LAKE ONTARIO COASTAL INITIATIVE (LOCI)

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LOCInews

Spring 2009

Phosphorus and Water - Why Are They Important To Us All?

BY JOSEPH C. MAKAREWICZ, THE COLLEGE AT BROCKPORT, BROCKPORT, NY

Murky green water! Water filled with excessive amounts of algae, weeds, and plants! What do overabundant amounts of water plants have to do with the element phosphorus?

Phosphorus is an essential nutrient for all living organisms; living matter contains about 0.3 percent dry-weight phosphorus. Phosphorus is a component of DNA, the hereditary material found in all our cells. Phosphorus is also a major structural component of bone in the form of a calcium phosphate salt. Phosphorus is essential to life! Compared to other macronutrients required by all living things, phosphorus is the least abundant and commonly the first nutrient to limit biological productivity in water. As we will see, too much of an essential nutrient can become a problem.

Phosphorus in lakes and streams occurs in three forms: inorganic phosphorus, particulate organic phosphorus, and dissolved organic phosphorus. Aquatic plants require inorganic phosphate for nutrition, typically in the form of orthophosphate ions (PO_4). In the majority of lakes, phosphorus is the limiting nutrient for algal growth. Phosphorus levels of freshwaters are generally lowest on hard granitic-type bedrock (Adirondack Mountain lakes) and increase in lowland waters derived from sedimentary rock deposits (the Finger Lakes). Water draining from mucklands, such as the Elba or Flint Creek areas of New York State, is rich in organic matter and tends to have high phosphorus concentrations.

Photo by Adam Kaningher

Above: Excessive eutrophication - in simpler terms, too many nutrients

Algae is a very simple form of plant life and is able to utilize the nutrients from fertilizer very quickly and easily. These "blooms" of algae grow very quickly and dramatically influence the oxygen levels in the water. Over time, the dissolved oxygen in the water is reduced and can reach a point where fish and other marine life can't survive.

The major source of phosphorus in lakes and rivers is runoff from the land, so-called non-point sources. As water passes through the soil, it dissolves soil and rock and releases phosphorus. The way that land is used is an important factor in how much phosphorus is dissolved and mobilized. Forested lands usually have small losses of phosphorus to streams and lakes. Improperly managed agricultural lands are often large sources of phosphorus to lakes through overfertilization with manure or inorganic fertilizers. The suburban use of lawn fertilizers is often thought to be a source of phosphorus. Point sources, such as the effluent

Thank You

This newsletter and other LOCI outreach and technical assistance programs are made possible by the support of NYS Senators Maziarz, Robach, and Alesi and Assemblymen Morelle, Oaks, and Hawley. We deeply appreciate their support.

Phosphorus enters the environment at locations where humankind has not been careful in managing its use.

from sewage treatment plants, are also a major source of phosphorus to streams and lakes when they are present in the watershed.

Sediment often contains much higher concentrations of phosphorus than water. Enriched sediment can be a source of phosphorus in water. Under conditions where oxygen is present in the water column, little or no movement of phosphorus from the sediment to the water occurs. However, under conditions where oxygen is depleted in the water, sediment phosphorus may readily move from the sediment into the water stimulating increased growth of algae. Phosphorus enters the environment at locations where humankind has not been careful in managing its use.

In lakes and rivers, plants and algal biomass respond to added phosphorus with luxuriant growth. Although such an outcome may be desirable in an agricultural field, too much additional phosphorus can cause numerous undesirable effects on water bodies such as:

1. An increase in plant and animal biomass or eutrophication;
2. An increase in water turbidity;
3. A decrease in biodiversity and changes in dominant biota;
4. A decline in ecologically sensitive species and an increase in tolerant species;
5. An increase in organic matter, leading to high sedimentation; and
6. Anoxic conditions, which can lead to self-fertilization and the release of phosphorus from the sediments.

Finally, eutrophication of phosphorus-enriched water bodies causes problems for human uses of water. Good quality of life requires clean water. The treatment of eutrophic water to make it potable becomes more difficult and costly. Potable water supplies may develop an unacceptable taste or odor problem. If cyanobacteria (blue-green algae) become prevalent, the water may become injurious to health of humans and animals. In embayments, at the nearshore, and in streams, weed growth may impede water flow and navigation. Cumulatively, the aesthetic, recreational, and economic value of the water, and the properties located on the water, may decrease. Phosphorus continues to be an element of concern in freshwaters requiring both short- and long-term management strategies which focus on long-term reduction, education, monitoring, and research.

Chimney Bluffs State Park

Lawn Care and Phosphorus

BY LAURIE BROCCOLO, BROCCOLO TREE AND LAWN CARE

Monroe County soils are typically high in phosphorous. It is myth that is needed for root growth. On new lawn installations where topsoil is stripped, it may be needed in minimum amounts to help roots get established. It is not needed to maintain the lawn's health

If installing new grass or trying to renovate a sparse lawn, get a soil test at Cornell Co-operative Extension - Monroe County Division, which is located at 249 Highland Ave.

> Eliminating soil erosion, phosphorous in fertilizers, and leaf leaching all contribute to healthier water quality.

P_2 is naturally occurring in leaves from trees and in our soils. To avoid leaching of Phosphorous into the storm sewers, avoid piling raked leaves at the curb, which decompose while waiting to be picked up.

Organic fertilizers may also be high in P_2 so check those labels. Phosphorous in the lakes encourages algae blooms that pollute our fresh water. Eliminating soil erosion, phosphorous in fertilizers and leaf leaching all contribute to healthier water quality.

Lawns need (N) nitrogen to maintain healthy growth. Potassium (K) is sometimes needed per soil tests. Be sure to add nitrogen when the grass needs to recover from spring growth, summer drought and to prepare for winter. Late May, Sept and Oct are the best times to fertilize. Sweep off fertilizer from the edges of the road and driveways to avoid runoff to the storm sewers.

Demand zero phosphorous fertilizers at your garden store or by your lawn care service. They are available and do not cost more. Just as important is to avoid bags of fertilizers with weed or insect control. Look at the label before you buy. The analysis of N, P, K is critical for determining the amount of fertilizer to use and more importantly to avoid adding the P_2 (Phosphorous) to soils that do not need it.

Broccolo Tree & Lawn Care

WELCOME TO THE HOME OF THE H2O HERO

Be an H_2O Hero

BY PAUL M. SAWYKO, COORDINATOR, WATER EDUCATION COLLABORATIVE

The Water Education Collaborative (WEC) is a coalition of local organizations that work together to increase water quality education in the community. The purpose of the Collaborative is to inspire people to protect and improve water quality in the streams and other waterbodies of the Genesee Region watershed, and ultimately our greatest natural resource, Lake Ontario. The WEC is the sponsor of the H2O Hero Campaign.

A primary focus of the H2O Hero's message is to keep phosphorus-laden household pollutants out of storm drains. Near your home, grated storm drains are found along roadways and within some swale areas. These storm drains collect the stormwater runoff from your yard and neighborhood and convey it to nearby stormwater retention facilities, streams, rivers, and other local waterbodies. Eventually, this stormwater and any acquired pollutants will flow into Lake Ontario and contribute to the higher phosphorus levels found in the lake's nearshore waters.

As part of the H2O Hero effort, many storm drains now display an H2O Hero marker to remind homeowners of the environmental hazards of allowing pollutants into storm drains. Visit www.h2ohero.org to learn how simple changes to many routine household activities and the use of stormwater mitigation techniques in your yard can reduce stormwater pollution and improve local water quality.

Good Conservation Farmers Use Less Phosphorus

STEPHEN LEWANDOWSKI, LOCI PROGRAM DIRECTOR

Good farmers survive by keeping their yields up. Conservation-minded farmers survive by protecting their land. Recent research suggests that keeping yields up and protecting land (and water) work together.

The New York Starter P research project, begun in 2001, brought together Cornell researchers, Pro-Dairy, Cooperative Extension, consultants and farmers to investigate the need for phosphorus fertilizers to grow corn. Sixty-five on-farm and thirteen research-station field trials have yielded some important, and cost-saving, results.

After nutrient tests for soils, manures, and crops were conducted, results showed that phosphorus applications such as $P_2 0_5$ could be reduced on cropland without suffering loss of yield. Phosphorus is particularly important to young plants at the germination and early growth stages, hence the term "starter."

Tests showed that, on soils with naturally high P levels that do not receive manure, $P_2 0_5$ applications could be reduced to 25 pounds per acre. On soils very high in P that receive manure applications, no $P_2 0_5$ needs to be purchased or applied. Yields and quality of the yield were unaffected.

A 450-acre dairy farm in the Town of Geneseo, Livingston County within sight of Conesus Lake, is owned by one of the farmer-researchers in the Starter P Project. Runoff from the farm enters Graywood Gully on its way to Conesus Lake. Testing of the water in tributaries draining sub-watersheds in agricultural who revealed high nutrient levels.

The Geneseo farmers have, over the years, adopted and installed best management practices such as roof gutters and tile, filter and buffer strips, fencing and strip cropping.

Testing the farm's manure indicated medium levels of phosphorus, attributable to nutrient-balanced rations fed to their cattle at the suggestion of their nutritionist. Testing the soil of various fields told them where phosphorus, whether in the form of manure or corn-starter fertilizer, needed to be applied.

In 2004, the farmer-researchers experimented with manure and fertilizer application rates; tests of corn quantity and quality at the end of the year confirmed that they remained high, despite cutbacks in P. They found that it paid to haul manure further to distant fields rather than rely on corn-starter applications. Overall, they reduced their fertilizer bill by $3,000 in the first year, and fertilizer prices have only risen since.

In five years of study (2002-2007) of the Conesus Lake watershed, researchers from SUNY Brockport found that Graywood Gully carried 47% less total phosphorus, as well as 58% less nitrate and 65% less total suspended solids. Not all of these reductions are attributable to the Starter P Project; other installed best management practices play a part in the reduction. The reductions of nutrient and sediment loading from Graywood Gully are in startling contrast to the results from other tributaries with few or no management practices.

Learn more at www.sare.org

Tests of corn quantity and quality at the end of the year... remained high, despite cutbacks in phosphorus

How Much Phosphorus is Entering the Environment? What Can We Do About Sources?

BY GEORGE THOMAS, CEI EXECUTIVE DIRECTOR

Excess phosphorous in Lake Ontario's waters not only causes impairments that reduce our enjoyment and access to that water, but also causes major algae problems. Pollution control and management plans should be established and implemented to reduce this overload of phosphorous; however, in order to develop the most effective plans, the amount of phosphorous that is currently entering the waterbody must be determined. In addition, we must calculate the maximum amount of phosphorous that the waterbody is capable of assimilating on a daily basis, while continuing to meet the water quality standard.

This calculated figure is called the Total Maximum Daily Load (TMDL). It is the sum of the load allocations from non-point sources plus the sum of the waste load allocations from point sources, plus a margin of safety. The TMDL represents the amount of phosphorous that the waterbody can receive daily and still meet the state water quality standards for use.

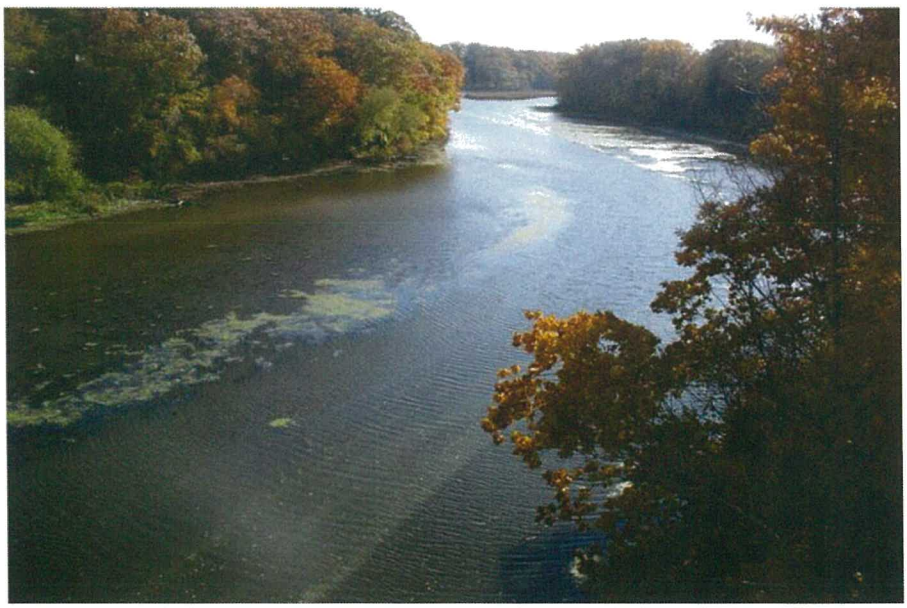
Heather King of KBH Environmental is working as a volunteer for LOCI, developing a phosphorous inventory for the Eighteenmile Creek Watershed of Niagara County. Her work could lead to development of a protocol to conduct inventories for all the major watersheds along New York's Lake Ontario coast. The long-term objective of this effort is to collect the data necessary to complete a phosphorous TMDL for watersheds delivering runoff to New York's Lake Ontario coastal waters. The prototype, Eighteenmile Creek, is classified as an impaired waterbody, an officially designated Area of Concern.

King is currently collecting data to quantify the various sources of phosphorous loading. She is looking at several categories of potential sources, including on-site septic systems, municipal wastewater treatment plants, stormwater drainage systems, concentrated animal-feeding operations, overland runoff from agricultural and forested land and urban and residential development, and atmospheric deposition.

Various watershed modeling techniques have been used to determine the extent to which the load from each source must be reduced to meet the water quality target. These limits become water quality-based effluent limits, which can be met via DEC permit conditions for point sources, implementation of best management practices for agricultural and development activities, and stormwater control. The actual solutions selected for each water body will be subject to public review and on-going evaluation.

The TMDL approach to water quality improvement has been mandated by the U. S. Environmental Protection Agency for waters on the 303(d) list (named after a section of the law) that have been classified as impaired. Most of Lake Ontario's coast, several bays such as Chaumont, Guffin, Little Sodus and Blind Sodus, and numerous streams and rivers such as Eighteenmile Creek, Genesee River, Little Black Creek and the Salmon River are listed as impaired.

The Lake Ontario Coastal Initiative (LOCI) has been working for several years to improve the quality of Lake Ontario's coastal water. An inventory of phosphorous and other nutrient loading to the nearshore, stream mouths and embayments is critical to the prioritization of future remediation efforts.



Those interested in learning more about the TMDL process can look at phosphorus TMDLs being prepared for Blind Sodus Bay at www.dec.ny.gov/docs/water_pdf/tmdlphosbsod.pdf and for Onondaga Lake at www.cnyrpdb.org/stormwater-phase2/docs/2009-03-09_phosphorustmdldevelopment.pdf.

State Considers New Phosphorus Limits

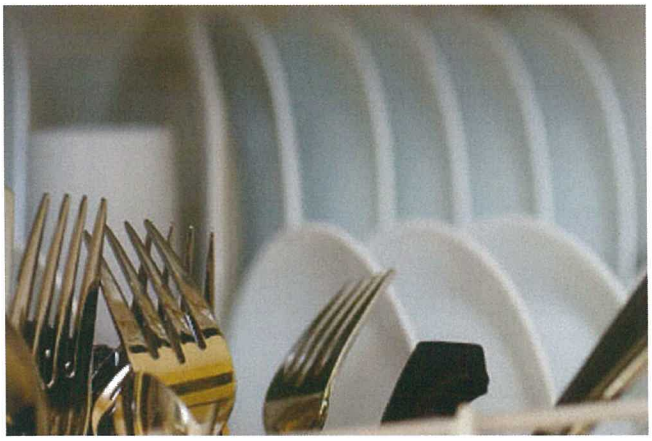
BY STEPHEN LEWANDOWSKI, LOCI PROGRAM DIRECTOR

Senate Bill 3780 sponsored by Senator Antoine Thompson (60th Senate District- Buffalo and Niagara Falls) would impose restrictions on the phosphorus content of lawn fertilizers and automatic dishwashing detergents sold in New York.

Among the three major nutrients necessary to life, nitrogen, potassium and phosphorus, phosphorus is usually present in small amounts and in short supply. It is the "limiting nutrient" in most freshwater aquatic ecosystems, meaning that additional phosphorus will spur the greatest amount of green growth. Most soils in our area, however, contain sufficient phosphorus to promote the germination and growth of lawns and gardens.

Environmentalists have long been concerned about the impact of too much phosphorus on our lakes, stream and rivers. Excessive green growth spurred by added phosphorus can damage their environmental health, beauty and usefulness.

Senate Bill 3780 would limit the phosphorus content of conventional automatic dishwashing detergents to 0.5% and lawn fertilizers to 0.67%. The bill creates options to purchase "specialty" detergents and fertilizers containing more phosphorus under certain conditions.



In the case of detergents for food and beverage processing equipment and dairy equipment, phosphorus levels of up to 8.875% are allowed. For lawn fertilizers, those containing more than 0.67% will only be allowed only in cases where new lawns are being installed and soil tests indicate a need. Retailers would be required to post educational signs explaining the difference between conventional and specialty fertilizers.

Effective phosphorus-free detergents are now commercially available.

Senate Bill 3780 would impose restrictions on the phosphorus content of lawn fertilizers and automatic dishwashing detergents.

The purpose of the bill is to reduce the phosphorus loading of our waters. Excessive enrichment by phosphorus produces a rapid "aging" effect, called eutrophication. Such enriched waters, such as those in the coastal region of Lake Ontario's bays, estuaries and stream mouths, are impaired in their ability to support diverse life, recreational use and use as public drinking water.

New York State has already begun to address phosphorus loading of the New York City watershed (Catskills), Lake Champlain and Onondaga Lake through the Total Daily Maximum Loads (TMDL) process, and 59 other water bodies are known to be impaired by phosphorus. Elsewhere in the country, Minnesota, Maine, Chesapeake Bay, Illinois, Indiana, Massachusetts, Ohio, Pennsylvania, Utah, Vermont and Washington have enacted limits on the phosphorus content of detergents and/or fertilizers.

Phosphorus can be removed by sewage treatment plants, but many plants would need to be retro-fitted to be effective, and the cost of the retro-fitting would far exceed the costs associated with limiting phosphorus inputs through Senate Bill 3780.

The law affecting sales would take effect on January 1, 2010 but allows use of already purchased materials until July 1, 2010.

Niagara County Focuses on Phosphorus

BY VICTOR F. DIGIACOMO, JR., REMEDIAL ACTION PLAN COORDINATOR,
NIAGARA COUNTY SOIL & WATER CONSERVATION DISTRICT

In February 2006 the Niagara County Soil & Water Conservation District (NCSWCD), in conjunction with the Department of Environmental Science and Biology at the College at Brockport, began a two-year survey of 17 streams located in Niagara County, New York. This survey has given the NCSWCD some tangible data that provides direction as to where it should focus its resources to minimize the loading of sediments and phosphorus to the surface waters of Niagara County.

The survey included monthly baseline and storm-event samples that were collected and analyzed for the total amount of phosphorus and Total Suspended Solids (TSS). Funds to complete the survey were acquired from the Finger Lakes - Lake Ontario Watershed Protection Alliance (FLLOWPA).

Comparing loss of phosphorus per acre of land per day (areal loss) in the watershed to downstream systems, Berkholtz and Jeddo Creeks have significantly higher losses (kilograms of phosphorus per hectacre per day) than any other watersheds in Niagara County by at least a factor of two. Considering the non-weighted areal loss of phosphorus, Eighteenmile Creek had the greatest overall loss of phosphorus (221.8 kg/P/day) of any watershed evaluated. Compared to other watersheds in western and central New York, these losses represent some of the highest losses per unit area of any watershed recorded by SUNY Brockport.

NCSWCD recently assisted a dairy farm in the Eighteenmile Creek watershed obtained funding to implement 940 acres of cover crops and construct a filter strip to address the nutrient-rich leachate from the farm's silage storage area. In addition, NCSWCD has recently applied for funding to complete five barnyard runoff management systems and a silage leachate management system on six farms identified within these priority watersheds. NCSWCD expects that these best management practices will tremendously reduce phosphorus and sediment loading to the surface waters of Niagara County.

LOCI Update

The Great Lakes Protection Fund (GLPF) funding, that was held for six months due to State budgetary issues, has been released. Through the newly released funding, LOCI staff have begun to lay the groundwork for a successful program.

LOCI was awarded a $100,000 grant from the Great Lakes Protection Fund to continue our work on the Great Lakes area. The LOCI partners, SUNY Brockport, Finger Lakes-Lake Ontario Watershed Protection Alliance, and CEI felt, from the time of the grant application, that collaboration with the GLPF would be an ideal arrangement because our goals are so similar. LOCI has a five-year track record of scientific research, broad public outreach to stakeholders including local businesses and government, and effective programs of technical assistance and re-granting to assist in fixing documented problems. Our application to the GLPF proposes carring each of these programs to the next level.

During this year, LOCI will call again on local leaders, organize an annual "Coastal Connections" conference, begin an inventory of nutrient sources, provide up-to-date and pertinent water quality data to various audiences, advocate for federal and state investments in wastewater treatment infrastructure, and work with municipal governments, of the area to identify and solve local water quality-related problems.

CEI Center for Environmental Information

The College at BROCKPORT STATE UNIVERSITY OF NEW YORK

FL-LOWPA

Finger Lakes - Lake Ontario Watershed Protection

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55 St. Paul Street · Rochester, NY 14604
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