

# Great Lakes Regulation and Forecasting

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**US Army Corps of Engineers**  
**Detroit District**





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# Great Lakes H&H Office International Missions

1. Produces official coordinated lake level forecasts
2. **Provides technical expertise to the International Joint Commission's (IJC) Great Lakes Boards of Control**
3. Measures flows in the connecting channels
4. Monitors hydrologic conditions of the Great Lakes

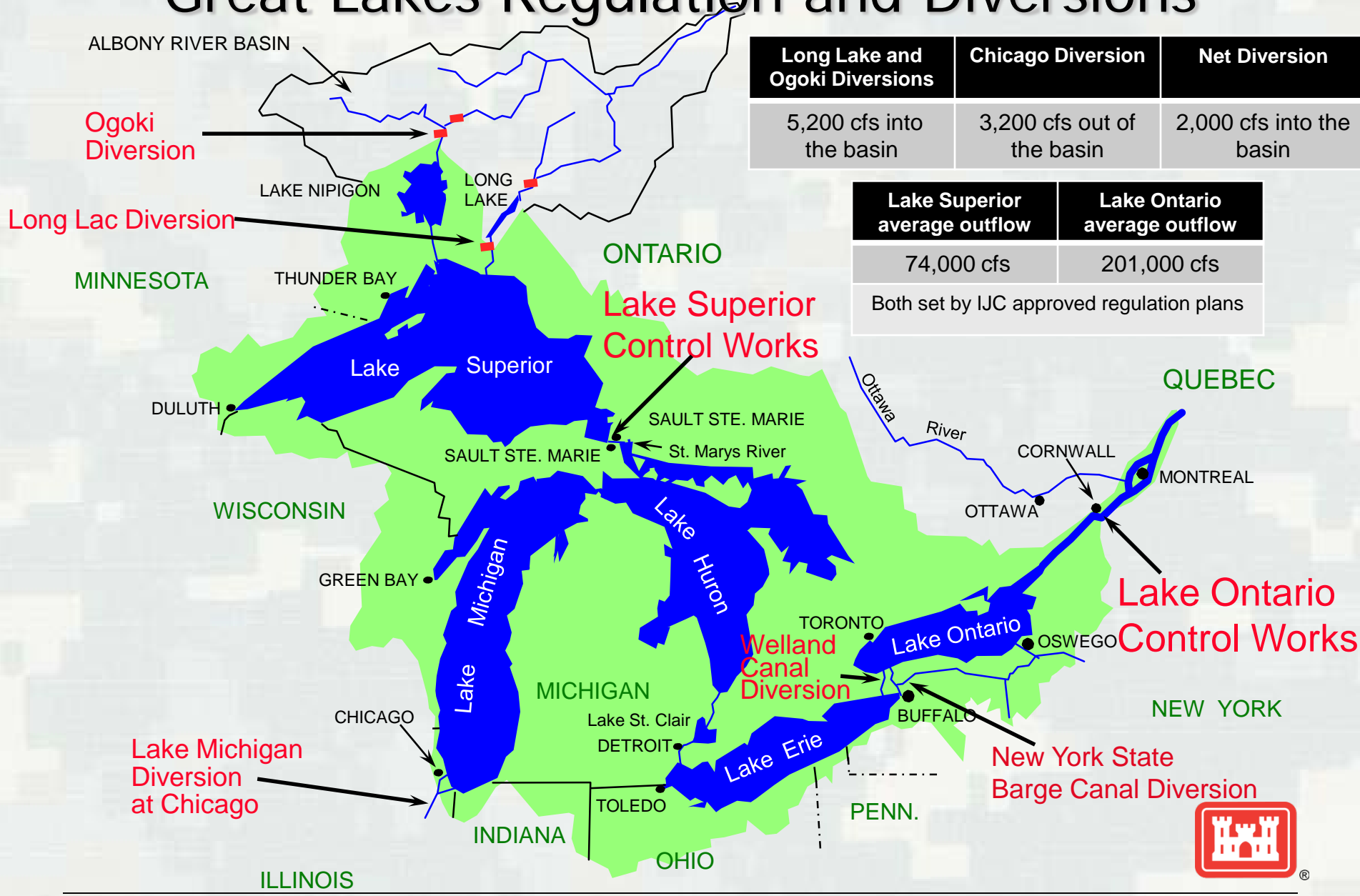


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# Great Lakes Regulation and Diversions

Long Lake and Ogoki Diversions	Chicago Diversion	Net Diversion
5,200 cfs into the basin	3,200 cfs out of the basin	2,000 cfs into the basin

Lake Superior average outflow	Lake Ontario average outflow
74,000 cfs	201,000 cfs
Both set by IJC approved regulation plans	





The Boundary Waters between the U.S. and Canada







# Lake Superior Board of Control

## Lake Superior REGULATION PLAN 2012

**The Upper Great Lakes System**

**Water Level Variations**

**Lake Superior Outflows and Regulation**

Water from Lake Superior flows to Lake Michigan-Huron through a number of structures stretching across the St. Marys River in the twin cities of Sault Ste. Marie in Ontario and Michigan. Regulating the release of water and overseeing operation of the control structures are the responsibilities of the International Lake Superior Board of Control, under the authority of the International Joint Commission.

**Lake Michigan-Huron Outflows**

Outflow from Lake Michigan-Huron occurs by way of the St. Clair River. Unlike the St. Marys River, the St. Clair is uncontrolled, and its flow depends solely on lake levels and physical characteristics of the river itself. The St. Clair River flows to Lake St. Clair and through the Central River before entering Lake Erie and continuing on further downstream.

**What is Plan 2012?**

It is the current regulation plan for Lake Superior. It provides a set of rules used to determine the amount of water to be released from the lake. The rules are designed to provide economic and environmental benefits, both upstream and downstream, while respecting specific physical and operational limits.

Plan 2012 provides modest benefits over the previous regulation plan, including:

- Preserves Lake Superior levels and flow through the St. Marys River during extremely dry conditions
- Protects important Lake Sturgeon spawning habitat in the St. Marys River
- Economic benefits to navigation and hydropower, and reduced costs to protect and maintain shoreline property
- More predictable flows and smaller month-to-month changes benefit hydropower and St. Marys Rapids interests
- More natural St. Marys River flows help sustain the river ecosystem health
- Simpler rules make Plan 2012 easier to manage



**How Plan 2012 Works:**

- 1. Start with more NATURAL FLOWS**  
Basis of Plan 2012 is the **PRE-PROJECT Flow Relationship**.  
What is pre-project flow? It's the flow that would have occurred prior to the canals and dam being built in the St. Marys River, which began around the year 1887.
- 2. Apply BALANCING PRINCIPLE**  
To help **BALANCE** water level conditions and their impacts on **ALL** stakeholders.  
Flows are adjusted depending on the difference of each lake's level from seasonal target levels based on average conditions.
- 3. Respect PHYSICAL & OPERATIONAL LIMITS**  
November Maximum = 3260 m<sup>3</sup>/s (except if Superior > 183.90 m...)  
3800 m<sup>3</sup>/s May to November if Superior > 183.90 m  
Winter Max = 2410 m<sup>3</sup>/s Increased to 2690 m<sup>3</sup>/s if Superior > 183.90 m  
1700 m<sup>3</sup>/s Minimum Flow Lake Sturgeon Every 5th June
- 4. Determine RAPIDS FLOW & Multi-Use ALLOCATIONS**  
MUNICIPAL & INDUSTRIAL USES + NAVIGATION LOCKS + RAPIDS & FISHERY + HYDROPOWER = PLAN 2012 FLOW & GATE SETTING

**More Info:**

International Lake Superior Board of Control  
www.ilsbc.org  
facebook.com/InternationalLakeSuperiorBoardOfControl

International Joint Commission  
www.ijc.org  
facebook.com/InternationalJointCommission

Units  
m = metres  
ft = 3.28 feet (ft)  
m<sup>3</sup>/s = cubic metres per second  
cfs = 35.3 cubic ft. per second (cfs)



# Niagara Board of Control

- Oversees and Monitors Flows
- Treaty Minimum Flows
- No Regulation plan





# St. Lawrence Board of Control





# Forecasting and Basin Conditions



US Army Corps  
of Engineers  
Detroit District

## St. Clair River Conveyance Change 2007 to 2012



Morphologic Change in the St. Clair River 2007 – 2012  
Conveyance Change Report

U.S. Army Corps of Engineers, Detroit District  
Great Lakes Hydraulics and Hydrology Office

## LAKES MICHIGAN-HURON WATER LEVELS – AUGUST 2016

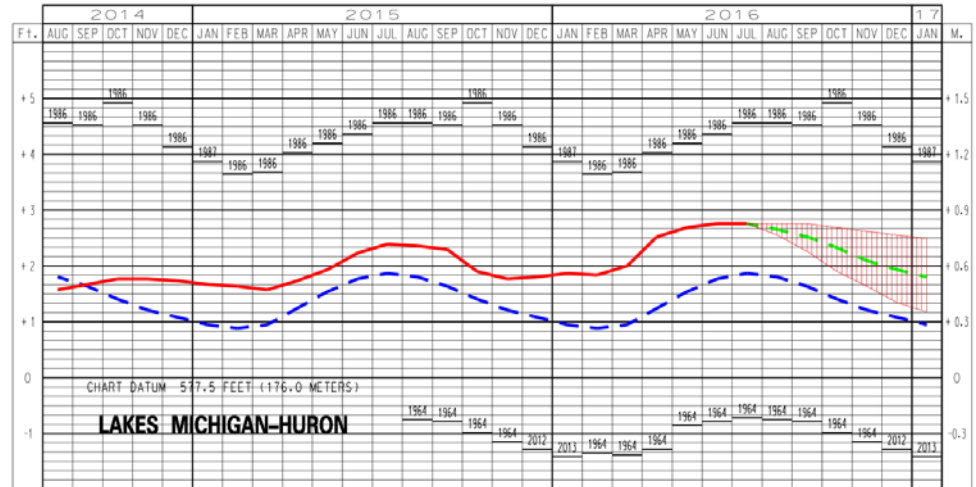
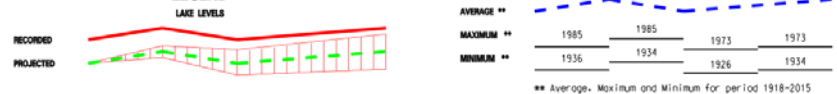


CHART DATUM 577.5 FEET (+176.0 METERS)

LAKES MICHIGAN-HURON

### LEGEND



\*\* Average, Maximum and Minimum for period 1918-2015



# Lake wide Average Levels

**Great Lakes Water Levels (Meters)**

**Great Lakes Water Levels**

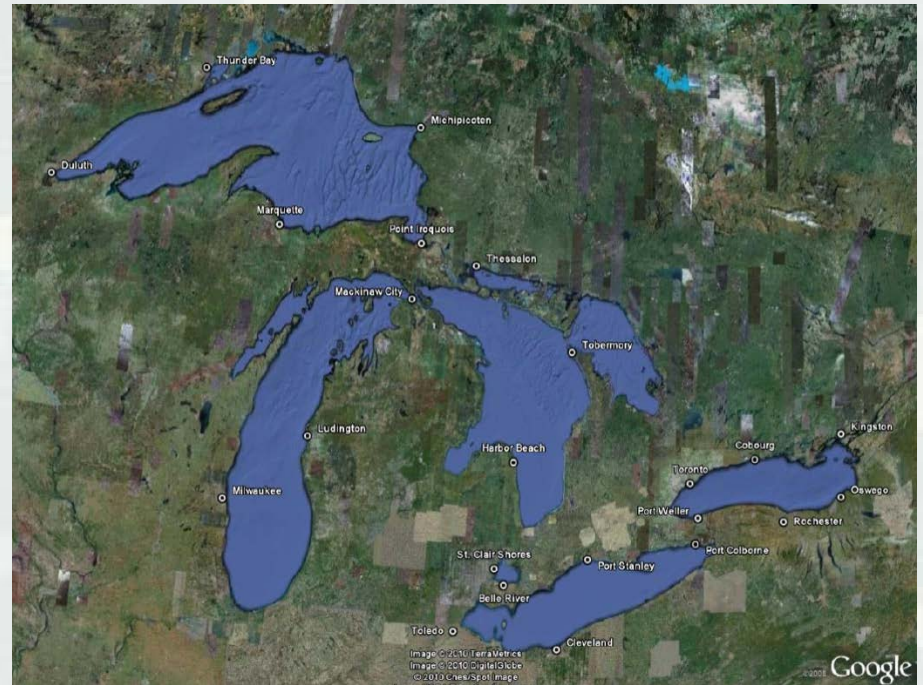
The United States Army Corps of Engineers collects and disseminates this water level data in cooperation with NOAA and the Canadian Hydrographic Service. All data are provisional and are referenced to IGLD 1985. Blanks indicate data that are missing or not yet available.

Date	Superior*	Michigan Huron*	St. Clair*	Erie*	Ontario*
	Daily Mean	Daily Mean	Daily Mean	Daily Mean	Adj. Daily Mean
01-AUG-2016	183.70	176.83	175.49	174.52	74.88
02-AUG-2016	183.69	176.83	175.49	174.52	74.88
03-AUG-2016	183.70	176.83	175.48	174.52	74.88
04-AUG-2016	183.69	176.83	175.48	174.51	74.87
05-AUG-2016	183.70	176.81	175.46	174.48	74.87
06-AUG-2016	183.72	176.81	175.46	174.50	74.86
07-AUG-2016	183.70	176.80	175.46	174.49	74.86
08-AUG-2016	183.68	176.80	175.46	174.50	74.84
09-AUG-2016	183.67	176.80	175.46	174.47	74.84
10-AUG-2016	183.69	176.79	175.45	174.47	74.84
11-AUG-2016	183.70	176.79	175.44	174.46	74.83
12-AUG-2016	183.71	176.80	175.44	174.45	74.83
13-AUG-2016	183.70	176.80	175.44	174.43	74.84
14-AUG-2016	183.70	176.81	175.45	174.47	74.85
15-AUG-2016	183.70	176.80	175.46	174.47	74.84
16-AUG-2016	183.69	176.81	175.49	174.44	74.85
17-AUG-2016	183.69	176.82	175.49	174.46	74.86
18-AUG-2016	183.69	176.82	175.49	174.47	74.85
19-AUG-2016			175.48		
20-AUG-2016			175.46		
21-AUG-2016			175.44		
Mean	183.70	176.81	175.47	174.48	74.85

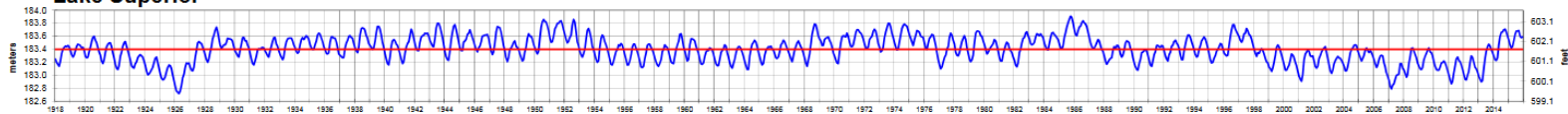
August Statistics	Historic Water Levels				
	Superior	Michigan Huron	St. Clair	Erie	Ontario
Aug Last Month	183.69	176.84	175.49	174.54	74.95
Aug Last Year	183.68	176.72	175.48	174.62	75.11
Minimum	183.01 (2007)	175.77 (1964)	174.41 (1934)	173.43 (1934)	74.00 (1934)
Maximum	183.86 (1952)	177.39 (1986)	175.90 (1986)	174.94 (1986)	75.58 (1947)
Long Term Avg**	183.53	176.55	175.15	174.25	74.88

\* Mean levels are calculated by averaging the best available gage data at report generation and are subject to change.  
 \*\* Period of Record 1918 - 2015

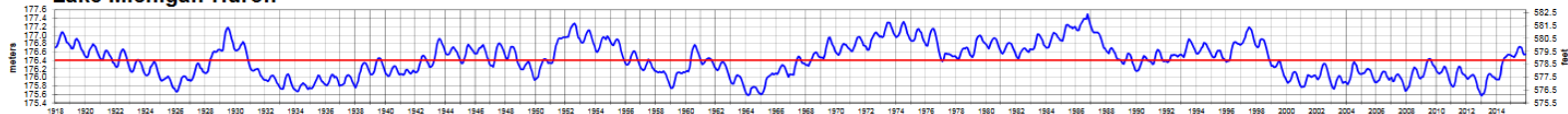


## Great Lakes Water Levels (1918-2015)

### Lake Superior

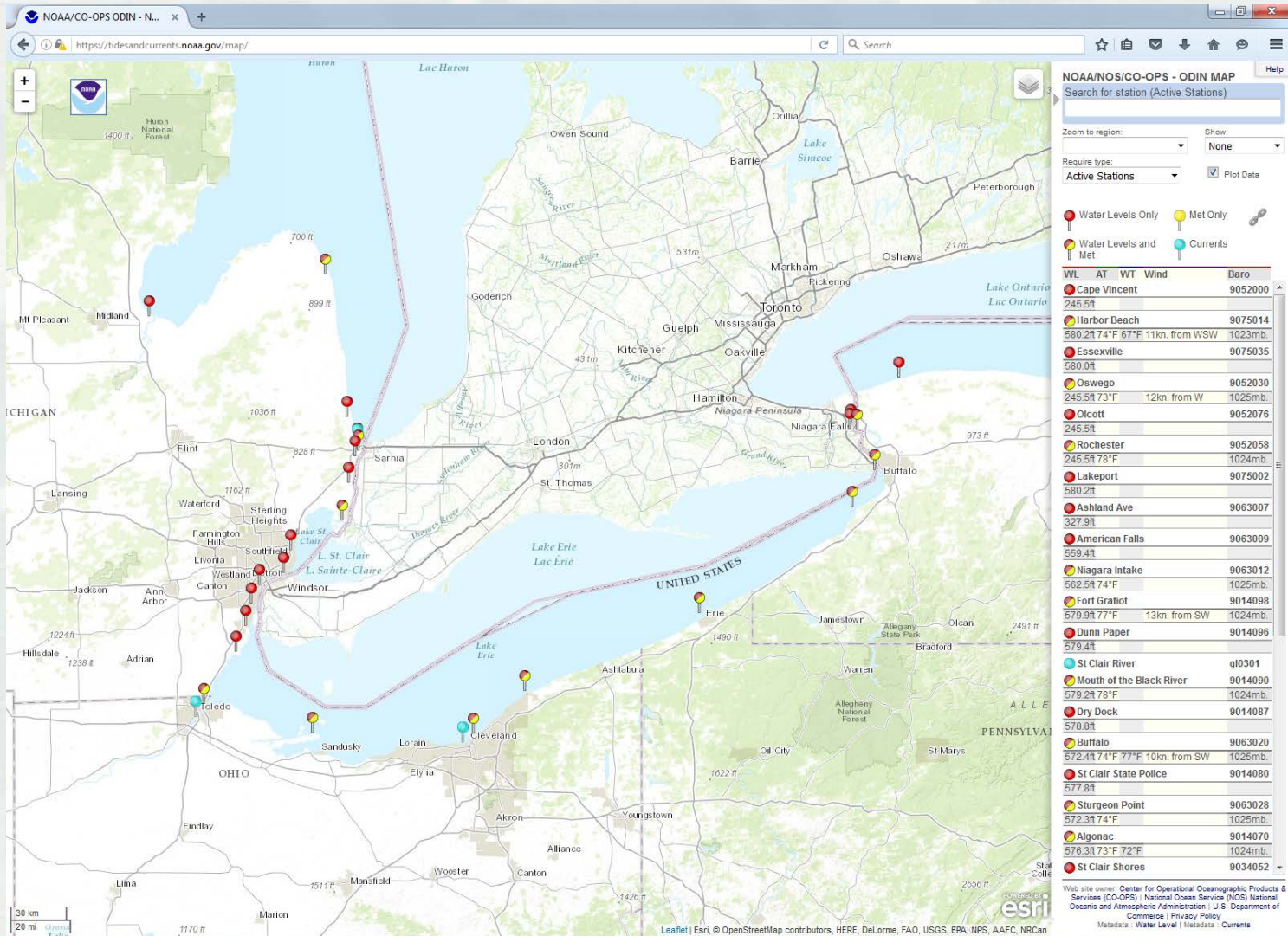


### Lake Michigan-Huron



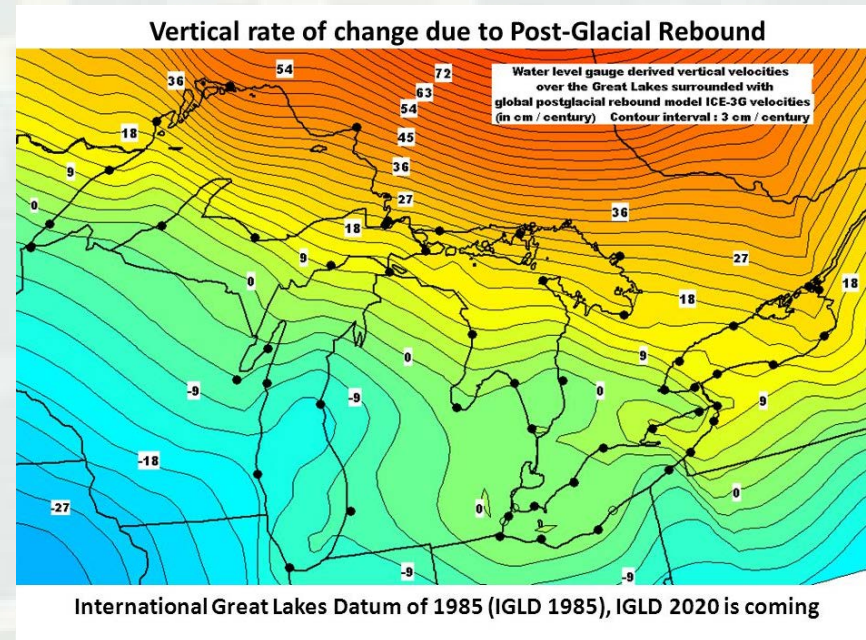
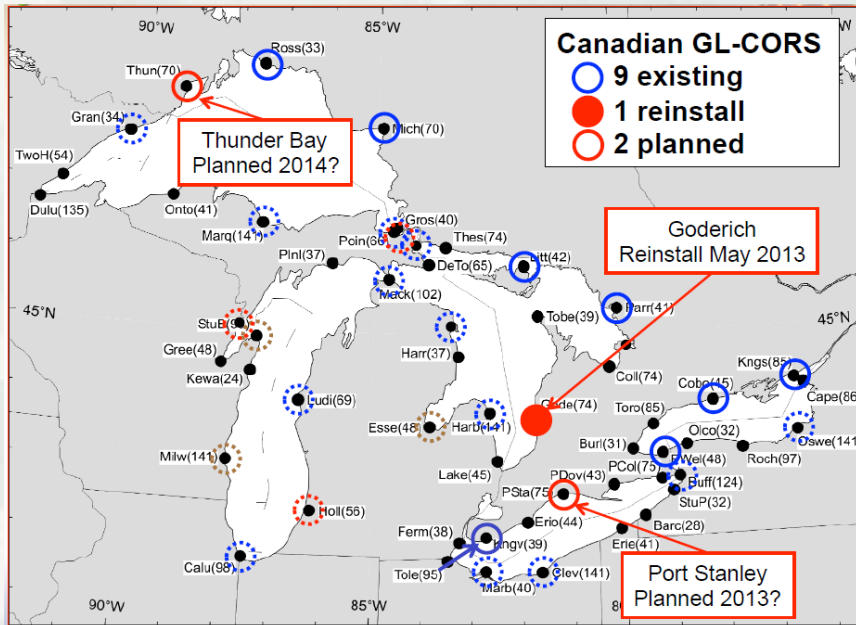


# Connecting Channel Gages





# Glacial Isostatic Adjustment (GIA)



# Coordinating Committee of Great Lakes Basic Hydraulic and Hydrologic Data

- US/CA Federal agencies key to water management of Great Lakes
- Coordinates key data in support of regulation to include:
  - ▶ Water Levels
  - ▶ Precipitation
  - ▶ Evaporation
  - ▶ Datums
  - ▶ Flows
- Established over 50 years ago.
  - ▶ 100<sup>th</sup> Meeting in Ottawa, May 2016



Environment and  
Climate Change Canada



Natural Resources  
Canada



# President's Budget Funding For Dredging Projects Between FY09-13

Funded For Dredging – 29  
 Total Commercial Projects – 60  
 Total Recreational Projects – 80

Of the 140 Great Lakes Navigation Projects, 29 (21%) received President's Budget funding at least one year in the past five. 50% of all the commercial projects received no funding for dredging in the last five President's Budgets.

