

A.1 Technology Name

Polymeric Sampling Devices

A.1.1 Source

Patmont, Eli, Mehregan Jalalizadeh, Mandar Bokare, Trevor Needham, Jeff Vance, Richard Greene, John Cargill, and Upal Ghosh. 2020. Full-Scale Application of Activated Carbon to Reduce Pollutant Bioavailability in a 5-Acre Lake. *Journal of Environmental Engineering* 146 (5): 04020024. [https://doi.org/10.1061/\(ASCE\)EE.1943-7870.0001667](https://doi.org/10.1061/(ASCE)EE.1943-7870.0001667).

A.1.2 Summary

Media:	Sediment porewater and water column
Study Type:	In-situ
Technology:	PE and POM
Peer Reviewed:	Yes
Publication Date:	May 1, 2020

A.1.3 Site Description

- The article presents North America's first full-scale remediation project using direct placement of activated carbon (AC) into sediments. This project was completed in 2013 at Mirror Lake (tidally influenced) on the St. Jones River in Dover, Delaware.
- The surface sediment (0–5 cm) contained 0.043 mg/kg TPCB on average before treatment. The treatment involved applying approximately 36 tons of AC to the 2-hectare lake, achieving an average dry-weight AC concentration of 4.3%.
- Surface sediment (0-5 cm) or sediment core samples were collected before AC application (as a baseline), and then 1-month, 1-year, and 3-year post-AC placement. These samples were analyzed for PCBs, OC, and BC.
- Passive samplers, including PE and POM, were deployed in the surface water and sediment porewater at the baseline, and then 1-month, 1-year, and 3-year after AC application.
- These passive samplers were allowed to equilibrate in-situ for 1 month, and PRC desorption data were used to adjust porewater PCB concentrations for nonequilibrium (Sanders et al. 2018).
- Fish species, both resident and migratory, were collected before and 3-5 years following the treatment.

A.1.4 Remedial Phase

Post-remedy

A.1.5 Outcome

A year after the remedial action, OC-normalized TPCB concentrations in surface sediments showed no significant change. However, there was a notable reduction in TPCB concentrations in the surface sediment porewater, decreasing from the baseline level of 138 pg/L to approximately 55 and 54 pg/L at the 1-year and 3-year post-application, respectively, marking

an average reduction of about 60%. Similarly, TPCB concentrations in surface water dropped significantly, from an average of 241 pg/L before the AC application to about 54 pg/L and 49 pg/L in the 1-year and 3-year post-application periods, showing an average reduction of approximately 80%. Analysis of resident fish like bluegill sunfish and brown bullhead showed a 70% reduction in lipid-normalized TPCB 3-5 years post-treatment, while migratory species like white perch and blueback herring exhibited limited changes. This study demonstrates the effectiveness of AC in sediment remediation, significantly reducing pollutant levels in both water and aquatic organisms.

A.1.6 References

Sanders, James P., Natasha A. Andrade, and Upal Ghosh. "Evaluation of Passive Sampling Polymers and Nonequilibrium Adjustment Methods in a Multiyear Surveillance of Sediment Porewater PCBs." *Environmental Toxicology and Chemistry* 37, no. 9 (2018): 2487–95. <https://doi.org/10.1002/etc.4223>.