

## **2008 – 2 Sulfide Mining**

The Minnesota DNR and the Army Corps. of Engineers are creating an Environmental Impact Statement on a new type of mine being proposed for Northern Minnesota near the Boundary Waters Canoe Area Wilderness, and 50 miles from Voyager National Park. This mine is different from long established iron ore mines that Minnesota has had over the years. These proposed mines, contain among the copper, nickel, platinum, and silver, significant deposits of sulfide. The sulfur in the resultant mine tailings could leach off into the surface and ground water, creating yellow and red streams and creeks with toxic heavy metals and sulfur. Water that contains heavy metals and sulfuric acid kills fish, birds and other aquatic life. The watershed for these proposed sulfide mines includes the Kawishiwi River which flows into the Boundary Waters Wilderness, and includes the St. Louis River which flows into Lake Superior.

Contaminated water flowing from abandoned mines is one of the most significant contributors to water pollution in the United States. A toxic form of pollution caused by sulfide mines is called Acid Mine Drainage (AMD). AMD can have severe impacts on aquatic resources, killing micro-organisms, insects, fish and other aquatic life. It stunts terrestrial plant growth, harms wetlands, contaminates groundwater, raises water treatment costs, and damages concrete and metal structures. There are several thousands miles of streams impacted by AMD within the United States. The economic losses on fisheries and recreational use mounts to hundreds of millions of dollars' annually. See appendices C and D. AMD causes elevated levels of dissolved metals and sulfates, which render the stream unsuitable as a source of drinking water for humans, livestock or for use as aquatic habitat for wildlife.

Because of the potential for Acid Mine Drainage, sulfide mines require treatment systems to ensure that acidic water is not discharged. These systems must be in place for the life of the mine, and continue in perpetuity to treat acidic waters after the mine is closed. Due to the ongoing treatment process, the risk of discharging acidic water increases over time. Water treatment systems at reclaimed mining sites is complicated by changing levels of ground water and fluctuating rain fall levels over decades and centuries. If movement of the acidic water is not contained within an impermeable barrier (e.g. pipe, plastic, glass, etc.) the acidic water flows into the underlying groundwater system. Once the acidic water enters the groundwater system, the detrimental affects on flora and fauna becomes widespread. Containment and treatment of the affected groundwater system is difficult, if not impossible.

Generation of acidic waters is a long-term situation that requires perpetual chemical treatment. Therefore, funding for long-term treatment of acidic waters and long-term responsibility and liability for environmental protection is on going. Mining companies and sulfide handling operators may not be perpetual and often go bankrupt. As a result, there are many examples of operators abandoning properties that discharge acidic water and requiring public money to clean up the site. See Appendix B.

Unlike many dry Western states, Minnesota is rich in water resources that are especially vulnerable and are a great part of Minnesota's outdoor heritage for anglers, canoeists, duck hunters and of course wildlife. Our neighbors in Wisconsin have a moratorium on mining metallic sulfide ores written into law. In effect, the Wisconsin law says: "Industry can mine metallic sulfide ores in Wisconsin when it can show one mine in the United States or Canada that has operated and been closed for ten years without significant damage to its watershed." See Appendix A.

The Izaak Walton League of America and the Minnesota Ika's in particular, have a long history of fighting for, protecting, and preserving Minnesota's North Woods and the wildlife it contains. It was instrumental in the effort to create the Boundary Waters Canoe Area Wilderness, and continues with efforts to protect the BWCAW from endeavors that may degrade its pristine quality. The Izaak Walton League is nationally known as an organization at the forefront of protecting water quality.

To ensure the protection of Minnesota's water resources which are critically important for anglers, canoeists, hunters, and the wildlife which depends upon these water resources, which include the Rainy River drainage which flows into the Boundary Waters Canoe Area Wilderness and Voyageurs National Park, and the St. Louis drainage which flows into Lake Superior, the Walter J. Breckenridge Chapter of the Izaak Walton League of America supports legislation which bans the use of perpetual treatment systems for mine tailings and the discharged water that is produced by mines.

The Walter J. Breckenridge Chapter of The Izaak Walton League of America further urges Minnesota to not permit any new mines that require ongoing water treatment after the mine was reclaimed.

*Submitted by the Walter J. Breckenridge Chapter*

## **Appendix A: Wisconsin Law**

### **293.50 Moratorium on issuance of permits for mining of sulfide ore bodies.**

Beginning on May 7, 1998, the department may not issue a permit under s. 293.49 for the mining of a sulfide ore body until all of the following conditions are satisfied:

(a) The department determines, based on information provided by an applicant for a permit under s. 293.49 and verified by the department, that a mining operation has operated in a sulfide ore body which, together with the host rock, has a net acid generating potential in the United States or Canada for at least 10 years without the pollution of groundwater or surface water from acid drainage at the tailings site or at the mine site or from the release of heavy metals.

(b) The department determines, based on information provided by an applicant for a permit under s. 293.49 and verified by the department, that a mining operation that operated in a sulfide ore body which, together with the host rock, has a net acid generating potential in the United States or Canada has been closed for at least 10 years without the pollution of groundwater or surface water from acid drainage at the tailings site or at the mine site or from the release of heavy metals.

## **Appendix B: Superfund Clean Up Sites**

The following mines are on the Environmental Protection Agencies National Priority List of Superfund sites that need or are in the process of being cleaned up. This list below is not exhaustive. All information taken directly from the EPA Super Fund web site.

See: <http://www.epa.gov/superfund/>

### **Summitville Mine – Colorado**

Large-scale, open-pit mining began at the site in 1984. The mine operator, Summitville Consolidated Mining Corp., Inc. (SCMCI), used cyanide heap leaching to extract precious metals from the ore. Almost immediately after its construction in 1986, a leak was detected in the Heap Leach Pad. SCMCI abandoned the site and announced it was filing for bankruptcy in December 1992. The EPA immediately assumed responsibility of the site as an emergency response. On May 31, 1994, Summitville was placed on the National Priorities List of Superfund sites.

### **Pike Hill Cooper Mine – Vermont**

Release date: 07/22/04 – The U.S. Environmental Protection Agency (EPA) today added the Pike Hill Copper Mine property in Corinth, VT to the National Priorities List (NPL), known as the Superfund list. More than 9 million pounds of copper was mined from Pike Hill. Some 20,000 tons of mill and tailings, are scattered over the surface of the 216 acres of the mine. The mine tailings are rich in metals and sulfides. As water passes over and through the tailings, sulfuric acid is produced and the metals within the tailings are

dissolved. This results in acid mine drainage and contributes to metals contamination to Pike Hill Brook and the Waits River. In October 1993, the Corinth Fire Department was told smoke was coming from the mine fill at the site. According to the U.S. Bureau of Mines, the smoldering was due to spontaneous oxidation and combustion of reactive sulfides in the mine fill. A 1997 Vermont Department of Environmental Conservation study of the fish populations in surface waters documented a significant impact from acid mine drainage just downstream of the mine. The site poses a risk to fisheries in the Connecticut River and Waits River, and a risk to a particular species of bat (Eastern Small-footed bat, *Myotis Leibii*).

### **Grey Eagle Mine – California**

The site is located on the banks of Indian Creek, a tributary of the Klamath River. Indian Creek is habitat for numerous wildlife species, in particular the coho salmon, chinook salmon, and steelhead trout. The steelhead and coho salmon are endangered species. The site was previously used as a copper mine mill tailings dump. Releases from the site adversely affecting Indian Creek and its fish have been documented by State agencies since the 1950s. Most recently, the North Coast Regional Water Quality Control Board has been unsuccessful in getting potentially responsible parties (PRPs) to conduct response actions. Current conditions at the site are causing a release of acid and heavy metals to Indian Creek as a result of the continued oxidation of sulfide mill tailings disposed onsite. Acid rock drainage (ARD), also referred to as acid mine drainage (AMD), is the process in which sulfide minerals oxidize in a weathering environment forming sulfuric acid. The sulfuric acid increases the mobility of many heavy metals by making them more soluble.

### **Gilt Edge Mine - South Dakota**

The Gilt Edge Mine, near Deadwood, is located at the headwaters of the cold-water fisheries and municipal water supplies of the northern Black Hills. It is a former 258-acre open pit, cyanide heap-leach gold mine. Nearly a decade ago, the mine operator, Brohm Mining Company (BMC) became insolvent, leaving 150 million gallons of acidic, heavy-metal-laden water in three open pits, as well as millions of cubic yards of acid-generating waste rock that requires cleanup and long-term treatment. In 1986, when the South Dakota Department of Environment and Natural Resources permitted BMC to conduct larger-scale open-pit mining, off-site waters were already contaminated. When BMC faced financial problems and informed the State that it could not continue site controls, the Governor of South Dakota requested that EPA propose the site for the Superfund National Priorities List (NPL). The site was proposed for the Superfund NPL in May 2000, and final placement of the site on the NPL was announced in the Federal Register in December 2000. Sulfide waste rock and exposed ore zones contain heavy metals, including arsenic, cadmium, chromium, copper, lead, nickel, silver and zinc. Elevated nitrates and sulfates are also present in heap leach residues. Copper, cadmium and zinc appear to be the metals contaminating the habitats of Strawberry and Bear Butte Creeks.

## **Iron Mountain Mine – California**

Through 1963, the 4,400-acre Iron Mountain Mine (IMM) site periodically was mined for iron, silver, gold, copper, zinc, and pyrite. When pyrite is exposed to moisture and oxygen, sulfuric acid forms. This sulfuric acid runs through the mountain and leaches out copper, cadmium, zinc, and other heavy metals. Much of the acidic mine drainage ultimately is channeled into the Spring Creek Reservoir by creeks surrounding IMM. Without sufficient dilution, this results in the release of harmful quantities of heavy metals into the Sacramento River. Approximately 70,000 people use surface water within 3 miles as their source of drinking water. The low pH level and the heavy metal contamination from the mine have caused the virtual elimination of aquatic life in sections of Slickrock Creek, Boulder Creek, and Spring Creek. Since 1940, high levels of contamination in the Sacramento River have caused numerous fish kills. The continuous release of metals from IMM has contributed to a steady decline in the fisheries population in the Sacramento River. In 1989, the National Marine Fisheries Service took emergency action to list the Winter Run Chinook Salmon as threatened under the Endangered Species Act and to designate the Sacramento River from Red Bluff Diversion Dam to Keswick Dam as a critical habitat. In January 1994, the National Marine Fisheries Services issued its final rule reclassifying the Winter Run Chinook Salmon as an endangered species. Surface water has been contaminated by the release of sulfuric acid, copper, zinc, and cadmium from the mine. People face a health risk if they accidentally ingest or come into direct contact with mine drainage. There is a potential for accumulation of contaminants in fish. The unplanned release of contaminants acutely toxic to aquatic life has contributed to the steady decline in fish populations and has contributed to the listing of the Winter Run Chinook Salmon as an endangered species.

## **Appendix C: Sample AMD impacts**

**Sample 1:** In the Appalachian Mountains of the eastern United States alone, more than 7,500 miles of streams are impacted. The Pennsylvania Fish and Boat Commission estimates that the economic losses on fisheries and recreational uses are approximately \$67 million annually. While most modern coal-mining operations (Figure 1) must meet strict environmental regulations concerning mining techniques and treatment practices, there are thousands of abandoned mine sites in the United States (Figure 2). Treatment of a single site can result in the restoration of several miles of impacted streams. The purpose of this document is to briefly summarize key issues related to AMD treatment. This document is intended as a brief overview; thus, it is neither inclusive nor exhaustive. The technical note presents the preliminary planning

<http://stinet.dtic.mil/oai/oai?verb=getRecord&metadataPrefix=html&identifier=ADA379475>

**Sample 2:** About 4,785 miles of streams with low pH in the mid-Atlantic region have been impacted by extraction of resources, primarily coal. West Virginia and Pennsylvania each have about 2,200 stream miles impacted. Maryland and Virginia have less than 400 impacted miles. And, about 350 stream miles are impacted by [air deposition](#), primarily in West Virginia and Pennsylvania . <http://www.epa.gov/reg3wapd/nps/mining/>

## Appendix D: US Geological Survey Map

The U.S. Geological Survey mapped streams and headwaters tainted with run off from hard-rock mines, releasing this version to the public in 1996

