mining impacts

Environmental impacts of mining in eastern Washington

Background

Hardrock mines, which utilize a non-renewable resource, operate from 5 to 15 years until the minerals are depleted. In contrast, metals contamination that occurs as a consequence of hardrock mining can continue for hundreds or thousands of years following the cessation of mining operations. For example, acid mine drainage still occurs from hard-rock mines in Europe that were worked by ancient Romans prior to A.D. 476.

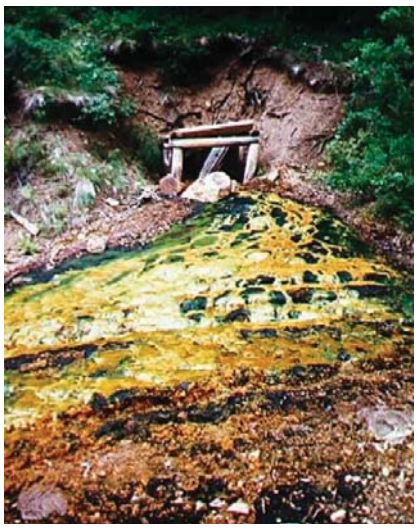
An abandoned mine site near a headwater tributary of the Methow River in Okanogan County, Washington

In the United States, more than 500,000 inactive and abandoned mines are estimated to exist in 32 states. Thousands of abandoned mines in eastern Washington are located in sensitive mountain watersheds. In Okanogan County, there are more than 150 sites that are threats to human health and the environment while new open-pit, cyanide-leaching mines are under development. The Alder Mine, Red Shirt Mill, Crescent Mine, Alder Mill, New Light Mine and Antimony Queen Mine are examples of sites producing heavy-metal effluent that affects water quality and poses risks to human health, endangered fish, and other resident biological communities in the Methow River basin.

Mine contaminants affect the biological, recreational, industrial, and municipal use of larger rivers many miles downstream from mining. In Okanogan County, acid mine drainage and heavy metals from abandoned mines are affecting communities of aquatic invertebrates, fish, mammals, riparian vegetation, and domestic water supplies.

Metal contamination of water supplies following mining operations

Water becomes contaminated when it comes in contact with solid mining waste that remains after mining has ceased. Rain and snow fall on the waste rock and tailings. The runoff produced becomes contaminated with metallic sulfides in the ore that oxidize, dissolve, and release heavy metals. Acid mine drainage and metals contamination is the greatest concern, but the leaching of chemicals from the milling and concentration process, most notably cyanide, can also be a serious problem. Water contaminated with metal sulfides and chemical additives is often discharged into surface waters that seep into the groundwater. Domestic water from wells located near abandoned mill sites has been found to contain heavy metals at levels that exceed drinking water criteria.



A mine portal discharging acidic heavy metal-laden water that contaminates a stream near Twisp, Washington

Biological hazards of mine waste contamination

Using the principles of epidemiology, strong relationships have been established between elevated levels of heavy metals, and the condition of invertebrate communities in impacted creeks. Elevated concentrations of cadmium, copper, selenium, and zinc in streamwater and sediments have reduced species diversity and abundance in these aquatic communities. Contaminated headwater streams are significant hazards to the environment and threaten juvenile salmonids, including bull trout, native steelhead, and chinook salmon, which use the lower portion of contaminated tributaries to the Methow River as rearing habitat.

Trout

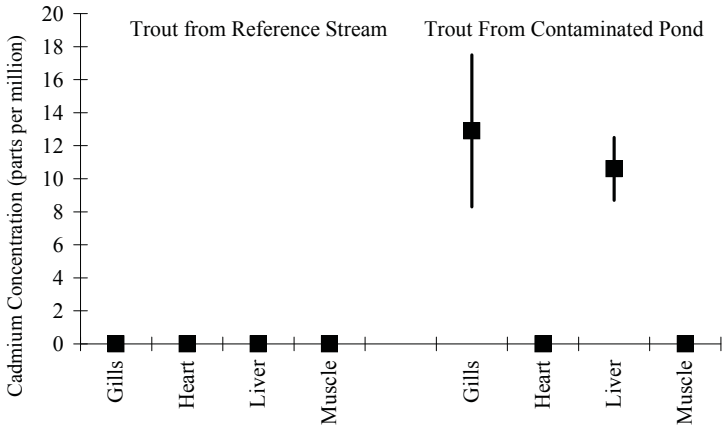
Excessive mortality and the accumulation of cadmium and zinc occur in rainbow trout exposed to metal concentrations that exceeded natural background levels. Resident trout in farm ponds fed by water contaminated by metals from abandoned mines concentrate cadmium and zinc in their gill and liver tissues.

Lactating mammals

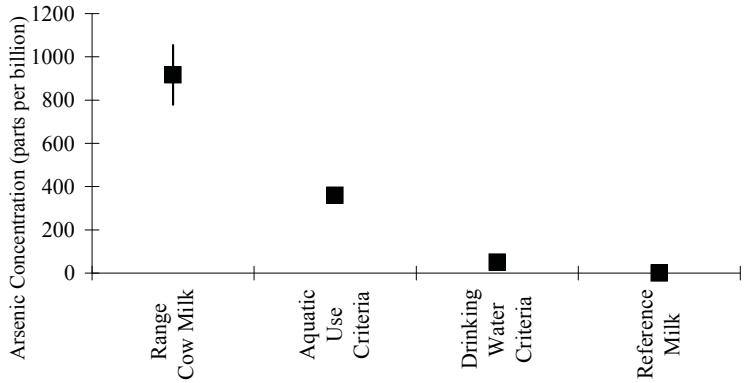
Lactating beef cows grazing on abandoned mine lands and drinking from creeks contaminated by acid mine drainage concentrate heavy metals in their milk. Arsenic, nickel, selenium, and zinc are found at concentrations that exceed reference samples as well as Washington's biological and drinking water criteria.

Plants

The analysis of core samples has shown that Douglas-fir trees growing on soils contaminated by mine waste are concentrating zinc. Manganese, zinc, iron, and aluminum also accumulated in needles and leaves of Douglas fir, ponderosa pine, and aspen.



Cadmium levels in tissue from trout in streamwater contaminated by heavy metal-laden acid mine drainage.



Arsenic levels in milk from range cows that drank streamwater contaminated by acid mine drainage.

Dan Peplow
photos by Casey Peplow

The Water Center

University of Washington ◆ Box 352100 ◆ Seattle, Washington 98195-2100
206.543.6920 ◆ cwws@u.washington.edu ◆ http://depts.washington.edu/cwws