River Watch Items for the September 2023 UWP Board Meeting

- River Watch items of interest:
  - Since July 2023 River Watch samples have been collected at 12 sites in August and September.
  - River Watch and E Coli samples were collected at Lower Blue Lake on 18 July and 5 September. A second set of E Coli sample bottles (14) was obtained from Project 7 on 22 August and an invoice for $280 was paid.
  - The River Watch QA/QC site visit has been scheduled for 29 September (8am – 10am).
  - In August 2023 all River Watch data from 2022 was archived into the River Watch database.
  - Taylor Poynor has agreed to become our latest River Watch volunteer and will be taking the River Watch training in Cedaredge on 18-21 October. Taylor has a lot of experience in water quality sampling and water quality issues associated with waste treatment plants.
- Streamflow:
  - This month's report shows only streamflow at the USGS gauge near Ridgway for the 2023 Water Year. The shape of the 2023 discharge pattern (blue line) in Figure 1 generally followed median flow values (yellow dots), however from about mid-April through the end of July actual discharge was significantly higher than median values.

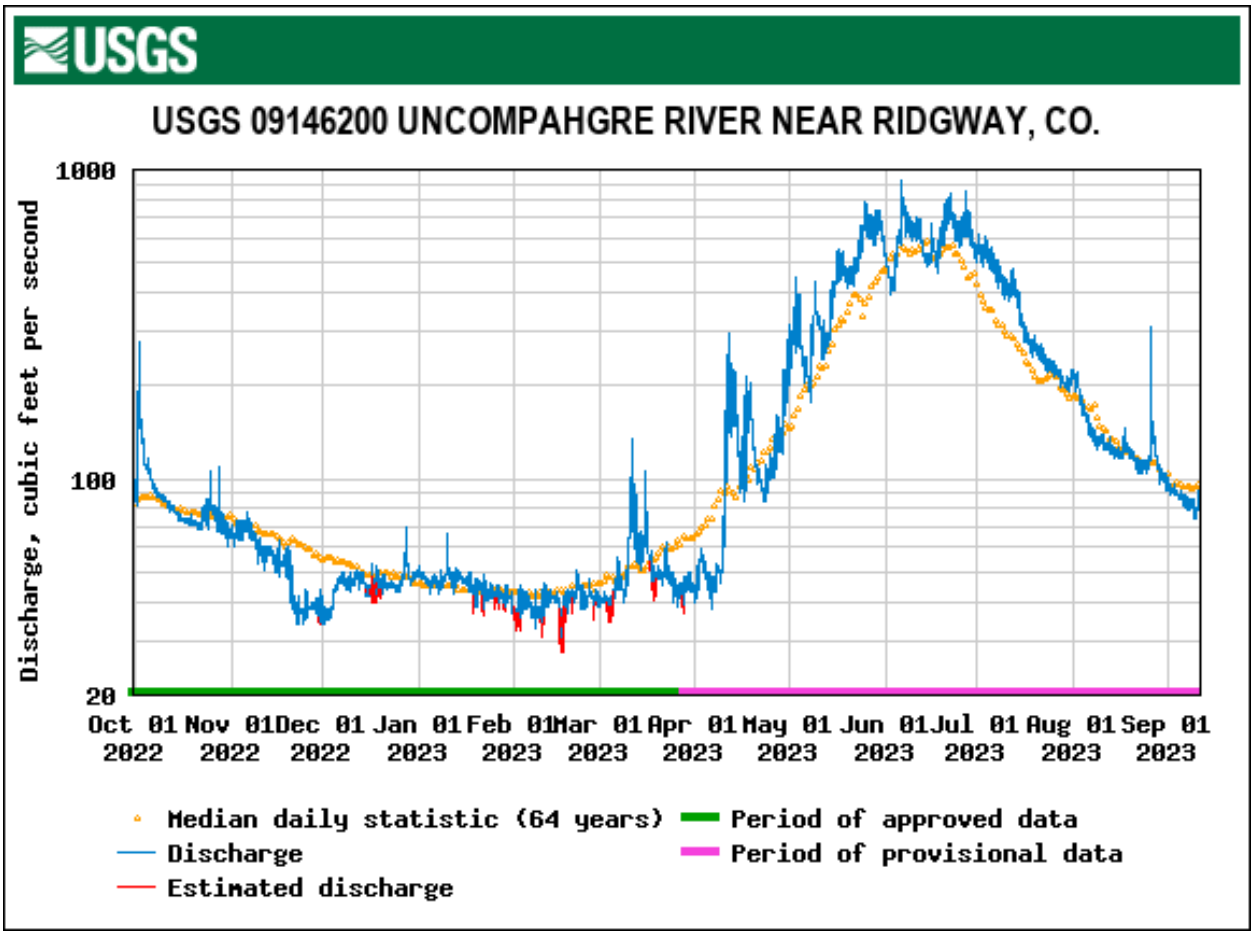

Figure 1. Streamflow chart for the USGS gauge near Ridgway (at CR24) for the 2023 water year up to 11 September 2023.

- 2022 Water Quality Assessment Report
  - 2019 – 2021 UWP River Watch sampling events were documented. From May 2019 through December 2021 there were 103 River Watch sampling events at 6-11 sites which included 103 standard (pH, hardness, alkalinity, and temperature) samples, 95 metals samples, 16 nutrient samples and 1 macroinvertebrate sample. River Watch sampling locations are shown in Figures 2 and 3.
  - Statistical Box Plot Analysis of data from 17 Upper Uncompahgre River Watch sites.
    - Data from 2019-2021 data from 12 UWP and Ouray volunteer sites and 2021 data from 5 new UWP "TMDL" sites were analyzed.
    - Examples of box plot analyses for pH, dissolved Zn, and total iron for 12 sites are shown in Figures 4, 5, and 7. Analysis of dissolved Zn at the five TMDL sites is shown in Figure 6. Box plots are ordered from high to low elevation as in Figures 2 and 3.
    - Full report has plots for pH, alkalinity, hardness, total Ca, Mg, Fe, and As, and dissolved Cd, Cu, Zn, Mn and Pb.
  - Review of the 2022 303(d) List of Impaired Streams in the Upper Uncompahgre
    - Table of Impaired Stream Segments showing impaired parameters by Water Use is included. Segments using River Watch data for assessment are identified.
    - Impaired stream segment data from 2015 – 2019 are compared to more recent River Watch data. Examples are given in Tables 1 and 2.
    - Changes to prior 303(d) Lists are noted, *e.g.* parameters taken off the list, or added to it.
    - Importance of River Watch data to the CDPHE impairment assessment is emphasized. River Watch data comprises ≥ 90% of the data used for assessment of several Uncompahge River segments.
    - Segments lacking sufficient data for assessment in 2022 were noted as potential new UWP River Watch sites. The impact of data from the five TMDL sites, not included in the 2022 assessment, is noted.
  - An Appendix reviews water quality measurements from Gray Copper Gulch taken between 2012 and 2021. Noted are distinct differences in water quality between the upper and lower parts of the watershed, and between periods of high and low flow. Implications for evaluating impairment based on only one lower elevation site are noted. An example graph for dissolved copper is shown in Figure 7.

Figure 2. Google Earth image showing Ouray County River Watch sites from Cow Creek (347) at the top (north) to USGS 3586 at the bottom (south).

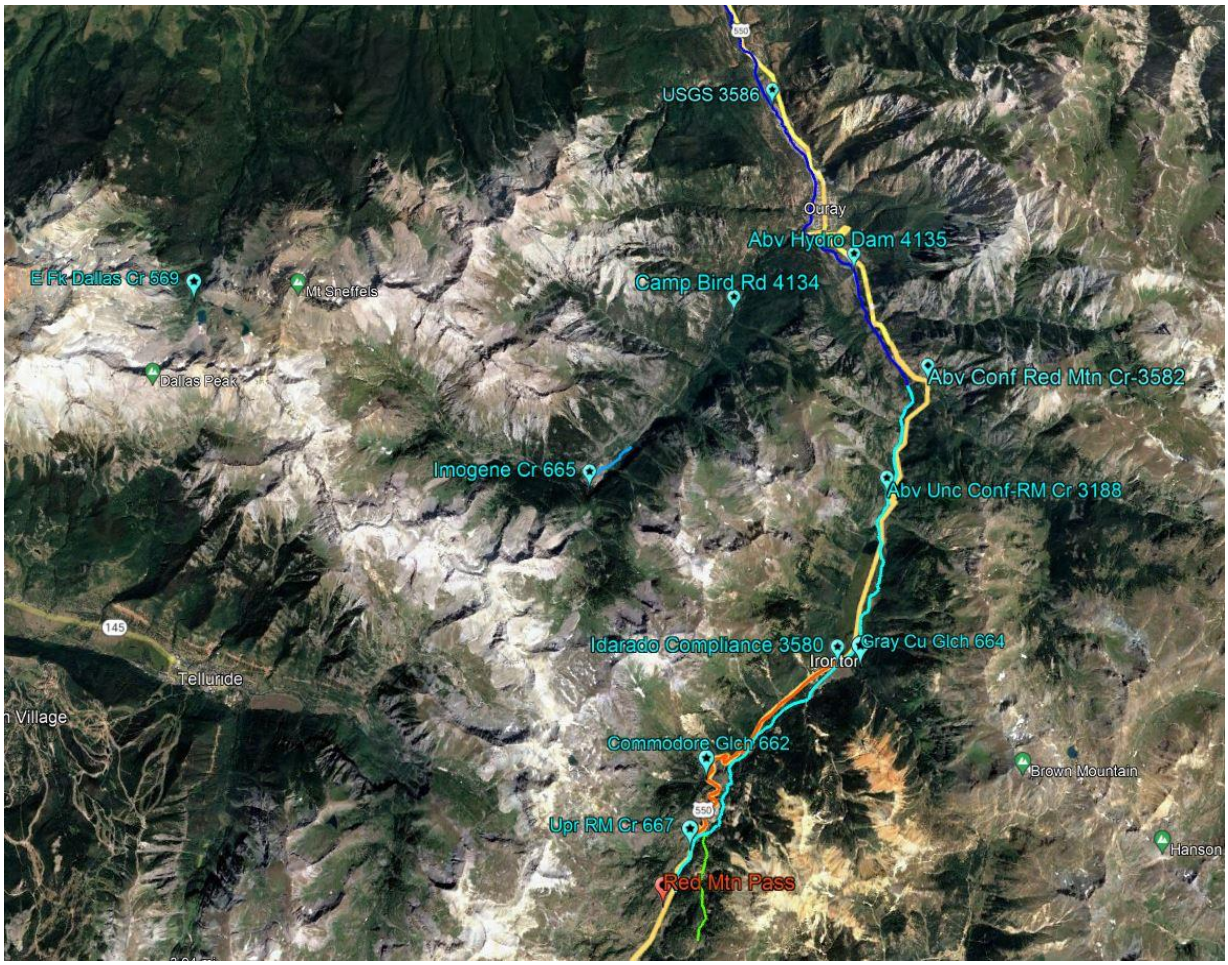

Figure 3. Google Earth image showing Ouray County River Watch sites from USGS 3586 at the top (north) to Upr RM Cr 667 at the bottom (south).

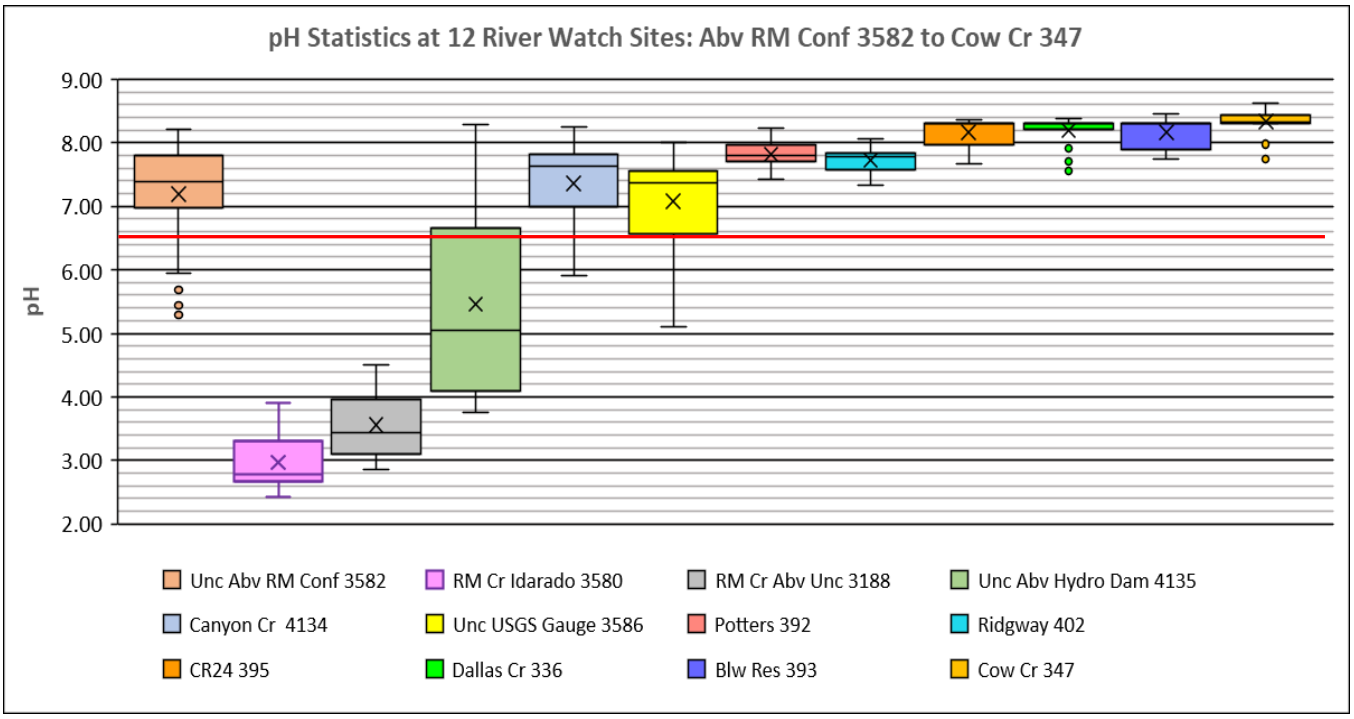

Figure 4. Box plots of pH data for River Watch sites 3582 (far left) downstream to 347 (far right). Locations are shown in Figures 1 and 2. Red line shows the minimum pH standard for aquatic life.

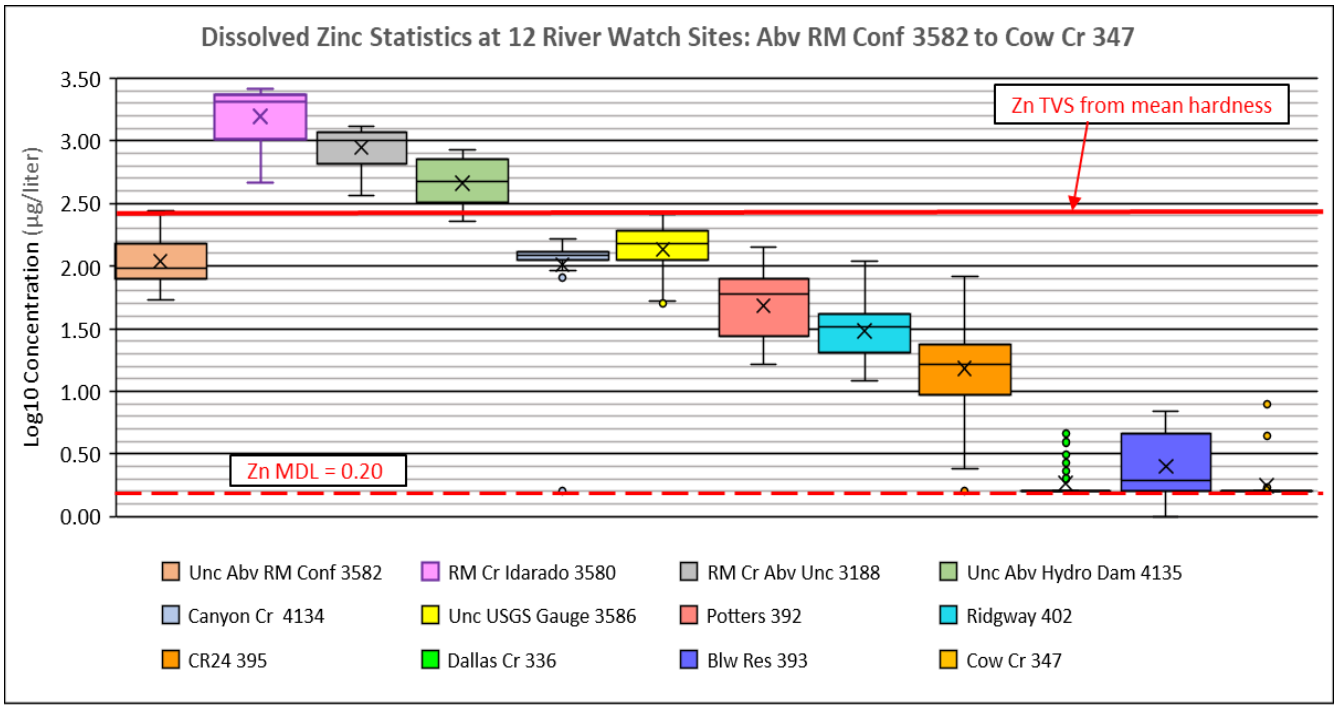

Figure 5. Box plots of dissolved zinc concentrations for River Watch sites 3582 (far left) downstream to 347 (far right). Locations are shown in Figures 1 and 2. Red line shows the chronic zinc standard for aquatic life. The method detection limit (MDL) for zinc is shown by the dashed red line.

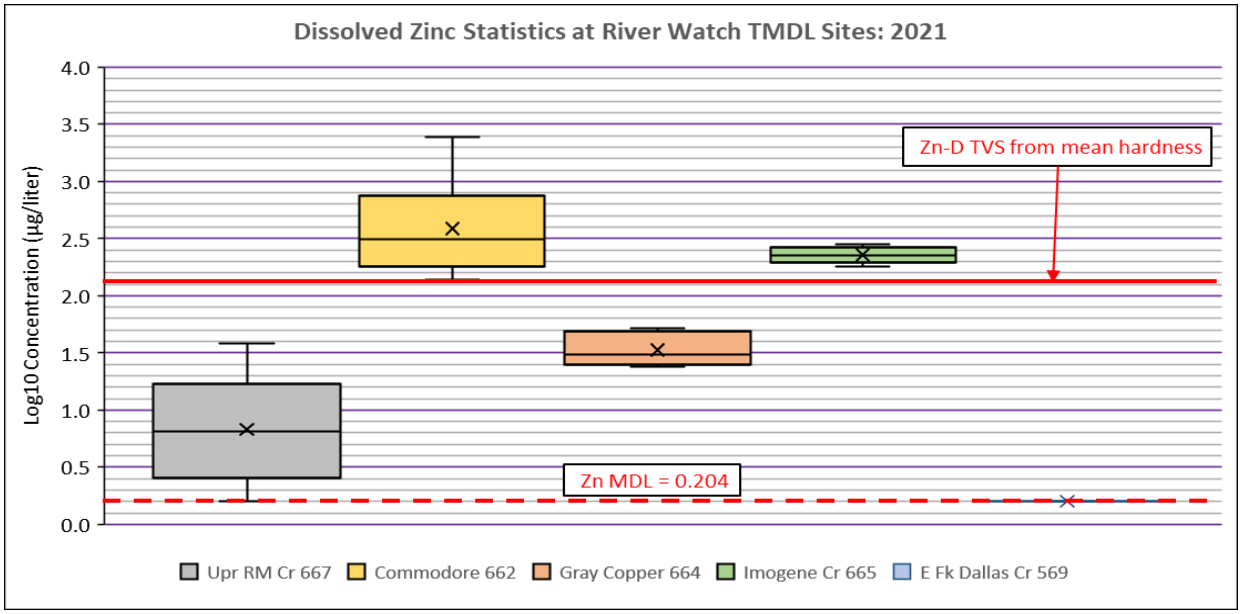

Figure 6. Box plots of dissolved zinc concentrations for the five TMDL sites (Upr Red Mtn Cr, Commodore Gulch, Gray Copper Gulch, Imogene Cr and E Fk Dallas Cr). Locations are shown in Figures 1 and 2. Red line shows the chronic zinc standard for aquatic life. The method detection limit (MDL) for zinc is shown by the dashed red line.

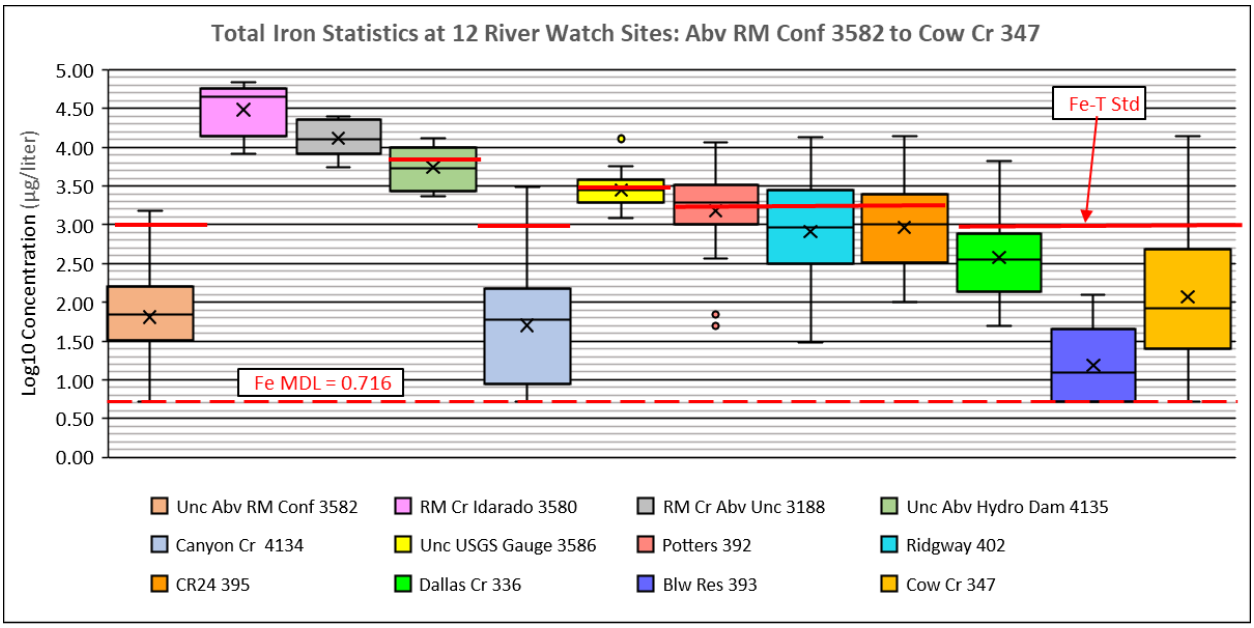

Figure 6. Box plots of total iron (Fe-T) concentrations for River Watch sites 3582 (far left) downstream to 347 (far right). Locations are shown in Figures 2 and 3. Red line segments show site-specific aquatic life use standards for different segments of the Uncompahgre River.

Table 1. Columns 1-6 show details from the 2022 303(d) Attainment Summary for Segment COGUUN03c_A using all water quality data from 2015-2019. Columns 7-9 show impairment values computed from 2019-2021 River Watch data. Column 10 indicates if the two data sets agreed. Red shading indicates non-agreement.

Uncompahgre River Basin Segment **COGUUN03c_A**: Uncompahgre R from point above conf with Dexter Cr to point below conf with Dallas Cr.					Uses: Aquatic Life, Water Supply, Recreation E, Agriculture				
2022 303(D) List and Assessment Data (2015-2019) WQCD Unc R Abv Cutler Cr (WQX-10608C), USGS (09146200), and RW Potters Ranch (392), Ridgway Town (402), CR24 (395)						2019-2021 RW Data: Potters Ranch (392), Ridgway Town (402), CR24 (395)			
Analyte	**Classification**	**Samples****	**Chronic TVS**	**85th %tile**	**303(D) List**	**Samples***	**Chronic TVS**	**85th %tile**	**303(D) Agreement**
Cadmium (D)	Aquatic Life	49	1.4	0.52	Delisted	87	1.51	0.53	Yes
Copper (D)	Aquatic Life	49	19.19	7.98	Delisted	87	20.67	6.58	Yes
Zinc (D)	Aquatic Life	49	272.68	46.38	No	87	295.12	67.02	Yes
			Std (1995-99)	74th %tile			Std (1995-99)	74th %tile	
Manganese (D)	Water Supply	49	180	159.53	Delisted	87	180	152.12	Yes
			WS standard	1 sample			WS standard	50th %tile	
Arsenic (T)	Water Supply	1	0.02	5.2	No*	87	0.02	4.00	No**
			min std	15th %tile			min std	15th %tile	
pH min	Aquatic Life	67	6.50	7.7	No	95	6.5	7.6	Yes
			Chronic Std	50th %tile			Chronic Std	50th %tile	
Iron (T)	Aquatic Life	49	1793	1176	Delisted	87	1793	1176	Yes
* 1 sample insuffcent to change listing. **Medians used with same day multiple samples.						* All samples used rather than medians. **Samples analyzed if > MDL			

Table 2. Columns 1-6 show details from three WQCD samples collected in 2012-2013 for Segment COGUUN05_B. Columns 7-9 show impairment values computed from 2021 River Watch data. Column 10 indicates if the two data sets agreed. Red shading indicates non-agreement.

Uncompahgre River Basin Segment **COGUUN05_B**: Commodore Gulch					Uses: Aquatic Life, Water Supply, Recreation E, Agriculture				
2018 303(D) List and Assessment Data (2012-2013): WQCD Commodore Gulch at Hwy 550 (TMDL-RM-05)						2021 RW Data: Commodore Gulch @ Hwy 550 (662)			
Analyte	Classification	Samples	Chronic TVS	85th %tile	303(D) List	Samples	Chronic TVS	85th %tile	303(D) Agreement
Cadmium (D)	Aquatic Life	3	0.19	0.68	M&E*	6	0.46	8.88	No*
Copper (D)	Aquatic Life	3	3.62	7.95	M&E*	6	5.37	302.03	No*
Zinc (D)	Aquatic Life	3	46.25	177.00	Yes +	6	70.36	2359.64	Yes
Lead (D)	Aquatic Life	3	0.78	3.06	M&E*	6	1.30	29.65	No*
				85th %tile			WS standard	85th %tile	
Manganese (D)	Water Supply	3	50	20.7	No	6	50	566.95	No*
			WS standard	50th %tile			WS standard	50th %tile	
Arsenic (T)	Water Supply	3	.02 - 10**	0.16	No	6	.02 - 10	data < MDL	N/A
			min std	15th %tile			min std	15th %tile	
pH min	Aquatic Life	3	6.50	7.32	No	5	6.50	~ 6.8	Yes
			Chronic Std	50th %tile			Chronic Std	50th %tile	
Iron (T)	Aquatic Life	3	1000	190	No	6	1000	491.50	Yes
* Exceeded TVS, but too few samples to add to 303(d) List. **Less restrictive value is used when a standard range is specified. + 3 samples exceeded acute Zn TVS						* Cd, Cu, Zn, Pb, and Mn would qualify for the 303(d) list rather than the M&E list.			

Table 3. Columns 1-6 show details from 10 WQCD and UWP samples collected in 2016-2017 for Segment COGUUN07_A. [Note that samples collected on the same day were not combined into median values.] Columns 7-9 show impairment values computed from 2021 River Watch data. Column 10 indicates if the two data sets agreed. Red shading indicates non-agreement.

Uncompahgre River Basin Segment **COGUUN07_A**: Gray Copper Gulch from source to confluence with Red Mtn Cr.					Uses: Aquatic Life, Water Supply, Recreation P, Agriculture				
2022 303(D) List and Assessment Data (2015-2019): UWP/WQCD sites Gray Cu Gulch GC-01, GC-02, GC Abv SM, GC Blw SM, Vrn-Adt-01, GC-05						2021 RW Data: Gray Copper Gulch @CR20 (664), same as UWP site GC-05			
Analyte	**Classification**	**Samples***	**Chronic TVS**	**85th %tile**	**303(D) List****	**Samples**	**Chronic TVS**	**85th %tile**	**303(D) Agreement**
Cadmium (D)	Aquatic Life	10	0.95	0.37	No	6	1.85	0.12	Yes
Copper (D)	Aquatic Life	10	12.30	238.50	Yes	6	26.14	18.68	No
Zinc (D)	Aquatic Life	10	169.91	84.00	Yes	6	378.98	51.51	No
Lead (D)	Aquatic Life	8	3.76	72.15	Yes	6	9.55	0.00	No
			Chronic Std	50th %tile			Chronic Std	50th %tile	
Iron (T)	Aquatic Life	10	2338	3550.00	No	6	2338	2295	Yes
			WS Std	85th %tile			WS Std	85th %tile	
Manganese (D)	Water Supply	10	620.50	523.48	No	6	620.50	580.95	Yes
			Ag Std	50th %tile			Ag Std	50th %tile	
Manganese (T)	Agriculture	10	200.00	118.00	No	6	200.00	431.55	No
			min std	15th %tile			min std	15th %tile	
pH min	Aquatic Life	3	6.50	6.90	Yes	6	6.50	6.69	No
*All samples from 2016-2017, only 1 2016 sample in 2022 assessment data file. **2022 list is the same as 2012 list.						All six samples from site 664 near mouth of Gray Cu Gulch			

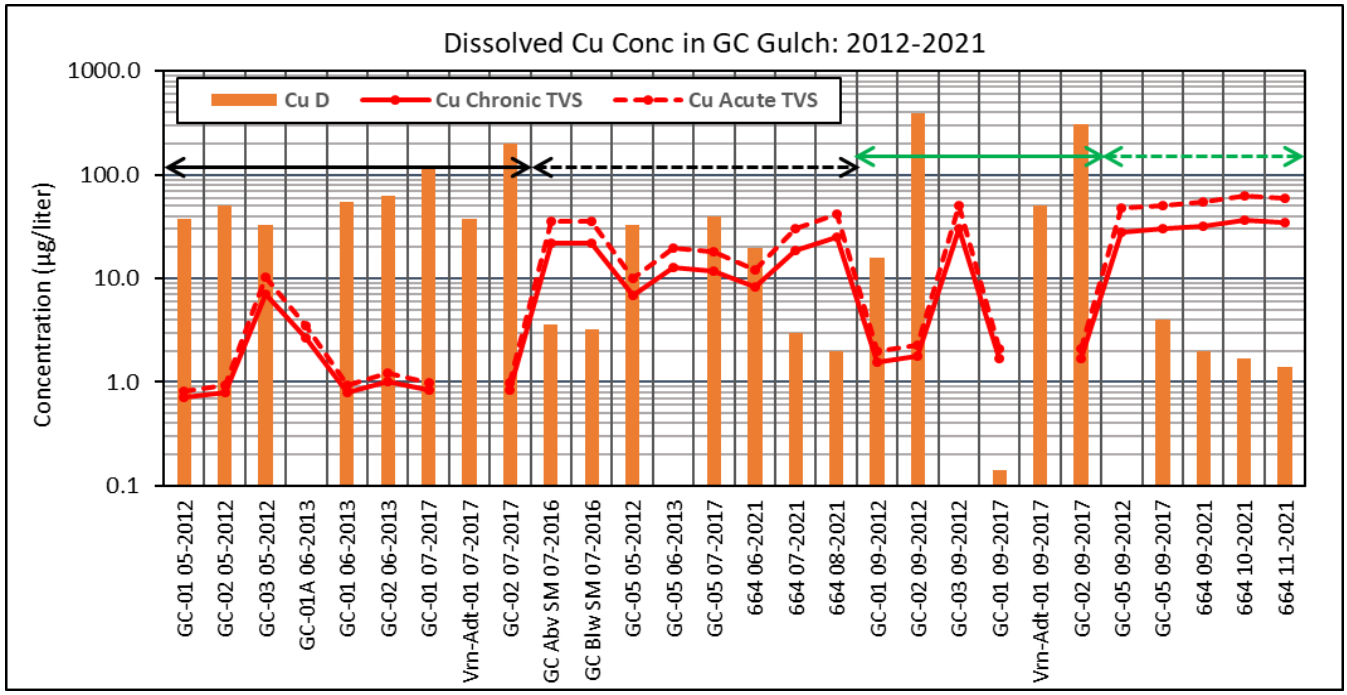

Figure 7. Cu-D concentrations (tan bars) and the hardness-based chronic and acute Table Value Standards (TVS) for aquatic life (red solid and dashed lines). X-axis labels show site numbers and dates (mm-yyyy) for the samples. The Vrn-Adt-01 measurements were made directly from the Vernon Mine Adit, not from the gulch itself. Black arrows enclose periods of higher flow, solid line for the higher elevation sites and dashed line for the lower sites. Green arrows enclose periods of lower flow, solid line for the higher elevation sites and dashed line for the lower sites; lowest being GC-05/RW-664 near the mouth of the gulch.