

Research finds low oxygen resources in Central New York's Three Rivers system

April 29 2010



Reseachers conduct the survey on Otisco Lake in Central New York. Credit: SyracuseCoE

A unique three-year longitudinal and vertical study of Central New York's Three Rivers system—involving the Oswego, Oneida and Seneca rivers—has revealed that oxygen resources have become degraded by several stressors, including the impact of wastewater treatment plants, nonpoint runoff, an increase in invasive zebra mussels and channelization of the flow. As oxygen is necessary to support life in aquatic ecosystems, its measurement is essential for gauging the overall state of water bodies; in one of the study's surveys, more than one-third of the 90-kilometer length of the river system failed to meet the New York water quality standard.

This research has shown the importance of utilizing innovative

technology to manage and monitor complex aquatic ecosystems in urban settings. Oftentimes, programs for treating [water](#) systems are implemented without robust data to identify the true source of the problem. The value of this case study comes from the large number of cause-and-effect relationships that were clearly identified through the monitoring system.

Steven Effler, director of research at the Upstate Freshwater Institute and Charles Driscoll, University Professor of Environmental Systems Engineering in the L.C. Smith College of Engineering and Computer Science at Syracuse University, presented recently the results of this Syracuse Center of Excellence Collaborative Activities in Research and Technology Innovation (CARTI) water research project—"An Intelligent Urban Environmental System (i-UES) for Central New York Water Resource Management"—to SyracuseCoE's Scientific Advisory Committee. SyracuseCoE awards CARTI projects using funds from the U.S.

[Environmental Protection Agency](#). Co-authors of the study are Anthony R. Prestigiacomio and Adam J.P. Effler of the Upstate Freshwater Institute.

While much attention has been given to the impact of rivers on lake [water quality](#), there had previously been little done to track the effects of lake outflows on receiving rivers. The water quality of these rivers is of great concern in order to protect their multiple uses—recreation, navigation, power generation and waste discharge—and to support regional development. Currently, the ability of the water systems to absorb the waste sent into them is significantly reduced.

"This study illustrates some of the complexities and challenges in managing urban water systems," says Driscoll. "There are multiple factors associated with the low oxygen concentrations in the Three Rivers system. As a result, multiple approaches will be needed to

improve the oxygen status of the river."

To assess the water quality of such large river systems, the study conducted eight longitudinal surveys—four in summer 2007 and four in summer 2009—collecting data from more than 50 sites, utilizing special instrumentation that measures temperature, conductance (the capacity to conduct electricity), turbidity (muddiness of water due to stirred up sediment), chlorophyll levels and dissolved oxygen.

The "boundary conditions" that show the baseline measurements were collected by solar-powered robotic monitoring platforms at the outflows of each lake.

With much conclusive evidence pointing to the oxygen depletion in the Three Rivers system, the research team recommends long-term, routine monitoring of the system, utilizing robotic systems. The researchers suggest that simply improving processes at individual wastewater treatment plants will not be enough to impact the system, and the team must continue to define dynamics and provide insights for rehabilitation. A water quality model can then guide management decisions for a recovery process.

More information: A project summary is available at [www.syracusecoe.org/projects/r ... riers/DriscollC2.aspx](http://www.syracusecoe.org/projects/rivers/DriscollC2.aspx)

Provided by Syracuse University

Citation: Research finds low oxygen resources in Central New York's Three Rivers system (2010, April 29) retrieved 27 April 2024 from <https://phys.org/news/2010-04-oxygen-resources-central-york-rivers.html>

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