Durango, CO - 08/06/2015,
Animas River early in the day, the same day the Gold King Mine spill occurred in Silverton, CO, 50 miles north

THE GOLD KING MINE

CHALLENGING COLORADO MINING LEGACY

Luke Giroux

Durango, CO - 08/07/2015,
Animas River one day after the Gold King Mine spill.
Photos: Barbara K Powers

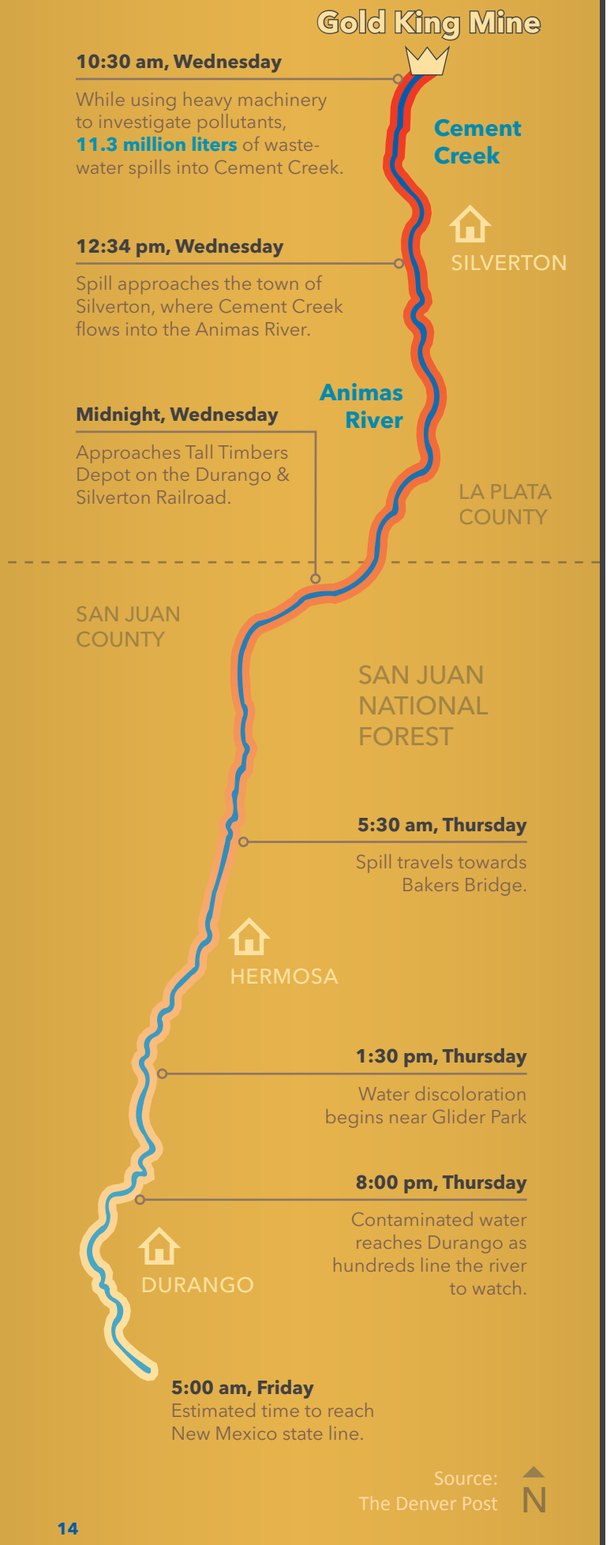
For many, Southwestern Colorado is known for its four-season recreation activities such as rafting and kayaking on rivers that flow out of world famous snow-packed ski areas. In the high-country, hiking, backpacking, and mountain biking trails extend off of old logging and mining roads, which are also used by locals and visitors for four-wheeling. Fun mountain towns like Durango, Silverton, and Pagosa Hot Springs have enough entertainment and commerce between backcountry trips to support locals and tourists alike. Even the many old mines scattered throughout the region offer historic interest in the early regional mining industry.

However interesting these old mines are as remnants of the wild west and the early Rocky Mountain natural resource extraction, many are also unsealed and remain as unresolved water and land pollution sources. In the state of Colorado alone, there are approximately 23,000 of these abandoned mines.

For decades, state and federal agencies have worked to remediate and close over 6,000 of these inactive mines, but many thousands more remain open. A few older Colorado mines are still active, but most are no longer producing.

Early mineral mining in the United States had rampant interest and activity with little regulation that controlled the excavations, resulting in such environmental effects as heavy metal polluted rivers and streams, and open unsafe tunnels, or adits (a horizontal access or drain tunnel).

The remnants of negligent mining practices aren't the only environmental offenders, as naturally occurring seepage from the region's mineral rich soils and geology also contributes to the high contaminant waters. Colorado's Gold King Mine incident last year stands as a glaring reminder of these original mining practices still left unresolved.



There are about 400 of these abandoned mines in the greater San Juan River watershed of southwestern Colorado, which includes the Animas River watershed where the Gold King Mine is located. This inactive gold and silver mine, located northeast of Silverton, was established in 1887 and closed in 1922. Unfortunately, on August 5, 2015, Environmental Protection Agency (EPA) inspectors discovered just how tenuous the conditions of these inactive mines are. While conducting a mine inspection, a water reservoir above the mine adit collapsed, releasing an estimated 11.3 million liters of acid mine drainage and heavy metals-rich water into nearby Cement Creek and the Animas River. The Animas feeds the San Juan River, which flows through New Mexico and ultimately into Lake Powell in Utah. The irony in this situation is that EPA inspectors were on site to evaluate additional remediation steps for the mine when the plugged water reservoir broke through.

Though initial communication to EPA management and local community officials was challenged by limited satellite and cell phone capabilities, inspectors soon warned communities and officials downstream. EPA management cautioned restricted water use across the spectrum for fishing, drinking, agriculture, and recreation purposes in Colorado, New Mexico, Utah, the Ute Mountain Ute tribe, the Southern Ute Tribe, and the Navajo Nation. Immediately down river, Silverton's public drinking water was not affected, but further downstream, Durango closed its Animas River intakes before the plume arrived. The EPA was able to supply drinking and irrigation water to users in Colorado's San Juan and La Plata counties. In New Mexico, authorities recommended closing water intakes along the Animas and San Juan rivers, and the EPA provided irrigation and livestock water at eight regional sites and delivered hay to Navajo and New Mexico ranchers.

EPA staff also quickly established numerous filtering and treatment ponds just below the adit rupture site to reduce toxic overflow from continuing downstream. Unfortunately, the construction of these ponds happened after the initial plume of contaminated water pushed through. But once they were put in place, officials were able to effectively control and treat whatever water was still flowing before it entered the Animas River and beyond. The pond treatment included lime to reduce acidity and raise pH, and sodium hydroxide solution, which aided metals sedimentation within the ponds.

EPA staff further established monitoring and testing of the contaminant plume during and after the incident. Though the initial plume passed through and dissipated in about an hour, residual contamination continued. River monitoring used pre-spill contaminant levels as baseline determination, and within weeks, river contaminant levels had returned to pre-spill conditions, ultimately allowing the Animas River to re-open for recreation purposes on August 14th, only nine days after the incident. It is important to note, however, that these monitored contaminant levels are complicated by historically high baseline levels which are found in the watershed from abandoned mines and naturally occurring sources not connected to mining.

Surface water testing, which still continues in 2016, includes the following parameters: salinity, turbidity, temperature, pH, dissolved oxygen (DO), conductivity, and oxidation reduction potential (ORP). During the weeks and months after the Gold King Mine incident, the EPA supported the involved states and downstream communities with substantial staff and funding to handle clean up, agricultural needs, ongoing testing and monitoring, and other issues resulting from the spill.

In addition to water testing for contaminants, the EPA contracted with the Mountain Studies Institute (MSI) out of Durango to assess the possible harm to benthic macroinvertebrates (BMI) from the discharge. BMI, such as immature and adult stages of invertebrate flies, beetles, worms, and snails, occur in relatively small numbers in the Animas watershed, and have historically contained high concentrations of metals. MSI concluded, in part, that the increase in copper, aluminum, and iron at some of the testing sites did not significantly affect these BMI populations, and must also be considered within the historic data of the region. Colorado Parks and Wildlife also concluded that Animas River fish populations, which are historically challenged by the watershed's water quality, were also not adversely affected by the Gold King Mine release.

The Gold King Mine clean up effort has prompted the EPA to add many other active and dormant mines in the region, and throughout the U.S., to the National Priorities List, which is supported by federal Superfund clean-up regulations and parameters. This plan includes additional efforts for inactive mine remediation to further reduce the possibility of an incident of this type occurring again. Though very well intentioned in this instance, and with similar issues among all of these mines, it is also very difficult to anticipate every variable in working with abandoned sites.

In 2016, the EPA's clean-up contractors have continued their stabilization efforts of the Gold King Mine adit and waste pile. These efforts include operating the Gladstone Interim Water Treatment Plant (IWTP) downstream, securing the adit and waste pile at the incident site, and removing and disposing solids from the treatment ponds.

Abandoned mines, established when regulations and oversight were often minimal or non-existent, present many challenges to modern attitudes and remediation efforts. Federal and local agencies have been left "holding the bag" of thousands of toxic water reservoirs and naturally occurring drainages, a seemingly Herculean clean up task to resolve. However, with this significant mishap at the Gold King Mine, federal and local officials and communities have been reminded of the tenuous nature of the situation, prompting public and private cooperation and action to restore the region's need for clean and safe flowing waters.

epa.gov/GoldKingMine

Above: Treatment ponds close to the Gold King Mine
Below: Water Monitoring in the Animas River with a YSI handheld multiparameter meter.

Below: Lime is added to a settling pond to assist in the pH adjustment of the water prior to discharge to Cement Creek on August 14th, 2015.
Photos: Eric Vance / EPA