

Hardrock Mining



POTENTIAL IMPACTS TO WATER, WILDLIFE, AIR
AND LAND.

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Hardrock mining: potential impacts to public lands



Zortman Landusky gold mine, MT.
Contaminated twelve streams in the Little Rocky Mountains.



- Water quality
- Water quantity
- Air quality
- Wildlife
- Vegetation
- Loss of access
- Scenic impairment



Surface mining generates large volumes of waste.

Typically, more than 95% of the material mined is left on the landscape as mine waste, creating a source of pollution to air, land and water if not controlled.



Hardrock mining is the largest source of toxic pollution in the U.S.

Source: U. S. Environmental Protection Agency, Toxic Release Inventory, 2013.

Nickel Mining: Laterite Deposits



Glenbrook Nickel Mine – Riddle, Oregon
The only nickel mine in the U.S. – operated until 1996.
Google map image courtesy of Friends of the Kalmiopsis

- Laterite deposits are close to the surface so they are mined by open-cut (not underground) methods.
- They are low-grade deposits – a small percent of the target mineral (the nickel) in the ore.
- As a result, these mines generate a large volume of waste and create significant surface disturbance.

Water Quality Impacts

Mines can harm water quality in many ways:

- Metals leaching
- Release or spills of processing chemicals, or processing fluids.
- Increased sediments/erosion
- Acid mine drainage*
(unlikely for nickel laterite deposit)



The Formosa mine, an underground copper zinc mine, has contaminated 18 miles of the Umpqua watershed in Oregon. Metals pollution eliminated prime habitat for the Oregon coast Coho salmon and steelhead.

Source: U.S. EPA, Fact Sheet: Formosa Mine, Douglas County Oregon, March 2007.

Metals Contamination

- Mines are in mineralized areas, so metals are often present in the rock (e.g., cadmium, copper, zinc etc.).
- As snowmelt or rain water washes over the disturbed area, or seeps through the exposed mine waste, metals may be released. If not controlled, the contaminated water can run into streams or seep into groundwater and pose a threat to humans, wildlife and fish.



The Beal Mountain mine on Forest Service land in Montana has leached contaminants into nearby native trout streams.

Example: Glenbrook Nickel Mine



Sampling for contaminants.

- At the Glenbrook ore loading and stock-piling facility in Coos Bay, the state of Oregon determined that nickel and manganese were released into groundwater in four locations.
- They also found soils contaminated with petrochemicals, and sediments around the dock contaminated with nickel and manganese.

Source: <http://www.deq.state.or.us/lq/ECSI/ecsidetail.asp?seqnbr=3408>

System Failures

Toxic materials (processing chemicals, process water, fuel, etc.) may be spilled or released due to human error or equipment failure, such as:

- pipeline failures
- liner leaks
- transportation accidents (trucks carrying processing chemicals)
- processing pond overflows

Missoulian

Troy Mine spills 40 tons of mine waste into stream

OCTOBER 02, 2009 7:30 AM • BY MICHAEL JAMISON OF THE MISSOULIAN

TROY - A tailings pipe ruptured at Troy Mine late Wednesday night, spilling an estimated 40 tons of slurried mine waste and discoloring a nearby stream.

"I wouldn't characterize it as a major incident, in my view, but we are in the process of cleaning things up," said Carson Rife, vice president of operations at Revett Minerals.

Acid spills from eastern Arizona mine into creek

Nov. 1, 2008 02:29 PM
Associated Press

Recommend Be the first of your friends to recommend this.

Tweet 1

TUCSON - Tens of thousands of gallons of a corrosive acid solution spilled out of a copper mine near Morenci into a creek, but mine workers were able to stop it from entering the San Francisco River.

The 168,000 gallon spill from the Freeport McMoran Copper and Gold mine in eastern Arizona's Greenlee County flowed about two miles down the creek before mine workers were able to build four earthen dams and stop it about 120 feet from the river.

The flow of the deep blue, foul-smelling, copper-sulfuric acid blend was contained within an hour of the spill's discovery early Thursday afternoon, said Ray Pini, city manager of neighboring Clifton.

side is
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had leaked out,

ainted white by

Diesel fuel spill could harm salmon in fishery

Associated Press

YELLOW PINE — Nearly 2,000 gallons of oily diesel fuel from a tanker wreck near Yellow Pine has percolated through rapids on central Idaho's Johnson Creek and could jeopardize a struggling chinook salmon and steelhead fishery there, state Fish and

Game Department biologists say.

A tanker delivering the fuel to gold mines at Stibnite and Thunder Mountain struck some rocks on a curve along the Johnson Creek Road at about 8:45 a.m. on Wednesday, said Valley County Undersheriff Larry Olson. It came back onto the road and tipped over.

Spills at Montana, Idaho and Arizona mines.

Example: U.S. Copper Mines



- A 2012 review of currently operating U.S. copper mines found that 100% experienced at least one pipeline spill or other accidental release.
- 92% failed to control contaminated mine seepage.

2008: Report of pipeline spill releasing 186,000 gallons of sulfuric acid and heavy metals into a tributary (Chase Creek) of the San Francisco River, resulting in a \$150,000 settlement with the State of Arizona.¹⁶ The highly acidic material traveled downstream more than 2 miles. The pollutants in the discharge exceeded Arizona surface water quality standards for copper, zinc and pH in Lower Chase Creek.

2007: Report of release of 1,200,000 gallons of pregnant leach solution released due to power failure.¹⁷

2006: Report of release of 3,000 pounds of sulfuric acid from pipeline break.¹⁸

2006: Report of 1,127 pounds of material from PLS pipeline.¹⁹

2006: Report of release of rich electrolyte (acid content 1,057 pounds) from an underground process pipeline.²⁰

2004: Report of release of 8,920 pounds of sulfuric acid and water from process pipeline due to failure of valve.²¹

2001: Report of release of 6,350 pounds of sulfuric acid released from pipeline.²²

2000: Report of release of 72,000 gallons of sulfuric acid released from pipeline.²³

List of spills at the Morenci Copper Mine, Arizona.

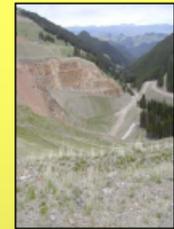
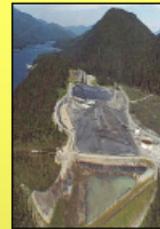
Source: U.S. Copper Porphyry Mines: the track record of water quality impacts resulting from pipeline spills, tailings failures and water collection and treatment failures. July 2006.

Water quality impacts are often underestimated



A 2006 study reviewed 25 modern hardrock mines to determine whether water quality predictions during permitting matched water quality impacts. It found that:

- During the permitting process, 100% of mine's predicted that they would meet water quality standards.
- 76% of mines resulted in groundwater or surface water pollution (exceed water quality standards).
- 85% of the mines near surface water with elevated potential for acid drainage or contaminant leaching exceeded water quality standards.



Comparison of Predicted and Actual Water Quality at Hardrock Mines

The reliability of predictions in Environmental Impact Statements



Bula
Environmental



Kuipers &
Associates

Water: loss of water/changes in flow



Typical open pit gold mine. Photo courtesy of Ecoflight.

- Large mines alter entire landscapes, interrupting the natural surface and groundwater flow patterns.
- Mines also use large amounts of water for processing, dust control, and other mine activities.

Impacts to Wildlife

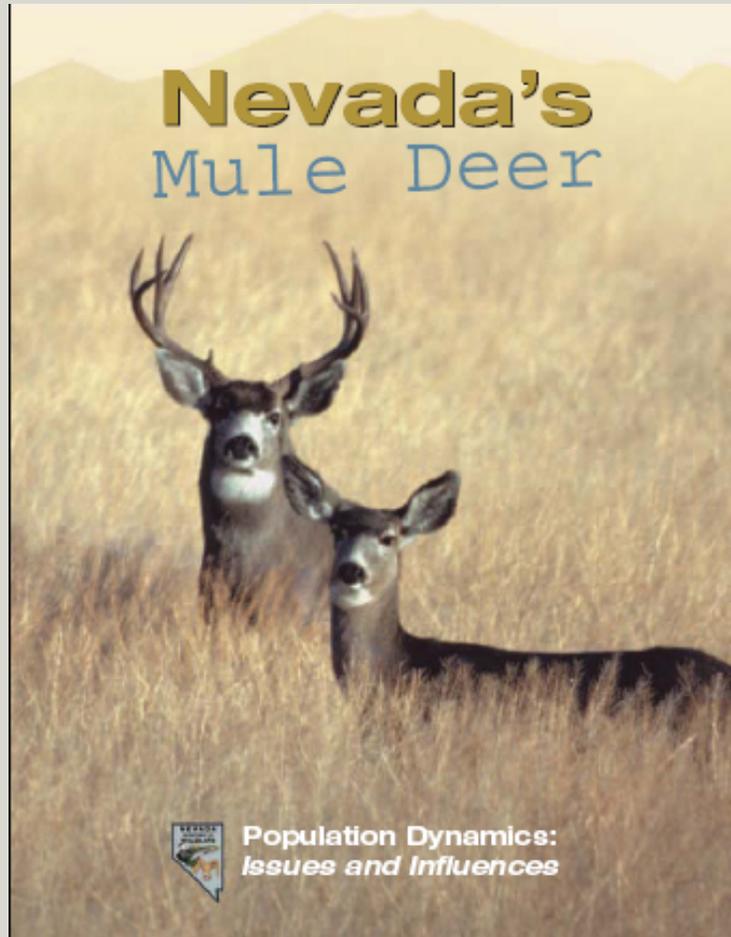


Large mines transform the landscape. Open pits, waste rock piles, slag piles, processing ponds, and other mine facilities can result in significant impacts to wildlife.

- Habitat Loss
- Exposure to toxic substances
- Habitat fragmentation
 - Haul roads
 - Utility corridors
- Disturbances (noise, blasting, increased traffic)



Nevada example: wildlife impacts



- In the Independence Range, impacts to important mule deer habitat occurred due to the direct loss of habitat from pits, waste rock dumps, roads and related fencing.
- The migration corridors within the southern portion of the Tuscarora Range have been severely compromised due to mining activity.

Sources: Nevada Division of Wildlife, MULE DEER HERD PRESCRIPTION MANAGEMENT AREA 6, Nevada, 2007 and Nevada Division of Wildlife, Nevada's Pronghorn Antelope, May 2003.



Exposure to toxic substances:

Oregon DEQ found approximately 39,000 cubic yards of soils contaminated with metals and petroleum.

Source: <http://www.deq.state.or.us/news/prDisplay.asp?docID=1208>



Glenbrook Nickel Mine: metals pollution



Loss of Access

Mining can essentially privatize public lands. Lands that were previously accessible for hunting, hiking, etc. often become off-limits.



Air Quality Impacts



Blasting at open pit copper mine.



Glenbrook nickel smelter

- Sources include: blasting, diesel emissions, processing facilities emissions, road dust, propane generators, etc...
 - Gas emissions (sulfur dioxide, carbon monoxide, nitrogen oxide, hydrocarbons etc.)
 - Particulates (metals, dust).

Nickel Mines: Air Quality



- The Glenbrook Nickel plant released orange dust over the neighborhood.
- Residents blamed the dust for health problems, and fifty people sued Glenbrook for damages. Glenbrook settled out of court.

Source

http://theworldlink.com/news/local/article_a842beb6-147b-5d77-8b92-fd5e27444582.html



- Human and animal studies reveal an increased risk of lung and nasal cancers from exposure to nickel refinery dusts. Chronic exposure to nickel in humans also results in respiratory effects such as an increased risk of chronic respiratory tract infections.



High energy costs and greenhouse gas emissions.

- High energy costs: between 252 to 572 GJ per ton of metal.
- High carbon dioxide emissions: 25 to 46 tons CO² per ton of metal.

Source: Mudd, G M, 2009, *Nickel Sulfide Versus Laterite : The Hard Sustainability Challenge Remains*. Proc. "48th Annual Conference of Metallurgists", Canadian Metallurgical Society, Sudbury, Ontario, Canada, August 2009



Google map image courtesy of Friends of Kalmiopsis

Nickel laterite mining: high energy costs and greenhouse gas emissions.

Mining on federal lands



- Under the federal government's current interpretation, the 1872 Mining Law elevates mining as the “highest and best use” for public lands.
- As such, federal land managers give preference to mining over all other land uses – from agriculture, recreation to clean water to hunting.



Mineral Withdrawal



Photo courtesy of Friends of Kalmiopsis

- Mineral withdrawals are an important tool for protecting public lands.
- The federal government has the administrative authority to withdraw mines from mineral entry for up to 20 years.
- Congress can withdraw lands permanently.