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Improving Water Quality In Monroe County

MONROE COUNTY John D. Doyle, County Executive

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The Black Creek Watershed Coalition

Large watersheds cross political boundaries, making comprehensive watershed planning for any individual town or county impossible on it's own. Towns and villages within Monroe County often work together on watershed planning, and Monroe County works with other counties with which it shares a watershed.

The Black Creek watershed consists of all the land that drains to Black Creek and its tributaries. This watershed incorporates all or part of the Towns of Bethany, Batavia, Elba, Stafford, Byron, LeRoy and Bergen in Genesee County and the Towns of Riga, Ogden, Wheatland, Sweden and Chili in Monroe County. The towns of Clarendon in Orleans County and Middlebury in Wyoming County also contain small parts of the watershed.

Intermunicipal watershed planning in Monroe County expanded with the Rochester Embayment Remedial Action Plan (RAP), a response to the 1987 U.S.-Canada Great Lakes Water Quality Agreement that required "Areas of Concern" to prepare RAPs. The Rochester Embayment was named as an "Area of Concern" and its RAP, completed in 1997, was developed by representatives of the six counties that share the Genesee River Basin and the Rochester Embayment drainage. Since 1997, Monroe County has increased its participation in watershed planning for smaller basins, such as Irondequoit Creek, Northrup Creek, and Long Pond, Oatka Creek and the North Chili tributary of Black Creek. As part of the planning process, some municipalities have developed intermunicipal agreements stating that they will work together to improve and protect water quality in specified watersheds.

History of the Black Creek Watershed Coalition

The planning group for the North Chili Tributary of Black Creek recommended planning for the greater Black Creek watershed. A "Caring for the Creek" symposium was held in spring of 2000, at which participants who live and work in the Black Creek watershed identified (1) environmental concerns within the watershed, (2) resources that should be protected, and (3) persons, agencies and organizations that could be involved in preparation of a watershed plan.

Monroe County, on behalf of the Black Creek Watershed Coalition, applied for and received in 2002 a Watershed Assistance Grant (WAG) from River Network, a national river- and watershed-conservation organization. The U.S. Environmental Protection Agency supports the WAG program. The grant made possible a 6-hour Black Creek Watershed Symposium and the formation of the Black Creek Watershed Coalition whose first meeting was held on April 11, 2002. The grant included funds to (1) hire a consultant to prepare a state-of-the-basin report, (2) prepare and distribute newsletters, and (3) create a website. The state-of-the-basin report is to be part of a Black Creek watershed planning document. In addition, Monroe County and Genesee County have drafted an intermunicipal agreement to work together "to

ALSO IN THIS ISSUE

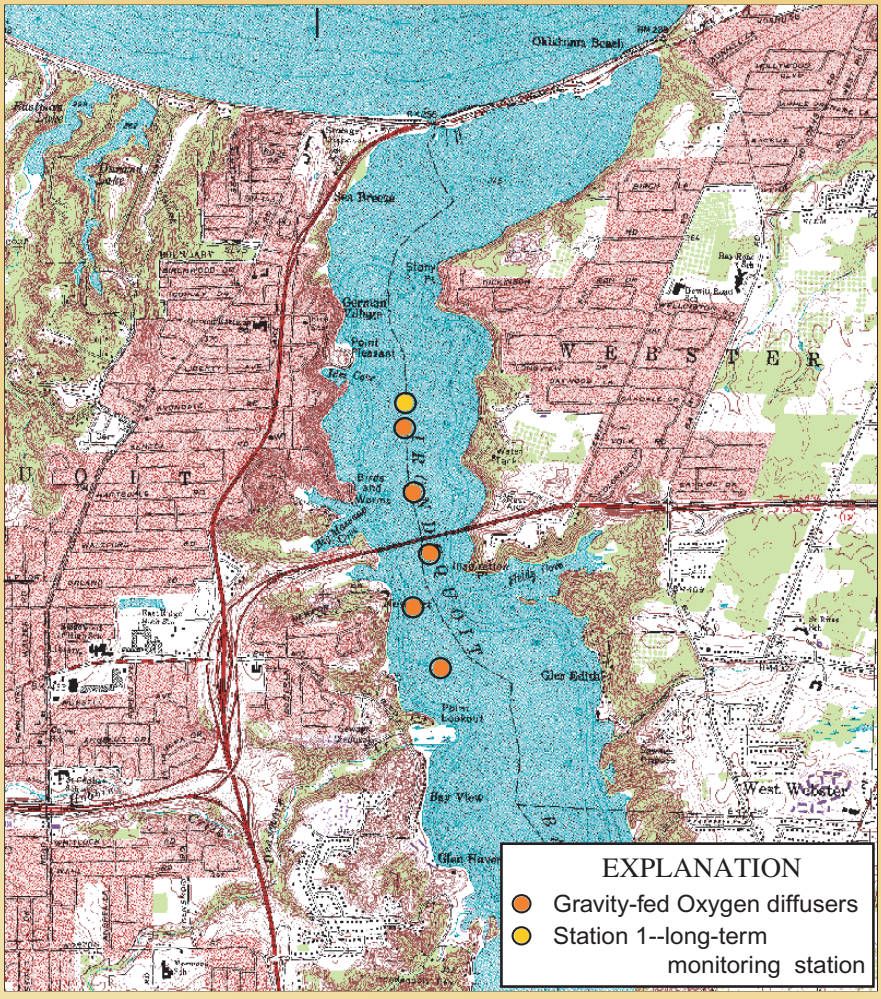
accomplish watershed-level planning for water quality and flood prevention in the Black Creek watershed." Other municipalities may enter into the agreement in the future.

All municipalities within the watershed are encouraged to participate in the coalition. Also invited to participate are representatives and members of environmental groups, farmers, business people, those with sports and outdoor recreation interests, homeowners, and other interested citizens.

Environmental Monitoring of Black Creek

The U.S. Geological Survey (USGS), in cooperation with the U.S. Army Corps of Engineers, is monitoring the flow of Black Creek near the center of the watershed at Churchville, as part of the flow-regulation system for the Mount Morris Dam on the Genesee River. Long-term water-quality monitoring began in 1998 as part of the USGS-Monroe County cooperative environmental monitoring program. Automatic sampling equipment was installed at the USGS streamflow-gaging station at Churchville in that year, and composite samples are analyzed for nutrients, common ions, and suspended solids. The resulting data are published in the annual USGS data report for western New York and are also available on the USGS website (http://ny.usgs.gov).

Hypolimnetic Oxygenation of Irondequoit Bay



Base from USGS digital raster graphic, 1:24,000

Figure 1. Location of five oxygen diffusers and long-term water-quality monitoring station in Irondequoit Bay east of Rochester, NY.

One of the water-quality goals for Irondequoit Bay (stated in the 1985 Irondequoit Basin Framework Plan) is to achieve a stable mesotrophic condition, rather than the present eutrophic state in Irondequoit Bay. Several Monroe county initiatives, supported by local, state and federal governments, have helped to improve the Bay's water quality has been advanced towards this goal over the last 30 years.

These initiatives include:

1) Diversion of waste water out of the watershed through construction of the cross-Irondequoit tunnel in the 1970s and 1980s.
2) Virtual elimination of raw sewage entering the watershed from combined sewer overflows in the City of Rochester as a result of construction and use of deep storage tunnels in the 1980s and 1990s.

3) Application of alum to deep-water areas of the bay in 1986 to seal bottom sediments.
4) Oxygen supplementation of the hypolimnion from the1990s through 2002.
5) Routing Irondequoit Creek storm water to additional areas of natural wetlands for treatment of nutrients by natural wetland processes.

These initiatives were accomplished through the Irondequoit Bay Pure Waters District, the Rochester Pure Waters District, and Monroe County Health Department programs.

Irondequoit Bay oxygen supplementation

Oxygen supplementation was a recommendation of the 1991 Clean Lakes Phase II Final Report by the Monroe County Department of Health. The goal was to introduce oxygen into deep waters of the bay to increase the natural removal of phosphorus that occurs through chemical and biological means. The assumption is that an increase in dissolved oxygen concentration of the water will (1) prevent anoxia and the associated release of phosphorus (an algae-producing nutrient) from bottom sediments and (2) will allow the removal of phosphorous from dead plant material by algae (phytoplankton), which are in turn harvested by zooplankton. The zooplankton are vulnerable to predation during their daily upward migration into the epilimnion and thereby transfer phosphorus up the food chain to planktivorous fish, which then migrate to nutrient poor Lake Ontario or are consumed by larger fish.
These, in turn, are vulnerable to harvest by anglers .

The initial goal in 1993 was to maintain a dissolved oxygen concentration of 4 to 5 mg/L (milligrams per liter) in the metalimnion (the concentration that allows in-migrating alewives from Lake Ontario to remove the zooplankton populations). This target was reduced in 1997 to maintain metalimnetic oxygen concentration ranges of from 0.5 - 1.5 mg/L during July and August when water is warmest and normally has the lowest dissolved oxygen concentrations.

Oxygen concentrations of 0.5 - 1.5 mg/L could form an oxygen-poor refuge for zooplankton which could then graze on the phytoplankton without the threat of predation by fish that require greater concentrations of oxygen. Thus, an oxygen-poor zone could provide a pathway for the biological removal of phosphorous from decaying plant matter, and serve as a natural control on algae. About 1,200 tons of oxygen has been gravity-fed from a storage tank to Irondequoit Bay into five diffusers during the summer months since 1993; each diffuser (fig. 1) is located 3 feet above the Bay bottom. Average median oxygen concentrations for the months of July and August in the metalimnion have increased 10-fold from 0.1 mg/L during 1984-92 to 1.10 mg/L during1993-2000 (fig. 2).

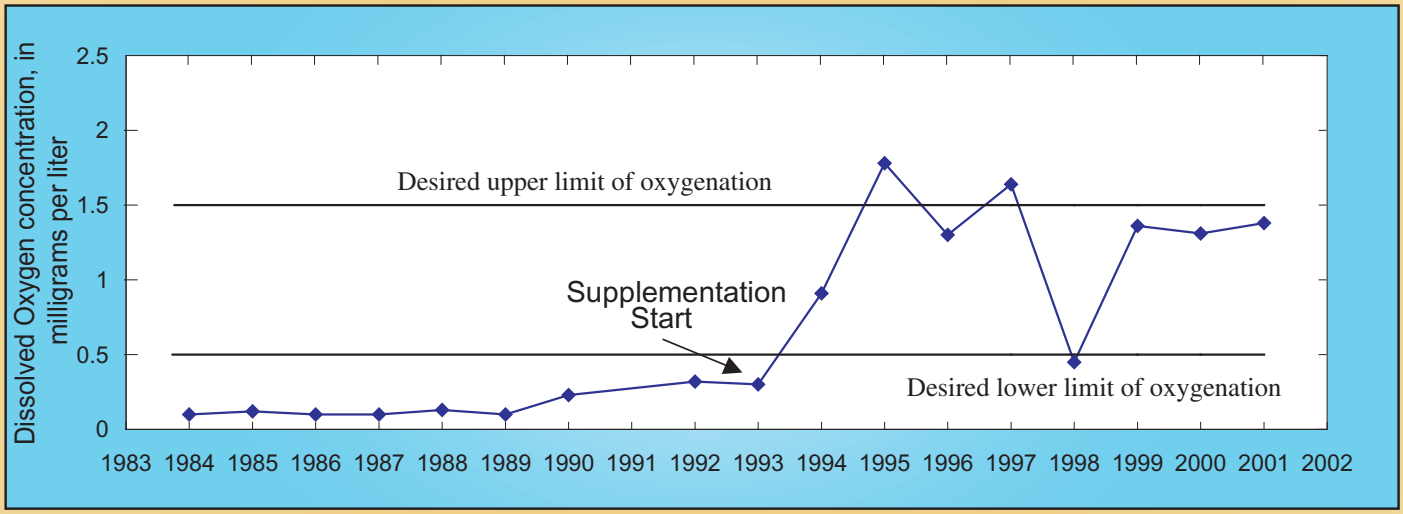


Figure 2. Median oxygen concentrations in the metalimnion averaged for months of July and August for years 1984-2000 at Station 1, Irondequoit Bay, New York (location shown in fig. 1).

Cornell University conducted a study during 1996- 97,

to confirm that an oxygen-poor zooplankton refuge could be formed by the use of oxygen diffusion in Irondequoit Bay. The results of that study are currently in review.

Irondequoit Bay Trophic State

The trophic-status target (fig. 3) for Irondequoit Bay was established in the Irondequoit Basin Framework Plan in 1985 with the objective of making the Bay suitable for recreation. The target area labeled WQMP (Water-Quality Management Plan) in figure 3 represents the target range of summer chlorophyll concentration as a function of phosphorus concentration. Irondequoit Bay was classified as eutrophic throughout the 1970s and 1980s and has been within the mesotrophic target three times in the 1995 (1995,1999, and 2001).

Improvements in Irondequoit Bay's trophic status are due to the removal of nutrients through diversion of waste water, the virtual elimination of combined-sewer overflows, the application of alum, supplementation with oxygen, and the Empire Wetlands project (a diversion of storm-related flows over a larger area of the wetland).

Terms used in these articles:

Eutrophic: Increased growth of algae and other aquatic plants and usually a corresponding depletion of dissolved oxygen due to an abundance of dissolved nutrients.

Mesotrophic: Moderate productivity due to a moderate amount of dissolved nutrients.

Oligotrophic: Low productivity due to a deficiency in dissolved nutrients.

Anoxia: Absence of oxygen

Epilimnion: The upper, well mixed, well illuminated region of a stratified body of water.

Hypolimnion: the lower, poorly mixed or stagnant part of a stratified body of water of essentially uniform temperature except during the period of overturn.

Metalimnion: The layer between the epilimnion and the hypolimnion in a stratified body of water.

Phytoplankton: Small (often microscopic) aquatic plants suspended in water.

Planktivorous fish: Fish that consume plankton.

Zooplankton: Plankton that consist of animals.

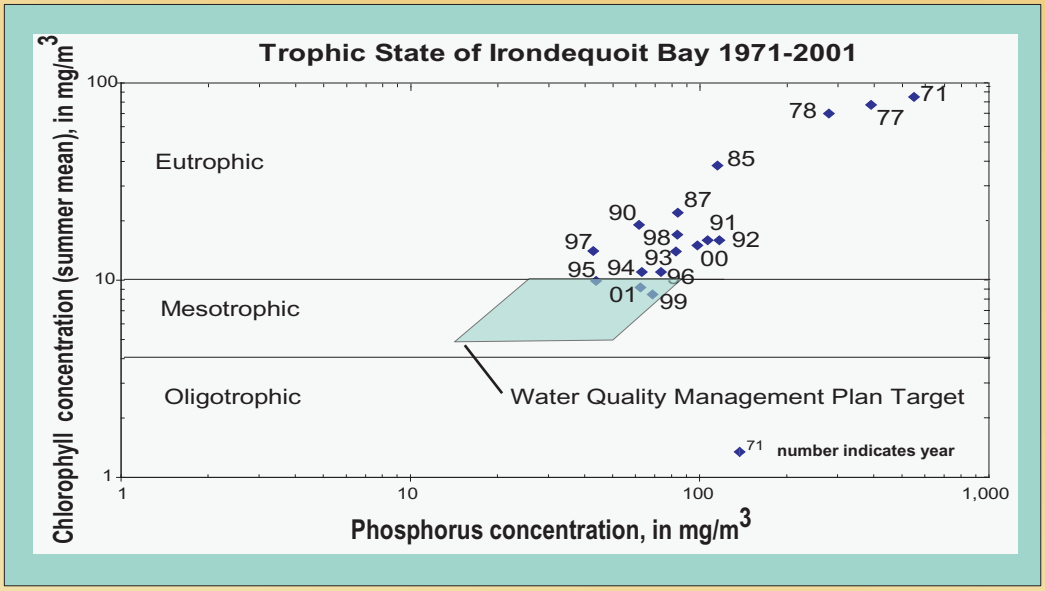


Figure 3. Trophic status target for chlorophyll and phosphorous in Irondequoit Bay (from Irondequoit Basin Framework Plan, 1985).

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