The Environmental Science of Surface Mining

By **Alecia M. Spooner** from **Environmental Science For Dummies** (http://www.dummies.com/how-to/content/the-environmental-science-of-surface-mining.html)

The environmental damage caused by surface mining is related to the large amount of surface material that humans remove during mining operations. The environmental effects of surface mining include

- Habitat destruction
- Soil erosion
- Air pollution from dust particulates
- Pollution (especially from sediments)

All surface mining techniques negatively affect the environment, though some methods are more damaging than others.

Strip mining

Strip mining, as the name describes, is a process of removing rock and soil in strips to get to the valuable mineral ores below. After miners extract the resources, they put back the leftover rock and soil, called *mining spoils* or*tailings,* to fill in the hole.

One way to replace tailings is to simply dump them; luckily, U.S. regulations require mining companies to replace tailings in a way that restores the landscape (and ecosystem) more closely to its pre-mined state, even though doing so is often expensive and difficult. When tailings aren't restored properly, they're often left in valleys where they cause flooding and disrupt watershed ecosystems with water pollution and increased sediments.

Mountaintop removal mining

Mountaintop removal mining is similar to the strip mining approach in the preceding section but on a much larger scale. This technique removes large amounts of rock and soil — whole mountaintops — to access the resources buried deep inside the mountain.

The mountaintop material is left in surrounding areas of lower elevation, such as nearby river and stream valleys, where it reshapes the landscape, pollutes water, and disrupts ecosystems. The figure illustrates how mountaintop removal mining dramatically changes a mountainous landscape. *Credit: Photograph by Getty Images/Pete Mcbride*

Pit mining

Sometimes valuable geologic resources appear at the surface of the Earth but extend deeper into the Earth — sort of a tip-of-the-iceberg kind of thing. In this situation, *pit mining* (also called *open-pit mining*) is an option. Pit mining involves digging a large hole to gather rocks and minerals from the Earth's crust.

Pit mines extend both into the ground and across the surface and are some of the largest mine operations in the world. Like other surface mining operations that remove materials, pit mining operations scar the landscape, destroy habitat, and pollute the air with dust and particulates.

Placer mining

Placer mining is a way of obtaining mineral and metal resources from loose river sediments. The water helps sift the valuable resources (such as gemstones or gold) from the sand, mud, and gravel in the riverbed. Placer mining occurs on a much smaller scale than other methods of surface mining.

Whereas other methods go straight to the source of the valuable material, the sought-after materials in placer mining have already been removed from their source by natural processes of erosion and weathering and have been carried downstream. Due to the smaller scale of placer mining, it does less damage to the surrounding environment compared to other methods of surface mining, though it can still disrupt river ecosystems with pollution and sediments.

In some places, such as the Yukon Territory in Canada where placer mining is common, miners make an effort to maintain the water quality by periodically testing for pollution and sediment overload. In some areas, miners have even developed placer mining systems that recycle the water used to sift gold so that polluted water isn't discharged back into the environment.

Ecological Effects of Subsurface Mining

By **Alecia M. Spooner** from **Environmental Science For Dummies** (http://www.dummies.com/how-to/content/ecological-effects-of-subsurface-mining.html)

Surface mining techniques don't work for extracting all valuable geologic resources. Diamonds and most metal ores, including gold, require extensive subsurface mines to access the rocks with these resources in them.

Subsurface mines are probably what you envision when you think of mining: systems of tunnels and vertical shafts with elevators to take miners underground where they can retrieve the valuable resources.

Subsurface mines produce large amounts of environmentally hazardous *acid mine drainage.* To keep the underground system of tunnels and mine shafts clear, mining companies have to pump out large amounts of water, which go into surface ecosystems. The groundwater from the mines is more acidic than surface waters and disrupts ecosystems by changing the pH conditions of soil and water sources.

Subsurface mining operations don't create the visible changes in the landscape that surface mining operations do, but the conditions of subsurface mines are extremely hazardous for the working miners. The potential for accidental cave-ins, explosions, and fires is high. The air quality deep within the mines is poor; the atmosphere is rife with particulates and gases that lead to respiratory diseases, including lung cancer.

Some mining companies have begun to realize that keeping mining operations environmentally safe and clean from the start is more cost-effective. Mining corporations prefer to avoid the expense of cleanup and restoration or of being held legally responsible for ecosystem destruction or human health effects. Instead, these companies see that some investment into sustainable mining practices to begin with, saves them money in the long run.

Impacts of Mining

(https://www.oxfam.org.au/explore/mining/impacts-of-mining/)

Mining can impact local communities both positively and negatively. While positive impacts such as employment and community development projects are important, they do not off-set the potential negatives.

We have found mining can negatively affect people by:

- forcing them from their homes and land
- preventing them from accessing clean land and water
- impacting on their health and livelihoods
- causing divisions in communities over who benefits from the mine and who doesn't
- changing the social dynamics of a community
- exposing them to harassment by mine or government security

These impacts are exacerbated when local people aren't consulted and are given no information about a planned mine. Even worse is when people are not given a say on whether or not a mine should even be developed.

The potential benefits that mining brings to a community can be undermined if secrecy surrounds the payment of mining taxes to the government or the benefits shared at the local level.