HARD ROCK MINING CREATES ACID MINE DRAINAGE (AMD)
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Acid mine drainage occurs when sulfide ores are exposed to the atmosphere, which can be enhanced through mining and milling processes where oxidation reactions are initiated. Mining increases the exposed surface area of sulfur-bearing rocks allowing for excess acid generation beyond natural buffering capabilities found in host rock and water resources.

Metals that were once part of the host rock are dissolved and exacerbate the effect of low pH on wildlife, aquatic species and humans. Concentrations of common elements such as copper, zinc, aluminum, iron and manganese all dramatically increase in waters with low pH. These environmental, human health, and fiscal consequences, if not mitigated, can have long-lasting effects. When fish are exposed directly to metals and acidic water through their gills, impaired respiration may result from chronic and acute toxicity. Fish are also exposed indirectly to metals through ingestion of contaminated sediments and food items.

Impact on wildlife and humans exposed to metal laden water may be related to calcium metabolism and protein synthesis deficiencies. Metals ingestion can also impact liver and kidney function.

Streams affected by acid mine drainage are poor in taxa richness and abundance. Scientific literature is filled with studies designed to quantify the adverse environmental effects of acid mine drainage on aquatic resources. Most recent investigations focus on multiple bioassessments of large watersheds. These assessments include water and sediment chemistry, benthic macroinvertebrate sampling for taxa richness and abundance, laboratory acute water column evaluations, laboratory chronic sediment testing, caged fish within impacted streams, and development of models to explain and predict impacts of acid mine drainage on various aquatic species.

Accurate prediction of acidic drainage from proposed mines is recognized by both industry and government as a critical requirement of mine permitting and long-term operation. The backbone of predicting acid generating potential from any geologic formation is the ability to characterize the presence and quantity of both acid-forming minerals and neutralizing minerals in the geologic materials to be unearthed during mining operations. The quality and quantity of leachate is subsequently evaluated to offer a supporting interpretation to laboratory analysis. Kinetic tests are recommended to evaluate reaction rates and to predict and measure drainage chemistry. Notable uncertainty exists in the long-term predictions of acid generation from geologic materials found in mining environments.

In a report comparing predicted and actual water quality at hard rock mines (Kuipers et al. 2006), the authors identified two types of characterization failures that led to differences between predicted water quality as speculated in EIS documents and the actual water quality either during or after mining began. The two characterization failure types were: 1) insufficient or inaccurate characterization of the hydrology, and 2) insufficient or inaccurate geochemical characterization of the proposed mine. The authors reported primary causes of hydrologic characterization failures as follows: overestimations of dilution, lack of hydrological characterization, overestimations of discharge volumes, and underestimations of storm size. The primary causes of geochemical characterization failures were identified as: lack of adequate geochemical characterization, in terms of sample representativeness and sample adequacy.

Fisheries have been impaired worldwide by releases of AMD from mining areas. The mining industry has spent large amounts of money to prevent, mitigate, control and otherwise stop the release of AMD using the best available technologies, yet AMD remains as one the greatest environmental liabilities associated with mining, especially in pristine environments with economically and ecologically valuable natural resources. Problematic to the long-term operation of large scale metal mines is recognition that no hard rock surface mines exist today that can demonstrate that AMD can be stopped once it occurs on a large scale. Evidence from literature and field observations suggests that permitting large-scale mining in sulfide-hosted rock with the expectation that no degradation of water will result due to acid generation imparts a substantial and unquantifiable risk to water quality and fisheries.