History of the Mine

The Gold King Mine was discovered in 1887 by Olaf Arvid Nelson, the "mighty Swede!" He had been working at the nearby Sampson Mine. Secretively he located the original Gold King claim on the slopes of Bonita Peak, in Southwestern Colorado. He immediately went to work on it. Eventually digging a 50-foot shaft and a 50-foot drift, but he never made money from it. Olaf eventually died of pneumonia in 1891 – or perhaps of overwork, in his Howardsville home, leaving a widow and six kids. The Gold King claim was patented, giving title of the land to Louisa, Olaf’s widow. In 1894, Louisa sold the Gold King claim to Northeastern capitalists Cyrus W. Davis and Henry Soule for a mere $15,000. The mine flourished and was developed by crosscuts, drifts and other openings forming 7 levels of shafts totaling 2,000 feet. The mine yielded more than 700,000 tons of gold and silver.

Operations continued until 1907 when a fire destroyed the surface buildings of the mine. The mine reopened in 1910 but closed shortly thereafter because of litigation and labor problems. In 1918 a new company bought the mine and it operated until the fall of 1922, shutting its tunnels forever. The Gold King Mine was destined to become one of the 23,000 abandoned mines peppering the Colorado landscape.
The Gold King Mine is located in the Upper Animas Watershed in Southwestern Colorado. These watersheds within the volcanic terrain of the San Juan Mountains contain some 400 abandoned and inactive mine sites, which have been the focus of both large and small-scale mining operations between 1871 and 1991. The watershed consists of three main streams, the Animas, Cement Creek and Mineral Creek; of all which drain the Silverton Caldera. The Animas River and many of its tributaries are historically impacted by high concentrations of heavy metals from both acid rock/mine drainage at mine sites and from naturally occurring metal loading sources not impacted by mining. By the end of mining operations, many of the mines were left discharging contaminated water into streams. In 1991, the last big mine in the region, the Sunnyside, stopped mining. Its owner, the Sunnyside Gold Corp., agreed not only to bulkhead (mine plug) its mine, but also clean up abandoned mines nearby, while continuing to run the metal-laden waters of upper Cement Creek through a water treatment facility.

Do you think a lot of the old mines contaminate the local streams and land in Colorado?
How do you think the mines affected the surrounding area?
On Wednesday, August 5, 2015, the United States Environmental Protection Agency was investigating the abandoned Gold King Mine. Heavy equipment disturbed loose material around a soil "plug" at the mine entrance. Acid mine drainage had built up behind the plug, which unexpectedly gave way due to water pressure in the tunnel, and a total of 3 million gallons of acid mine drainage dumped into the Cement Creek. The yellow-orange water was laden with metals including mostly iron, but also lead, aluminum, zinc, cadmium, arsenic, beryllium and copper.

Was the EPA aware of the contaminated water? The EPA had considered drilling into the mine from above in order to measure the water level directly before beginning excavation at the entrance, (as was done at nearby mines in 2011). Had they done so, they would have discovered the true water level, and changed their plan. The disaster would not have occurred. EPA files have been found indicating that U.S. government officials "knew of 'blowout' risk for tainted water at the mine." They had learned of this risk through a June 2014 work order that read "Conditions may exist that could result in a blowout of the blockages and cause a release of large volumes of contaminated mine waters and sediment from inside the mine, which contain concentrated heavy metals." But EPA continued with their plans and ignored all warnings prior to the inspection. The EPA did not notify local residents of the spill until 24 hours after it occurred, a delay which the locals criticized. On August 8, Governor Hickenlooper and the leader of the Navajo Nation declared a state disaster. On August 11, New Mexico governor declared a state of emergency.

Who do you think is responsible for the disaster?
What else do you think could be affected by the contamination?
The Effects of the Disaster

Why Did the Water Turn Yellow?
Many abandoned mines have deep tunnels below the water table that were created to mine ore. During mining, water is pumped out of the tunnels, but after the mine is closed, the water table can rise back up, filling the empty tunnels with water. When the ore in the tunnels is exposed to water and air, acid is generated and metals from the rock seep into the water. This creates a thick, metal-filled mixture called "acid mine drainage." Acid mine drainage is usually a rusty red to orange color due to the presence of iron. When a spill occurs into a waterway, and the acid mine drainage is mixed with fresh water, it becomes less acidic, which changes the way iron and other metals interact with the water and with solids in the water. The iron in the water settles into the water, turning it yellow. Old-time miners referred to this as "yellow boy." As more water is mixed in, iron and other metals settle into river bottom sediments and the color returns to normal.

How Big was the Spill?
The acid mine drainage released in the spill contained a number of metals and salts totaling about 190 tons of solids, including several forms of toxic metals such as lead, iron, arsenic, mercury, and cadmium. These solids were mixed in 3,043,067 gallons of water. This volume of water is approximately 9 football fields spread out at one foot deep. Immediately after the spill occurred, the EPA and other federal state agencies began working to control additional acid mine drainage and began making water quality measurements to evaluate impacts on the spill.
EPA's Reaction
At the time of the spill, some locations along the river contained existing infrastructure to remove metals, particularly where it had previously been a problem. In other locations, the only alternative at the time of the spill was to allow the acid mine drainage to become naturally diluted as it flowed downstream. As the initial pulse of the spill moved down the river, it began mixing and became more diluted and less acidic. The metals eventually settled into the river bottom sediments. Within two days, the EPA built settling ponds to divert additional acid mine drainage flow away from Cement Creek and treated the water to neutralize the acid and remove solids and metals from the water.

Short Term Impacts From the Spill
Cement Creek:
Water quality was dramatically affected in Cement Creek following the spill. Although the levels of metals declined throughout August 2015, by mid-September 2015, the levels of most metals remained above pre-spill levels. Cement Creek is typically used for recreation and agriculture. On September 15, 2015 the water was not meeting standards for agricultural use. However, metals and acidity of water and sediments downstream in the Animas, San Juan and Colorado Rivers, as well as Lake Powell had returned to pre-spill levels and were able to be used for recreation, agriculture and drinking water.

Recreation:
The Animas River was closed for recreation following the spill, but re-opened for recreational use within a week. The San Juan and Colorado Rivers remained open for recreation.

Do you think the toxic metals that settled into the rivers sediments will have any affect on the environment?
Short Term Impacts From the Spill

Agriculture:
Intakes for irrigation water were temporarily turned off along the Animas and San Juan Rivers following the spill. Water quality along the affected waterways had returned to pre-spill levels and could be used for irrigation. It was also stated that crops that were grown during the spill were safe for consumption. Many local Navajo farmers rely exclusively on the San Juan River to irrigate their fields and water their livestock. Many tribal irrigation intakes in the area closed due to the spill were shut off for a long time, following water-use restrictions issued by the Navajo Nation. The canal system which provides water to the communities of San Juan, Upper Fruitland and Nenahnezad, was reopened weeks after the water was declared safe for use. Downstream, the Shiprock Chapter, voted to re-open their ditch a year later, causing the crops of many Navajo farmers to die.

Livestock:
By mid August 2015, The Colorado Department of Agriculture State Veterinarian's office declared that water from the Animas River could be used to water livestock. However, excess sulfate in the irrigation water could have decreased the availability of copper in hay and pastures, therefore cattle ranchers and farmers may have to supplement cattle feed with copper.

Gardening:
Local gardeners who used water from the Animas River to grow leafy vegetables and root crops were advised to consult Colorado State University. Some studies have shown that both leafy vegetables and root crops may take up metals easier than other types.

Aquatic life:
On September 2, 2015, the Colorado Department of Public Health and Environment declared that trout from the Animas River were safe to eat. Due to the already slow release of acid mine drainage into the Animas River, there were already a limited number of fish in waterways in the area where the spill occurred. To find out if the spill could affect the developing/young wild fish, 108 fingerling rainbow trout were placed in cages in the Animas River near Durango before the Spill reached the area. The fish were kept in the river for five days until the plume passed. One fish died, unrelated to water quality and the other 107 remained healthy, with no signs of stress throughout the exposure.

Would you feel comfortable using the water for your livestock or gardens? Would you feel comfortable catching and eating a fish that was exposed to the contaminants?
Short Term Impacts From the Spill

Drinking Water:
States continue to work with public drinking water systems to ensure the water is safe to drink. Sampling performed by the Colorado Department of Public Health and Environment demonstrated that public drinking water systems drawing from groundwater wells near Animas River, or even directly from the river itself (with appropriate treatment) provided safe drinking water. Private drinking water wells within a mile of the Animas River were advised to get their water tested by a professional.

Possible Long Term Impacts from the Spill
The EPA reported that there appears to be no short-term effects to health or the environment following the mine spill. But they will not understand the long-term impacts of this highly concentrated release of metals into the environment for quite some time. This longer-term question will depend on the behavior of metals deposited in sediments. There is a potential for the sediments to be stirred up and metals released during high water events or recreational use. The metals could become concentrated in fish that live in the river and feed on things that grow in the sediments, as well as other wild animals that feed on things that grow in or along the river. Metals in the sediments could seep into the groundwater, resulting in impacts to drinking and irrigation water. If the metal-rich sediments deposit on river shores, they could potentially dry out and be blown as dust by wind, where they could contaminate surrounding soil, and could also be inhaled. Locals who enjoy swimming in the river put themselves at risk of prolonged exposure to the contaminants.

There are at least 230 inactive mines in Colorado spilling thousands of gallons per minute into local waterways, according to Colorado State officials. The EPA has estimated that 40% of river headways in the West are impaired by acid mine drainage flowing from metal mines. This has contaminated 1,645 miles of rivers and streams.
Possible Long Term Impacts From the Spill

**Biological Magnification:**
Toxins can become more concentrated as they travel up the food chain. At the bottom of the food chain, insect larvae consume trace amounts of the toxins that aren't nearly enough to harm them. On the next level, minnows eat large amounts of the larvae and accumulate more of the toxins in their tissues. Finally, larger predators absorb the poisons contained in all the fish they consume. By the time a fat, juicy trout reaches a person's dinner plate, its tissues contain heavy metals at dangerously high concentrations. This process happens to all kinds of pollutants, and since humans are at the top of most food chains, we are especially at risk of ingesting lethal amounts.

What has happened since the spill?
A fifth lawsuit had been filed in August of 2018 against the EPA over the mine waste spill. The lawsuit was filed in federal court in Albuquerque, New Mexico by 295 Navajo farmers and ranchers. They are asking for about $74 million. The lawsuit claims farmers and ranchers lost crops and livestock and had to pay to haul clean water because the spill prevented them from using water from the polluted rivers. The new lawsuit was consolidated with four others filed previously by the Navajo Nation, the states of New Mexico and Utah and about a dozen New Mexico residents. That suit seeks a total of $2.3 billion. The EPA asked the judge to dismiss the lawsuits. The judge has not ruled on the request.

Another report states that even after three years since the spill, the federal government has not repaid any of the victims for the millions of dollars in economic damage they claimed. There are 380 claims for lost income, fallen property values and other loses from the spill. Farmers, rafting companies, fishing guides, homeowners and others have filed lawsuits claiming about $318 million in economic losses.
ENGAGING QUESTIONS

1. Who do you think is responsible for the Gold King Mine spill? The EPA, the owners of the mine, or nobody?

2. Do you think there will be effects from the spill...in 5 years? 20?

3. How comfortable would you feel eating a fish caught in the Animas River? Eating vegetables that were watered using water from the contaminated rivers? Eating meat from the cows who drank the water?

4. Do you think there is a chance of another mines in Colorado contaminating the rivers and streams, like the Gold King Mine?

5. Learning that there are 230 abandoned and contaminated mines in Colorado that have already caused the death of 1,645 miles of rivers and streams....who should be responsible for cleaning them up?

6. Do you think it is possible that the contaminated water could get into our aquifers and drinking water?