

# Presque Isle Bay Sediment



Presque Isle Bay is the heart of Pennsylvania's 63 miles of Great Lakes shoreline and home to its only Great Lake port. This natural formation is located on the southern shore of Lake Erie. It is formed by a seven-mile curved sand spit, which is a major bird migration pathway and home to the endangered piping plover. Presque Isle Bay supports an ecologically diverse community of plants and animals including more than 50 species of fish. Over the years, the bay has absorbed the impacts of industrial, sewage, and stormwater pollution. Because of its shape, the bay pollutants go settle to the bottom becoming entrapped in the sediment.



## Study, study, and more study

Since the early 1980s, Pennsylvania's Department of Environmental Protection (DEP) and its partners conducted 13 studies and found the Bay's sediment to contain moderate amounts of a number of contaminants. These included organic chemicals and heavy metals. In 2005, the U.S Environmental Protection Agency funded the most comprehensive bay sediment survey to date. Surface sediment was collected from 32 locations (see Figure 1) within the bay and adjacent study areas. Samples of the deeper, buried sediment were also collected to evaluate contamination over time. The study looked at chemical contaminants, whether the sediment was toxic to sediment-dwelling organisms, and other ecosystem health indicators identified by the Presque Isle Bay Public Advisory Committee.

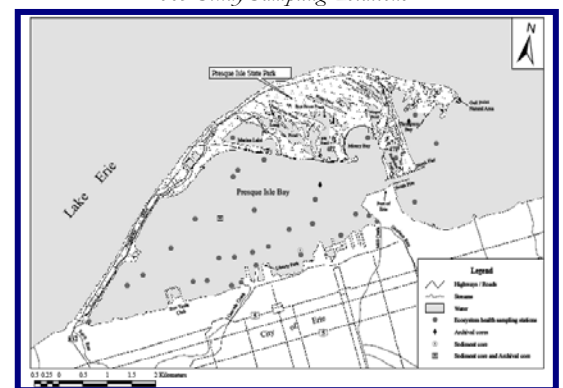
## Why should we care about sediment?

Sediments are the particles that lie below the water in lakes, bays, ponds, and streams. They are essential elements of aquatic ecosystems because they support the production of food and provide habitats for many sediment-dwelling invertebrates and bottom-dwelling (benthic) fish.

## Assessment of Sediment Quality

The 2005 study confirmed what was known about the bay's sediment. Selected sediment quality guidelines were used as an initial screening tool to indicate whether individual contaminants were present at levels that could harm the ecosystem. This screening was used to identify potential areas of contamination. The presence of a contaminant, even above guideline concentrations, does not necessarily mean there will be an impact on sediment-dwelling animals and those that feed on them. Because the bay's sediment contains a mixture of contaminants, several models were used to predict toxicity, taking into account the concentration and chemical form of the contaminants. Direct sediment toxicity tests were also conducted to validate the models and to show whether the bay's sediment causes acute (e.g., death) or chronic (e.g., affecting growth or reproduction) toxicity to sediment-dwelling organisms.

Figure 1  
2005 Study Sampling Locations



## The Results

Metals like lead, nickel, and cadmium were found at concentrations higher than sediment quality guidelines at fewer than half the 32 sampling locations. Additionally, the concentrations of seven organic compounds associated with the combustion of fuel were found above sediment quality guidelines in more than 20 percent of the sampling locations. However, when the overall contamination resulting from the combined concentrations of metals, organics, and PCBs was considered, none of the whole sediment samples exceeded levels that are linked with reduced survival or growth of sediment-dwelling organisms. Measurements of how animals incorporate contaminants (i.e., bioavailability measurements) indicated that metals are likely binding with sulfides or organic carbon and not available for uptake by sediment-dwelling organisms. Organics, on the other hand, were potentially bioavailable at almost 20 percent of the sampling locations and could contribute to sediment toxicity.



Direct toxicity tests, however, did not show a relationship with measured contaminant concentrations in the sediment samples or confirm predicted toxicity. Although limited toxicity to midges was observed, the samples with the highest levels of organic contaminants in all but one location where organics were predicted to be bioavailable were not designated toxic. Therefore, it is unlikely that organic contaminants caused the limited toxicity that was observed with the bay's sediments.

## Conclusions

The evaluation of sediment quality in Presque Isle Bay indicates that factors other than the contaminants in the sediment may be contributing to the limited toxicity to the benthic organisms that was observed. Analysis of the data shows that metals and PAHs, while present, do not or rarely occur in the AOC or study area sediments at concentrations sufficient to adversely affect benthic organisms and there is no evidence that the moderate amount of contamination found is degrading the ecosystem.

## Next Steps

DEP, in consultation with members of the Bay's Public Advisory Committee, is developing a long-term monitoring plan to ensure that the concentrations of sediment contaminants do not increase. Sediment monitoring will begin in 2008 and take place every three years until 2018 and every five years after that. Additionally, a monitoring and restoration plan is under development for the Presque Isle Bay watershed. This plan will identify places in the watershed where work needs to be done to reduce the amount of sediment and contaminants entering the bay.

## Get Involved

The Presque Isle Bay Public Advisory Committee meets quarterly to hear updates on the work being done in the bay and provide advice to the DEP. If you are interested in becoming a member of the committee or just want to be added to the mailing list, please contact:

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