

## The Impacts of Copper on Aquatic Ecosystems

The use of copper in anti-fouling paint for boat hulls demonstrates that it is highly toxic to aquatic organisms. In fact, copper is one of the most toxic metals to aquatic organisms and ecosystems.

Because copper is an algacide, it is not surprising that it causes decreased algal growth when inadvertently discharged to a water body. Algae are at the base of food chains, so the amount of algae present in an aquatic ecosystem will affect the amount of food available for aquatic animals including zooplankton, insects, shellfish, fish and aquatic mammals. Also, insects such as mayflies that do not tolerate polluted water will disappear, and other species of insects that can tolerate polluted water will appear.

A change in the composition of the insect community will affect which species of shellfish and fish are present. **The high toxicity of copper to algae creates a ripple effect throughout the ecosystem** and demonstrates that changing one part of an ecosystem will affect the entire ecosystem (Odum, 1971; Taub, 2004; Wright and Welbourn, 2002).

### ***Can't find my way back home***

The impacts of copper on salmon are well documented and include acute toxicity, difficulties migrating to and from the ocean, disorientation and stress. In copper-contaminated streams, juvenile salmon have difficulty migrating into salt water. Returning salmon become disoriented or refuse to enter copper-tainted streams.

Studies suggest that copper contamination of salmon habitats could interfere with the salmon's olfactory function (sense of smell), (Sandahl et al., 2004) producing sub-lethal effects, which are eventually lethal. (McIntyre et al., 2008).

Fish rely on their sense of smell to find food, avoid predators and migrate. Rainbow trout are particularly sensitive to the toxic effects of copper and other metals.

### ***Lessons from B.C. waters***

The Britannia Mine, located 50 km north of Vancouver, was abandoned in 1974. The continual discharge of effluent and groundwater contaminated with

metal and acid mine drainage resulted in a marine dead zone in Howe Sound. Almost no fish or shellfish were to be found.

Britannia Creek, once productive salmon habitat, is now virtually devoid of life. Environment Canada described the Britannia Mine as “the single worst point source of metal pollution on the North American continent”.

**Elevated copper and zinc levels have been found in crabs, mussels, oysters and shrimp up to 18 km away from Britannia Mine**, along with significantly reduced numbers of these species.

In another example, the Mount Washington open-pit copper mine on Vancouver Island operated for only 3 years from 1964-67. The waste rock piles and mill tailings lie at the head of the Tsolum River. The copper-laced acid mine drainage from Mount Washington Mine leaches into the Tsolum River, which used to be the home of healthy runs of coho, pink, chum salmon, and steelhead numbered in the hundreds of thousands.

The toxic impacts of copper in the Tsolum River have virtually destroyed the salmon populations. The B.C. Ministry of Environment’s assessment concludes: **“The fisheries resource is believed to have declined by 90 per cent predominantly because of acid mine drainage from Mount Washington.”**

In the spring of 1982, 2.5 million pink salmon fry were released into the Tsolum River from a pilot hatchery. These fish were expected to return in the fall of 1984. Not a single salmon came back.

No Fisheries Act charges have ever been laid against the owners or operators of the Mount Washington Mine or Britannia mine despite the longstanding and ongoing pollution of fish-bearing waters.

### **Sources:**

1. “Impacts of Copper on Aquatic Ecosystems and Human Health,” from [mining.com](http://mining.com) January 2009. By Frances Solomon, Adjunct Professor at the Norman B. Keevil Institute of Mining Engineering, University of British Columbia, Vancouver, B.C.
2. A submission to the Commission on Environmental Cooperation pursuant to Article 14 of the North American Agreement on Environmental Cooperation, June 1998. Represented by Sierra Legal Defence Fund.  
[http://www.cec.org/Storage/84/7960\\_98-4-SUB-E.pdf](http://www.cec.org/Storage/84/7960_98-4-SUB-E.pdf)