Has anyone noticed the color of Animas River this spring?

With a heightened awareness since the Gold King Mine release, many people in the community have begun to note the color of the Animas River.

The Animas River naturally turns various shades of brown during spring runoff as a result of snowmelt and suspended sediment.
“The river looked a bit orange today, should I be concerned?”

Mountain Studies Institute (MSI) has been monitoring water quality of the Animas River at Rotary Park in Durango before, during, and after the 2015 Gold King Mine release. We plan to continue monitoring during spring runoff in 2016. We collected our first water quality sample of the season on February 15 2016 and now have water quality data from February, March, April, and May.

Visit the Mountain Studies Institute website for more information: www.mountainstudies.org

Photo from February 15, 2016
So far in the spring of 2016, MSI has collected 15 samples from Feb through May.
For perspective, these are spring runoff photos compared to the color of the Gold King Mine plume on August 7, 2015.
Click through the following pages to learn how metal concentrations in the Animas River so far in the Spring of 2016 compare to water quality standards and observations from before, during, and after the Gold King Mine release...

...or skip ahead to the end for a summary

Please keep in mind that this is an example from only one location (Rotary Park in Durango) on the Animas River and may not be indicative of the entire Animas River watershed.
We will start by using an example of one metal, total zinc, from the Animas River at Rotary Park in Durango, Colorado.
Metal concentration (ug/L), log scale, is on the vertical axis.
Total Zinc, Animas River at Durango, CO: 2002-2016

Grey diamonds = Historic River Watch samples from the Animas River – 2002 to 2014

**Note:** 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.
Orange diamonds = Samples collected during the Gold King Mine Plume (August 6 to August 9, 2015)
Blue diamonds = Samples collected post-Gold King Mine Plume including fall storm events (August 10 to October 26, 2015)
Red diamonds = Sample collected this spring

Historic River Watch samples (2002-2014)

Gold King Mine Plume samples (8/6/15 - 8/9/15)

Post-Gold King Mine Plume samples (8/10/15 - 10/26/15)

~Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34. Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.
*Question* = How does the spring 2016 concentrations compare to concentrations during the 2015 Gold King Mine plume?

*Answer* = Spring 2016 concentrations were less than concentrations observed at the peak of the Gold King Mine plume.
Red outlined diamonds = All samples collected in the spring February through June - 2002 to 2016

Question = How does spring runoff in 2016 compare to previous springs?

Answer = the bulk of observed zinc concentrations so far this spring are consistent with previous springs.
EPA – Recreational Screening Level
Set to protect use of the Animas River for recreation

Protective of users who accidentally swallow river water (swimmers, rafters, tubers) or users who intentionally ingest river water (backpackers, overnight river users)

*Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34. Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO
Total Zinc, Animas River at Durango, CO: 2002-2016

Colorado Department of Public Health and Environment (CDPHE) – Drinking Water Supply Standard

Set to protect use of the Animas River for domestic drinking water supply

EPA Surface Water Recreational Screening Level (50,000 µg/L)*
CDPHE Domestic Water Supply Maximum Contaminant Level 30-Day Exposure (5,000 µg/L)**

Spring 2016 samples
All samples collected in the spring: February through June
Historic River Watch samples (2002-2014)
Gold King Mine Plume samples (8/6/15 - 8/9/15)
Post-Gold King Mine Plume samples (8/10/15 - 10/26/15)

*Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34.
Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.
Colorado Department of Public Health and Environment (CDPHE) – Agriculture Standard

Set to protect agricultural use of the Animas River – irrigation and livestock watering

Notes:
- Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Regs. 31 and 34.
- Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.
So far this spring, zinc concentrations have been at levels considered safe for Recreation, Agriculture, and Drinking Water Supply (**below water quality benchmarks**).
Now let’s look at an example of another metal, total lead, from the Animas River at Rotary Park in Durango, Colorado.
Concentrations of lead observed this spring were similar to previous springs.

Question = How does spring runoff in 2016 compare to previous springs?
How did lead concentrations during spring runoff compare to water quality benchmarks?

So far this spring, lead concentrations have been at levels considered safe for Recreation and Agriculture. Most samples indicate that lead concentrations were at levels considered safe for use as a Drinking Water Supply.
Although most samples indicate that lead concentrations were at levels considered safe for use as a drinking water supply, samples from May 6 and May 22 had lead levels that were below the water quality standard for domestic drinking water supply. However, the City of Durango does not source drinking water from the Animas River during spring runoff and treated city water meets all drinking water standards.
Lead concentrations surpassing the domestic water supply standard are not unprecedented on the Durango stretch of the Animas. A similar level of lead was detected in 2008.
To see graphs for additional metals, please visit the Mountain Studies Institute online:

www.MountainStudies.org/AnimasRiver
So far, have metals during spring runoff been higher than water quality benchmarks?

- **Recreation**: None
- **Agriculture**: None
- **Drinking Water Supply**
  - **Mn**: dissolved manganese
  - **Pb**: total lead

**Aquatic Life**
- **Acute**: None
- **Chronic**
  - **Al**: total aluminum
  - **Fe**: total iron

*Note: t=total recoverable; d=dissolved*
Should I be concerned?

So far, the Animas River has contained low levels of metals during spring runoff.

So, what does that mean? 

The good news is:

Metal concentrations during spring runoff were not high enough to surpass:

- EPA Recreation Screening Levels
- CDPHE Aquatic Life Acute Water Quality Standards
- CDPHE Agricultural Water Quality Standards
Should I be concerned?

*More good news:*

- Metals most thought to be harmful to aquatic life, Copper, Zinc, and Selenium, *did not surpass* CDPHE Aquatic Life water quality standards during spring runoff, during fall 2015 storm events, or during the Gold King Mine release.

- Metals of particular concern, Arsenic and Mercury, *did not surpass* water quality standards during spring runoff.
Should I be concerned?

Manganese and lead surpassed CDPHE Domestic Drinking Water Quality Standards during spring runoff.

However:

- City of Durango does not source drinking water from the Animas River during Spring Runoff

- When the City of Durango does source drinking water from the Animas River, water is thoroughly treated and meets all water quality regulations.

- Manganese at this level is not of concern for human health. The concern is associated with aesthetic effects, such as staining of appliances.
Should I be concerned?

But, there were some concerns:

Aluminum and iron surpassed CDPHE Chronic Standards for Aquatic Life during spring runoff. High levels of aluminum and iron are not unprecedented, they have occurred during spring runoff in previous years.

It is important to note that there are large natural sources of aluminum and iron in the Animas River watershed that are not related to mining activities.

Mountain Studies Institute, Colorado Parks and Wildlife, Southern Ute Indian Tribe, and other organizations will continue to monitor aquatic life to assess overall river health.
We know that metal contamination from natural sources and mine-related sources have negatively impacted water quality of the Animas River for over a hundred years.

Some of the water quality data from spring of 2016 have been encouraging – we have no indication of any continued threat to human health from Animas River water, but the data do raise some concerns for aquatic life in the Durango stretch of the Animas River. These concerns can only be addressed by continued monitoring of water quality and aquatic life.
If you are interested in diving deeper into the data on your own, visit The Mountain Studies Institute online at: www.MountainStudies.org

...or check out the following pages for graphs of more metals.
Dissolved Aluminum, Animas River at Durango, CO: 2002-2016

Metal Concentration (μg/L)

EPA Surface Water Recreational Screening Level (170,000 μg/L)*

Spring 2016 samples

All samples collected in the spring: February through June

Historic River Watch samples (2002-2014)

Gold King Mine Plume samples (8/6/15 - 8/9/15)

Post-Gold King Mine Plume samples (8/10/15 - 10/26/15)

Samples with concentrations below Method Detection Limit

* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.
Total Arsenic, Animas River at Durango, CO: 2002-2016

- **EPA Surface Water Recreational Screening Level (50 µg/L)**
- **CDPHE Agriculture Standard 30 Day Exposure (100 µg/L)**
- **CDPHE Domestic Water Supply Maximum Contaminant Level 30-Day Exposure (10 µg/L)**
- **Spring 2016 samples**
- **All samples collected in the spring: February through June**
- **Historic River Watch samples (2002-2014)**
- **Gold King Mine Plume samples (8/6/15 - 8/9/15)**
- **Post-Gold King Mine Plume samples (8/10/15 - 10/26/15)**
- **Samples with concentrations below Method Detection Limit**

*The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

**Colorado Department of Public Health and Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34.

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.
Dissolved Arsenic, Animas River at Durango, CO: 2002-2016

- CDPHE Acute Standard for Aquatic Life (Dissolved, 340 μg/L)
- CDPHE Chronic Standard for Aquatic Life (Dissolved, 150 μg/L)
- EPA Surface Water Recreational Screening Level (50 μg/L)*

- Spring 2016 samples
- All samples collected in the spring: February through June
- Historic River Watch samples (2002-2014)
- Gold King Mine Plume samples (8/6/15 - 8/9/15)
- Post-Gold King Mine Plume samples (8/10/15 - 10/26/15)
- Samples with concentrations below Method Detection Limit

* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of filtered water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.
Total Copper, Animas River at Durango, CO: 2002-2016

- **EPA Surface Water Recreational Screening Level** (6,700 µg/L)*
- **CDPHE Agriculture Standard 30-Day Exposure (200 µg/L)**
- **CDPHE Domestic Water Supply Maximum Contaminant Level 30-Day Exposure (1,000 µg/L)**

* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

**Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34.**

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.
Dissolved Copper, Animas River at Durango, CO: 2002-2016

* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.
Total Iron, Animas River at Durango, CO: 2002-2016

- EPA Surface Water Recreational Screening Level (120,000 μg/L)*
- CDPHE Chronic Standard for Aquatic Life (1,000 μg/L, Total)**
- Spring 2016 samples
- All samples collected in the spring: February through June
- Historic River Watch samples (2002-2014)
- Gold King Mine Plume samples (8/6/15 - 8/9/15)
- Post-Gold King Mine Plume samples (8/10/15 - 10/26/15)
- Samples with concentrations below Method Detection Limit

*The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of filtered water per day, from the Animas, orally, for 64 days each year for a total of 30 years.
**Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34.
Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.
Dissolved Iron, Animas River at Durango, CO: 2002-2016

* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of filtered water per day, from the Animas, orally, for 64 days each year for a total of 30 years.
Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.
Total Lead, Animas River at Durango, CO: 2002-2016

- EPA Surface Water Recreational Screening Level (200 µg/L)*
- CDPHE Agriculture Standard 30-Day Exposure (100 µg/L)**
- CDPHE Domestic Water Supply Maximum Contaminant Level 1-Day Exposure (50 µg/L)***

Spring 2016 samples
All samples collected in the spring: February through June
Historic River Watch samples (2002-2014)
Gold King Mine Plume samples (8/6/15 - 8/9/15)
Post-Gold King Mine Plume samples (8/10/15 - 10/26/15)
Samples with concentrations below Method Detection Limit

* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of water per day, from the Animas, orally, for 64 days each year for a total of 20 years.
**Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34.
Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.
Dissolved Lead, Animas River at Durango, CO: 2002-2016

- EPA Surface Water Recreational Screening Level (200 μg/L)
- CDPHE Acute Standard for Aquatic Life, based on average hardness
- CDPHE Chronic Standard for Aquatic Life, based on average hardness
- Spring 2016 samples
- All samples collected in the spring: February through June
- Historic River Watch samples (2002-2014)
- Gold King Mine Plume samples (8/6/15 - 8/9/15)
- Post-Gold King Mine Plume samples (8/10/15 - 10/26/15)
- Samples with concentrations below Method Detection Limit

* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of filtered water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.
Total Manganese, Animas River at Durango, CO: 2002-2016

* The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of filtered water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.
**Dissolved Manganese, Animas River at Durango, CO: 2002-2016**

- **EPA Surface Water Recreational Screening Level (7,800 µg/L)**
- **CDPHE Acute Standard for Aquatic Life, based on average hardness**
- **CDPHE Chronic Standard for Aquatic Life, based on average hardness**
- **CDPHE Domestic Water Supply Maximum Contaminant Level 30-Day Exposure (50 µg/L, dissolved)**
- Red diamonds: Spring 2016 samples
- Yellow circles: All samples collected in the spring: February through June
- Gray diamonds: Historic River Watch samples
- Gold circles: Gold King Mine Plume samples (8/6/15 - 8/9/15)
- Blue diamonds: Post-Gold King Mine Plume samples (8/10/15 - 10/26/15)
- White circles: Samples with concentrations below Method Detection Limit

*The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of filtered water per day, from the Animas, orally, for 64 days each year for a total of 30 years.*

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.
Total Selenium, Animas River at Durango, CO: 2002-2016

The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of filtered water per day, from the Animas, orally, for 64 days each year for a total of 30 years.

Colorado Department of Public Health and the Environment (CDPHE) standards based on Colorado surface water quality classifications and Reg. 31 and 34.

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.
Dissolved Selenium, Animas River at Durango, CO: 2002-2016

- **EPA Surface Water Recreational Screening Level (830 µg/L)**
- **CDPHE Acute Standard for Aquatic Life (Dissolved, 18.4 µg/L)**
- **CDPHE Chronic Standard for Aquatic Life (Dissolved, 4.6 µg/L)**
- **Spring 2016 samples**
- **All samples collected in the spring: February through June**
- **Historic River Watch samples (2002-2014)**
- **Gold King Mine Plume samples (8/6/15 - 8/9/15)**
- **Post-Gold King Mine Plume samples (8/10/15 - 10/26/15)**
- **Samples with concentrations below Method Detection Limit**

*The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of filtered water per day, from the Animas, orally, for 64 days each year for a total of 30 years.*

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.
Dissolved Zinc, Animas River at Durango, CO: 2002-2016

- **EPA Surface Water Recreational Screening Level (50,000 μg/L)**
- **CDPHE Acute Standard for Aquatic Life, based on average hardness**
- **CDPHE Chronic Standard for Aquatic Life, based on average hardness**
- **Spring 2016 samples**
- **All samples collected in the spring: February through June**
- **Historic River Watch samples (2002-2014)**
- **Gold King Mine Plume samples (8/6/15 - 8/9/15)**
- **Post-Gold King Mine Plume samples (8/10/15 - 10/26/15)**
- **Samples with concentrations below Method Detection Limit**

*The recreational screening level represents the level at which no adverse health effects are expected to occur in humans consuming 2L of water per day, from the Animas, orally, for 60 days each year for a total of 30 years.

**Colorado Department of Public Health and Environment (CDPHE) standards based on Colorado surface water quality classifications and Regs. 31 and 34. Standards vary with water hardness and are plotted here using an average water hardness of the Animas River at this location, 208 mg/L."

Note: 2002 - 2014 data is River Watch data from the Animas River at the fish hatchery in Durango, CO. 2015 and 2016 data is Mountain Studies Institute data from the Animas River at Rotary Park in Durango, CO.