ADEQ Arizona Department of Environmental Quality

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FACT SHEET

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Legacy Mine Drainage

What is a legacy mine?

Legacy mines are locations where historic mining activity occurred many decades ago, sometimes more than a century. Legacy mines have no active mining operations. Active mines operate under modern environmental regulations and associated permits. Legacy mines often pre-date these environmental regulations.

What is legacy mine drainage?

Legacy mine drainage is discolored water — orange, brown or green — coming from old, inactive mine sites and can sometimes be seen in creeks and streams or from openings in the ground. The water is typically acidic (having a low pH) and has a higher concentration of metals (e.g., copper, lead, zinc). Legacy mine drainage can occur when minerals left exposed to the environment from historic mining activities come into contact with water.

An example of mine drainage at the former McCleur Mine in Yavapai County, south of Prescott.

Why does it happen?

Mining is common in areas where the geology contains sulfide-bearing rocks. These types of rocks often contain economically important minerals that mining operations aim to extract. As groundwater or rainwater and snowmelt move through the rocks, minerals dissolve into the water. When air comes into contact with the mineral-rich water, a series of chemical reactions occurs. These reactions form sulfuric acid and solidify the dissolved minerals, which settle on the bottom of the stream.

What is the source?

It is common in some areas of Arizona for surface water to be weakly acidic due to natural geology and legacy mine drainage. Mine drainage occurs when water discharges from inactive horizontal mining shafts, called adits, or from snowmelt or rainwater running over waste materials generated from historic ore processing operations. Mine drainage is more common during wet years, when groundwater can flood old mine workings or when snowmelt and rain saturate mine waste on the ground.

Why is it orange?

Many sulfide-bearing rocks also contain large amounts of iron. As this iron is exposed to oxygen, it forms orange or red iron oxide that discolors the water.

Does mine drainage water pose a health risk to people?

The two most common ways people can be exposed to mine drainage are skin contact and accidental ingestion.

In general, limited skin contact with or exposure to mine drainage does not pose an immediate health risk to people. However, there are many variables that determine risk and caution is advised.

As a precautionary measure, ADEQ urges people to always stay away from discolored surface water and soil, as well as stormwater runoff in both urban and rural areas. In addition to metal pollutants, stormwater and surface water flows can carry bacteria and pathogens.

Drinking water with high metal concentrations over a lifetime can cause chronic health problems.

Mine drainage from an historic adit at the former Storm Cloud Mine in Yavapai County, south of Prescott.

Mine drainage from an historic adit at the former Hillside Mine in Yavapai County.

What about domestic well water?

Public drinking water systems are required to treat water to meet the standards in the federal Safe Drinking Water Act. However, the water quality of private wells (those owned by individual homeowners) is not regulated by federal or state law. ADEQ encourages private well owners to regularly test their well water according to guidance provided by the Arizona Department of Health Services: azdhs.gov/preparedness/epidemiology-disease-control/environmental-toxicology/well-water/index.php.

Can wildlife be affected by mine drainage?

There is less biodiversity in ecosystems impacted by mine drainage. Insects, fish and other aquatic life do not thrive in streams impacted by mine drainage, and the larger species that depend on them have a harder time foraging in these areas. If water affected by mine drainage is consumed by an animal regularly over its lifetime, heavy metals can build up in its body, which could contribute to a variety of chronic illnesses.

What is ADEQ doing?

ADEQ is actively addressing the impacts of legacy mine sites to the environment through multiple programs, including our Clean Water Act point and nonpoint source programs, Voluntary Remediation Program, Water Quality Assurance Revolving Fund program and through collaborations with other state and federal agencies and Arizona's public universities. Learn more: azdeq.gov/LegacyMines

Contact

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Additional Resources:

usgs.gov/mission-areas/water-resources/science/mine-drainage
epa.gov/nps/abandoned-mine-drainage

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