Too Much of a Good Thing: The Problem of Nutrient Pollution

Nicole Zacharda, Program Manager, Great Lakes Commission

September 14, 2019
N-P-K
Nitrogen

Phosphorus

Potassium?
Nutrients & Water Quality Impacts

**Phosphorus**
- ✅ Algae (harmful & nuisance)
- ✅ Harmful algae may produce algal toxins
- ✅ Decomposing algae depletes oxygen, creating hypoxia or dead zones

**Nitrogen**
- ✅ Also contributes to algal bloom formation & toxicity
- ✅ Acute threat to drinking water ("Blue Baby Syndrome," *methemoglobinemia*)
Total Phosphorus Contributions to the Great Lakes
2002 data sources, presented by Robertson et al., 2019; JAWRA

- Wastewater treatment plants: 21.5%
- Urban and open areas: 14.5%
- Forest, wetland, shrub: 14.9%
- Fertilizers (farm): 15.9%
- Manure: 11.5%
- Agriculture (additional): 10.9%
- Atmospheric (lake): 10.8%
Robertson et al., 2019; JAWRA

65% reduction at Great Lakes Water Authority announced this year.
Total Phosphorus Contributions to the Great Lakes
2002 data sources, presented by Robertson et al., 2019; JAWRA

Agriculture 38%
Communities 36%

Significant voluntary efforts since 2002, but reductions difficult to measure

Significant reductions have occurred through regulatory efforts since 2002

- Wastewater treatment plants
- Urban and open areas
- Forest, wetland, shrub
- Fertilizers (farm)
- Manure
- Agriculture (additional)
- Atmospheric (lake)
Total Phosphorus (μg/L)

Spring 2017 (Lakes Ontario, Erie, Huron, St. Clair, Michigan and Georgian Bay)

Spring 2016 (Lake Superior)

Maumee River Loads

Figure 10 — Proportion of total phosphorus and nitrogen load from different sources for the Maumee watershed, average of 5-years (wy13-wy17).
Fox River Basin

Figure 19. Sources of baseline TP loading in the LFR Basin

From Wisconsin DNR’s TMDL Report
Saginaw Bay

Percent of Phosphorus Load

- Agriculture
- Commercial
- Forest
- Grass/Pasture
- High Density Residential
- Low Density Residential

Adapted from a 2010 Michigan DEQ study
Graphic courtesy of Heidelberg University
“For over forty years, the Great Lakes Water Quality Agreement has served as a guidepost for the binational management of the Great Lakes and as a model of international cooperation for the protection of water quality in other large lakes of the world.”

From [www.binational.net](http://www.binational.net)

The agreement, between the U.S. and Canada, is overseen by a Great Lakes Executive Committee
The 2012 GLWQA & Annex 4

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<th>Interim Substance Objectives for Total Phosphorus Concentration in Open Waters (μg/l) (as represented by Spring means)</th>
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<td>Lake Erie (western basin)</td>
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New target established in 2016 for western & central basins: 6000 MT (aka the 40% reduction goal)
State & Provincial Leadership

- Permit limits for point sources
- Non-traditional “point sources” (concentrated animal feeding operations & storm water)
- Environmental certification programs for farms
- Restrictions on fertilizer use and application
- Support for green or natural infrastructure
- Water quality standards for nutrients
- Funding for research initiatives
- Grant programs for nonpoint source control
- Identification of high-quality (or at risk) waterbodies
- Water Quality Trading
Two overused (yet valid) sayings... and one opinion

✓ What gets measured, gets managed

✓ Don’t let the perfect be the enemy of the good

✓ None of this is going to be easy, but it is necessary
The Minnesota Buffer Law
Updated on: June 13 2019
The Minnesota Buffer Law requires landowners to establish perennial vegetation buffers of up to 50 feet along lakes, rivers, and streams and buffers of 15 feet along ditches in order to reduce nutrient and sediment losses. Learn More

Erie County Pennsylvania’s PA ViNES Program
Updated on: June 14 2019
PA ViNES (Pennsylvania Vested in Environmental Sustainability) is a voluntary program that promotes self-assessment of on-farm operations in Erie County’s vineyards and provides a pathway for grape growers to access financial incentives. Learn More

The Michigan Agriculture Environmental Assurance Program (MAEAP)
Updated on: June 13 2019
The Michigan Agriculture Environmental Assurance Program (MAEAP) is a voluntary verification program that helps farmers reduce environmental impacts from their operations by providing technical assistance and nonpoint source education. Learn More

Healthy Urban Waters’ Huron-to-Erie Real-Time Drinking Water Protection Network
Updated on: June 13 2019
The Huron-to-Erie Real-Time Drinking Water Protection Network collects data on source water quality in real time to promote collaborative water research and community education, and as a tool to aid emergency response. Learn More

The Indiana Agriculture Nutrient Alliance
Updated on: June 13 2019
The Indiana Agriculture Nutrient Alliance works to inform and engage agriculture groups, government agencies, conservation organizations, and academic partners to improve information on nutrient management practices and improve water quality in Indiana. Learn More

The Wisconsin Nutrient Strategy
Updated on: June 13 2019
The Wisconsin Nutrient Strategy is a framework that brings together diverse nutrient management and policy management activities for point and nonpoint sources across the state. It documents the progress of ongoing management strategies. Learn More
This map shows retailers participating in the FarmSteady Fertilizer Certification program. The program encourages agricultural retailers, service providers, and other certified professionals to implement proven best practices through the EPA, which refers to using the Right Source of Nutrients at the Right Rate and the Right Time in the Right Place. ErieStat is helping participants track progress in terms of acres being managed consistent with the EPA, numbers of clients working with 4R certified professionals, and retailer certifications in the Lake Erie Basin or Erie Stat. For more information, visit the ErieStat website.

Sources: 4R Ontario, Nutrient Stewardship Council

For more information visit:
ErieStat Strategies - Agriculture
ErieStat Investments - Agriculture

Blue Accounting
ErieStat

Tracking Progress Toward a Healthier Lake Erie

Maumee River Spring SRP Loading and Spring Discharge

-SRP: Soluble reactive phosphorus

Spring SRP Loading (metric tons)
Spring Discharge (million cubic meters)


Spring SRP Loading
Spring Discharge
Spring SRP Loading Target
January 27, 1986

Dear Claudia Melear and Margie Pless:

You must think me terribly rude for not answering your very pleasant letter of December 6. The fault, however, is not mine. It just arrived this morning, having been somewhat circuitously forwarded from New York via pony express.

Although I will be unable to accept your kind invitation to come to Cleveland, I do agree with you that my 1971 statement in the Lorax about the condition of Lake Erie needs a bit of revision. I should no longer be saying bad things about a body of water that is now, due to great civic and scientific effort, the happy home of smiling fish.

I can assure you the process of purifying my text will commence immediately. Unfortunately, the purification of texts, like that of lakes, cannot be accomplished over night. The objectionable line will be removed from future editions. But it could possibly take more than a year before the existing stock of books has moved out of the book stores.

In the meantime, thank you for your letter and for all the great Loraxian work you have been doing.

Dr. Seuss

Theodor S. Geisel
A “great civic and scientific effort” (that “cannot be accomplished overnight”)...

Birkholz Fellows’ Path to an Action Agenda for Nutrients
The Institute Agenda

1. Introductory Web Meetings:
   ✓ September 20
   ✓ October 4

2. Briefing Book delivery
   ✓ Week of October 7
   ✓ Also available as a pdf.

3. Weekend Retreat in Detroit
   ✓ Friday afternoon tour of the Great Lakes Water Authority Water Resource Recovery Facility
   ✓ Evening session to understand different perspectives on nutrient control
   ✓ Saturday morning farm tour
   ✓ Action Agenda creation