



NUTRIENTS IN THE GREAT LAKES AND ST. LAWRENCE RIVER

Nutrient contamination of the Great Lakes, and to a lesser extent the St. Lawrence River, was one of the major pollution problems that led to major government action in the 1970's. This was especially the case with Lake Erie, which was declared "dead" because of the harmful algal blooms and dead zones for oxygen caused by the nutrients. The Great Lakes Water Quality Agreement between the United States and Canada and the Clean Water Act in the U.S., both in 1972, called for dramatic reductions in nutrient loading to the lakes, with a focus on phosphorus.

The problem has always been most serious in Lake Erie because it is shallower and warmer, and because of the significant loadings from the tributaries. Problems have also arisen in Green Bay in Lake Michigan, Saginaw Bay in Lake Huron, and Hamilton Harbor and the Bay of Quinte in Lake Ontario. Because of lower populations and less agriculture, and the size, depth, and characteristics of Lake Superior, it has not experienced the algal blooms like in the other lakes.

With the dramatic reductions in phosphorus loadings in the 1970's and 1980's, the problem with algal blooms diminished. This was especially evident in Lake Erie, where the fishery rebounded so quickly and dramatically that it was recognized as having some of the best walleye (pickerel) fishing in the world.

In the late 1990's and early 2000's, the levels of phosphorus in Lake Erie started to go up, and it was not clear why. Further investigation led to the conclusion that two separate types of phosphorus were present, and that particulate phosphorus had gone down, but dissolved phosphorus had gone up. Unfortunately, the dissolved phosphorus is more reactive and is more likely to lead to formation of algal blooms, and the toxic microcystin which presents a serious threat to drinking water. Making the problem worse is climate change, with the warmer air and water temperatures, and especially the severe storm events that increase the amount of runoff. This is what led to the massive algal blooms in 2011 in Lake Erie.

Generally, cities have invested billions in wastewater treatment facilities over the years to reduce phosphorus and many other pollutant discharges and contribute much less than agricultural and other non-point sources to current loadings. In addition, to get further reductions, it is much more cost effective to get reductions from non-point sources than point sources.