



# Sources of Knowledge Newsletter

Sharing Perspectives on the Natural and Cultural Heritage of the Bruce Peninsula

## Sources of Knowledge 2013 Challenges of a Changing Lake May 3-5, 2013

**Admission \$90 includes Saturday dinner; \$85 if paid by March 15<sup>th</sup>. \$35 for dinner and evening event only.**

If you bought property beside one of the Great Lakes in the past thirty years you will know now, if you did not know it before, that you chose to live beside a dynamic body of water that bounces up and down like a yo-yo. This winter the upper Great Lakes reached near-record low water levels. This was most evident on Lakes Michigan and Huron but all five lakes, plus Lake St. Clair, remain below their long-term averages. On January 4<sup>th</sup> the U.S. Army Corps of Engineers announced that the 1964 record low for Lakes Huron/Michigan has been surpassed; they are at their lowest since records began nearly a century ago.

The USACE began keeping water level records in 1918. If you go to: [http://www.waterlevels.gc.ca/C&A/netgraphs\\_e.html](http://www.waterlevels.gc.ca/C&A/netgraphs_e.html), you can see how the levels have changed since 1918. Take particular note of the prolonged period of low lake levels we are currently experiencing (since 2000), as compared with a maximum period of five years during the past century.

Another useful online tool is the *Great Lakes Water Level Dashboard*, at: <http://www.glerl.noaa.gov/data/now/wlevels/dbd/> provided by the National Oceanic and Atmospheric Administration (NOAA). Among other things, this will help you to visualize historic water level trends going back to 1861.

One variable the Army Corps constantly monitors is the supply of water to each Great Lake, which is made up of rainfall on the lake surface, runoff to the lake, and (negatively) evaporation from the lake. People often claim that a diversion in Chicago to the Mississippi River watershed is to blame. Others point to erosion or dredging in the St. Clair River. Recently, the International Joint Commission (IJC) published their studies on the impacts of dredging and erosion in the St. Clair River and regulating Lake Superior water levels. Among other things, the International Upper Great Lakes Study (IUGLS) evaluated remedial measures for historic dredging projects and erosion. *The Study Board found that there had been some erosion in the St. Clair River between 1962 and 2000, but the riverbed had stabilized since then, making it unclear whether action would be appropriate.* Further details can be found in their reports at:

<http://www.ijc.org/iuglsreport>

The IUGLS also evaluated the impacts of climate change (see below for an up-date on Bill Caulfeild-Browne's data on Tobermory's rising temperatures) on lake levels in the Great Lakes region. They concluded that - *lake levels are likely to continue to fluctuate, but still remain within a relatively narrow historical range – while lower levels are likely, the possibility of higher levels cannot be dismissed.* In other words the lake levels will continue to rise and fall. According to the study the key variables are precipitation, runoff, and evaporation and these are affected by climate change but there is great uncertainty about how they all interact.

Water levels are not the only climate-related trend being observed on the Great Lakes. Ice cover is also declining. The Great Lakes have lost 71% of their ice cover since 1973, according to a study by the Great Lakes Environmental Research Laboratory (GLERL) <http://www.glerl.noaa.gov>. This past winter, all the lakes, including Lake Superior, were virtually ice free with just 5% ice coverage, the second lowest on record and it appears that the same will happen this year. It is not clear what the long term impacts of this will be.

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Little Tub Harbour, Tobermory and the *John & Alex* shipwreck (photo: Bill Caulfeild-Browne)



2009



2012

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The fish community also continues to

experience new and novel change. The invasion by rainbow smelt in the 1920s, followed by alewife and sea lamprey in the 1950s dramatically affected Lake Huron's fish community. Tragically, combined with over-fishing, these invasive species resulted in the extinction or extirpation of four of Lake Huron's seven cisco species and the collapse of lake trout populations (only two remnant stocks survived). In the absence of a dominant predator, smelt and alewife populations exploded. A turnaround came in the 1960s through sea lamprey control and the stocking of Pacific salmon created conditions more favourable for lake trout. While still recovering from this first round of invasive species, the 1990s marked the invasion of zebra mussels, quagga mussels, and round goby from the Caspian region. A profound impact to the food web has coincided with their colonization, including: increased water clarity; decreased phosphorous concentrations; dramatic decline in zooplankton and lakebed invertebrates (e.g., *Diporeia* sp.); increased lakebed periphyton growth; and, the near disappearance of alewife (in 2003) and a general decline in forage fish. Round goby have also continued to spread, and through competition for food and predation on eggs and young fish, have also impacted the ecosystem. See the State of the Great Lakes Report for more details: <http://www.sourcesofknowledge.ca/state-of-the-environment-reports>.

If you would like to learn more about the state of the lake and what you can do to help, the fifth annual **Sources of Knowledge Forum**, scheduled for May 3-5, 2013, will bring together Canadian and U.S. experts on the Great Lakes. Through presentations and \ workshops, the Forum will:

- Present the latest research on changing lake levels, shorelines, and fish communities.
- Explore examples and opportunities for better stewardship.
- Share perspectives on the lake – from artist to scientist.

The first four forums were held in the Park Visitor Centre which could only hold 100 people. Tickets always sold out quickly. This year, in order to make the Forum available to all who want to attend it will be held in the Tobermory Community Centre. If you are interested in being part of this important event go to the Sources of Knowledge website for registration details at: <http://www.sourcesofknowledge.ca/>

## Update on evidence of climate change in Tobermory

By: Bill Caulfeild-Browne

At our 2012 Forum I provided evidence of climate change in Tobermory by comparing statistics from Environment Canada for the period 1914-1983 with those from my Big Tub weather station from 1997 to 2011. Since then we have experienced one of the warmest years on record. In order to provide an up-to-date picture, I have now incorporated 2012 in my statistics (see table below).

All figures are in degrees Celsius and are rounded to one decimal point. The first three

lines are what I showed at the 2012 Forum. (The details can be seen at <http://sourcesofknowledge.ca/pdf/2012-Climate-Change-Proceedings.pdf>) The next two lines show the effect of adding the year 2012 to the mix. As can be seen, this exceptionally warm year confirms that we are currently experiencing significantly warmer winters than in the past century. Summers appear warmer too, though the differences are not statistically significant. Attendees at last year's Forum may remember that there was no ready explanation for the spike in September's temperature. 2012's data simply confirms the spike.

The caveats presented last year still apply; although the location of the Big Tub Station is very close and very similar to the previous Environment Canada station, the locations are not the same. Further, climatologists usually demand thirty years of records to find their means reliable. Big Tub station has only 16 years. Nevertheless, the evidence continues to be strongly indicative of climate change.

Climate change is a complex issue. Recent research in the UK warns that recent years may have had a cyclical warming trend laid on top of the larger global warming we are experiencing. While the underlying climate change trend will continue, the rate of change may not be as much as being currently forecast once the cyclical trend declines.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>EC (1914-1988)</b>	-6.2	-6.7	-2.7	3.7	9.1	14.5	18.3	18.3	14.5	9	2.8	-3
<b>Big Tub (1997-2011)</b>	-5.2	-4.7	-1.6	4.1	9.3	14.7	18.6	18.6	15.5	9.2	4.2	-1.5
<b>Difference (warming)</b>	<b>1</b>	<b>2</b>	<b>1.1</b>	<b>0.4</b>	<b>0.2</b>	<b>0.2</b>	<b>0.3</b>	<b>0.3</b>	<b>0.8</b>	<b>0.2</b>	<b>1.4</b>	<b>1.5</b>
<b>Big Tub (1997-2012)</b>	-5	-4.5	-1.3	4.1	9.5	14.8	18.7	18.7	15.5	9.2	4.1	-1.4
<b>Difference (warming)</b>	<b>1.2</b>	<b>2.2</b>	<b>1.4</b>	<b>0.4</b>	<b>0.4</b>	<b>0.3</b>	<b>0.4</b>	<b>0.4</b>	<b>1</b>	<b>0.2</b>	<b>1.3</b>	<b>1.6</b>