GREAT LAKES–ST. LAWRENCE WATER LEVELS

Do recent drops in lake levels indicate a new trend or are they part of a natural cycle?

Water levels in the Great Lakes are the result of a balance between water entering the system (through inflows from rivers, rain, snowfall, snowmelt and runoff) and water leaving it (through outflows to rivers, evaporation to the air, and withdrawals for various human uses). Natural seasonal and yearly variations in these factors can result in temporary changes in lake levels, but more permanent changes could come about as a result of climate change.

Changes in the climate of the Great Lakes–St. Lawrence region have brought more rainfall to replenish lake waters, but they have also brought higher temperatures, a longer warm season, and a shorter ice season, all of which increase evaporation and water loss. If the increases in rainfall and evaporation balance each other, climate change may have little effect on lake levels. There are concerns, however, that continued warming will increase evaporation rates more than precipitation and cause lake levels to fall.

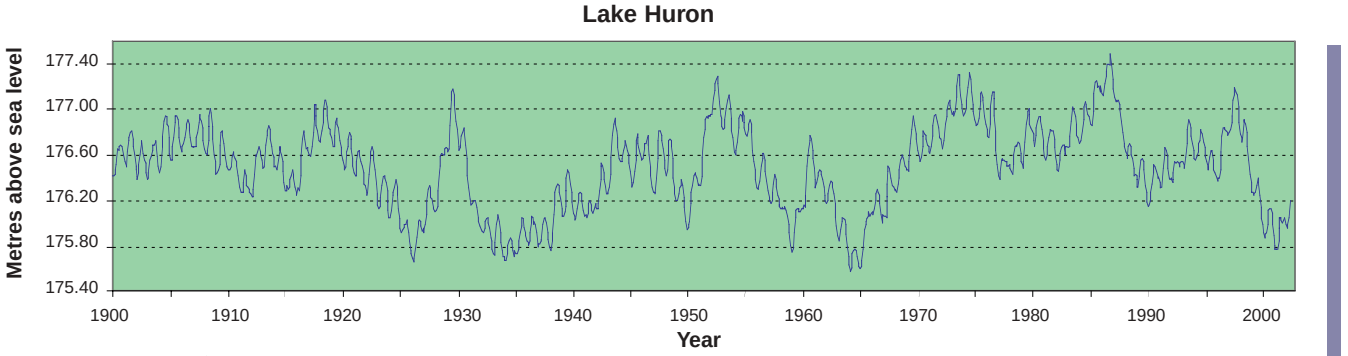
A significant lowering of lake levels could reduce the output of hydroelectric power, force ships to carry lighter loads, require cottagers to relocate docks, boathouses, and water intakes, and shrink or dry up wetlands that are important food sources and breeding grounds for fish and waterfowl. Extensive dredging would be needed to deepen channels and keep the connecting rivers between Lakes Huron and Erie navigable for commercial shipping. Similarly, the St. Lawrence River below Montreal might have to be totally transformed by the addition of dredged channels, locks, and dams to keep it open for large ships.

FOCUS: Lake Huron

Located in the middle of the Great Lakes system, Lake Huron is perhaps the most suitable of the lakes to use as an indicator of the effect of climate change on water levels. Lake Huron also reflects the influence of natural forces more directly than Lakes Superior and Ontario, where water levels are regulated to some extent by Canadian and U.S. authorities.

Over the past century, water levels in Lake Huron have not shown a consistent long-term trend. Instead, they have alternated irregularly every couple of decades between higher and lower phases. Extreme low water levels on the lake occurred in the mid-1960s, while the longest period of low-water levels was in the hot, dry years of the 1930s. Through the 1970s, 1980s, and most of the 1990s, lake levels were actually higher than the long-term average.

In the late 1990s, however, low water levels, similar to those of the 1960s, returned. It remains to be seen whether these signal the beginning of a longer trend or are just another phase in the lake's periodic swings between low and high water phases.



Source: *Environment Canada*

The graph shows changes in the average monthly lake level between 1900 and 2002. The level is given in metres above sea level. Although water levels in Lake Huron have varied considerably from decade to decade, no long-term change is yet apparent.

THE BIGGER PICTURE

Water levels in each of the Great Lakes and the St. Lawrence River are influenced to some extent by local climate and drainage conditions. Consequently, they do not always change in exactly the same way. Nevertheless, the long-term picture for Lake Huron is fairly representative of the system as a whole. Water levels in the Great Lakes have fluctuated within a range of about 1.8 metres over the past century, but no long-term trends have been apparent in any of the lakes or in the St. Lawrence River. Temperature changes in the region have been fairly small – about 0.5°C over 100 years – and that may be one reason why long-term changes in water levels have not yet appeared.

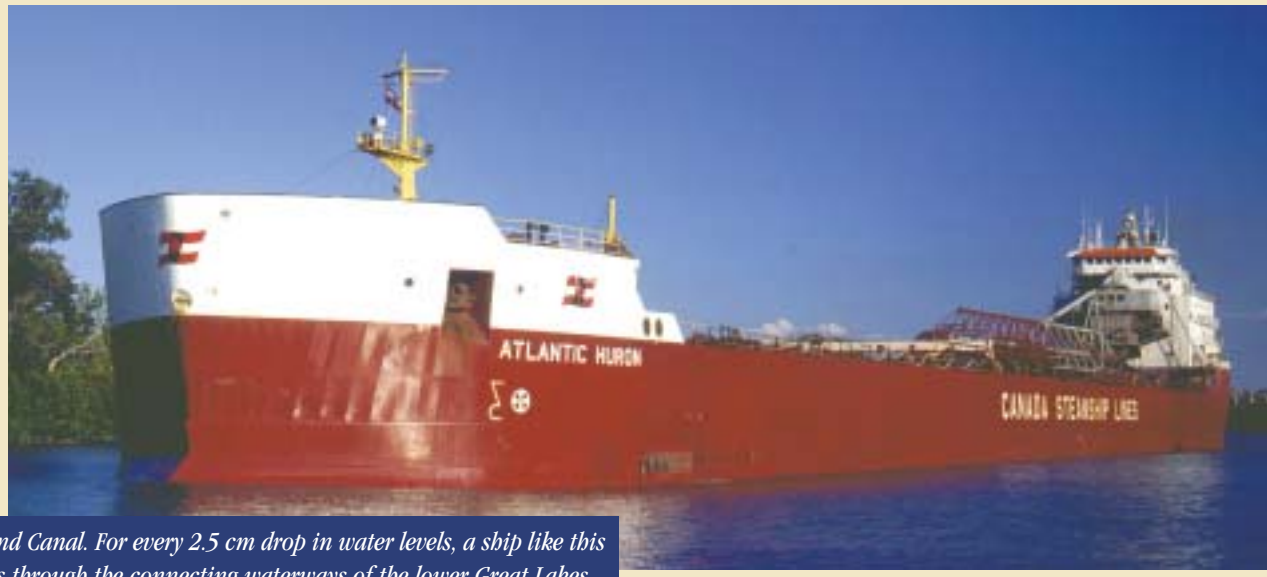
Still, concerns about low water levels remain, and one good reason is that the economic costs they impose are so high. Between 1988 and 1991, for example, when water levels at Montreal were 30 cm below average, the tonnage of goods passing through the port fell by 15%.

LOW WATER BLUES

After nearly three decades of high water levels, the rapid drop in lake levels in the late 1990s came as a sharp surprise to many. By 1999 the levels of all of the Great Lakes and the St. Lawrence River were below their long-term averages, and the system had lost almost as much water as flows over Niagara Falls in two and a half years.

In spite of above-average spring and early summer rains, water levels continued to drop in 2000. Cottagers found their docks on dry land and marina owners were forced to call in dredges to dig channels so they could keep their businesses open. Ships had to run lighter and higher in order to pass through canals and shallow channels, and hydroelectric power production was down substantially at both Niagara and Sault Ste. Marie.

The following year was not much better. In August, water levels in Montreal harbour were a record 95 cm below average. In late October, sustained high winds in Lake Erie pushed large volumes of water toward the lake's eastern end. This short-term effect caused already low water levels to fall a further 1.5 metres at the lake's western end and in the Detroit and St. Clair rivers. That was enough to make the link between Lakes Erie and Huron impassable for large vessels, and shipping traffic came to a halt until water levels rose two days later.



The Atlantic Huron transits the Welland Canal. For every 2.5 cm drop in water levels, a ship like this must travel 100 tonnes lighter to pass through the connecting waterways of the lower Great Lakes.