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Installation of a Network of Gauge Stations within the Western Lake Ontario Basin (Niagara, Orleans, and Monroe Counties)

FEBRUARY 2011 LAKE ONTARIO WATERWAYS

US Army Corps of Engineers®
Buffalo District
BUILDING STRONG®

Network of Gauge Stations in Western Lake Ontario Basin

- Addresses GLRI Focus Areas
- Addresses LaMP Ecosystem Indicators

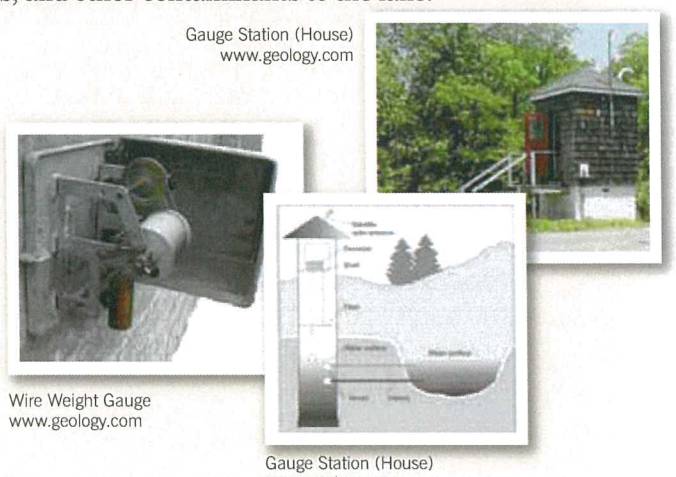
This project would develop a network of stream gauge stations in the Western Lake Ontario basin along tributaries within Niagara, Orleans, and Monroe counties. The project will meet the needs that currently exist for accurate measurements of tributary loadings to Western Lake Ontario. These gauges would augment the existing U.S. Geological Survey (USGS) gauges throughout the basin, providing more comprehensive and accurate data. This project addresses specific Great Lakes Restoration Initiative (GLRI) Focus Areas, and supports Lake Ontario Management Plan (LaMP) Goals and Objectives.

Project Overview and Background

Current Limitations on Tributary Loadings

Currently, for the major tributaries to Lake Ontario, loadings are estimated based on the closest gauge. For example, pollutant loadings within Eighteenmile Creek are currently estimated based on gauges in Tonawanda Creek. This results in inaccuracies in data and a lack of a clear understanding as to the contributions that these tributaries may be making to Lake Ontario water quality and ecosystem degradation. The western shoreline of Lake Ontario is listed on the 2010 New York State Section 303(d) List of Impaired/Total Maximum Daily Load (TMDL) Waters as impaired due to phosphorus. This impairment spans the shoreline from Niagara County east through Orleans County. The tributaries to Lake Ontario serve as sources of nutrients, pesticides, and other contaminants to the lake.

A basin-wide network of stations would allow for accurate measurements of the influx of nutrients and other potential contaminants to the nearshore area, along with a greater understanding of the flow and transport dynamics of the tributaries contributing to the lake. An understanding of these characteristics would aid in identifying opportunities to implement management actions and remedial strategies to improve the overall health of the Lake Ontario ecosystem.



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Gauging Stations, Their Function, and Current Status in the Western Lake Ontario Basin

The primary function of many stream gauges is to measure the water surface elevation and/or volumetric discharge. Discharge is the volume of flow passing a specific point in a given time interval and is measured in cubic feet per second (cfs). This value also reflects any sediment or solids in the water.

The USGS maintains gauges throughout the U.S., including New York. In addition to hydrologic parameters, USGS gauges can also include water quality parameters, such as nutrients, suspended sediment, and turbidity, among others. The information collected at the various gauges is either transmitted via satellite back to the USGS or another managing entity, or manually retrieved and downloaded/observed in person.

Within the western Lake Ontario basin, there is a general lack of existing and functioning gauging stations. Several of the tributaries to Western Lake Ontario, including Twelvemile Creek, Eighteenmile Creek, and Johnson Creek, either have gauges that are no longer in use or have never been gauged. Other tributaries are only monitored for discharge but do not include monitoring for any water quality parameters (see tributary listings below).

SELECTED TRIBUTARIES TO WESTERN LAKE ONTARIO AND THEIR GAUGING STATUS

Tributary	USGS Gauge Number and Location	Status/Description of Monitoring Parameters
Niagara River	04216000 (Buffalo)	Discharge only
Twelvemile Creek	N/A	Non-gauged
Eighteenmile Creek	04214200 (North Boston)	Water quality parameters (dissolved solids, major metals, nutrients) have not been monitored since 1964; not currently monitored for discharge
Johnson Creek	N/A	Non-gauged
Oak Orchard	04220045 (Shelby)	Discharge only
Marsh Creek	N/A	Non-gauged
Sandy Creek	N/A	Non-gauged
West Creek	04220250 (Hilton)	Streamflow only
Salmon Creek	N/A	Non-gauged
Canaseraga Creek	04224650 (Canaseraga)	Streamflow/discharge only
	04224775 (above Dansville)	Streamflow/discharge only
	04225000 (near Dansville)	Streamflow/discharge only
	04225500 (Groveland)	Not currently in use
	04227000 (Shakers Crossing)	Not currently in use
Coneseus Creek	04227995 (Lakeville)	Streamflow only
Genesee River	04221000 (Wellsville)	Discharge only
	04223000 (Portageville)	Discharge only
	04221500 (Scio)	Discharge only
	04227500 (near Mt. Morris)	Streamflow/discharge only
	04230650 (Ballantyne Bridge near Mortimer)	Gauge height
	04231500 (below Erie Canal at Rochester)	Not currently in use
	04231600 (at Ford St. Bridge, Rochester)	Streamflow/discharge only
	04232000 (Rochester)	Not currently in use
Black Creek	04231000 (Churchville)	Streamflow
Oatka Creek	04230380 (at Warsaw)	Discharge only
	04230500 (at Garbutt)	Discharge only; water quality monitoring ceased in 2009
Honeoye Creek	04229500 (Honeoye Falls)	Not currently in use
Mill Creek	0423204140, 0423204141 (near Bushnell Basin)	Not currently in use

Support for GLRI Goals

The project will facilitate progress toward two GRLI Focus Areas: Monitoring and Evaluation and Nearshore Health and Nonpoint Source Pollution. Expansion of the USGS infrastructure will enhance stream and watershed monitoring capabilities and will provide for defining specific problems and the implementation of solutions. Over the long-term, data obtained from a functional network of gauge stations in the Western Lake Ontario basin will support management actions toward reducing the loading of sediment, nutrients, and other contaminants which will improve the health and function of nearshore habitats.

GLRI Focus Areas

Monitoring and Evaluation

- Introducing a cooperative monitoring and observing system which provides a comprehensive assessment of the Great Lakes ecosystem
- The necessary technology and programmatic infrastructure to support collaborative monitoring and reporting exists

Long-Term Goals of the Nearshore Health and Non-Point Source Pollution Focus Area

- Achieving a significant reduction in soil erosion and the loading of sediments into tributaries
- Ensuring that nearshore aquatic, wetland and upland habitats sustain the health and function of natural communities by managing land use, recreation, and economic activities
- Making high quality, relevant information about the nearshore areas readily available to assess progress and inform enlightened decision making

Support for Addressing LaMP Ecosystem Indicators

This project would provide data to address two LaMP Ecosystem Indicators—nutrients in open waters and critical pollutants in open waters—through the provision of water quality data for various tributaries to Western Lake Ontario. These data will serve as measures of the levels of nutrients and critical pollutants entering the lake.

LaMP Ecosystem Indicators

Nutrients in Open Waters

- Nutrient levels should be sufficient to support aquatic life without causing persistent water quality problems, such as depletion of dissolved oxygen levels, nuisance algal blooms, and decreased water clarity

Critical Pollutants in Open Waters

- Critical pollutants in open waters should not pose a threat to human, animal, and aquatic life

An expanded network of operating stream gauges will result in a more comprehensive assessment of the Western Lake Ontario ecosystem.

Project Specifics

The project will implement a network of gauging stations that will form the basis of a Western Lake Ontario-specific monitoring system which will result in the provision of basin-wide data that will speak to inputs to the nearshore environment from the various tributaries. Using that data, informed decisions can be made to manage the health of, and improve the ecological functions to, nearshore habitats.

The existing USGS infrastructure will be utilized to the maximum extent practicable. The first tier of actions will be focused on the following:

- Augmenting existing USGS gauges with water quality monitoring. This action would target the following tributaries with existing gauges: Niagara River, Oak Orchard Creek, West Creek, Canaseraga Creek, Coneseus Creek, Genesee River, Black Creek, and Oatka Creek.
- Re-instating discontinued gauges and equip those with both hydrological and water quality monitoring capabilities. This action would target the following tributaries with discontinued gauges: Eighteenmile Creek, and Genesee River (gauges 04232000, 04231500).

The second tier of actions will focus on the following:

- Installing new gauges in non-gauged tributaries. This action would target the following tributaries: Twelvemile Creek, Johnson Creek, Marsh Creek, Sandy Creek, and Salmon Creek.

Each gauge will monitor discharge and stage in addition to a standard suite of water quality parameters.

These gauges will be daily data sites. Daily values will be summarized from the time-series data for each day and may represent the daily mean, median, maximum, minimum, and/or other derived value. Data will be automatically downloaded to the existing USGS network for those existing gauges, and for those newly installed gauges, data will be downloaded and maintained by the county Soil and Water Conservation Districts (SWCD) in which each tributary is located. These data will then be made available to NYSDEC, Natural Resource Conservation Service (NRCS), Area of Concern Remedial Action Plan (RAP) coordinators, local SWCDs, and other interested entities.

The gauging stations will include measurements of the following water quality parameters which are indicated in the LaMP as measures of the Nutrients in Open Waters and Critical Pollutants in Open Waters indicators:

- Total phosphorus levels
- Chlorophyll-a
- Water clarity
- Concentrations of critical pollutants

Project Goals

- Create a robust network of gauge stations to provide accurate measurements of tributary loadings to Western Lake Ontario
- Collect accurate measurements of potential contaminants and sediments
- Develop in-depth understanding of Lake Ontario tributaries to initiate restoration projects
- Provide data to address the long-term goals of the Nearshore Health and Nonpoint Source Pollution and Monitoring and Evaluation GLRI Focus Areas
- Support the Goals and Objectives of the LaMP

Project Objectives

- Augment existing USGS gauges with water quality monitoring capabilities
- Reinstate discontinued gauges and equip those with both hydrological and water quality monitoring capabilities
- Install new gauges in non-gauged tributaries

Project Outcomes

- A comprehensive network of gauge stations in tributaries to Western Lake Ontario which will provide accurate loading measurements and will allow for identification of follow-on management actions

Costs

The construction of a new gauging station, would require approximately $30,000 in up front costs; these costs are not inclusive of the ongoing operation of the gauge.

Project Sponsors and Collaborators

Eighteenmile Creek RAP Coordinator

Sources

USGS. 2011. USGS Water Quality Data for the Nation Grouped by Hydrologic Unit. Website accessed on January 25, 2011. Available at: http://waterdata.usgs.gov/nwis/dv?referred_module=qw&state_cd=ny&format=station_list&sort_key=site_no&group_key=NONE&range_selection=days&period=365&date_format=YYYY-MM-DD&rdb_compression=file&list_of_search_criteria=state_cd%2Crealtime_parameter_selection