

# THE GREAT LAKES PROBLEM



## The Problem

In the Great Lakes in the United States, water flows from Lake Erie into Lake Ontario. From Lake Ontario, water flows through the St. Lawrence Seaway to the ocean. Each year, 36% of the water in Lake Erie flows into Lake Ontario and 12% of the water in Lake Ontario flows out to the sea. Assume that presently there are 1800 tons of a pollutant dissolved uniformly in the water in Lake Erie and 2400 tons of the pollutant in Lake Ontario. The pollution in the water in the Great Lakes moves from lake to lake as the water flows from one lake to another. If the production of new pollutants were to suddenly stop, how long would it take for the levels of pollution to be reduced to 10% of their present values?

## Three Lakes or More

In the Great Lakes in the United States, water flows from Lake Huron into Lake Erie, and from Lake Erie to Lake Ontario and out through the St. Lawrence Seaway to the ocean. Each year 11% of the water in Lake Huron flows into Lake Erie, while 36% of the water in Lake Erie flows into Lake Ontario, and 12% of the water in Lake Ontario flows out to the sea.

In years past, there were aluminum factories on each of the lakes, pumping a pollutant into the lakes. Last year, all of the plants closed down except for one plant on Lake Huron that continues to pump 30 tons of pollutant per year into Lake Huron. At the time the other plants shut down there were 1200 tons of pollutant in Lake Huron, 1800 tons of pollutant in Lake Erie, and 2400 tons of pollutant in Lake Ontario. The pollutant is dissolved uniformly in the water in the three lakes. Estimate the levels of pollutant in the three lakes over the next 5 years.