

MONROE



COUNTY

Working together to

# Improve Water Quality

in Monroe County



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What can we do to prevent our water supply from becoming polluted from the effects of population growth and urbanization? The following examples describe what the Monroe County Environmental Health Laboratory and the U.S. Geological Survey (USGS) are doing to address water pollution and improve water quality in Monroe County.

## LONG-TERM DATA SHOW WATER-QUALITY IMPROVEMENT IN THE GENESEE RIVER

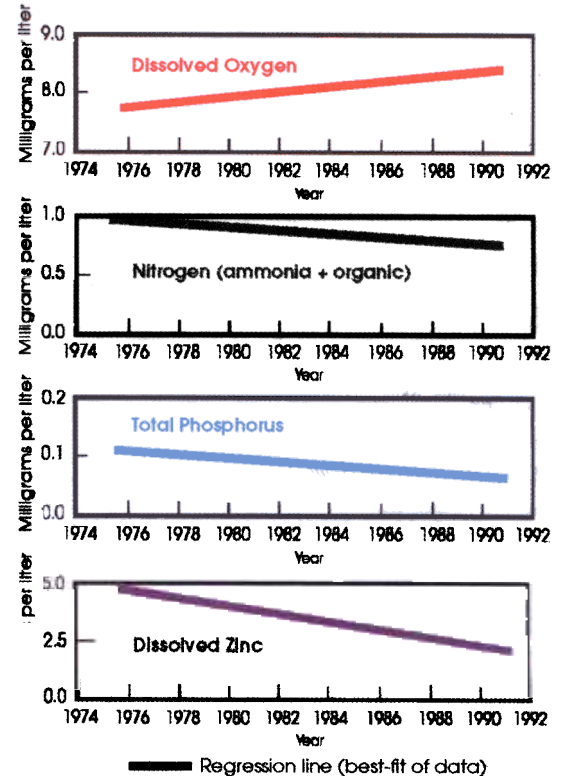
The environmental movement of the late 1960's brought an increased awareness of how human activities affect the land, air, and water. The USGS, recognizing a lack of comprehensive, long-term data on the quality of the Nation's major streams, established the National Stream Quality Accounting Network (NASQAN) in 1974, with 515 monitoring stations on the major streams in the major drainage basins throughout the Nation.

NASQAN is a systematic and uniform data-collection, analysis, and reporting program designed to obtain a broad range of stream-water-quality information, including physical characteristics such as temperature, volume, and turbidity, and chemical characteristics, including concentrations of cations, anions, trace metals, and nutrients. This information can be used to indicate long-term regional and national trends in the quality of our Nation's water resources.

A NASQAN site on the Genesee River at Charlotte Docks, Monroe County, was operated for 20 years until it was discontinued in 1994.

Data through 1994 show distinct water-quality improvement in the Genesee River over the past 20 years. The most significant trends are a marked decrease in dissolved zinc and total phosphorus concentrations; a slight decrease in nitrogen; and a slight increase in dissolved oxygen concentration (essential for fish and other aquatic life). This improvement in water-quality is probably related to changes in pollution-control measures and management practices adopted by Monroe County and other counties through which the Genesee River flows. Without further data collection, future trends are difficult to track. ♦

### WATER-QUALITY TRENDS GENESEE RIVER AT CHARLOTTE DOCKS



Genesee River near Rochester, New York

## CONVERSION OF STORMWATER-DETENTION BASINS TO CREATED WETLANDS FOR THE MITIGATION OF STORM RUNOFF CONTAMINATION

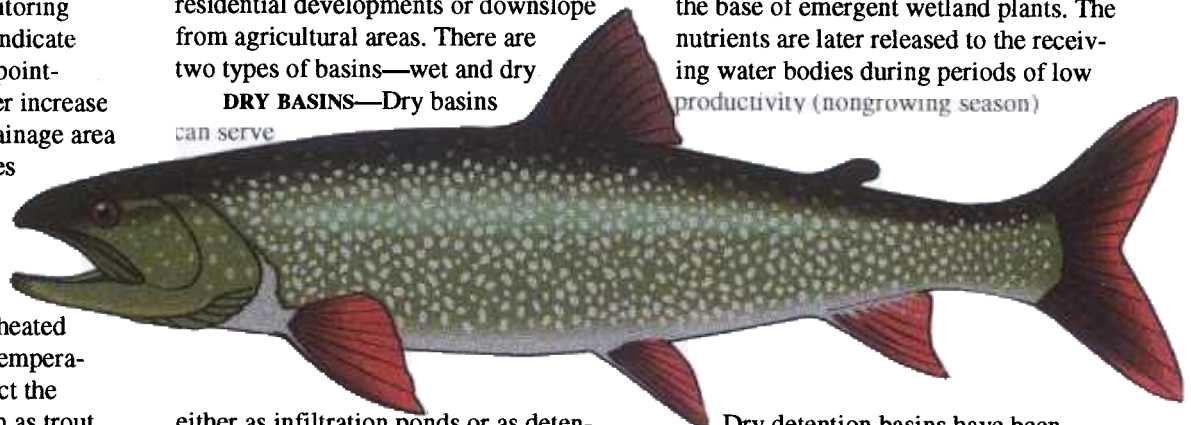
Chemical pollutants and sediment carried in storm runoff from nonpoint sources, such as from fields and residential areas, adversely affects the chemical quality of streams and receiving waters. Associated problems include (1) sediment accumulation, (2) increase in water temperature, and (3) nutrient enrichment and eutrophication of the lakes and bays that these waters feed. The National Urban Runoff Program (NURP) study of the Irondequoit Bay drainage basin in 1980-83, and subsequent monitoring activities in Monroe County, indicate that the concentrations of nonpoint-source pollutants in stormwater increase when the percentage of the drainage area covered by impervious surfaces increases. For example, water temperature increases when it flows over dark, hot surfaces, such as pavement and rooftops. This artificially heated water can raise stream-water temperatures enough to adversely affect the habitat of cold-water fish, such as trout. New York State Water Quality Regulations for Surface and Groundwater define thermal discharge as "...a discharge that results or would result in a temperature change of the receiving water"; it also states that "No discharge at a temperature over 70 degrees Fahrenheit shall be permitted at any time to streams classified for trout." Irondequoit Creek and its tributaries—Oatka Creek and Shipbuilder's Creek—in Monroe County are classified for trout. Critical time periods for thermal discharges in this area are July and August, when ambient temperatures are at their highest.



*Agriculture in Monroe County*

The increase in nonpoint-source pollution from increased development is evident in the water-quality trends of several water bodies in Monroe County, such as the Greece Ponds, Irondequoit Bay, and the nearshore areas of Lake Ontario within the Rochester Embayment. Pollution and sedimentation from storm runoff can be mitigated through use of stormwater-detention basins designed to impound and slowly release storm runoff and are located adjacent to residential developments or downslope from agricultural areas. There are two types of basins—wet and dry

**DRY BASINS**—Dry basins can serve



either as infiltration ponds or as detention basins. The two types may look similar, but they perform different functions, depending on the permeability of the soil. Infiltration ponds provide an area for stormwater to collect and slowly percolate into the ground. In some areas, impermeable soil or high ground-water levels prevent use of infiltration ponds, and in other areas, the soil is so permeable that underlying groundwater can be contaminated by "first flush" runoff, which contains high concentrations of contaminants—a concern of municipalities that use aquifers that are recharged by the infiltrating runoff for drinking water. Filtration can remove contaminants to a degree, but causes a decrease in streamflow, which can adversely affect fisheries, especially during the summer.

Dry detention basins detain storm runoff and release it to streams gradually, providing time for sediment to settle out and thereby remove nutrients that adhere to the sediment particles. This mechanism does not remove dissolved contaminants, however, and has only a limited ability to improve water quality.

**WET BASINS**—Research indicates that one of the most effective ways to treat nonpoint-source runoff is to divert it through natural or created wetlands. Many of these wetlands are shaded and vegetated basins with shallow standing water that not only retain water for slow release, but can provide opportunities for additional water-quality improvement through uptake of nutrients by vegetation and metabolism of nutrients by the bio-film (microbial community) that forms at the base of emergent wetland plants. The nutrients are later released to the receiving water bodies during periods of low productivity (nongrowing season)

Dry detention basins have been designed since the early 1970's to control storm runoff in residential areas to match predevelopment rates. These basins can easily be converted to small wetlands through procedures that maintain shallow standing pools and encourage colonization and growth of wetland plants. Such conversions are some of the recommended management practices set forth in the New York State Department of Environmental Conservation (NYSDEC) Technical and Operational Guidelines for Stormwater Management.

A concern raised by NYSDEC staff is the increase in water temperature that



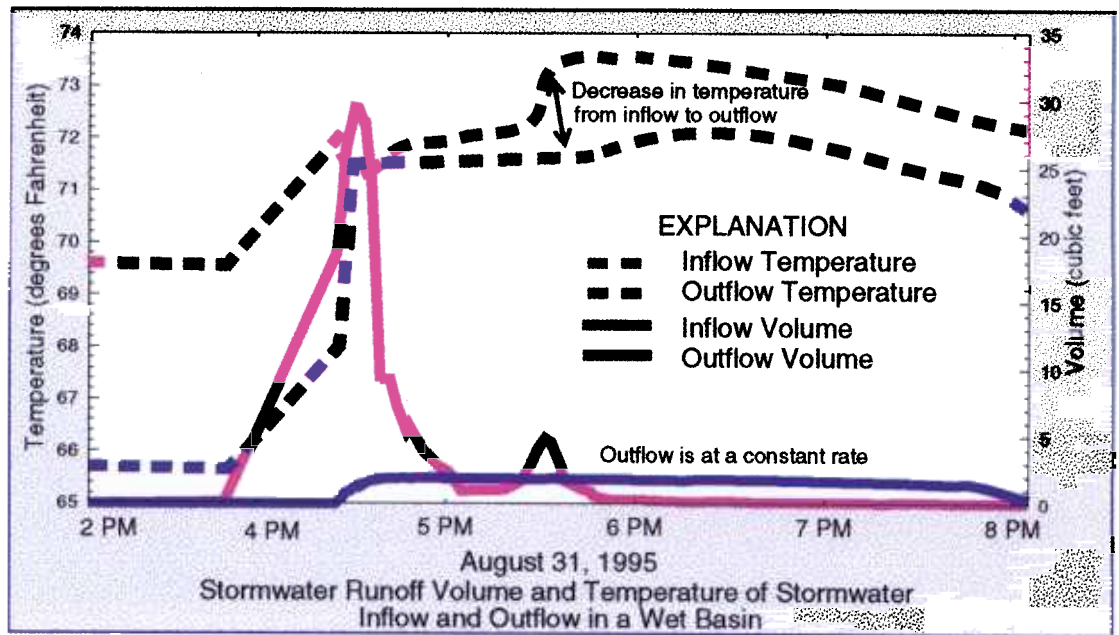
*Runoff from residential developments drain to receiving streams and lake*

occurs when sunlight warms the ponded water in the created wetlands. Although the flow of warmed water from created wetlands to warm-water streams that support fish such as pike and bass is not a concern, it could adversely affect streams that support cold-water fish such as trout. Therefore, NYSDEC concluded that dry infiltration ponds with slow discharge are the most appropriate method where the ponded stormwater drains to cold-water bodies.

Detention of flows in shallow, shaded, vegetated basins may actually mitigate temperature effects by (1) extending the mixing times in receiving streams, (2) allowing the heat to dissipate at night, and (3) providing a degree of cooling through evapotranspiration. The graph above shows how stormwater cooled by almost 2 degrees Fahrenheit (outflow temperature minus inflow temperature) during the time in which basin outflow was regulated.

Both the Water Quality Coordinating Committee (WQCC) of Monroe County and NYSDEC agree that the county needs to—

- Develop a comprehensive-ecosystem approach to protect trout streams,



- use the ecosystem approach to identify and prioritize the multiple water-resource goals of the NYSDEC and WQCC, and
- increase monitoring to provide data specific to the Monroe County area.

As part of the expanded monitoring, all water-quality-monitoring stations in the County that are operated in conjunction with the USGS have been equipped with continuous recording thermistors to monitor stream temperature. In 1992, Monroe County received grants from the NYSDEC and the U. S. Environmental Protection Agency (USEPA) to

convert dry detention basins to created wetlands for treatment of storm runoff. As a result, a converted detention basin in the Town of Pittsford has been equipped to monitor water-quality and temperature.

Additional data collected at unconverted detention basins that serve poorly drained areas, and from dry basins converted to wet basins during periods of low and high runoff, are needed to determine which type of detention basin best mitigates water-temperature increases and pollution from nutrients derived from increased development and farming practices. ♦

### AGENCY PERCEPTIONS OF THE ELLISON PARK WETLANDS NEAR IRONDEQUOIT BAY

During the past 20 years, several Federal, State, and local agencies have noted (1) the value of improving the water quality of Irondequoit Bay, and (2) the role that the wetlands at the mouth of Irondequoit Creek could play in the improvement. Some comments by agencies and researchers follow:

- *The public is keenly aware of the condition of the bay and this is reflected in their support of the \$130 million that have been spent so far to divert sewage effluents from the bay. Although these expenditures are being made to improve and restore the bay, there is a very serious concern by local officials about the remaining urban runoff which will continue to enter the bay and limit or deter the restoration process.*

New York State Department of Environmental Conservation, 1979, Significance and control of urban runoff- Lake George/Irondequoit Bay, In Appli-

cation for Federal Assistance to the U.S. Environmental Protection Agency, NYSDEC, Albany, NY.

- *Although some form of intervention may be necessary to accelerate the rate of improvement in bay water quality, the present external loading of 39 kg/day must be reduced to approximately 14 kg/day to maintain the bay in a trophic state consistent with recreational usage.*

O'Brien and Gere, 1983, Nationwide Urban Runoff Program, Irondequoit Creek basin study final report: Syracuse, N.Y., O'Brien and Gere.

- *The most cost-effective control measure to reduce the present basinwide stormwater runoff phosphorus load from Irondequoit Creek involves the use of the wetlands immediately upstream of the bay... Monroe County should prepare a comprehensive work-plan for using the wetlands immediately upstream of Irondequoit Bay for stormwater runoff control. Such a plan should include an environmental assessment leading to the design and construction*

Continued on page 4



**Ellison Park Wetlands (foreground); Irondequoit Bay and Lake Ontario (background).**

Continued from page 3

*of a flow regulating structure at the 'Narrows'. Also included in the plan should be provisions for determining the effectiveness and long-term impacts of wetlands treatment.*

O'Brien and Gere, 1983, Nationwide Urban Runoff Program, Irondequoit Creek basin study final report: Syracuse, N.Y., O'Brien and Gere.

- *Irondequoit Bay will be managed in order to achieve the standards for Class B waters set forth by NYSDEC in 6 NYCRR, Part 701 such that the desired best usage of primary contact recreation will not be impaired.*

Taddiken, Alan, 1985. Irondequoit Basin framework plan: Rochester, N.Y., Water Quality and Resource Management, Center for Governmental Research, Monroe County.

- *Eutrophication is also a problem in two major embayments along the lake, Irondequoit Bay, and Sodus Bay. Local inputs of nutrients from point and non-point sources are responsible.*

New York State Department of Environmental Conservation, 1986. New York State Water Quality 1986: Albany, N.Y., New York State Department of Environmental Conservation, Division of Water.

- *The expansion of inundation from 20 percent of the wetland to 80 percent of it could cause a 100-percent increase in sediment and associated nutrient retention, or about 25 percent of the basin load. If the channel-bank and levee system were not continuous, and if flow from the main channel could be diverted into the wetland at several points upstream from the Wetland Narrows, additional flow dispersion and constituent retention could theoretically be attained.*

Kappel, W.M., Yager R.M., Zariello, P.J., 1986, Quantity and quality of urban storm runoff in the Irondequoit Creek basin near Rochester, New York, Part 2—quality of storm runoff and atmospheric deposition, rainfall-runoff-quality modelling, and potential of wetlands for sediment and nutrient retention: U.S. Geological Survey, Water-Resources-Investigations Report 85-4113, p. 93.

- *Improvement is threatened by apparent increases in external phosphorus loadings. If the water quality improvements in Irondequoit Bay accomplished to date are to be maintained, and if further progress toward our goal is to be achieved, additional steps must be taken. These may include...continued and strengthened efforts to reduce external inputs.*

Spittal Lisa, and Burton, R.S., 1991, Irondequoit Bay phase II clean lakes project final report: Rochester, N.Y., Monroe County Department of Health.

- *Goal: All Waterways... in the Irondequoit Basin should meet the best-use classification goals set for them by the New York State Department of Environmental Conservation.*

*Goal: Irondequoit Bay Water Quality will be such that swimming will be possible at the level and intensity of use of water bodies with widespread recreational and aesthetic appeal such as Conesus Lake or Sodus Bay.*

*Goal: Irondequoit Bay water quality will be such that angling will be possible for a wide variety of cold and warm water species.*

Peet, M. 1992. Monroe County water quality strategy: Rochester, N.Y., Monroe County Department of Planning and Development. ♦

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**For a list of Monroe County reports published by the U.S. Geological Survey.**

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