

Prepared in cooperation with the
 U. S. Environmental Protection Agency
 New York State Department of Environmental Conservation

Sediment Toxicity and Condition of Benthic Invertebrate Communities in the Rochester Embayment Area-of-Concern

*The results of standardized toxicity tests, using *Chironomus dilutus*, and the condition of macroinvertebrate assemblages from bed sediments collected at sites from both inside and outside the Rochester Embayment Area of Concern will help determine if the benthos beneficial use is currently impaired or not.*

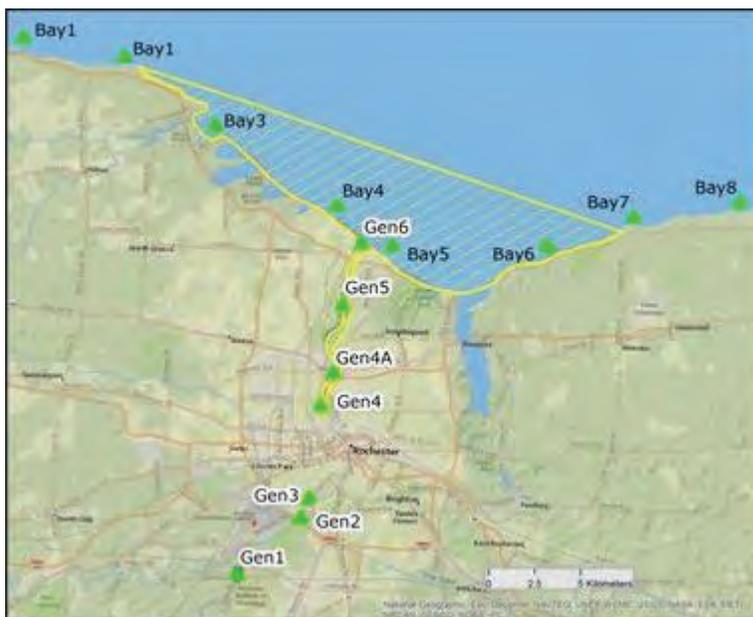
Background

Heavy metals, phosphorus, and organic contaminants in water and sediments of the lower Genesee River, resulted in the designation of fourteen beneficial uses as impaired in the Rochester Embayment Area of Concern (AOC). The benthic macroinvertebrate community or “benthos” Beneficial Use Impairment (BUI) was designated as degraded in the Genesee River because the [New York State Department of](#)

[Environmental Conservation \(NYSDEC\)](#) impairment metrics generally identified slight to moderate impacts through the 1990s and 2000s. Accumulation of “sediments on more suitable substrates” and “contaminants in sediment of the Genesee River related to past municipal and industrial waste-water treatment plant discharges were identified as specific stressors to the benthos. The easternmost area of the Lake Ontario West Basin and the westernmost area of the Lake Ontario

Central were included in the AOC because associated benthic community assessments were inconclusive or unavailable. Data collected by the NYSDEC Rotating Intensive Basin Survey (RIBS) in 2005 and 2010 and one other study suggest that the lower Genesee River may meet the benthos BUI removal criteria. A March 2012 draft GLNPO report (Site characterization at the Genesee River sediment site, Rochester Embayment AOC, Rochester, New York) by Battelle found that sediments from 40 sites in Genesee River were not acutely or chronically toxic to the amphipod *Hyalella azteca*. Although few (if any) of these results were linked to comparable data from non-AOC reference sites, they suggest that the BUI for benthos may be outdated in parts of this AOC. The Remedial Action Plan established specific criteria in the Rochester Embayment AOC for delisting the “Degradation of Benthos” BUI. These criteria are: (1) “Benthic macroinvertebrate communities are “non-impacted” or “slightly impacted” according to NYSDEC indices”, or (2) “In the absence of conclusive community structure data, the toxicity of sediment-associated contaminants is not statistically higher than controls.” The RAP recommends that more comprehensive information on the status of benthic communities and toxicity of bed sediments are needed inside the Rochester Embayment AOC, and also at unaffected reference (control) sites, to determine if one or both delisting criteria have been achieved in parts or all of this AOC.

Study Sites in the Rochester Embayment Area-of-Concern



Objectives

The main objective of this study is to determine if the benthos beneficial use is, or is not impaired in parts of the Rochester Embayment AOC. Benthic macroinvertebrate community data and bed sediment-toxicity test results will be used specifically to test whether bed sediments in the Rochester Embayment AOC meet both established criteria (see above) for delisting the benthos BUI.

Approach

The approach of this study will be to generate bed sediment toxicity and benthic community data needed to test two related hypotheses that address the two criteria for delisting the benthos BUI. The first hypothesis is that bed sediments at selected sample locations in the AOC (in the embayment, Genesee

River, and Braddock Bay) are no more toxic to the test species than bed sediments collected from control sites located outside the AOC. Acute (survival) and chronic (growth) whole bed-sediment toxicity tests will be conducted using the midge (*Chironomus dilutus*), following standard USEPA methods. The second hypothesis is that the benthic macroinvertebrate communities from targeted sites within the AOC are not significantly different, or are affected (impacted) no more seriously than the communities encountered at reference (control) sites located outside the AOC according to spatial patterns in benthic community composition (nonparametric ordination) and the Biological Assessment Profile (BAP) index and component metrics for Ponar samples collected from soft bed sediments developed by NY State Department of Environmental Conservation. The component metrics of the BAP include: species richness, Hilsenhoff Biotic Index,

Dominance-3, Percent Model Affinity, and species diversity. The scores from the five indices are converted to a common 0-10 scale. The mean score of the five indices denotes the overall BAP and associated impact for each site. A Petite Ponar sampler will be used to collect 5 replicate macroinvertebrate- community samples and a single composite sample for bed sediment toxicity tests at each study site. Statistical analyses and multivariate (ordination) methods will be used to test the two hypotheses and to determine if the bed sediments within the Rochester Embayment AOC meet either criterion for delisting the benthos BUI.

Related Publications

B.T. Duffy, B.P. Baldigo, A.J. Smith, S.D. George, and A. David. submitted. Assessment of macroinvertebrate communities and bed sediment toxicity in the St. Lawrence River at Massena Area-of-Concern, New York, USA. *Journal of Great Lakes Research*.

Collecting Sediment Samples



Sediment toxicity-test organism: *Chironomus dilutus*



Primary Researchers

Barry Baldigo
U.S. Geological Survey
425 Jordan Rd
Troy, NY 12180
(518) 285-5605
bbaldigo@usgs.gov

Brian Duffy
NYS Dept. of Environmental Conservation
425 Jordan Rd
Troy, NY 12180
(518) 285-5682
btduffy@gw.dec.state.ny.us

For Additional Information

Visit the New York Water Science Center Web site at:
<http://ny.water.usgs.gov>
Or contact Ward O. Freeman, Director
(518) 285-5665 dc_ny@usgs.gov