

River Watch Items for the December 2022 UWP Board Meeting

- River Watch items of interest:
 - Samples from four River Watch sites were collected on 3 and 4 December 2022. The remaining two sites are expected to be sampled on either the 7th or 9th of December.
 - Our River Watch site visit, originally scheduled for mid-December has been postponed until sometime between January and March 2023.
 - I am working on a report that summarizes River Watch sampling and data collected by UWP volunteers from May 2019 through December 2021. I would like to have this report completed by the end of the year.
 - In looking at recent results on macroinvertebrates I found the following useful link to Colorado Benthic Macroinvertebrates:
<https://storymaps.arcgis.com/stories/64e3a6eda9f94b7f925bd551ea66ce87>
The site contains a wealth of information on “WQCD's use of benthic macroinvertebrates for the assessment of Aquatic Life Use”.

- Precipitation, streamflow and reservoir storage:
 - Much of November after the 7th was relatively dry in the Gunnison Basin, but a few storms at the end of the month kept the basin above “normal” for the water year. On December 4th the Gunnison Basin had 108% of its median Snow Water Equivalent (SWE), well below the 213% found on November 7th. The Idarado SNOTEL site dropped from 100% of its median to 86% over the same period.

- Streamflow on the Uncompahgre at the USGS gauge near Ridgway is shown in Figure 1. Streamflow stayed relatively close to median flow until about 20 November, then dropped to near 40 cfs and remained at that level through 4 December, where the median flow is about 55 cfs. An interesting peak of 90 cfs is shown on 30 November. A similar peak was not noted upstream on the USGS gauge near Ouray but was found on the Cow Creek gauge on the same date and about two hours later.

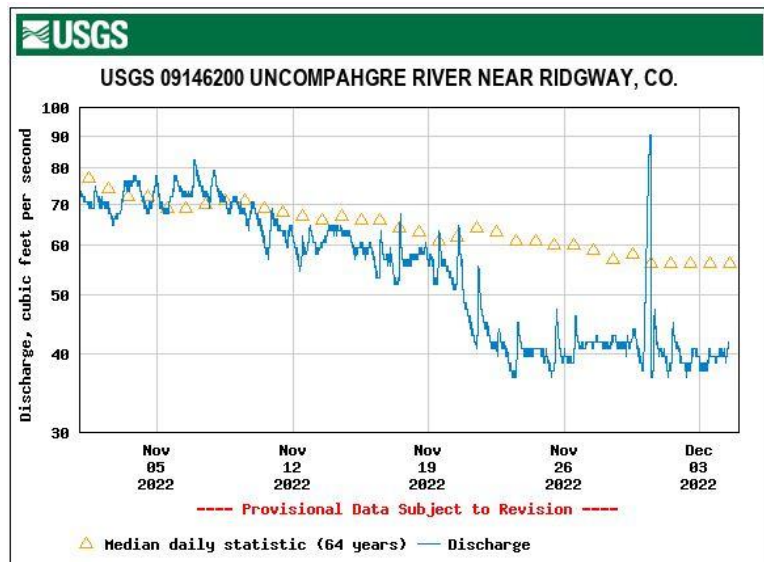


Figure 1. Streamflow at the USGS gauge near Ridgway from 1 November to 4 December 2022. Triangles are median values.

- For the period shown in Figure 1, Ridgway Reservoir storage went from 64,650 acre-ft to 66,470 acre-ft, a gain of 1,820 acre-ft and about 3,000 acre-ft above the median for the date.
- For the 2022 River Watch report box and whisker plots will be one of the ways used to summarize the 2019-2021 data. The box plots are quite useful in characterizing water quality data. Figure 2 is an example of hardness box plots from the 11 UWP sites. The plot details are described below:

- The **whiskers** extend up from the top of the box to the largest data point that is less than or equal to 1.5 times the **interquartile range** (the data enclosed by the box), and down from the bottom of the box to the smallest data point that is larger than 1.5 times the **interquartile range**.
- The data range between the bottom whisker and the bottom of the box is the **1st quartile** and the range between the top of the box and top whisker is the **4th quartile**.
- The **median** is shown as a line in the center of the box and splits the **2nd and 3rd quartiles**. The **mean** is marked by an "x" within the box.
- Values outside the whiskers are considered **outliers** and are represented by dots, as with the Dallas Creek box in Figure 2 (fourth box from the left).

Based on the median and mean values in Figure 2 it is evident that hardness increases gradually, upstream to downstream with the first four boxes. The spread of the data from minima around 100 to maxima near 400 is due to the seasonal changes in streamflow, greater hardness at low flow and less hardness at high flow. For the lower River Watch sites left of the dashed line, Cow Creek (reddish box) had the largest median of the lower sites and greatest data spread, the entire range extending from 80 to 520.

The higher River Watch sites are shown to the right of the vertical dashed line in Figure 2. Except for the Gray Copper Gulch site (yellow box), the higher sites had much lower hardness and less variability than the lower sites. Hardness is mostly due to the presence of calcium and magnesium in streams and ground water, so the lower hardness values at four of the higher sites indicates a lack of these elements at higher altitudes in the watershed. The presence of calcium and magnesium at Gray Copper Gulch is unusual for a higher site where volcanic and igneous rock dominate the geology.

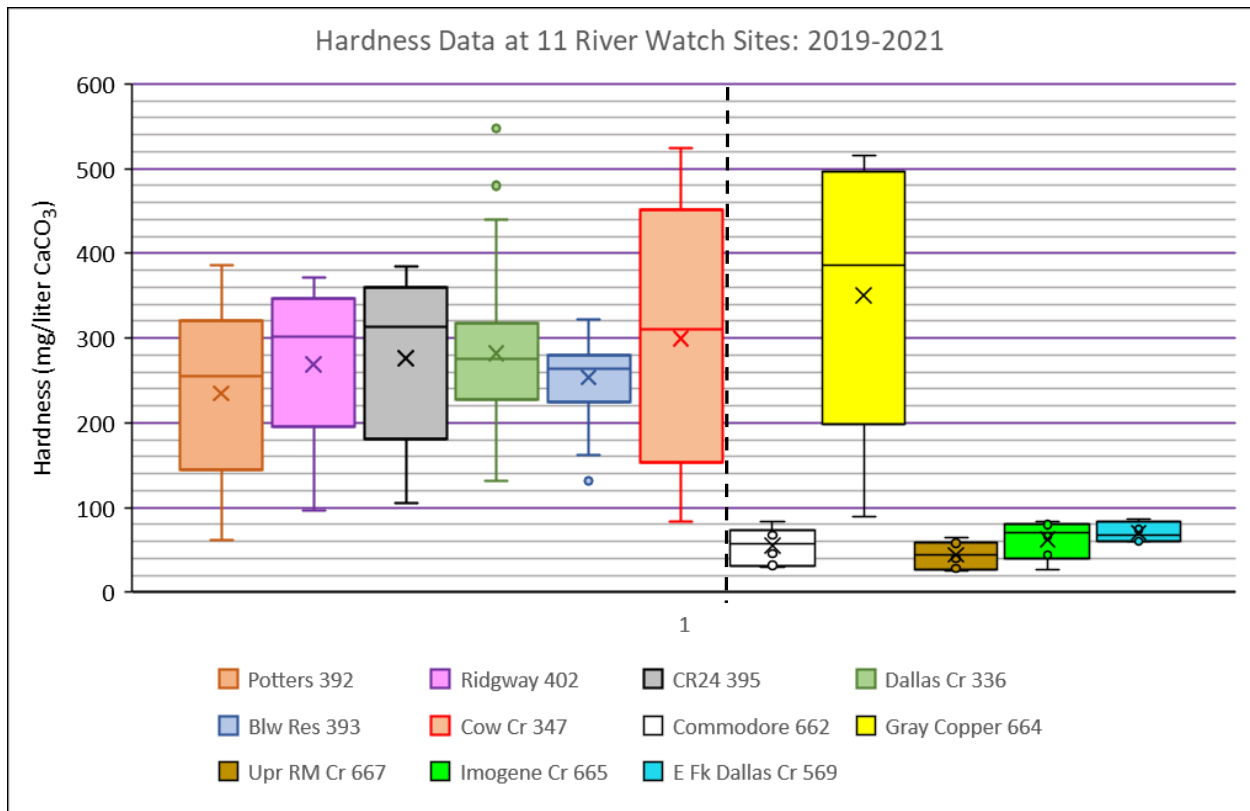


Figure 2. Box and Whisker plots of total hardness data for the 11 UWP River Watch sites collected between 2019 and 2021. The six lower sites from Potters Ranch to Cow Creek are shown to the left of the dashed line and the five higher sites are to the right of the line.