# Clear Creek Water Quality

## Prepared by Clear Creek Watershed Foundation, April 2017


### OVERVIEW

The Clear Creek watershed is a 526-square mile drainage basin located in central Colorado that has benefitted from long-term water-quality monitoring and stream flow gaging. This presentation focuses upon the lower part of this watershed and provides a comparison of stream quality to applicable water-quality standards and beneficial-use criteria. This water quality characterization relied upon the use of several databases (see Acknowledgements). Nearly 22,000 analytical results for over 60 water quality parameters at seven different sampling sites, were reviewed and evaluated during the preparation of this presentation. Monitoring sites, including gages, are shown on the map.

Generally, water quality is quite good in Clear Creek from Golden to the South Platte River. However, as in most urban waters, ***E. coli*** levels are typically elevated, indicating the potential presence of pathogens in the water column (Figure 2). Recreational users should avoid ingesting even small quantities of untreated Clear Creek water and wash their hands after being in the stream. Also, both ***Total Nitrogen*** and **Total Phosphorus** are elevated in Lower Clear Creek, as discussed below in Figures 5 and 6. Despite extensive mining-related impacts in the mountainous areas of the Clear Creek watershed, toxic heavy metals are not a sigificant problem in Lower Clear Creek, although ***Iron*** and ***Manganese*** are somewhat elevated as shown below in Figure 10. While Clear Creek is in compliance with ***daily maximum temperature*** standards, there are presently insufficient data to determine compliance with ***maximum weekly average temperature*** standards. Also, there is a paucity of data for ***organic chemicals***, which is important given current industrial land uses and past disposal practices in the lower Clear Creek corridor.

### Water Quality Standards and Beneficial Uses

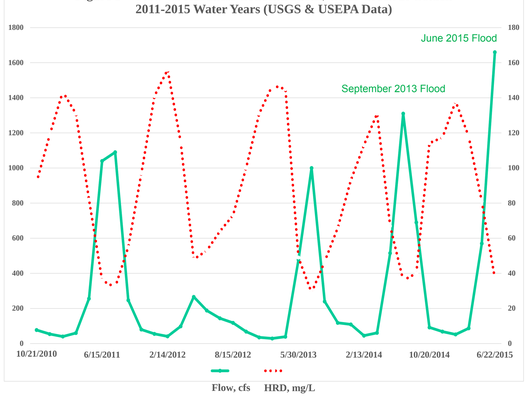
Water quality standards are established to protect the physical, chemical and biological integrity of waters throughout each state and across the nation. There are, in fact, hundreds of numerical standards to consider, when conducting water quality assessments.

| Beneficial Uses | Water Quality Standards | Figure references |
|---|---|---|
| Water Supply | Total Phosphorus | Figure 7 |
| | Total Nitrogen | Figure 5 |
| | Nitrate & Nitrite | Figure 6 |
| | Manganese & Iron | Figure 8 |
| Aquatic Life | Dissolved Oxygen | Figure 4 |
| | Zinc & Copper | Figure 9 |
| | Hardness & Flow | Figure 1 |
| Recreation | E. Coli Bacteria | Figure 2 |
| | pH | Figure 3 |

### Hardness and Flow

Hardness is not toxic. As the Hardness increases, the toxicity of most metals decreases. Hardness concentrations throughout the watershed vary seasonally with wintertime hardness values about twice those of summertime. Hardness values are low when stream flow is high. Meanwhile, flow in sufficient amounts is the most critical habitat element for fish and water-dependent wildlife.

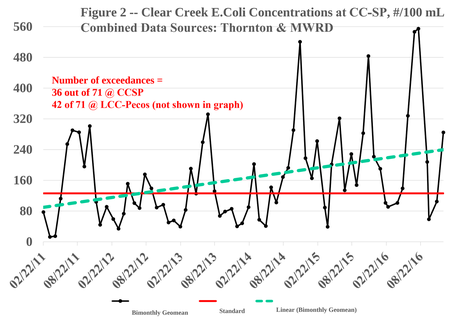
**Figure 1 -- Flow vs. Hardness Concentrations, Clear Creek at Golden 2011-2015 Water Years (USGS & USEPA Data)**




### Escherichia coli

Escherichia coli bacteria is the *indicator species* for the presence of disease causing organisms in the water. Just above its confluence with the South Platte River and upstream, near Pecos St., E. coli levels exceed the standard.

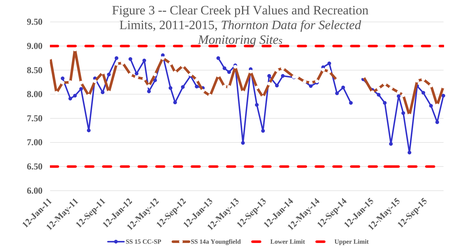
**Figure 2 -- Clear Creek E.Coli Concentrations at CC-SP, #/100 mL Combined Data Sources: Thornton & MWRD**




### pH

**pH is an key water-quality variable contolling trace-metals solubility. Waters that are too acidic, or alkaline, damage sensitive tissues (eyes, skin) impacting recreational water uses (e.g. swimming).**

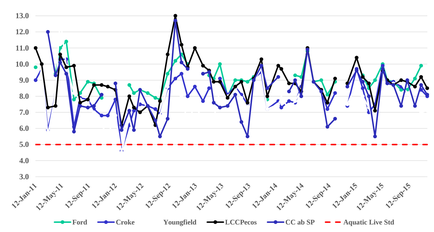
Figure 3 -- Clear Creek pH Values and Recreation Limits, 2011-2015, *Thornton Data for Selected Monitoring Sites*




### Dissolved Oxygen

**Many species of aquatic organisms are exquisitly sensitive to low dissolved oxygen concentrations. The D.O. standard of 5 mg/L is generally met in Clear Creek.**

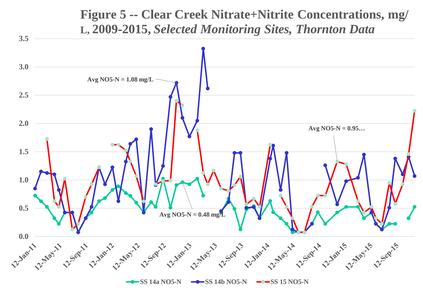
**Figure 4 -- Dissolved-Oxygen Concentrations, mg/L, 2011-2015**




### Nitrate-Nitrite

**Nitrogen as Nitrate, or Nitrite, in drinking water can be harmful, especially to developing fetuses. The Primary Drinking Water standard is 10 mg/L. Fortunatly, Clear Ceek is well below that standard.**

**Figure 5 -- Clear Creek Nitrate+Nitrite Concentrations, mg/L, 2009-2015, *Selected Monitoring Sites, Thornton Data***

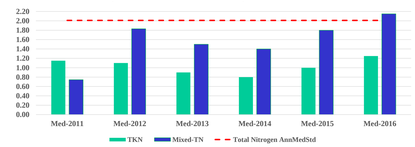



### Total Nitrogen

Excessive Total Nitrogen can promote harmful algal blooms, including toxic strains of blue green algae. Current levels at CC-SP are approaching the interim standard for TN.

**Figure 6 -- Total Nitrogen & TKN Concentrations, mg/L, 2015-2016, Median Values vs. Annual Median Standard**

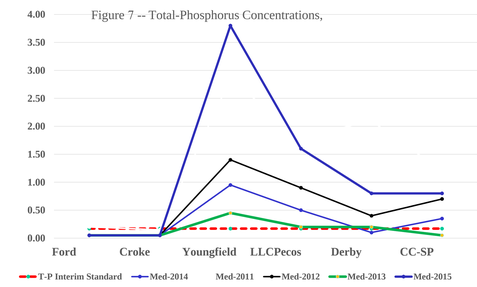
*MWRD Data for Site CC-SP near Confluence near South Platte River*




### Total Phosphorus

Total phosphorus is a nutrient that can cause eutrification and harmful algal blooms, impacting water supplies with taste and odor problems and harming water sport enthusiasts with toxicity from certain types of algae. T-P annual median values in lower Clear Creek often exceed the interim standard of 0.17 mg/L

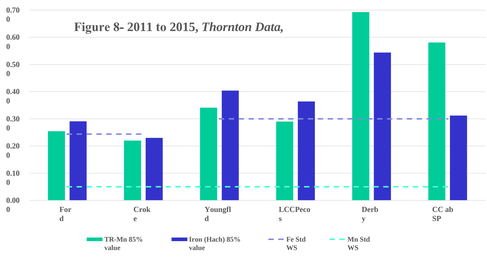
Figure 7 -- Total-Phosphorus Concentrations,




### Iron and Manganese

Neither Manganese or Iron is particularly toxic to fish, or human health, but if untreated, they can cause aesthetic problems in water supplies (e.g., staining in plumbing fixtures and clean laundry).

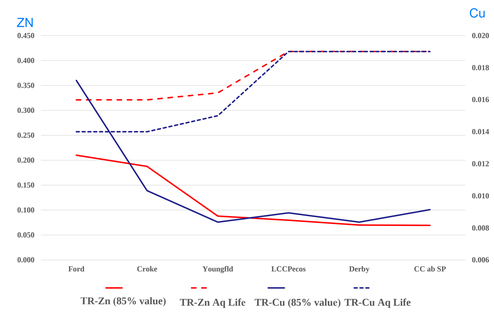
**Figure 8- 2011 to 2015, *Thornton Data,***




### Copper and Zinc

**With the exception of copper at Ford Street in Golden, the concentration values for Copper and Zinc- two of the most common toxic metals found in Colorado streams- do not exceed the standards.**

**Figure 9 -- Zinc and Copper 85% Concentrations, mg/L, 2011-2015- Thornton Data,**




### Acknowledgements

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