

Figure 1. The Uncompahgre Watershed in Ouray County from the UWP watershed brochure. Mine restoration project locations are shown by the star symbols. Governor Basin is a current project being led by UWP.

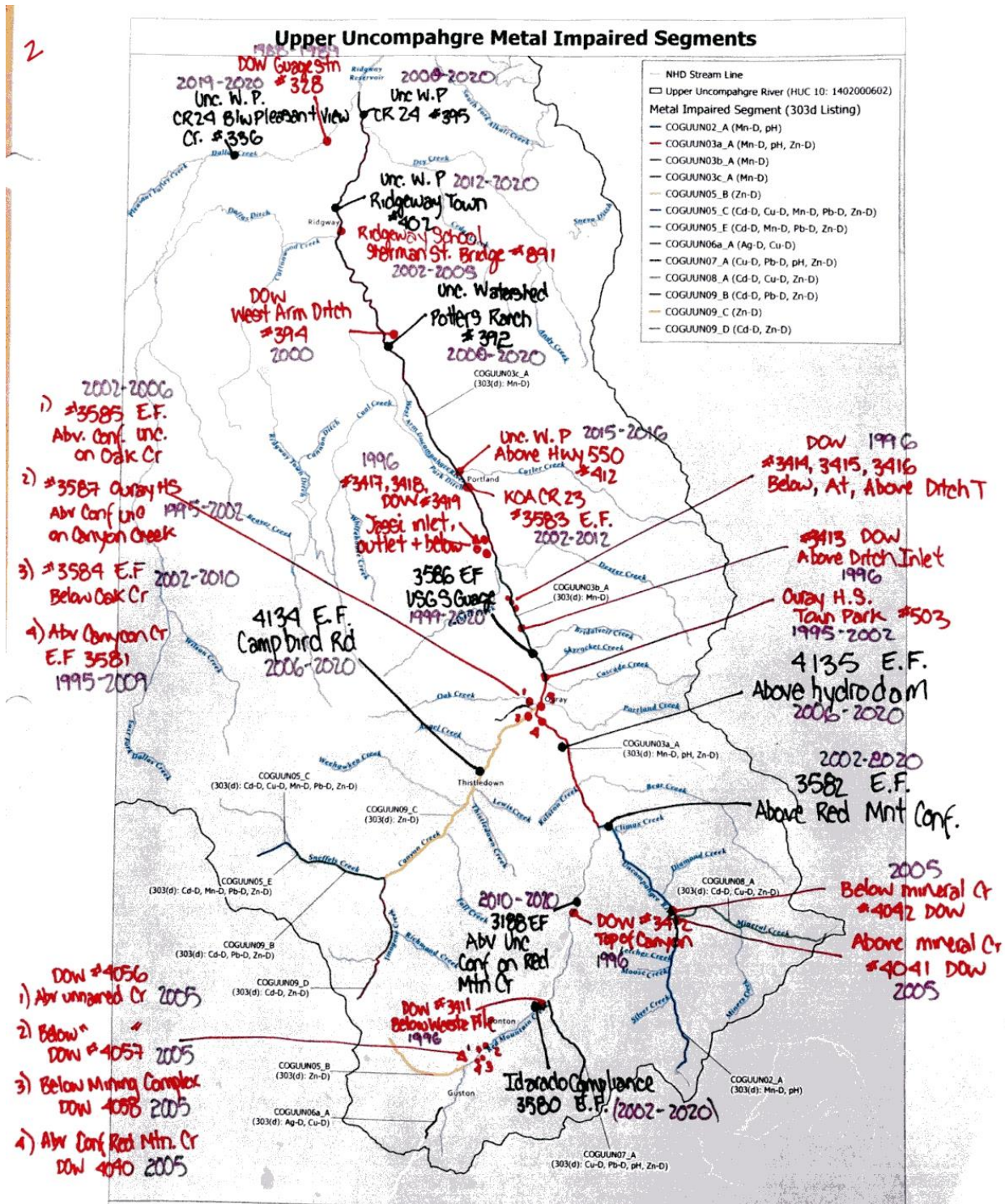


Figure 2. Map of the Upper Uncompahgre watershed showing the locations of past (red labels) and current (black labels) River Watch water quality sampling sites.

Water Quality in the Upper Uncompahgre Watershed

The amount of cadmium, copper, lead, silver, zinc, and pH (acidity) in several streams in the Upper Uncompahgre Watershed do not meet standards used to protect aquatic life. Fish, macroinvertebrates, and other aquatic species are often more sensitive to metals than humans because these species spend most of their lives in or near water, including during very sensitive early stages of life. As a result, aquatic-life standards often are more stringent and more protective than human-health standards.

Several streams in the watershed exceed the water supply standard for manganese. This standard is a secondary standard used to protect water aesthetics like color, taste, and odor. It is not a human-health standard.

Information on how specific parts of the Uncompahgre River and its tributaries measure up to water quality standards is available at www.uncompahgrewatershed.org/links.

A Primer on Water Quality Standards

In Colorado, state and federal agencies collaborate to implement the Clean Water Act. Water quality standards are a critical component of pollution control. The following factors are considered when developing water quality standards for any pollutant:

- toxicity and risks affiliated with the pollutant;
 - water uses such as agriculture, aquatic life, recreation, and water supply;
 - protective level of exposure for each water use; and
 - the amount of pollutant present when toxic effects occur.
- Chronic toxicity occurs over time and affects organism survival, reproduction, and growth. Acute toxicity refers to a lethal dose in sensitive species or portions of the population (e.g. larvae).

The process to develop water quality standards is complex and evolves as we learn more about biology, toxicology, and techniques used to detect pollutants. Because of the need to protect all water uses, the water use that is most sensitive to a given pollutant is the effective standard for that pollutant. This practice assures that all water uses are protected when the standard for the most sensitive water use is met.

This is a cursory introduction to the Clean Water Act and water quality standards in Colorado. Additional resources are available at the link referenced above this box.

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Standards for Common Water Uses in Ouray County



Agriculture standards protect livestock and crops. Sensitive life stages include pregnancy, lactation, and juvenile animals.



Aquatic life standards protect fish, macroinvertebrates (aquatic insects and invertebrates like worms), and riparian birds.



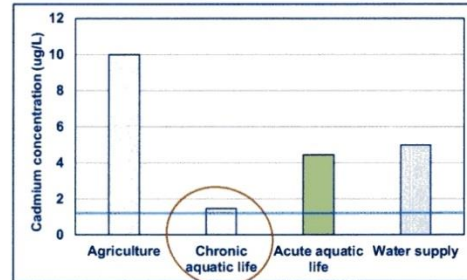
Recreation standards protect recreational users that may ingest small amounts of water while swimming, kayaking, etc. Recreational use is the effective standard for E. coli.



Water supply standards protect raw drinking water supplies. These standards often include two parts: protecting human health and identifying the maximum contaminate level (MCL). MCL is the legal limit on the amount of a substance allowed in a public water supply. The Safe Drinking Water Act regulates public drinking water supplies.

Cadmium Standards in the Uncompahgre River near Ouray

The chart below shows cadmium standards for water uses (the colored bars) and cadmium concentrations (the blue line) in the Uncompahgre River near Ouray at River Watch station 3586. The standard to protect aquatic life from chronic toxicity (light green bar) is the most sensitive water use. Because cadmium concentrations are less than the chronic aquatic life standard, all water uses are protected. This chart demonstrates how standards work. Similar charts for each pollutant for each stream and river segment in the watershed would not fit into this short booklet. The link on the previous page provides access to additional data.



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Figure 3. From the UWP Uncompahgre Watershed Brochure. Brief descriptions of water quality and water quality standards based on water use. Graph at the lower right shows how the cadmium standard varies by water use, with the aquatic life chronic standard being the lowest.

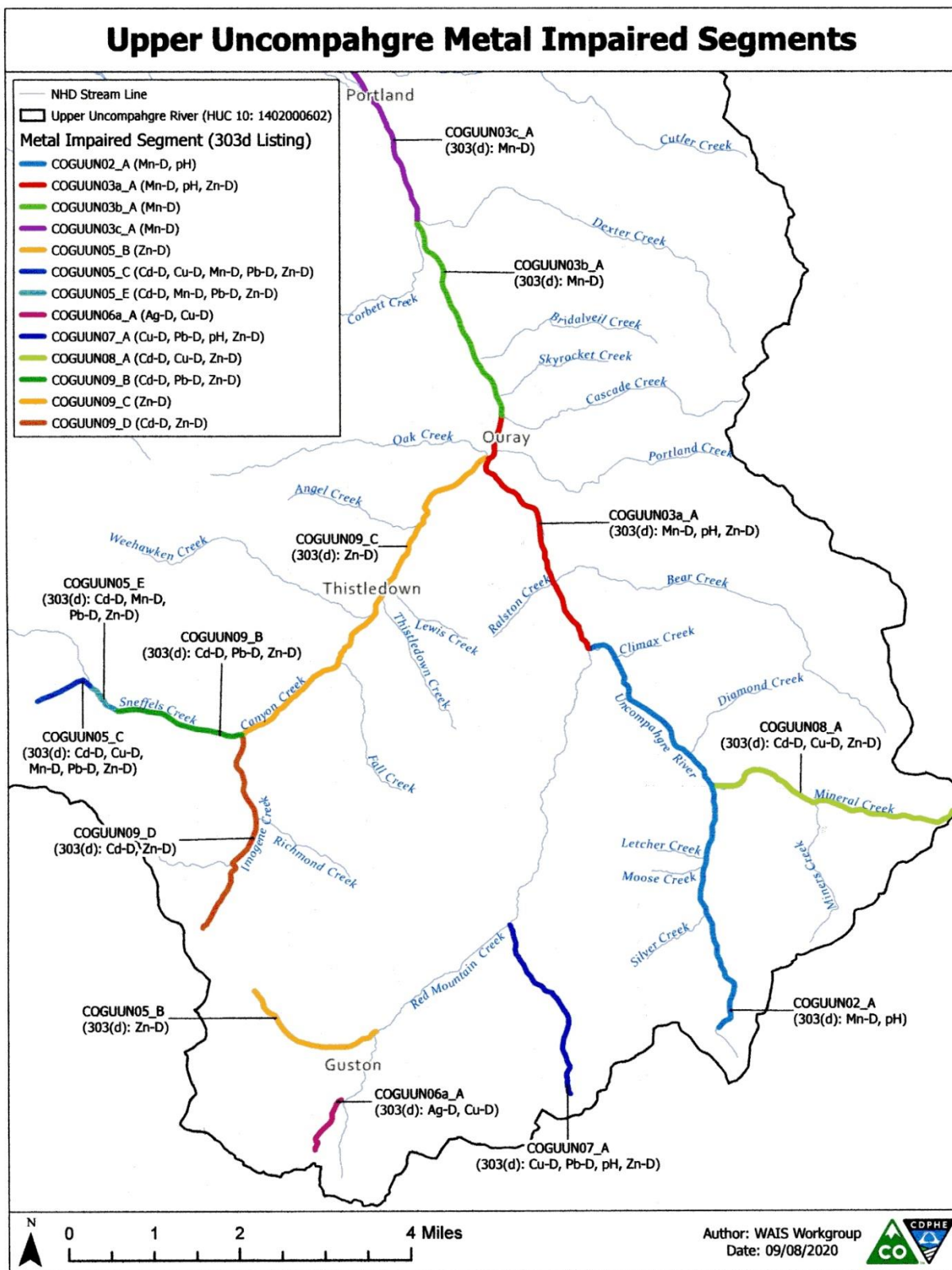
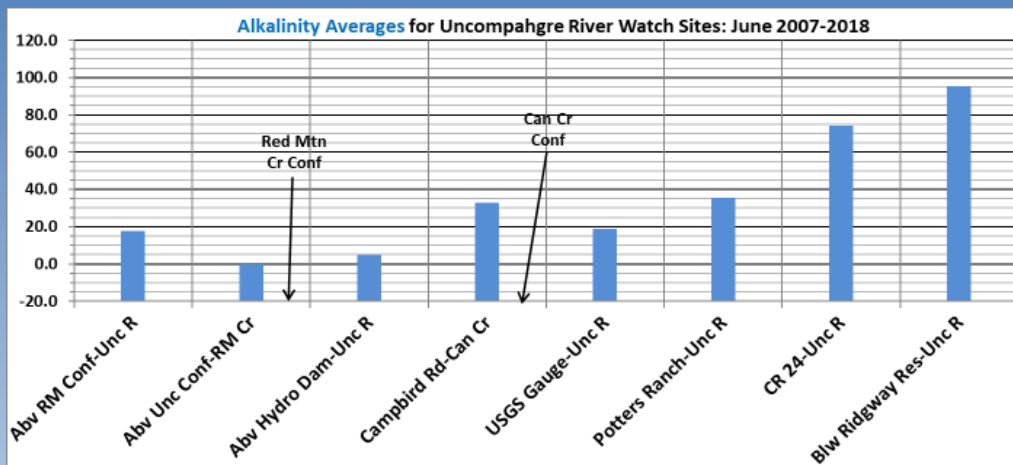


Figure 4. Map showing the Upper Uncompahgre watershed with metal impaired stream segments highlighted by dark colors. The metals causing impairment are noted in the legend and in the note attached to each impaired segment. (Map courtesy of CDPHE)

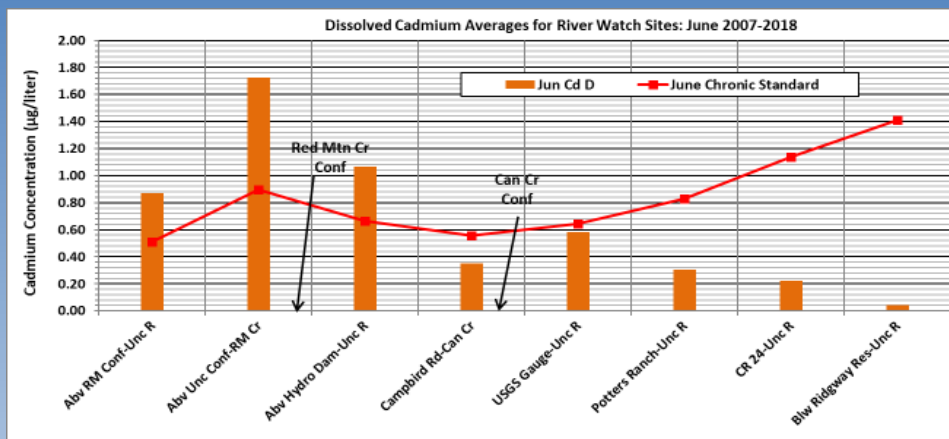
Example of RW data: Alkalinity plotted upstream to downstream



- Alkalinity generally increases along the river at high flow
 - Very low alkalinity at high elevation sites (lack of carbonates)
 - Alkalinity increases as streambed changes and water from agricultural land enters the river below Ouray
 - Higher alkalinity buffers acidic water from Red Mtn Creek

Figure 5. Plot of average total alkalinity from eight River Watch sites on the Uncompahgre River, Red Mtn Creek and Canyon Creek. Data are from all June (high flow) samples collected between 2007 and 2018. The furthest upstream site is on the left and furthest downstream site is on the right.

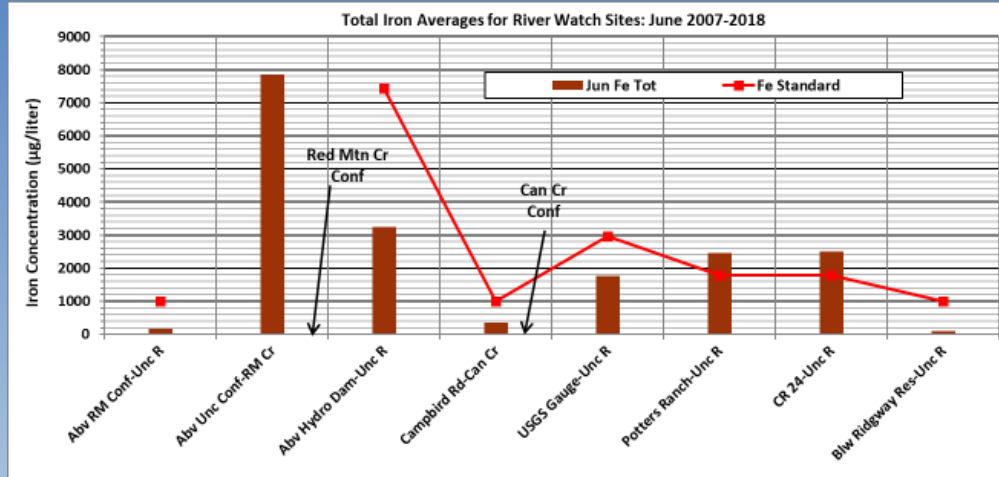
Example of RW data: Dissolved Cadmium plotted upstream to downstream



- Several Uncompahgre streams are listed as impaired for Cadmium
 - Main source from Red Mtn Creek
 - Cd chronic standard exceeded at highest 3 sites
 - Cd concentration decreases downstream from Red Mtn with increased flow (dilution)
 - Chronic standard increases below Ouray as water hardness increases

Figure 6. As in Figure 5 except showing a plot of average dissolved cadmium (Cd) from eight River Watch sites on the Uncompahgre River, Red Mtn Creek and Canyon Creek. The Cd chronic standard for aquatic life is shown by the red line.

Example of RW data: Total Iron plotted upstream to downstream



- How total iron concentration changes along the river at high flow
 - Main source from Red Mtn Creek
 - Low iron concentrations from UpperUnc and Canyon Creek
 - Unlike dissolved metals iron increases below Ouray at high flow
 - Chronic standard exceeded at 2 sites
 - Very low concentration below reservoir

Figure 7. As in Figure 5 except showing a plot of average total iron (Fe) from eight River Watch sites on the Uncompahgre River, Red Mtn Creek and Canyon Creek. The Fe chronic standard for aquatic life is shown by the red line.