

# Lake Simcoe Science

## A Local Perspective on Climate Change

### What is Climate Change?

Climate change refers to a shift in long-term weather conditions brought about by a change in the earth's average global surface temperature. In general terms, the average temperature of the earth is warming and this warming is causing changes in our weather patterns.

The cause of the warming is thought to be primarily a result of human activities, chiefly, the burning of fossil fuels. The Intergovernmental Panel on Climate Change (IPCC) is considered to be the world authority on the subject and is an excellent resource for anyone interested in learning more about the issue from a global perspective ([www.ipcc.ch](http://www.ipcc.ch)).

### A Local Perspective on Climate Change

Climate change is considered to be one of the most pressing global environmental and humanitarian issues of our time. But what is global is also local.

In the Lake Simcoe watershed, we are seeing variation and changes to our regional climate. Whether this is the result of global climate change or other factors is not entirely clear. What is clear is that we are going to have to learn to plan and adapt to that changing climate moving forward.

*Fossil fuels create greenhouse gases which scientists have concluded leads to global warming.*

### The Science of Climate Change in the Lake Simcoe Watershed

LSRCA researchers monitor flow and water levels in our streams and creeks for a number of reasons:

1. For flood protection - one of our mandates is to monitor water levels and issue warnings to municipalities and other agencies in the event of potential flooding.
2. To gauge the amount of water in Lake Simcoe's tributaries in order to make informed decisions around ecological water needs and human water uses and takings.
3. To detect changing patterns in river flows, such as magnitude, timing or seasonality.
4. Flow data is a key component in calculating phosphorus loads to Lake Simcoe.

What we are seeing at many of our flow monitoring stations is a changing pattern of more water flowing in rivers and creeks during the winter and less flowing in the spring. Changes to this pattern could have profound impacts on water availability and the ecology of the area.



*Changes to seasonal water flows could have a profound impact on water availability and ecology.*



## Changing Seasonal Flow: More Winter H<sub>2</sub>O

The seasonal water cycle in this part of Canada is greatly influenced by the spring snow melt. This seasonal event serves to replenish ground water, and acts as a trigger for biological processes in many plants and animals.

In winter, frozen ground acts like pavement. It doesn't allow water to seep into it. With the vegetation dormant, there is also little biological uptake of this water by plants. This encourages water to run along surfaces, collect in low lying areas and run off into creeks, rivers, and ultimately Lake Simcoe, collecting pollutants along its way.

Monitoring data of seasonal river flows in the Black River, near Washago, show the volume of river flow is slowly increasing in winter and decreasing in spring.

This winter/spring pattern is being seen at a number of monitoring stations across our watershed. Other gauges across Southern Ontario show the same trend - more water running into creeks and rivers in the winter and less in the spring.

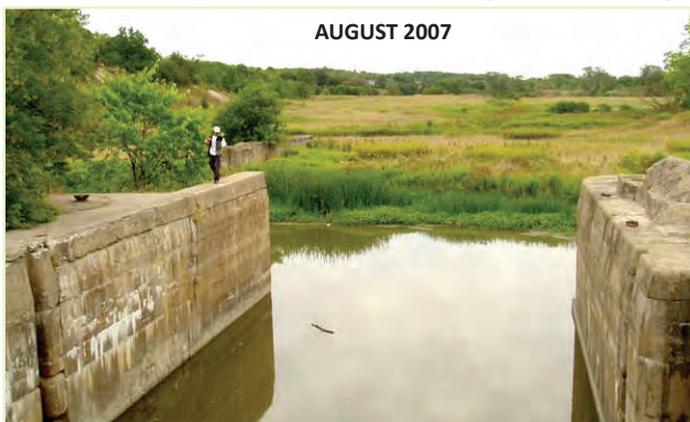
## The Implications of Climate Change on Phosphorus in Lake Simcoe

We can already see the impact of changes to seasonal flow by looking at a winter melt event in 2009.

The two pictures below show the East Holland River. On the left, you see summer conditions (August 2007) and a low water level. On the right is the same location in winter (February 2009), with very high water levels.

What the photos can't show, but what we have measured, are the amounts of phosphorus entering our waterways in both situations. On the left, phosphorus loads were calculated at 0.00058 tonnes per day. On the right, that number is 2.06 tonnes per day.

### East Holland River in Holland Landing - Low and High Seasonal Flows



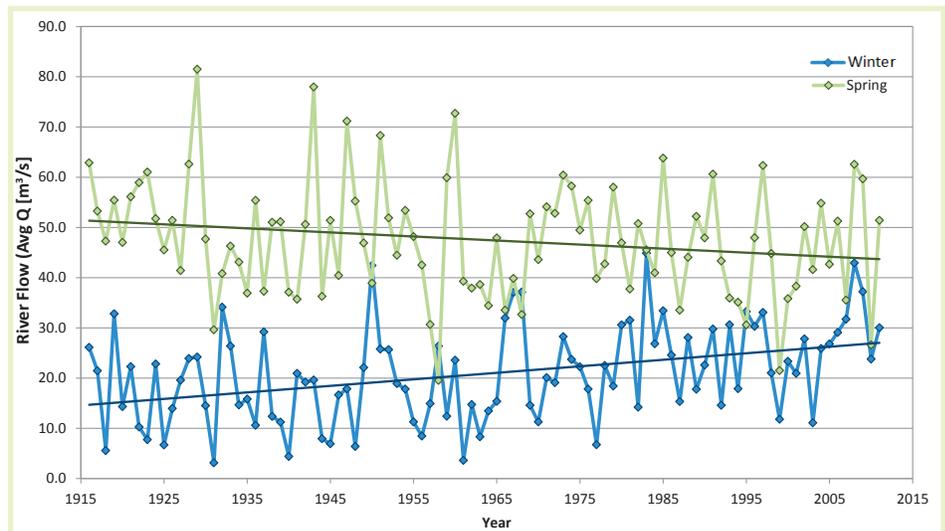
AUGUST 2007



FEBRUARY 2009

Photos of the East Holland River taken in August 2007 and February 2009 show varying water levels and flow during different seasons.

### Black River Near Washago - Seasonal Average River Flow



Graph shows spring and winter flows for the past 97 years on the Black River at Washago, just north of Lake Simcoe. Over this period we can see the increasing trend in winter flow volume and decrease in spring flow volumes. Source: Water Survey of Canada

## Is Our Weather Becoming More Extreme?

One of the potential signs of climate change is an increase in extreme or record breaking weather. Can we see this in the Lake Simcoe watershed? One interesting example from our neighbouring watershed to the south is the Don Valley Parkway flooding twice this year – on May 28 and again on July 8.

In our own watershed, we have seen two opposing extreme years almost back to back. What we mean here is that we have seen a “record breaking” dry year followed by “record breaking” wet years.

For example, 2007 was a near record breaking year in terms of low river flows. The next two years (2008, 2009) were record breaking or near record breaking in terms of high water flows. Extremes like this are becoming more commonplace.

While it is not possible to directly attribute these few examples to climate change, it is the increased frequency of these type of events globally that climate change scientists point to as one of many lines of evidence that climate change is occurring.



Don Valley Parkway (DVP) floods after storm. Toronto, July 2013. Photo credit: CTV



OPP ice rescue in Kempenfelt Bay, Lake Simcoe, March 9, 2012. Photo credit: Jennifer Howard

## Lake Ice Cover is Decreasing

Ice cover records for Lake Simcoe go back to 1853, the longest record in Canada. This record has uncovered a disturbing trend of increasingly shorter ice seasons.

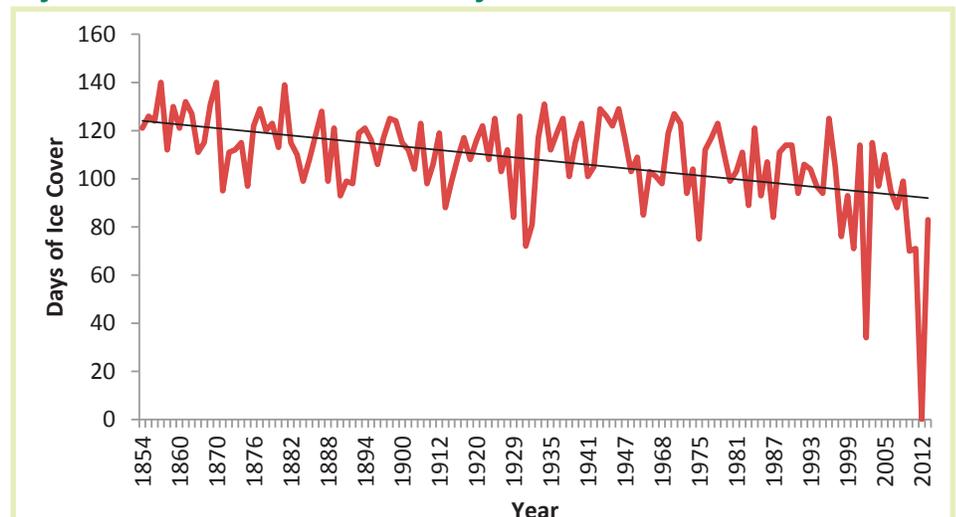
The number of days with ice cover is on the decline. The sharp downward spike in 2012 is because the lake did not completely cover with ice.

It is also worth mentioning that the five years with the shortest ice cover occurred after the year 2000. The five years of longest ice cover occurred before 1900.

A shorter ice season doesn't just mean a shorter ice fishing season. A number of key lake processes are driven by lake temperature, which can have dramatic impacts on the cycling and distribution of oxygen and nutrients in the lake. There are also a number of biological processes that are tied to annual changes in lake temperatures. Changes in lake ice could alter the timing of these temperature changes potentially causing predator/prey relationships to become decoupled.

For example this could leave young fish with no prey to eat at key stages of development. It is difficult to completely predict the extent of impacts to Lake Simcoe. Continued monitoring will be critical in detecting changes and informing adaptation planning and future lake management.

### Days of Ice Cover for Lake Simcoe by Year



160 years of recording ice cover for Lake Simcoe shows a trend of declining number of ice cover days per year. Source: IceWatch Canada, [www.naturewatch.ca](http://www.naturewatch.ca)



*Example of applying bio-engineering techniques to enhance flood control by promoting infiltration.*

## LSRCA's Role in Climate Change

### Going with the Flow

One way to respond to a changing climate is to build resilience into our communities... to prepare and adapt to the new circumstances that climate change brings.

Low Impact Development tries to work with nature to manage water as close to its source as possible, by minimizing hardened surfaces like pavement and enhancing flood control on site using rain gardens and bio-engineering techniques.

LSRCA is working with the development community to have these new technologies adopted in all new communities. We are also lobbying all levels of government to legislate the adoption of new technologies that have proven effective at managing water.

## LSRCA's Science and Monitoring Becomes More and More Important

Our work in flood monitoring and forecasting is becoming more important than ever. More water flowing in our streams and rivers in winter increases the possibility of winter flooding. In order to respond to this new reality, we need to better understand how our watershed responds to run-off during winter conditions.

In addition, continued monitoring of the lake, rivers and biology of the watershed will play a key role in detecting the impacts of climate change as well as helping to generate the information that will help build adaptation plans for the watershed.

## Regulating Properties within our Jurisdiction

Unintended consequences of work done on properties can be quite serious, flooding neighbours, destroying habitat and contributing to poor water quality in Lake Simcoe.

Conservation Authority permits are required for certain work for a reason. Increasing demands on our infrastructure as a result of a growing population is compounding the impacts from individual landowners who undertake work on their property without a permit.

If you're covering over, paving, building, filling in, changing slopes or working near a shoreline, your actions are likely to be impacting how water travels. Contact us to make sure your work isn't going to cause problems down the road. We want to work with you to help you achieve your goals without compromising the environment.

## What You Can Do

- Reduce use of fossil fuels – consider carpooling instead of driving alone to work. Smart Commute can help you find a commuting partner: [www.smartcommute.ca](http://www.smartcommute.ca).
- Use energy saving fixtures and appliances – find coupons and other information at Hydro One website: [www.hydroone.com](http://www.hydroone.com).
- Shop local – these items haven't been shipped from far away and therefore required less fossil fuels to make their way to you.
- Get a 72-hour emergency kit – for the possibility of power outages and weather related emergencies. See: <http://www.getprepared.gc.ca>.



**Lake Simcoe Region**  
conservation authority

120 Bayview Parkway, P.O. Box 282,  
Newmarket, ON L3Y 4X1  
905-895-1281 1-800-465-0437  
[www.LSRCA.on.ca](http://www.LSRCA.on.ca) [info@LSRCA.on.ca](mailto:info@LSRCA.on.ca)



Established in 1951, the Lake Simcoe Region Conservation Authority provides leadership in the restoration and protection of the environmental health and quality of Lake Simcoe and the surrounding watershed with our community, municipal and other government partners. To learn more visit [www.LSRCA.on.ca](http://www.LSRCA.on.ca). Alternative formats of this publication are available upon request.