

The Superfund Site at Berlin, New Hampshire

A History of Contamination

From 1898 to the 1960's, at the former Chlor-alkali facility just downstream of the Sawmill Dam on the Androscoggin River, various industrial chemicals, including chlorine, caustic soda, hydrogen, and chloroform, were made using electrolytic cell houses, collections of chemical compound separators that used electrically-charged mercury and graphite particles in order to deconstruct more complicated chemicals into the desired industrial ones. Along with the production of the desired chemical, excess salt compounds containing graphite and mercury were disposed of improperly—either by being dumped on the land surrounding the river or in the Androscoggin itself.

In 1962, chemical operations were stopped as the Chlor-alkali facility went out of business, and in 1963 the land was abandoned. The 4.6 acre site was largely untouched until, in 1997, a Limited Environmental Assessment was made on the site, confirming that it was highly contaminated. In 1999 a chemical “cap”, or barrier of neutralizing chemicals, was placed at the site and efforts began to clean the site up to higher environmental standards.



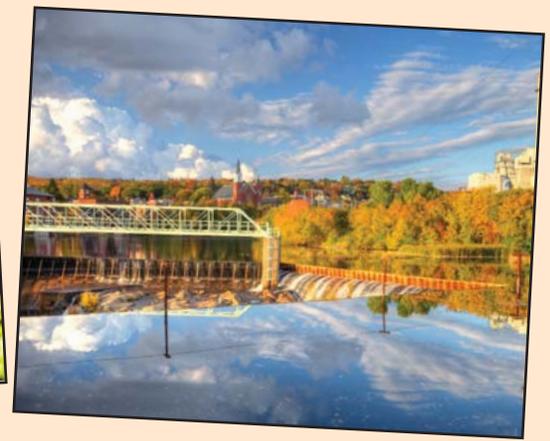
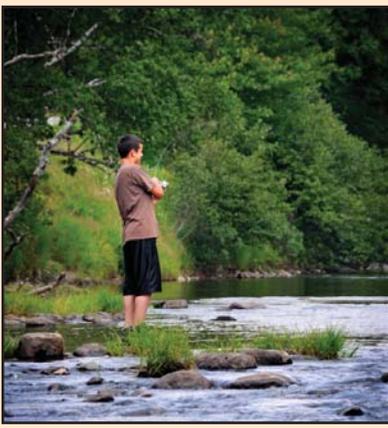
All photos are of the Androscoggin River,
located in Berlin, New Hampshire



Threats the Site Poses to the Environment

According to New Hampshire Department of Environmental Services (NH DES) estimates, for every ton of industrial chemicals produced by mercury-based electrolytic cells, half a ton of compounds with mercury in them were created as waste and disposed of in the surrounding area. Mercury levels in the soil around the Chlor-alkali facility were found at concentrations far higher than the NH DES' standards, and the site's groundwater exceeded the Ambient Groundwater Quality Standards for mercury, lead, arsenic, chloroform, and methylene chloride.

The mercury contamination was so pervasive that it could be observed in the bedrock of the site, where it has been able to leak into the Androscoggin River. After settling in the bottom of the river, bacteria turn the inorganic mercury into methylmercury, a dangerous neurotoxin, which is in turn consumed by microscopic organisms at the bottom of aquatic food chains. Methylmercury becomes more concentrated as it moves up the food chain in a phenomenon known as biomagnification. Fish with chronic exposure to methylmercury have problems with motor function, have irregular spawn patterns, and have lower reproductive success, while aquatic birds suffer from brain lesions, spinal cord degeneration, difficulty flying and swimming, lowered reproductive success, and fewer and smaller eggs if they do reproduce.



So What About Us?

Though humans who happen to stay on contaminated land may also suffer similar effects of chronic mercury exposure, the most common way for humans to be exposed to mercury is through the consumption of fish or wildfowl from the contaminated ecosystem. Eating recreationally caught fish, especially those high on the food chain such as trout and pike, or hunted birds, like ducks or geese, from the contaminated Androscoggin River area is strongly advised against by the U.S. Environmental Protection Agency (EPA), and for good reason. Mercury intake is dangerous to all humans, but is particularly dangerous to pregnant women, unborn babies, and young children since it causes problems with the nervous system, memory, speech, personality, and brain function. In high doses it can even hurt liver and kidney function in normal adults. Currently, the New Hampshire Department of Environmental Health has declared that while the site is safe for humans to be near, eating any wildlife nearby or even downstream of the site is strongly discouraged. Consumption of fish in the affected parts of the Androscoggin River is currently a public health hazard.

For more information on Dartmouth's mercury research, please visit our website,
<http://www.dartmouth.edu/~toxmetal>.

For more information on the Berlin Superfund site, please visit EPA's website, <http://1.usa.gov/iAaRZn>

For more information on EPA's Superfund site process, please visit
<http://www.epa.gov/superfund/index.htm>

or NH DES at <http://des.nh.gov/organization/divisions/waste/hwr/fss/superfund/index.htm>

Working Hard to Clean Things Up

Declared a Superfund site in 1999 by EPA, clean-up work began when the NH DES demolished the last electrolytic cell house and placed a chemical cap on the soil underneath, dug drainage trenches, set up fencing around the area, and built groundwater wells to continue monitoring levels of toxic contamination. Contractors recovered 50 to 100 pounds of mercury from areas surrounding the site, and in 2000, the Androscoggin riverbank was swept for mercury deposits. Since then, continual efforts to monitor and continue to remove traces of toxic metals have occurred, and EPA has stated that it plans to have the final site clean-up started in the next four to five years.

Dartmouth Superfund Research

Over the summer of 2010, researchers with the Dartmouth Toxic Metals Superfund Research Program studied mercury in soil, water, plants and animals at the Berlin Superfund site adjacent to the Androscoggin River. Researchers studied the fate of methylmercury within the food web of the river, and additional studies involved characterizing the form of methylmercury in the Androscoggin. By measuring how much of the toxin was bound to organic materials or associated with organic tissue of plants and animals, results from this research will help determine how methylmercury is being transported and taken up in the Androscoggin River ecosystem. Future research will involve comparing the pattern of mercury bioaccumulation between invertebrates and fish near the Superfund site and those farther downstream.

If you would like to be a part of the process to engage the Berlin community in research to benefit public health and the environment, please contact Michael Paul at michael.paul@dartmouth.edu, or call him at 603-643-3137.



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