A Legacy of Pollutants in Nova Scotia

Assessing Risks, Taking Action

The Problem

Early results of recent studies suggest a high risk of adverse biological effects in the intertidal environment of Seal Harbour, Wine Harbour and Harrigan Cove.

Unregulated gold mining earlier in Canada's history (1860 to the mid-1940s) has left a legacy of environmental contaminants – a pollution problem for today.

For nearly a century, gold was produced from 64 mining districts in Nova Scotia, from Guysborough to Yarmouth County. Wastes from milling processes using mercury amalgamation techniques were high in mercury and naturally occurring contaminants such as arsenic.

Although use and release of arsenic and mercury are now controlled by federal legislation such as the *Canadian Environmental Protection Act (1999)* and the *Fisheries Act*, historically this was not the case. Sand-like tailings were deposited directly in or near natural water bodies and are still a potential source of contamination today. The tailings pose risks to freshwater ecosystems and nearshore intertidal marine environments in some harbours along the eastern shore.

Such risks to the environment cause concern for the health of nearby human populations and ecosystems. Governments need information on the extent and nature of the contamination to decide what protective measures should be taken.

Seeking Solutions through S&T

The Province of Nova Scotia established the Historic Gold Mines Advisory Committee to coordinate analysis of ecosystem and human health risks from past practices at selected abandoned mine sites. Environment Canada is a member of the committee's Marine Working Group, with federal colleagues from Natural

Canada-wide Standards for mercury emissions from coal fired electric power generation plants, announced in October 2006, are expected to capture a minimum of 60 percent of the largest single source of mercury emissions in Canada from human activity.

Resources Canada, Fisheries and Oceans Canada, Health Canada and the Canadian Food Inspection Agency.

In 2004 and 2005, researchers conducted collaborative studies to learn more about the extent and effects of wastes from historic gold mines. They compared concentrations of arsenic and mercury in marine sediments with environmental quality guidelines such as those published by the Canadian Council of Ministers of the Environment in 1999. Early results suggest a high risk of adverse biological effects in the intertidal environment of Seal Harbour, Wine Harbour and Harrigan Cove.

Scientists from Environment Canada sampled three species of edible intertidal marine molluscs (soft-shell clams, blue mussels and periwinkles), sediments and water at 10 intertidal sites. The sites are found along the south and east shores from Gold River to New Harbour – a reference site not affected by gold mining operations. The samples were analyzed for metal contaminants, including mercury and arsenic, at the Environment Canada Atlantic Region Environmental Science Centre (Moncton, New Brunswick) and at the Canadian Food Inspection Agency laboratory in Dartmouth, Nova Scotia.

Transforming Knowledge into Action

Who can use these results?


Photo credit: Michael Parsons, NRC

Results from this study were shared immediately with federal and provincial departments responsible for managing shellfish harvesting and consumption. Health Canada then conducted a human health risk assessment for the concentration of inorganic arsenic in soft-shell clams and blue mussels collected at Seal Harbour. The harbour has never been approved for shellfish harvesting but it was recommended to Fisheries and Oceans Canada to close the harbour and surrounding waters to all types of harvesting.

In particular, no consumption of clams and mussels is allowed close to the mouth of West Brook, the source of the mine tailings. Consumption limits are set for clams and mussels in all other areas in Seal Harbour. Signs have been posted to alert shellfishers and the public that harvesting is closed until further notice.

Preliminary analysis of ecosystem data shows:

- **elevated concentrations of arsenic and mercury in sediment samples in some areas;**
- **significant uptake of arsenic in soft-shell clams;**
- **lower numbers of animals and lower biomass in animals (such as molluscs) living in and on sediment;**
- **some toxic arsenic in soft-shell clams and blue mussels*;**
- **arsenic levels in clam tissue collected in Seal Harbour 160 times higher than levels measured in clams from the New Harbour reference site.**

Indeed, concentrations of arsenic in soft-shell clams in areas of Seal Harbour were higher than those previously reported in the worldwide scientific literature for molluscs.

**Arsenic is present in marine organisms in several forms: some toxic, some not.*

The Province of Nova Scotia and collaborators continue to analyze risks at various historic gold mine sites. Currently, Environment Canada is planning further studies and continues to communicate results to the regulatory and scientific community, as well as to the public.

Benefits to Canadians

Mercury is still used today in many other countries in unregulated, small-scale gold mining. These uncontrolled releases are the source of more than 10 percent of the mercury in the world's atmosphere known to be caused by human activities.

Residents and visitors to the eastern shore of Nova Scotia can readily access the advice they need to avoid harvesting at these identified sites and reduce their exposure to contaminants.

This knowledge also assists ongoing efforts to protect and cultivate healthy coastal ecosystems, an environmental benefit to Canada's natural heritage. These areas provide essential habitat and feeding grounds throughout the year for many species of birds, fish and mammals.

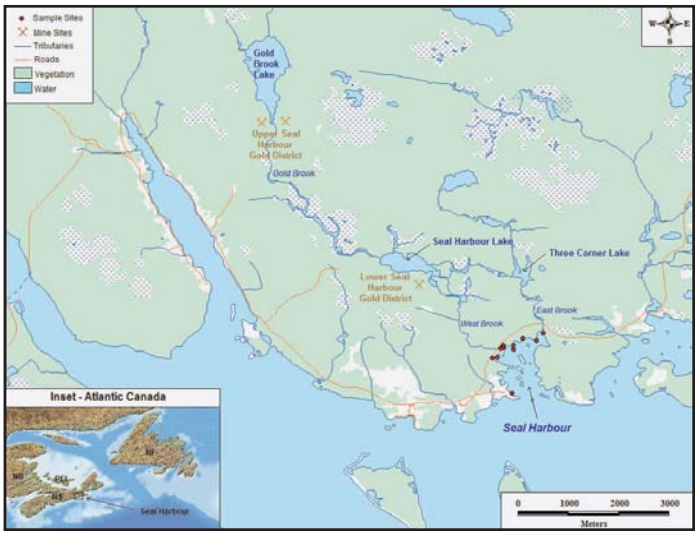
Photo credit: Kok-Leng Tay

For more information:

Environment Canada's Shellfish Growing Area Classification Index
www.atl.ec.gc.ca/epb/sfish/maps/class.html

Historic Gold Mines Advisory Committee
www.gov.ns.ca/enla/contaminatedsites/goldmines.asp

Doe, K, R. Mroz, K.-L. Tay, J. Cameron, S. Teh, A. Cook, S. Chen, M. Leger, and G Norton. 2007. In press. Biological effects of gold mine tailings on the intertidal marine environment in Nova Scotia, Canada. Geochemistry: Exploration, Environment, Analysis
http://geea.geoscienceworld.org



Credit: Environment Canada

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 Catalogue No. En164-15/1-2007E-PDF; ISBN 978-0-662-46656-7