

Algal Blooms in Lake Erie: An Introduction

About Lake Erie

The Lake Erie Basin is home to 13.5 million people in Canada and the United States, making it the most populated basin of the Great Lakes. Figure 1 shows the Western, Central and Eastern basins of Lake Erie, and the larger tributaries.

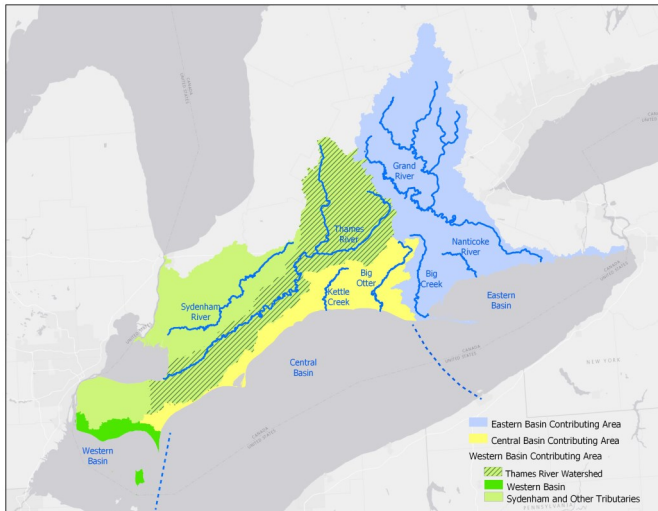


Figure 1. Lake Erie basins and larger tributaries.

Lake Erie is the smallest in volume, the shallowest and the warmest of the five Great Lakes, and tends to receive more phosphorus than other lakes. As a result, it is particularly vulnerable to algal blooms.

For more than a decade, toxic and nuisance algal blooms in Lake Erie have increased in frequency, and the summer of 2015 saw the largest documented algal bloom in Lake Erie's history. Blooms threaten drinking water quality, fish populations, beach quality, coastal recreation and the overall health of the lake. In addition, when algae die and decompose, hypoxic conditions can be created, meaning there is a lack of oxygen in the water. In 2012, hypoxic conditions were responsible for tens of thousands of dead fish washing up on a 40-kilometre stretch of shoreline between the communities of Erievau and Port Stanley in Ontario. Figure 2 shows a close-up of algal growth in Lake Erie in 2013.



Figure 2. Algal growth in Lake Erie in 2013. Photo courtesy of Dr. Jeff Reutter, Ohio Sea Grant and Stone Lab, Ohio State University.

Causes of the Algal Blooms

The increased occurrence of harmful algal blooms in Lake Erie is influenced by many factors, including excess nutrients, climate change and invasive species such as zebra mussels. Phosphorus is the primary nutrient driving increased algal blooms in the lake and comes from multiple sources, both urban and rural. Urban sources include wastewater treatment plants, combined sewer overflow discharges, construction site runoff, storm water runoff, lawn fertilizers and improperly maintained septic systems. Rural and agricultural sources include soil erosion from fields and nutrient runoff from manure, fertilizer and other soil amendments.

In contrast to blooms in the 1970s and 1980s, rural and urban non-point sources (meaning diffuse or not a single identifiable source) are now contributing the majority of phosphorus to Lake Erie. There has also been a significant increase in recent years in the amount of phosphorus that is dissolved in the water and more readily available for algal growth.

Agriculture in the Lake Erie Basin, which represents over 75 per cent of the land base, is a significant contributor of phosphorus to the lake.

Phosphorus Reduction Commitments

In February 2016, Canada and the United States agreed to a 40 per cent reduction target for phosphorus entering the Central and Western basins of Lake Erie.



Satellite image of algal blooms in Lake Erie and Lake St. Clair in 2011. Image copyright European Space Agency – ESA, processed by Earth Watching (ESA/ESRIN).

Ontario is committed to taking action to address excess levels of phosphorus in Lake Erie and to reduce the occurrence of harmful algal blooms. One way the government has shown this commitment is the Great Lakes Agricultural Stewardship Initiative (GLASI), a four-year, \$16 million funding program launched in 2015 to improve soil health and reduce nutrient loss from agricultural sources.

In June 2015, Ontario signed the Western Basin of Lake Erie Collaborative Agreement with Michigan and Ohio, committing Ontario to a 40 per cent reduction in phosphorus entering Lake Erie by 2025.

Agriculture will play an important role in achieving the 40 per cent target. The Government of Ontario is working in close collaboration with other governments, partners and stakeholders to develop a domestic action plan to outline strategies for meeting the targets in different watersheds.

Challenges for Agriculture

Agricultural lands are particularly at risk of erosion and nutrient loss in the non-growing season when soils are exposed. Climate change is making this worse by contributing to more severe and frequent storm events. Additionally, a number of changes in agricultural land use and land management practices, such as conversion of land away from pasture, increased sizes of farms and limited crop rotation, have impacted soil health and the nutrient content in tile and surface water.

Phosphorus is an essential nutrient for crops and livestock; however, unless properly managed, phosphorus can move from land to streams, rivers and lakes and contribute to algal blooms in Lake St. Clair and Lake Erie. Improving soil health through practices like crop rotation, reduced tillage, cover crops, and the appropriate timing and application of nutrients are an integral part of the solution. Current science indicates that a multi-barrier approach that uses multiple best management practices (BMPs) is most effective at minimizing phosphorus loss from fields through runoff and tile drainage.

What Can Farmers Do?

Reducing phosphorus loads in the Lake Erie Basin by 40 per cent will not be easy. It will take the collective efforts of all farmers, landowners, land managers, businesses, governments and others to reach the reduction targets. You can help by implementing BMPs for your operation. BMPs are developed by a team of farmers, researchers, extension staff and agribusiness professionals to help you maximize your profit while minimizing nutrient loss.

Some things you can do:

- Look on the Ministry of Agriculture, Food and Rural Affairs (OMAFRA) website at ontario.ca/omafra for BMP resources, including “A Phosphorus Primer,” a detailed publication on reducing phosphorus loss from agricultural sources. Visit ontario.ca/agbestpractices for a list of books in our Best Management Practices series.
- Find out what BMPs are right for you by completing an Environmental Farm Plan or Farmland Health Check-Up. For more information, visit the Ontario Soil & Crop Improvement Association’s website at ontariosoilcrop.org.
- Consider cost-share funding. Financial support is available for implementing select BMPs on your farm. Find out more about funding programs like Growing Forward 2 and the Great Lakes Agricultural Stewardship Initiative at ontariosoilcrop.org.
- Learn more about Fertilizer Canada’s 4Rs program in Ontario at fertilizercanada.ca/nutrient-stewardship/4rs-across-canada/ontario/