



The Incredible Vanishing Water

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Where did the water go? Is it ever coming back?

That, in a nutshell, is what people around Lake Charlevoix have been asking as the level of the Lake has plummeted nearly three feet in the last two years and five feet since its historic high in 1986.

Part of the answer to the first question is scientific, related to changing weather patterns and natural cycles in the amount of water that flows into three of the Great Lakes: Michigan, Huron, and Superior. Another part is technical, dealing with how water flows out, most through the St. Clair River around Detroit and on to Lake Erie and a much smaller amount into a channel in Chicago. A somewhat unknown but fairly large consumptive use of Great Lakes water is that used for urban and industrial purposes. Such operations as water-bottling plants are also net water losses. Some of the rest of the missing water is a bit of a mystery.

Answering the second question — what does the future hold — is even harder. Weather patterns could change, as could the amount of water used or diverted by humans out of the lake system. Ultimately, those of us who use the lake don't have a lot of power to affect the water levels, unless we want to undo some history. More about that later...

Basic Stuff

Lakes, like Lake Charlevoix, are depressions in the earth's surface that collect and lose water in a number of different ways. On the collecting side there is of course direct precipitation (rain, snow, sleet etc.) that falls into the lake or falls in the lake's watershed and then flows through tributaries (rivers, streams, underground springs, etc.) to increase the volume of water in the lake. The outflow of water from lakes (often called diversions by water scientists) can occur through water outlets such as a river, or by flowing into the underground water table and on into water-carrying aquifers. Evaporation is another loss and can account for more loss of lake water than most of us are aware of.

Natural inflow and outflow are what determine a lake's level. In the case of Lake Charlevoix, the Boyne and Jordan Rivers are the most conspicuous sources of water to the Lake. These inflows are augmented by Horton and Stover Creeks and by a myriad of small creeks and springs. Rain, snow and sleet add a bit more. The Pine River, the shortest river in the United States, flowing through to Round Lake, is the major outflow and that outflow is augmented by losses to evaporation.

The level of Lake Charlevoix responds directly to any change

in the level of Lake Michigan because Lake Charlevoix is connected directly to Lake Michigan through the Pine River, which flows into Round Lake and then into the channel to Lake Michigan. It is worth noting that other inland lakes, such as Walloon, Elk and Mullet that are not connected to the Great Lakes, have not suffered significant water losses during the last few years.

According to David Miles of the Charlevoix Historical Society, the water level of Lake Charlevoix was originally some four feet higher than Lake Michigan than it is today. When the Pine River was dredged for shipping in 1896, the lake level dropped to match the level of Lake Michigan.

All lakes fluctuate somewhat with seasonal changes in precipitation — higher in the late spring and early summer and lower in the late fall and winter. Irregular cycles of higher and lower lake levels are caused by the availability of water from the various natural sources and losses through diversion and evaporation.

In January 2008, the level in Lake Charlevoix was nearing the all-time low recorded 44 years ago. U.S. Army Corps of Engineers data show the levels of Charlevoix, Michigan and Huron are about 3.5 inches above the record low water levels recorded in 1964. They are 26 inches — more than two feet — below their long-term average level. For many lake property owners this means an extra 25 feet of beach and not being able to get their hoists low enough to get their boats into them.

Moreover, the drop has happened very quickly. In 1998, the lake levels were four feet higher than now. This quick change is somewhat unprecedented in our relatively short period of recorded data, which goes back only 160 years. We do know from evidence of old beaches that line the western shore of Lake Michigan, that the Great Lakes have over the centuries receded many miles, indicating that the levels have dropped many times since the lakes were carved out 12,000 or so years ago.

Sadly, there are indications that water levels will continue to fall. For example, in November 2007 the volume of precipitation falling on lakes Michigan and Huron broke a record low established in 1908, according to Corps of Engineers data. "There was more water evaporating from the two lakes in November than there was precipitation going into the lakes. In effect, we took water out of the lakes," said Carl Woodruff, a hydraulic engineer at the Corps' Detroit office.

In an average November, precipitation enters lakes Michigan

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and Huron at a rate of 1,111 cubic meters (1,453 cubic yards or 300,000 gallons) per second. In November 2007, the lakes suffered a net loss as water evaporated from the lakes at a rate of 3,230 cubic meters or more than 850,000 gallons per second, according to Corps of Engineer's data. In short, evaporation took away three times as much water as fell as rain. In the last two years, Lakes Michigan and Huron dropped 2.9 feet, the largest such change on record.

Frank H. Quinn, a retired hydrologist with NOAA's (The National Oceanic and Atmospheric Administration) Great Lakes Environmental Research Laboratory in Ann Arbor, said his studies over the past two years had found that 80 to 90 percent of the lakes current drop-off could be attributed to weather. Quinn noted that the unprecedented drop ended a 30-year run of above average high lake levels. During the summer of 1986, Lake Michigan spilled over its banks and washed some lakefront homes off of their foundations.

A long-term cause of the drop in Great Lakes water level, according to NOAA climate experts, is that despite recent La Niña climate patterns, the region has experienced an over-riding long-term warming trend, which means less ice and more evaporation in winter months. Quinn also cited hotter temperatures and lower amounts of rainfall. Last winter's warmer temperatures and below average precipitation meant that there was less winter snow, which the lakes require for the normal spring lake level rise. The hotter temperatures increased the lake evaporation and reduced the runoff in the tributary streams.

One fact about evaporation is that it can be a major factor in water loss in the winter. Lake-effect snowfall, for example, is caused by water that evaporates in cold weather and then falls, usually on land when it condenses into snow. It does not contribute to overall lake levels since it is water that has been evaporated from the lakes before coming down as snow. In fact in some cases, the snow from evaporation from the Lakes falls outside the watershed and is a net loss.

Each of the Great Lakes has different circumstances. Lake Superior has a major inflow from rivers in Canada which used to flow North to the Arctic but which have had their flow reversed for hydro electric power stations that ultimately divert the water into Lake Superior. This has increased the volume of Lake Superior that is controlled at the entrance to the Saint Mary's River for hydropower and the locks. The extra water from this diversion also increases flow into Lakes Michigan and

Huron. (The Straits of Mackinaw is so wide and water flows so easily within it that Lakes Michigan and Huron act like one lake in terms of water levels.) That outflow from Lake Superior at the Soo is a major inflow to the two lakes, which also get water from a number of smaller rivers and streams.

In addition to the evaporative losses, water flows out of Michigan and Huron at two main outlets: the Chicago Sanitary Canal and the St. Clair River at Port Huron. While Lakes Michigan and Huron are at almost all-time lows, Lake Superior, also approaching its all-time low, according to NOAA data, is down 16 inches from its mean data line while Lakes Michigan and Huron are down 30 inches. The lower Lakes St. Clair and Erie are up somewhat because of water flow in from the St. Clair River and wetter weather in Lower Michigan and in Indiana, Illinois and Ohio.

Scientists use the term "consumptive use" to describe the practice of taking and using water from lakes or rivers, but not returning it. Today, according to Environment Canada, more than 115 cubic meters of water per second is lost from the Great Lakes basin due to consumptive use. The amount will increase as the population on the Canadian side of the Great Lakes basin is expected to rise by about 20 percent, reaching an estimated 12 million people by 2020.

We can measure fairly closely how much is lost to evaporation and consumptive use, but other components of the drop are the subject of often-heated arguments. The best example of that is the question of loss from the dredging of the St. Clair River at Port Huron. A claim has been made that this deepening of the river accounts for a major drop in the water level in Lakes Michigan and Huron but others think it is only marginally significant.

A Canadian study released in early January 2007 says a "drain hole" in the St. Clair River caused by dredging and other commercial projects is costing Lakes Huron and Michigan a combined 2.5 billion gallons of water each day. That exceeds the amount diverted from Lake Michigan to provide

Chicago's daily water supply, the Georgian Bay Association said. The group based its findings on water level data compiled by U.S. government agencies.

The association first reported on water losses from Lake St. Clair dredging in 2005. But the latest report says the volume flowing south from Lakes Michigan and Huron is three times greater than originally believed and has caused an overall water level decline of nearly 2 feet since 1970.

"This new report reveals that the problem is far more serious than first thought and underscores the need to fix the problem immediately. Mary Muter, chairwoman of the association's Environment Committee, said recently.

But scientists working for a U.S.-Canadian advisory group say that video images from the St. Clair River bottom show no evidence that erosion is causing water levels on Lakes Michigan and



Trevor Mays



Huron to drop, the Associated Press reported.

Although preliminary, the findings intensified a debate over whether people or nature is more to blame for the two lakes' steady decline since the late 1990s.

Leaders of the research team said it was too early to judge the validity of a Canadian group's contention that erosion on the upper portion of the river is the leading culprit. They said the underwater video — taken along a roughly 30-mile stretch — showed the riverbed is covered with gravel, pebbles and stones

established, but it has brought into question how carefully requirements are being met.

There have also been requests to use Great Lakes water by communities outside the watershed that would release that water after use to the Mississippi River, a diversion that could ultimately provide more water for the naturally parched western states. In addition, the development of drinking water bottling plants has also increased the amount of water withdrawn from the Great Lakes watershed.

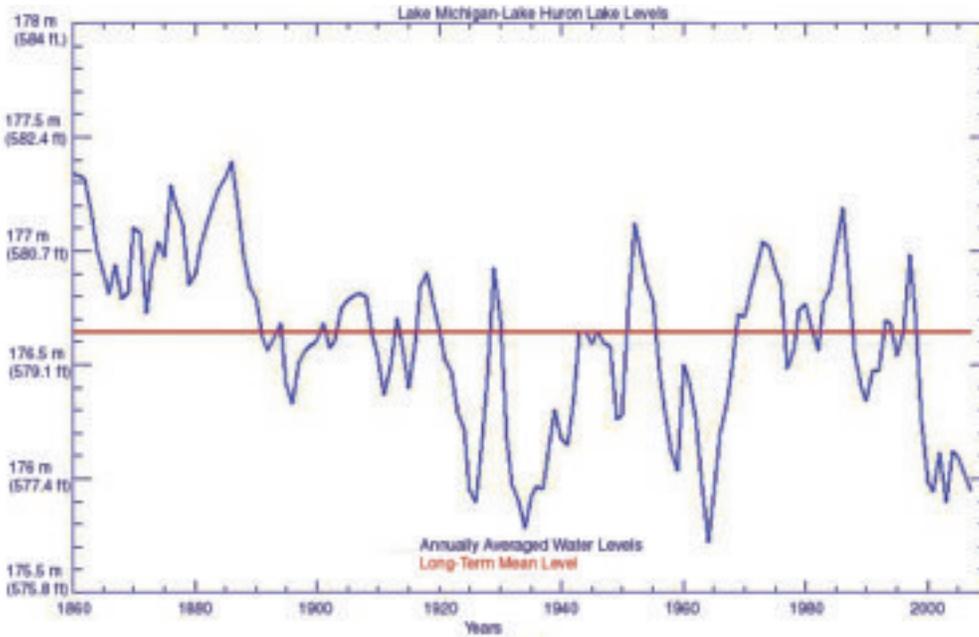
Some Ideas about Solutions

It is often easy to find and describe problems like the low water levels of the Great Lakes. Solving the problems are harder and could involve tough decisions.

The residents of Charlevoix County cannot easily affect some solutions that jump out of the discussion of water levels of the Great Lakes. Global warming, for example, is an international issue that individual citizens and citizen groups affect in only a limited and political way.

Many issues on the Great Lakes water levels are international and are governed by treaties between the federal government and Canada. Again individual citizens can have input to various lake problems though the IJC and through their state governments.

For example, watching over diversions



up to 10 inches long. The rock layer is stable, meaning “the bed cannot be eroding,” the team’s report said. “On a preliminary basis, we’re finding that ongoing erosion does not appear to be a cause of low water levels,” said John Nevin, spokesman for the The International Joint Commission, which advises the U.S. and Canada on Great Lakes issues.

The IJC has long acknowledged that dredging caused Lakes Huron and Michigan to drop nearly 16 inches from the mid-1800s to the 1960s. The debate now is over whether it also is causing the present low-water period.

The IJC this year began studying the issue. Under pressure from U.S. Senators and other political leaders it promised a final report by next year. Michigan Gov. Jennifer Granholm and U.S. Senator Debbie Stabenow have asked the U.S. Army Corps of Engineers to consider placing underwater barriers in the river to limit its flow even before the study is finished.

Another issue is whether Chicago has allowed a great deal more water to flow out the Sanitary Canal than is allowed by its agreement with the IJC. The facts in this issue have not yet been

such as the flow of water through Chicago and studies of the effect dredging has on outflow through the St. Clair River. These regional issues should not be hard to control, but political action is needed.

Tip of the Mitt Watershed Council, which works on a local basis on water resource issues, also is involved with regional, state, and national water issues. They are currently leading a Great Lakes basin-wide effort for Great Lakes restoration that includes water level policy. If you don’t know their work, check them out at www.watershedcouncil.org.

What about Lake Charlevoix? Maybe it’s time to ask for the lake level to be controlled by a dam on the Pine River. Because of the large amount of boat traffic between Lake Charlevoix and Lake Michigan, a lock should be part of the complex. A dam and lock would be a fairly simple way of keeping Lake Charlevoix regulated and perhaps even a way of generating some small amount of hydroelectric power.

It’s our lake. What can be done to protect it into the future is a question for all of us.

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Did you know...?

Lake Charlevoix is the third largest lake in the state with a surface area of over 17,200 acres and 56 miles of shoreline? The maximum depth in the main basin is 122 feet. The largest tributaries to Lake Charlevoix are the Jordan River and the Boyne River. Other significant inflow comes from Horton, Stover, Porter, and Loeb creeks. (source: Wikipedia)