Slate River are a likely source; all other reported values were less than half of the duplicate concentration (Table 2). It appears that the duplicate was contaminated immediately following sample collection or during transit to the lab. The sample collected from SR-4 leaked during transit and could not be analyzed at the laboratory.

Table 2. *E. coli* concentrations in the USR Watershed as measured on 8/12/2013

Monitoring Location	Location Description	*E. coli* Concentrations[1] col/ 100 mL	Attains Primary Contact Standard (126 col/100 mL)
SR-3a	Slate River about a half mile above the last road crossing	0	Yes
SR-4	Slate River above Pittsburg Mine	NM[2]	NA
POV-3	Mainstem of Poverty Gulch below Confluence with Baxter Creek	27	Yes
SR-6	Slate River below Poverty Gulch, above Wetland	32	Yes
SR-6 dup	Duplicate sample collected at SR-6	126	Yes
SR-7	Slate River above Oh-Be-Joyful Creek and Campground	62	Yes
OBJ-4	Oh-Be-Joyful Creek at Mouth, above Slate River	6	Yes
SR-8	Slate River below Oh-Be-Joyful Creek and Campground	18	Yes
SR-9	Slate River above Coal Creek	51	Yes
SR-10a	Slate River above Crested Butte WWTP	52	Yes
SR-10	Slate River immediately below the Town of Crested Butte WWTP	57	Yes
SR-11	Slate River below the Town of Crested Butte WWTP, at Recreation Path Bridge	42	Yes

Notes

1. The samples were analyzed with EPA Method 1603: *E. coli* modified mTEC.
2. The sample collected from SR-4 failed in transit prior to analysis, so there is no data to report.

The headwaters of the Slate River, as measured at SR-3a, were not a source of *E. coli* on August 12, 2013 (Table 2). Poverty Gulch, sampled at POV-3, appears to be a minor source of *E. coli* to the Slate River. The *E. coli* concentration at POV-3 was 27 col/100 mL; or about 20 percent of the primary contact standard (Table 2). *E. coli* concentrations near the mouth of Oh-Be-Joyful Creek were 6 col/100 mL; which is less than 5 percent of the primary contact standard (Table 1). Coal Creek did not elevate *E. coli* concentrations in the Slate River on August 8, 2013.

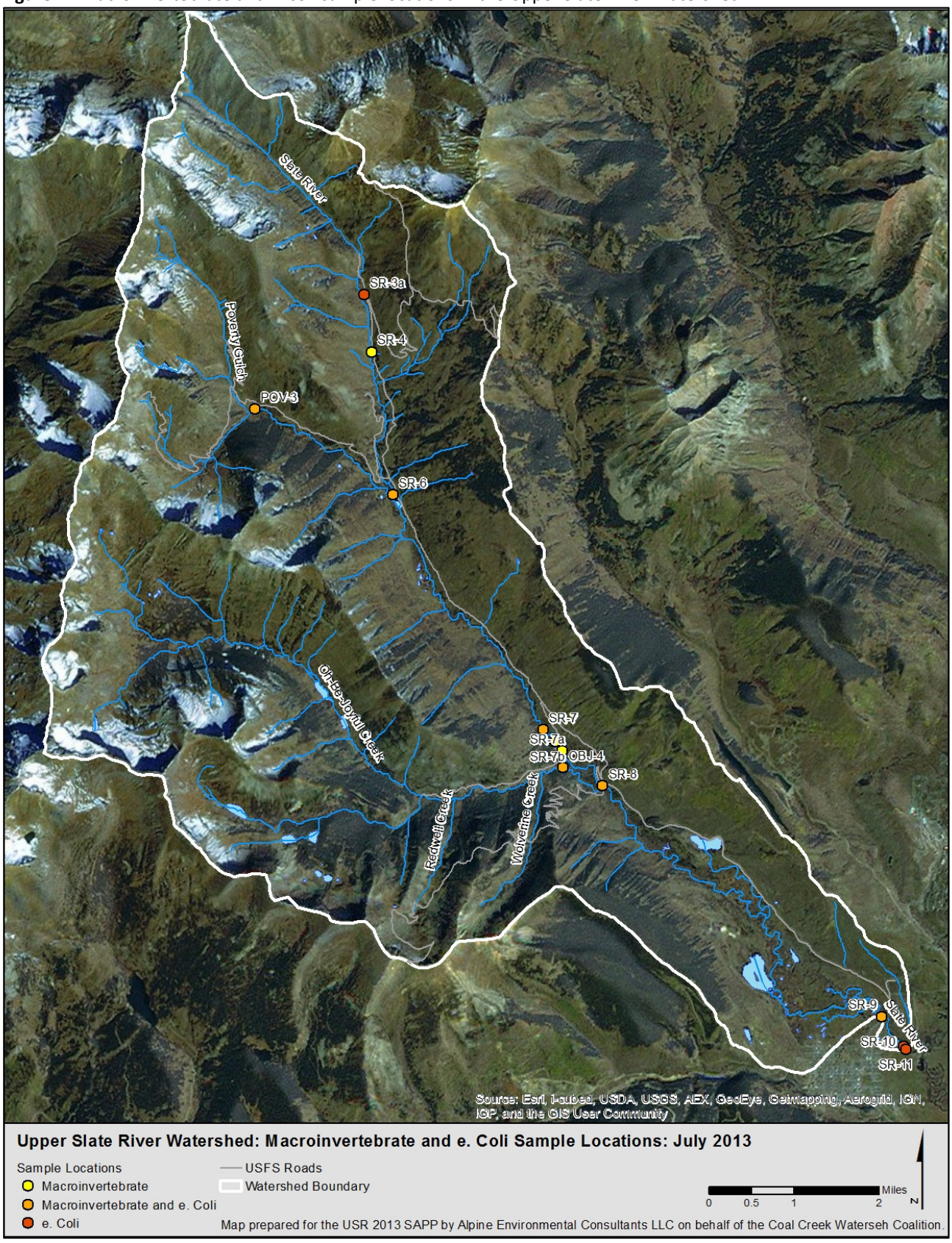
In the mainstem of the Slate River below Poverty Gulch *E. coli* concentrations were 32 col/100 mL (Table 2). In the Slate River near the Oh-Be-Joyful Campground *E. coli* concentrations ranged from

18 to 62 col/100 mL (Table 2). The campground area did not increase *E. coli* concentrations in the samples collected on August 12, 2013.

Based on the August 12, 2013 *E. coli* concentrations, discharge from the Crested Butte Waste Water Treatment Plant (WWTP) does not substantially alter *E. coli* concentrations in the Slate River. The Slate River above the WWTP, SR-10a, had an *E. coli* concentration of 52 col/100 mL (Table 2). Downstream of the WWTP discharge the *E. coli* concentrations were 57 and 42 col/100 mL for sites SR-10 and SR-11, respectively (Table 2). SR-10 is immediately below the WWTP discharge and SR-11 is approximately 500 feet downstream of the discharge point. The *E. coli* concentrations measured at SR-10a and SR-10 vary by about 10 percent and likely represent natural variation, rather than any effect attributed to the discharge. This is further supported by a decline in *E. coli* concentrations at SR-11, the Slate River about 500 feet below the discharge.

Grazing occurs in many parts of the watershed, including immediately adjacent to several sample locations. Heavy recreational use and camping occurs near the confluence of the Slate River and Oh-Be-Joyful Creek, in the Poverty Gulch drainage and the headwaters of the Slate River. As measured on August 12, 2013, these activities did not appear to elevate *E. coli* concentrations markedly and all samples were well below the applicable primary contact standard of 126 col/100 mL (Table 2).

Figure 1. Macroinvertebrate and *E. coli* sample locations in the Upper Slate River Watershed



Conclusion

Through awarded funding from the Colorado Healthy Rivers Fund, and in-kind donations from the staff of the Bureau of Land Management Gunnison Office, the Coal Creek Watershed Coalition and the Upper Slate River Committee were able to develop a more robust data set and fill data gaps as it relates to Macroinvertebrates and E.coli, and overall water quality data in the Upper Slate River Watershed.

Successful completion of this objective has resulted in completed data collection, processing and analysis meeting all quality assurance and quality control criteria previously established by the CCWC in the Sampling and Analysis Project Plan. The data has also provided a baseline of water quality conditions in the watershed to document changes in water quality from restoration activities or new developments in the watershed.

Additionally, this data has been incorporated into the final Upper Slate River Watershed Plan and will be used to prioritize restoration and protection activities. That plan will be completed and released to the public on May 1st 2014, and will act as a guiding organizational document for the Coal Creek Watershed Coalition and Upper Slate River Committee in development and facilitation of future restoration projects in the Upper Slate River Watershed.

Appendix

Project Budget

BUDGET	CHRF Funding	Trout Unlimited	Town of Crested Butte	Upper Gunnison District	In-kind Contri-butions	Total Cost
Task B. Slate River Water Quality Monitoring						
1. Macroinvertebrate Sampling[1,2]	$1,815				$5,738	$7,553
2. *E. coli* Sampling and Analysis[1]	$885					$885
3. Project Coordination	$300					$300
Subtotal	**$3,000**	**$0**	**$0**	**$0**	**$5,738**	**$8,738**
Project Subtotal	**$3,000**	**$0**	**$0**	**$0**	**$5,738**	**$8,738**

[1] - In-kind provided by the US Bureau of Land Management volunteer time for sample collection, mileage, and equipment.

[2] - In-kind from the U.S Bureau of Land Management for sample analysis at seven sites of the ten proposed sites with a value of $1,400.

CCWC Field Technician, Zach Vaughter collects Macros on August 12th 2013 on the lower reach of the Slate River before it's confluence with Coal Creek. Mt. Crested Butte in the background.