MONROE COUNTY ENVIRONMENTAL HEALTH LABORATORY AND THE U.S. GEOLOGICAL SURVEY

MONROE COUNTY
John D. Doyle, County Executive

USGS science for a changing world

Working together to Improve Water Quality in Monroe County

Issue 4 *Summer 1998*

What can be done to prevent the effects of urbanization from polluting our waters? The following examples describe what the Monroe County Environmental Health Laboratory and the U.S. Geological Survey are doing to address water pollution and to improve water quality in Monroe County.

Photo: Flow-Control Structure at the Narrows in the Ellison Park Wetlands (location shown in fig. 1, p. 2)

WETLAND STUDY ENTERS SECOND PHASE

A major recommendation of the Nationwide Urban Runoff Program (NURP) study of 1980-81 for the removal of nutrients from storm runoff before it enters Irondequoit Bay was the use of the cattail wetland at the mouth of Irondequoit Creek as a natural water-treatment system. Since the end of the NURP study, the Monroe County Environmental Health Laboratory (MCEHL) and the U.S. Geological Survey (USGS) have been collecting water-quality and streamflow data from Irondequoit Creek at Blossom Road, just upstream from the wetland and, for the past 8 years, near the mouth of Irondequoit Creek at Empire Boulevard (fig. 1, p. 2). These data are being used to document the effects the wetland, which lies mostly between Blossom Road and Empire Boulevard, has on the chemical quality of Irondequoit Creek, which flows through the wetland into Irondequoit Bay.

Data collected in Phase I (1989-96), which preceded the installation of the control structure shown in the photo above, indicate that the wetland improves the water quality by removing certain constituents. For example, the graph in figure 2 (page 2) shows that about 28 percent of the annual total phosphorus load is retained in the wetland. Total phosphorus retention appears to have been improved by an increase in the diversion of water from Irondequoit Creek to the Haywood Millrace in 1992, which allowed more water to flow into the eastern side of the upper wetland area. Other studies have been conducted to assess the flora, fish, bird, and benthic-macroinvertebrate communities, and sedimentological characteristics of the wetland.

Phase II began in 1997 with the construction of the flow-control structure at the Narrows, midway through the wetland (fig. 1). The

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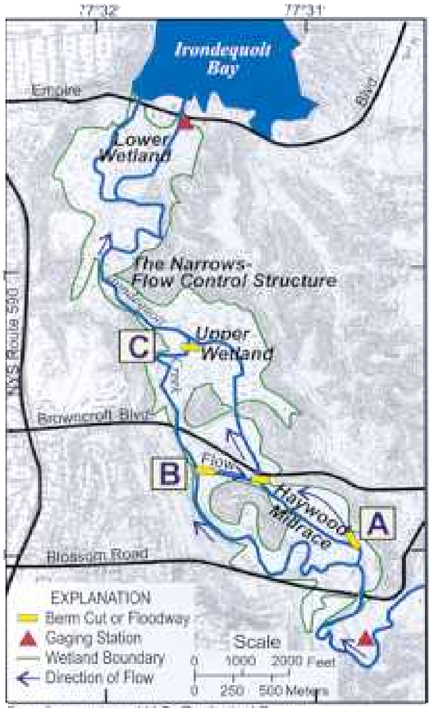

Base from scanned U.S. Geological Survey
Rochester East, NY 1:24,000, 1978

Figure 1. Location and pertinent features of Ellison Park Wetland in Irondequoit Creek basin, (location is shown on p. 4)

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control structure was designed to maximize the wetland's potential for improving water quality by increasing the frequency of inundation, and the dispersion into, and detention of, channel flow in the wetland. By facilitating (1) the uptake of nutrients (nitrogen and phosphorus) by organisms that reside on the surface of wetland plants (biofilm), and (2) the sedimentation of particulate matter, these hydrologic changes are intended to decrease the amount of nutrients entering Irondequoit Bay, where they would otherwise contribute to excess aquatic plant growth and eutrophication.

Other actions of Phase II have been implemented to increase movement of water into the upper wetland (fig. 1). These measures include (1) culvert improvements on the Haywood Millrace, (2) a floodway excavation east of the Millrace (A in fig. 1), and (3) two berm cuts, one about 2,600 feet upstream from the Narrows (C in fig. 1), and the other about 1,400 feet upstream from Browncroft Boulevard (B in fig. 1). These channel modifications are intended to divert up to 50 percent of bankfull stormflows from Irondequoit Creek to the Millrace and through the nutrient-deficient upper wetland, and likely will reduce the duration of flooding in Ellison Park.

Data gathered during the next 5 years will be used to evaluate the continued or improved effectiveness of the wetland in nutrient removal. Additional studies of flora, fauna, and sediment will be conducted in the 2nd and 4th years to detect any adverse effects this diversion may have on the wetland ecosystem. If water-quality data indicate that the system is effective, and if the other studies indicate no adverse effects on the ecosystem, construction of an automated flow control system will be considered. ■

For more information, refer to the report "Hydrology, Sedimentology, and Biology of Ellison Park Wetland at the Mouth of Irondequoit Creek near Rochester, New York", published by the USGS in cooperation with the Monroe County Department of Health, Water-Resources Investigations Report 96-4269, by William F. Coon.

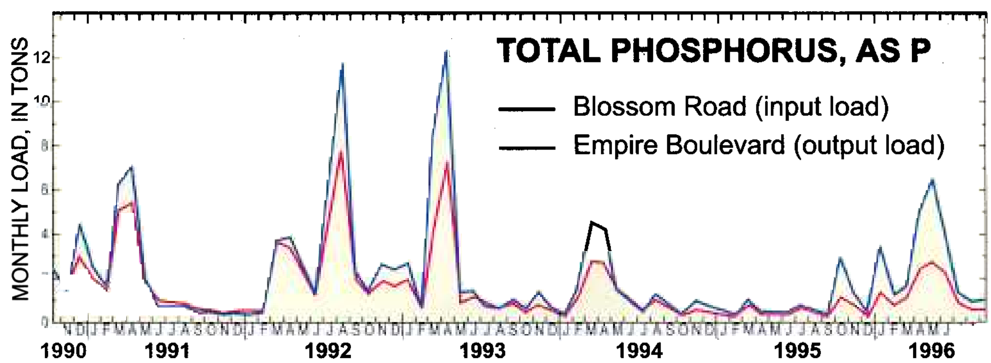

Figure 2. Monthly loads of total phosphorus at the inflow and the outflow of the wetland. (see gaging station locations shown in fig. 1)

WATER-QUALITY IMPROVEMENTS IN THE IRONDEQUOIT CREEK BASIN

Water quality in Irondequoit Bay was declining for several decades, largely as a result of sewage discharges and nutrients from stormflows that entered the Bay directly from Irondequoit Creek. The discharge of wastewater to Irondequoit Creek was eliminated with the completion of an interceptor sewer in 1979 under the Monroe County Pure Waters Master Plan. Monroe County has continued its effort to improve the quality of Irondequoit Bay by decreasing nutrient concentrations in stormflows of Irondequoit Creek.

The USGS, in cooperation with the MCEHL, has collected and analyzed water-resources information from the Irondequoit Creek basin since 1980 to estimate temporal trends in nutrient and contaminant loads. The Nationwide Urban Runoff Program (NURP) study of the Irondequoit Creek basin during 1980-81 investigated nonpoint-source contamination and provided a baseline from which to track changes in the chemical characteristics of Irondequoit Creek. Monroe County used the results of NURP and related studies to develop the Monroe County Water Quality Management Plan (WQMP) for the Irondequoit Bay drainage basin (fig. 3). This plan set measurable goals and suggested management practices for land use within the watershed.

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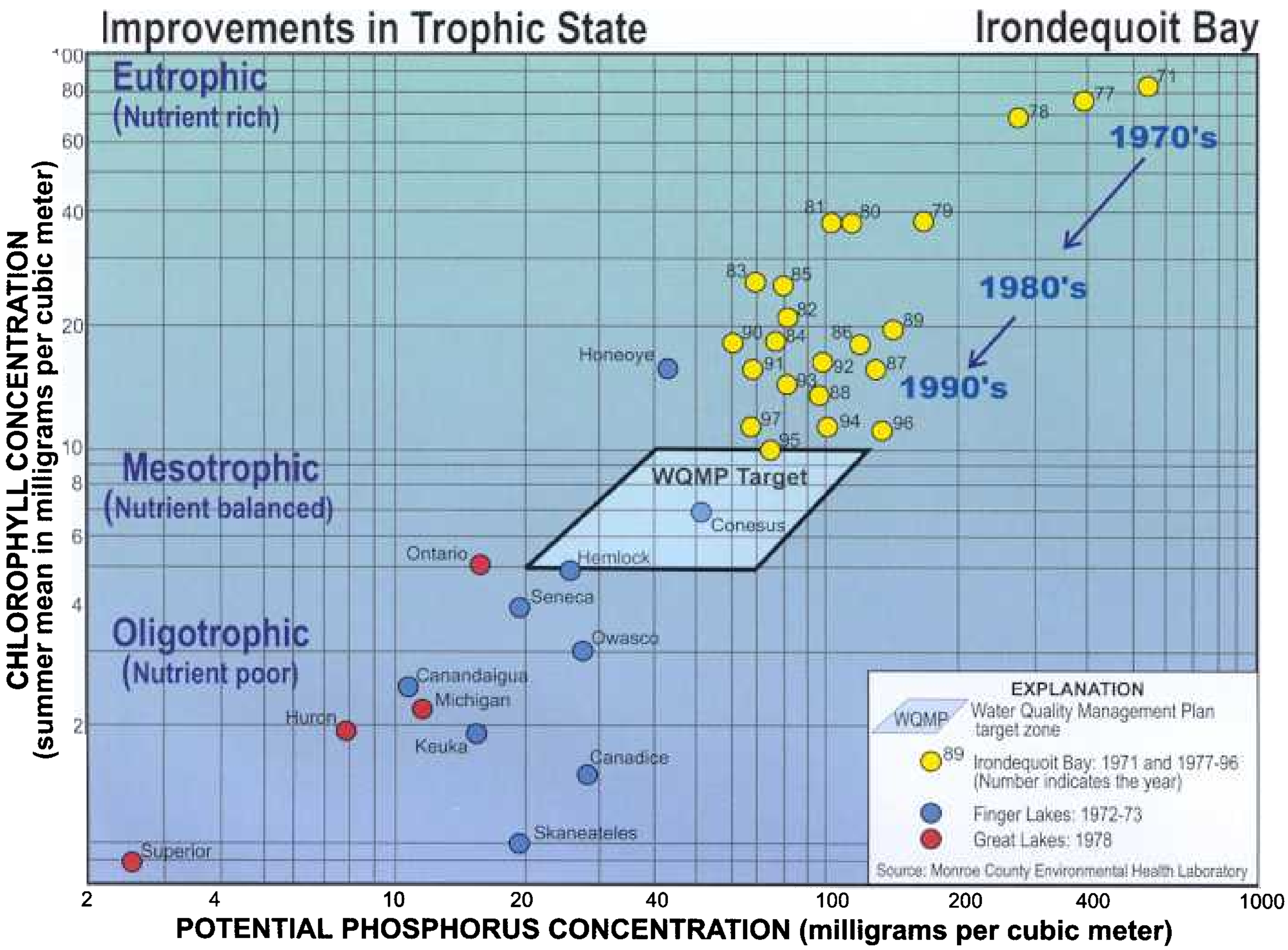

Figure 3. Trophic state of Irondequoit Bay since 1971, and of Finger Lakes and four Great Lakes during the 1970's.

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Surface-Water Sampling

The MCEHL collects water-quality and streamflow data at key locations in the Irondequoit Creek basin to monitor the effects of management practices and identify possible sources of contamination. The Blossom Road and Empire Boulevard sites (sites 10 and 11, fig. 4) are the points at which Irondequoit Creek flows into, and discharges from, the wetlands, respectively. The tributary with the highest contaminant-loading rate in the basin is Allen Creek (site 9, fig. 4). The site on East Branch Allen Creek (site 8, fig. 4) is used to monitor the subbasin where the goal of a collaborative effort of the Town of Pittsford, Monroe County, and the USGS is to demonstrate no net increase in pollutant loads with development using Best Management Practices (BMPs). The Railroad Mills site (site 7, fig. 4) represents inflow to Irondequoit Creek from the Town of Mendon and Ontario County, which contains the largely undeveloped portion of the upper Irondequoit Creek basin.

Chemical-Trend Analysis

Trend analysis of water-quality data is useful in evaluating the effects of changes in land use, air quality, climate, and the stream environment; it is also useful in evaluating the effectiveness of management practices to improve water quality in a given area. A trend of a chemical constituent's load over a specified period indicates an overall change in the mass loading of that constituent at a specific sampling site. Phosphorus, for example, is a nutrient that contributes to plant growth in Irondequoit Bay. A trend analysis shows a decreasing trend of 6 percent in flow-adjusted phosphorus concentrations entering the wetlands.

Similarly, the graph in figure 3 shows that potential phosphorus and chlorophyll concentrations (measures of biologically available phosphorous and algal biomass) in Irondequoit Bay are decreasing and are approaching the Water-Quality-Management Plan (WQMP) target range. Trends in other constituents are also being tracked to indicate areas where management practices may need improvement. ■

For more information refer to:
Nationwide Urban Runoff Program Irondequoit Basin Study Final Report, 1983, conducted in cooperation with the New York State Department of Environmental Conservation and the Water Planning Division, U.S. Environmental Protection Agency, Washington D.C.

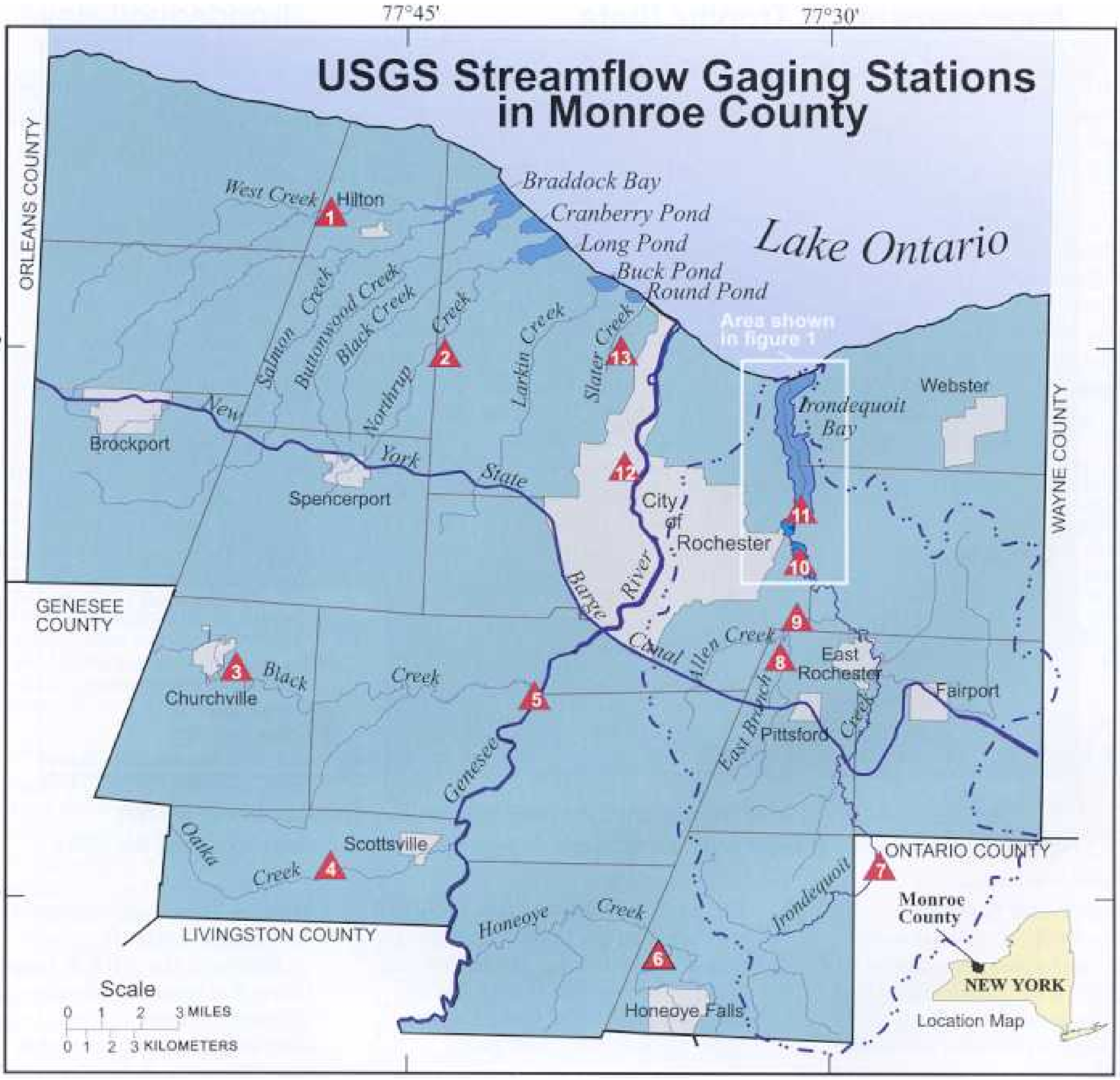

Figure 4. USGS Streamflow gaging stations used to collect data on streamflow in Monroe County.

EXPLANATION

Streamflow Gaging Stations-Station name and USGS station number (in parenthesis)

Irondequoit Creek Drainage Basin

County Boundary

1. West Creek near Hilton (04220250)
2. Northrup Creek at North Greece (0422026250)
3. Black Creek at Churchville (04231000)
4. Oatka Creek at Garbutt (04230500)
5. Genesee River at Ballantyne Bridge near Mortimer Road (04230650)
6. Honeoye Creek at Honeoye Falls (04229500)
7. Irondequoit Creek at Railroad Mills near Fishers (04232034)
8. East Branch of Allen Creek at Pittsford (0423204920)
9. Allen Creek near Rochester (04232050)
10. Irondequoit Creek above Blossom Road near Rochester (0423205010)
11. Irondequoit Creek at Empire Blvd. (0423205025)
12. Genesee River at Rochester (04232000)
13. Slater Creek near Greece (0422028490)

For additional information, refer to the report titled "Water Resources of Monroe County, New York, Water Years 1984-88, with Emphasis on Water Quality in the Irondequoit Basin, published by the USGS, in cooperation with Monroe County Department of Health, Water-Resources Investigations Report 96-4054, by Johnston, W.H., and Sherwood, D.A., or visit the website: http//www.water.usgs.gov.

For a list of Monroe County reports contact:
Monroe County Environmental Health Lab
740 East Henrietta Road
Rochester, NY 14623
(716) 274-6820

For a list of Monroe County reports published by the U.S. Geological Survey contact:
Subdistrict Chief
U.S. Geological Survey
903 Hanshaw Road
Ithaca, NY 14850-1573
(607) 266-0217