Remedy Effectiveness and Restoration Effectiveness at Ponds Behind Erie Pier and Pickle Pond in the St. Louis River AOC

G. Peterson[1], G. Ankley[1], A. Balz[2], G. Beaubien[2], M. Gordon[1], J. Hoffman[1], S. Janssen[3], M. Kahl[1], D. Krabbenhoft[3], J. Lazorchak[2], T. Luxton[2], M. Mills[2], T. Newcomer-Johnson[2], M. Pearson[1], D. White[2], R. Yeardley[2]

U.S. EPA Office of Research and Development, [1](Duluth MN), [2](Cincinnati OH); [3]U.S. Geological Survey Upper Midwest Water Science Center (Middleton WI)

Greg Peterson | Peterson.Greg@epa.gov | 218.529.5128

Remedy and Restoration Effectiveness Assessment

A Remediation to Restoration to Revitalization (R2R2R) approach is being implemented in Great Lakes AOC's. R2R2R refers to an observation that socioeconomic revitalization (R3) may be catalyzed by remediation (R1) of contaminated sediments and/or restoration (R2) of habitat.

Understanding conditions both before and after remediation and restoration is essential for assessing project outcomes. Place-based research to improve methods for the assessment of outcomes is being conducted at select case study locations. This presentation describes the collection of baseline condition data for two SLRE case studies to evaluate methods for assessing the effectiveness of pending remediation and restoration efforts at Pickle Pond (PP) and Ponds behind Erie Pier (PBEP).

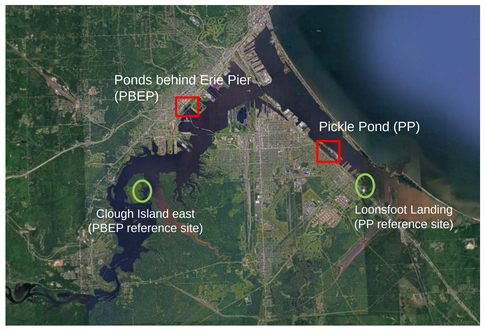
The objective of these studies is to evaluate and demonstrate a multi-indicators (multiple lines of evidence) approach to assessing AOC project outcomes.

See companion poster by Williams et al. focused on revitalization (R3) research at these sites.

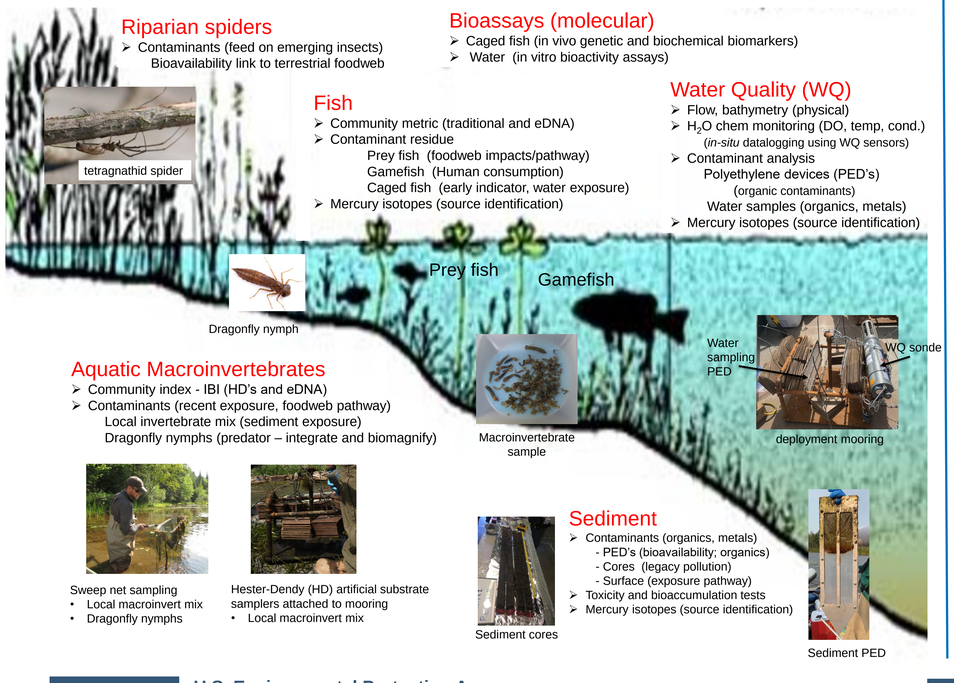
Study Locations

Case study (red square) locations and associated reference (green oval) sites.

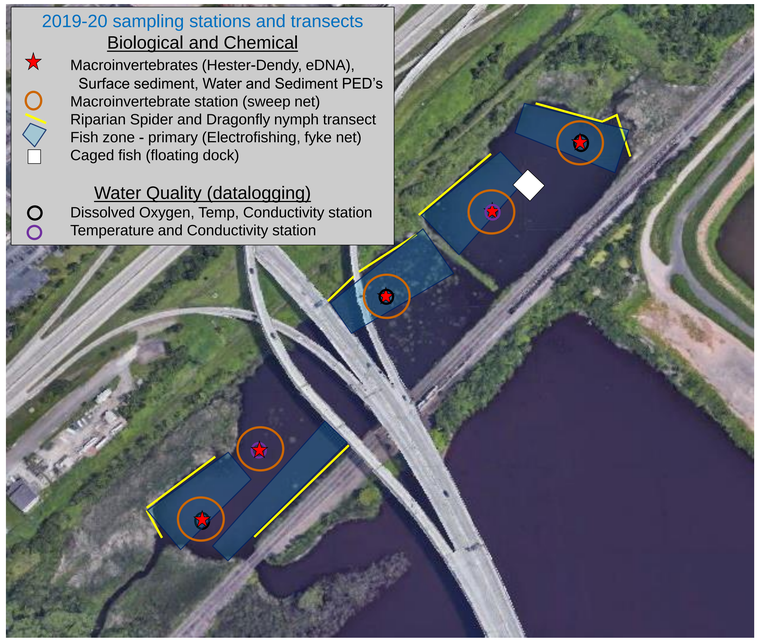
Comparable data collected from reference (control) sites help account for variability unrelated to R1 and R2 efforts.



Multiple Lines of Evidence (Biological, Chemical and physical)



Ponds Behind Erie Pier



Site and project description

This site is contaminated with industrial legacy pollution and is ecologically degraded. It continues to receive surface runoff and stormwater input. The ponds are connected to the estuary by a non-navigable channel.

R1 and R2 effectiveness Research (this study)

- Multiple years of baseline data (2019 and 2020) prior to R1 and R2 activities
- Reference conditions assessed at Clough Island (east) site
- Follow up sampling to be done immediately after R1/R2 and long-term monitoring plan to be established

Remediation (R1) and Restoration (R2)		R1 and R2 effectiveness research (this study)
R1 actions planned (2021) Remove sediment polluted with organic contaminants (PCB's, PAH's, Dioxins/Furans), mercury and other heavy metals (chromium, lead, cadmium, copper, zinc) **R2 actions planned (2021)** Change depth profile Remove invasive plants stormwater/source control	**R1 target impacts** Sediment contamination Fish contamination Bug contamination **R2 target impacts** Water Quality Bathymetry Fish and wildlife habitat Invertebrate habitat Aquatic vegetation	**Assessment Endpoints (Lines of evidence)** • Water quality monitoring (*in situ* datalogging) • Water contaminants (chemistry, PED's, bioassays) • Sediment contaminants (chemistry, PED's) • Sediment toxicity and bioaccumulation (lab tests) • Contaminant bioaccumulation - resident biota (fish, macroinvertebrates, dragonflies, spiders) • Exposure Biomarkers (caged fish) • Community index (macroinvertebrates, eDNA, fish)

Sweep netting for dragonfly nymphs

Partners

US. EPA
USGS
US Army Corps
MPCA
City of Duluth

caged fish work on floating dock

Pickle Pond

Site and project description

This site is connected to Superior Bay and is adjacent to Barkers Island, an area important for recreation and tourism. Contaminated sediments and invasive species contribute to degraded water quality and habitat conditions. The site receives runoff from an active railroad yard and municipal stormwater outfalls. R1 and R2 actions aim to restore important fish nursery habitat and stopover for migratory birds.

R1 and R2 effectiveness (this study)

- Baseline conditions measured in 2020 prior to remediation and restoration activities anticipated in 2021
- Reference conditions assessed in 2020 at Loonsfoot landing, in Superior Bay.
- Follow up sampling to be done immediately after R1/R2 and long-term monitoring plan to be established

Remediation (R1) and Restoration (R2)		R1 and R2 effectiveness research (this study)
R1 actions planned (2021) Remove sediment polluted with organic contaminants (PCB's and PAH's), mercury and other heavy metals (lead, copper, zinc) **R2 actions planned (2021)** Enhance connectivity Change depth profile Remove invasive plants stormwater/source control	**R1 target impacts** Sediment contamination Fish contamination Bug contamination **R2 target impacts** Fish passage / access Water Quality Bathymetry Fish and wildlife habitat Invertebrate habitat Aquatic vegetation	**Assessment Endpoints (Lines of evidence)** • Water quality monitoring (*in situ* datalogging) • Water contaminants (chemistry, PED's) • Sediment contaminants (chemistry, PED's) • Sediment toxicity and bioaccumulation (lab tests) • Contaminant bioaccumulation - resident biota (fish, macroinvertebrates, dragonflies, spiders) • Exposure Biomarkers (caged fish) • Community index (macroinvertebrates, eDNA, fish)

Partners

US. EPA
USGS
US Army Corps
WDNR
City of Superior

Nighttime spider sampling

U.S. Environmental Protection Agency
Office of Research and Development

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