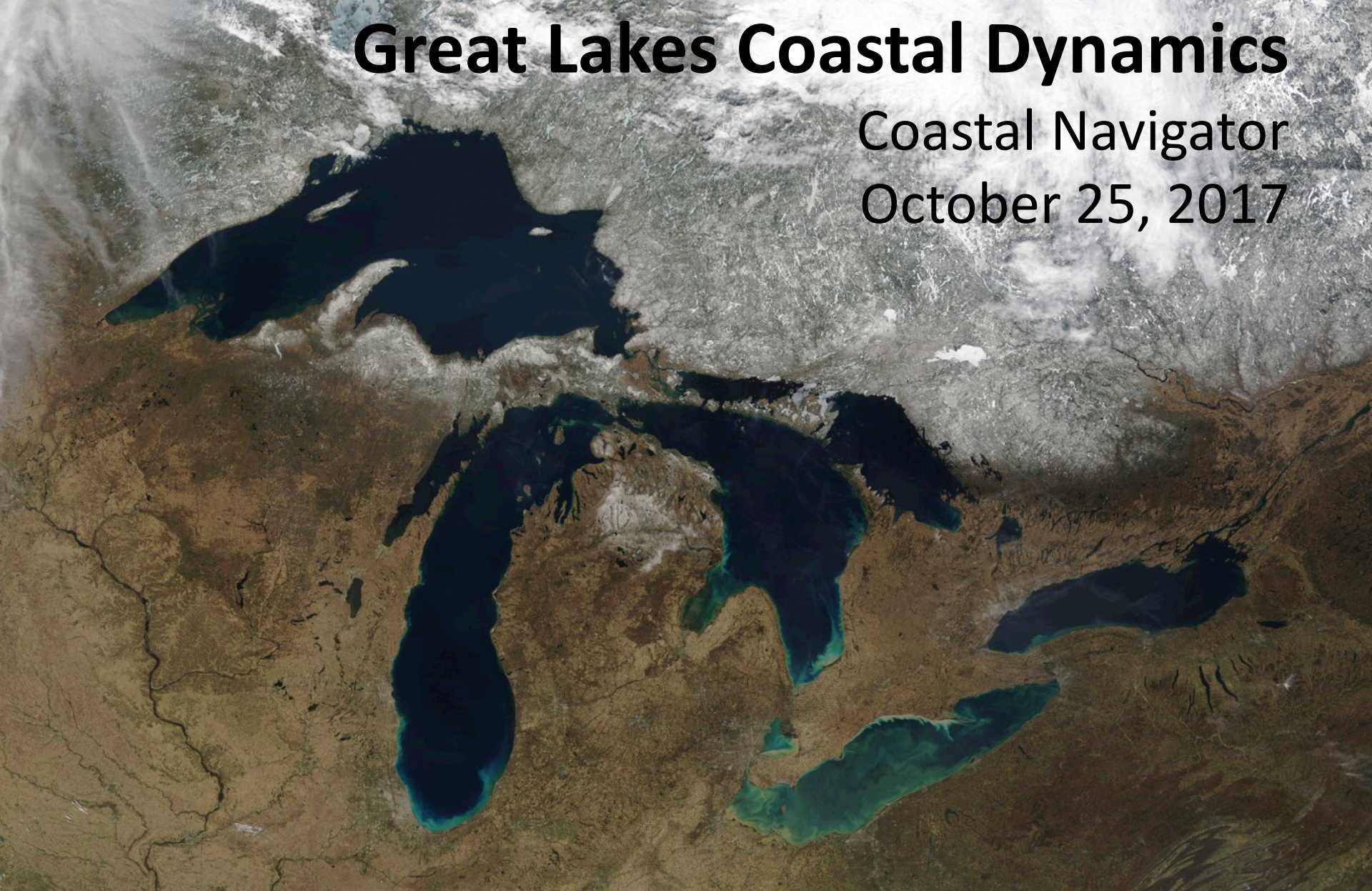


# Great Lakes Coastal Dynamics

Coastal Navigator

October 25, 2017



**Guy Meadows, PhD.**

**Director, Great Lakes Research Center**

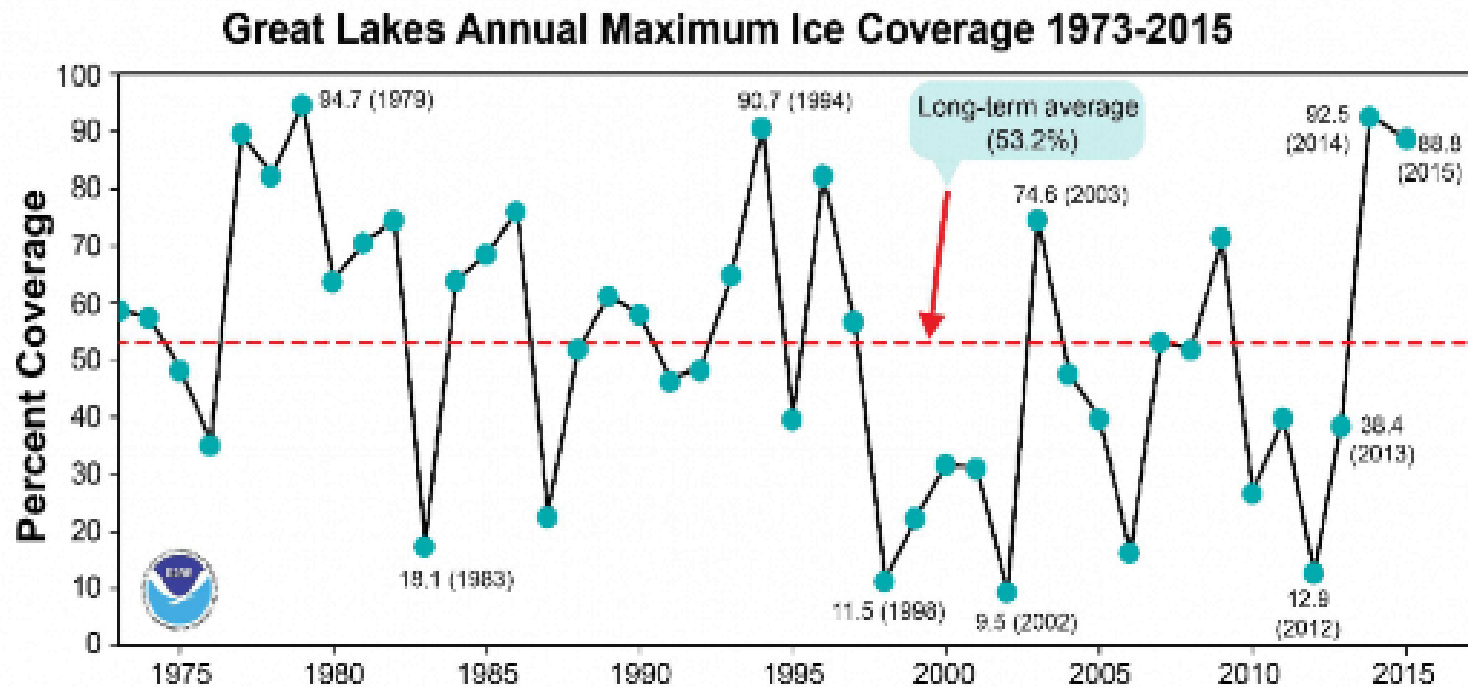
**Robbins Professor of Sustainable Marine Engineering**



# Sustainable Coastal Communities

## Ice as an Indicator of Storminess

### Frequency and Intensity of Storms



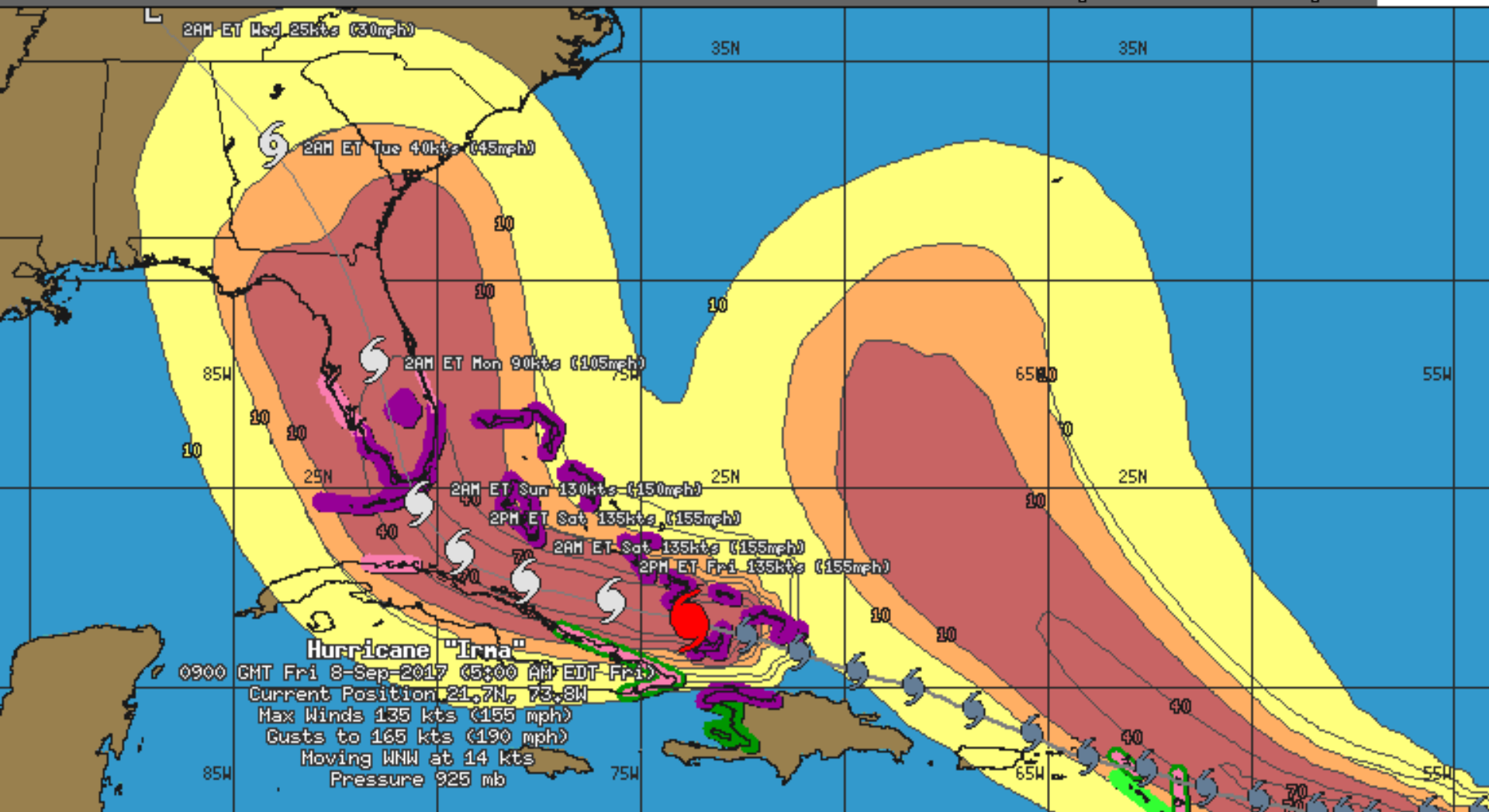


# Storms Are Increasing Everywhere

06:00 13-SEP-2017 GMT Copyright © 1998-2016 WSI Corporation <http://www.wsi.com>

Tropical Cyclone Tracking based on TPC guidance released: 08:54z 08-Sep-2017

Updated: 08:55z 08-Sep-2017



Tropical Storm  
Hurricane

Watch Warning

past cur fest

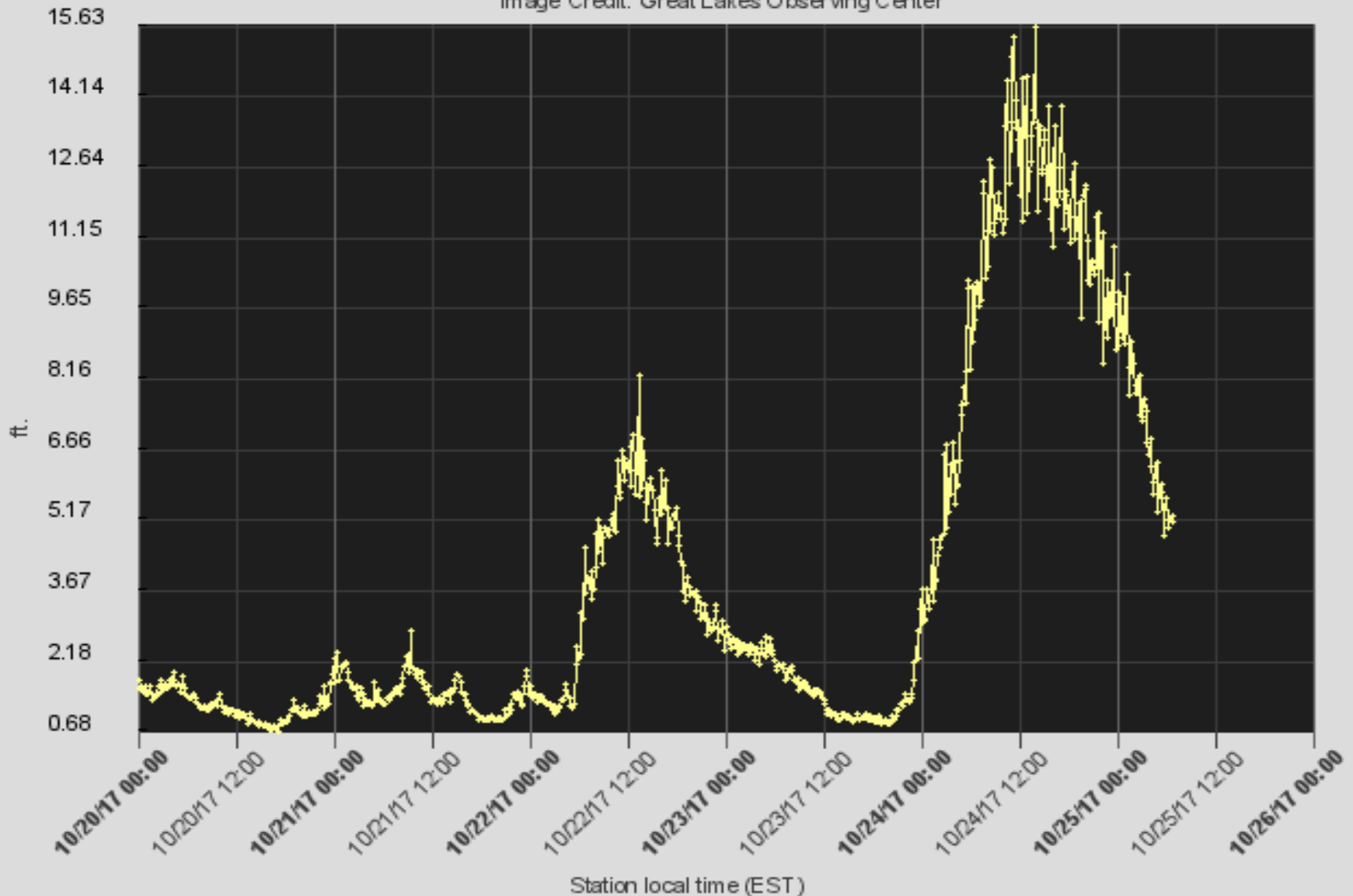
Wind Probabilities contours drawn 10, 40, 70 %

>34kts(40mph) >50kts(60mph) >64kts(75mph)

# Yesterday's Storm

## WVHGT at 45023

Image Credit: Great Lakes Observing Center

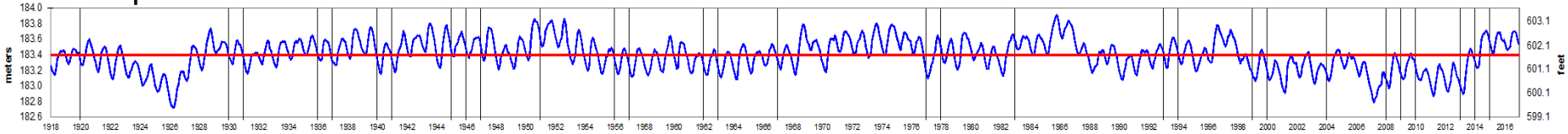




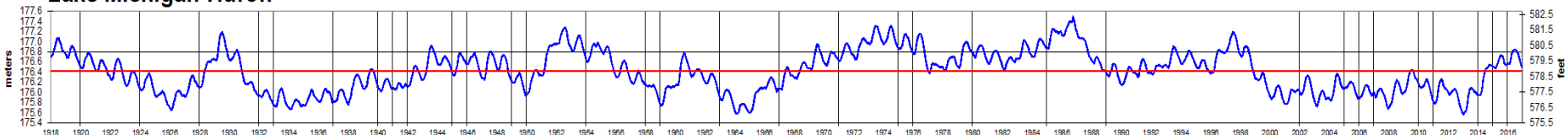
# Great Lakes Water Levels (1918-2016)

— Monthly Mean Level  
— Long Term Annual Average

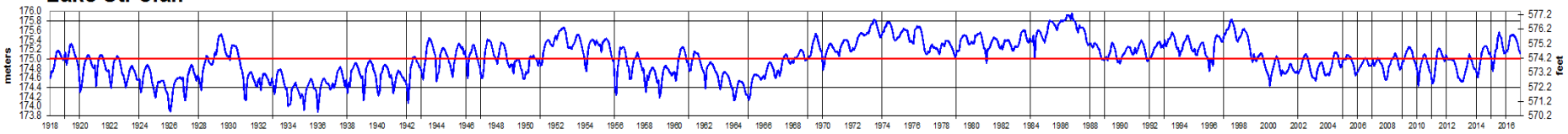
## Lake Superior



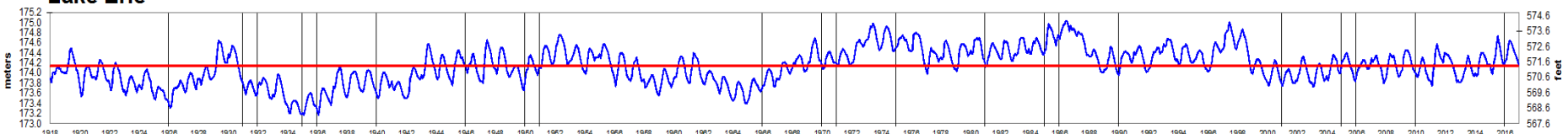
## Lake Michigan-Huron



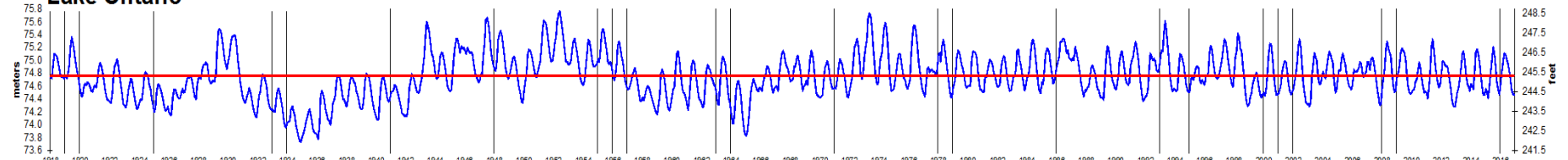
## Lake St. Clair



## Lake Erie



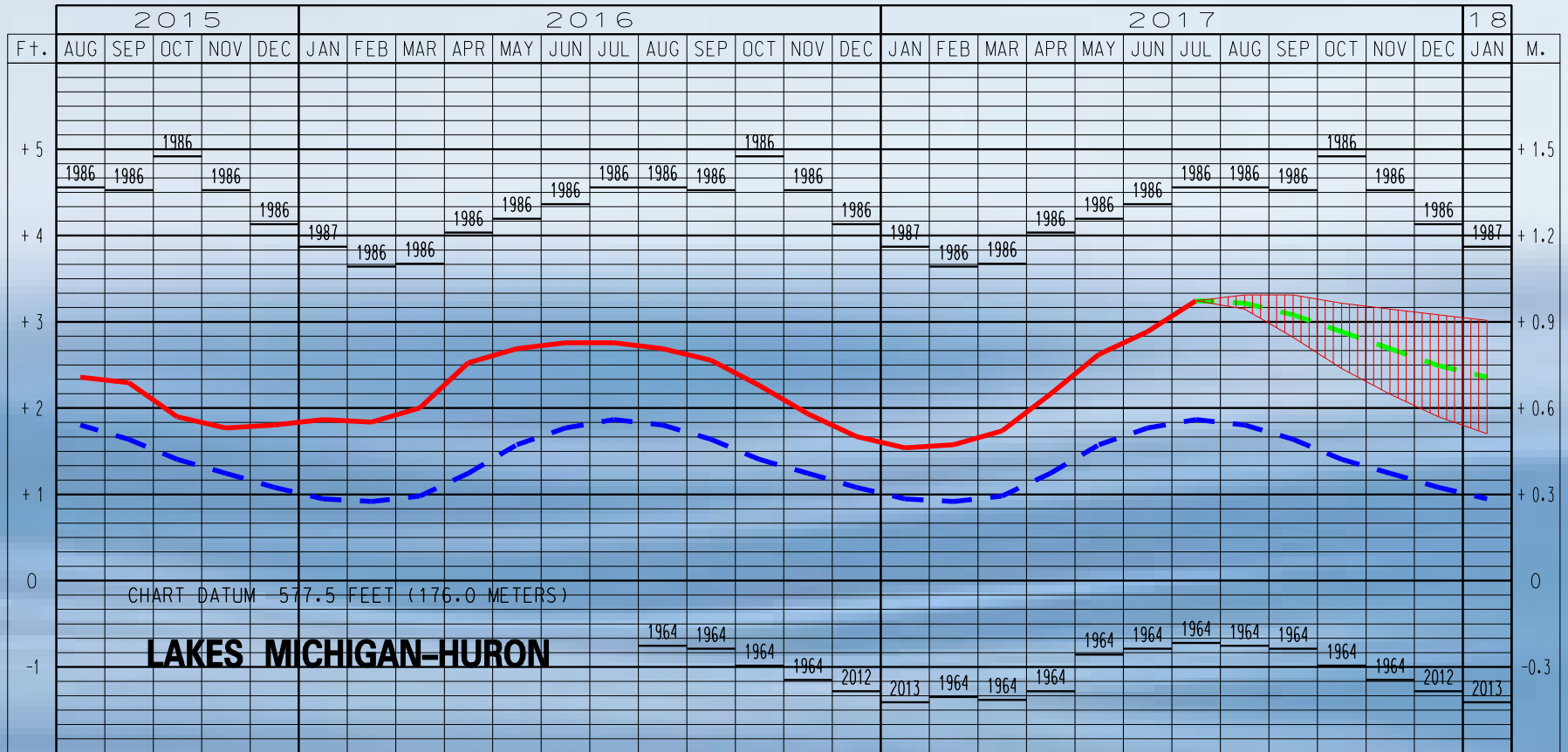
## Lake Ontario



The monthly average levels are based on a network of water level gages located around the lakes.

Elevations are referenced to the International Great Lakes Datum (1985).

# LAKES MICHIGAN-HURON WATER LEVELS – AUGUST 2017

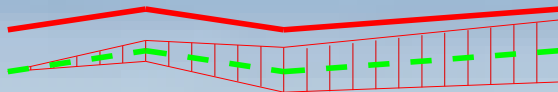


## LEGEND

LAKE LEVELS

RECORDED

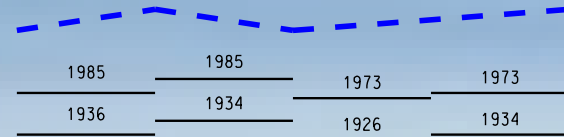
PROJECTED



AVERAGE \*\*

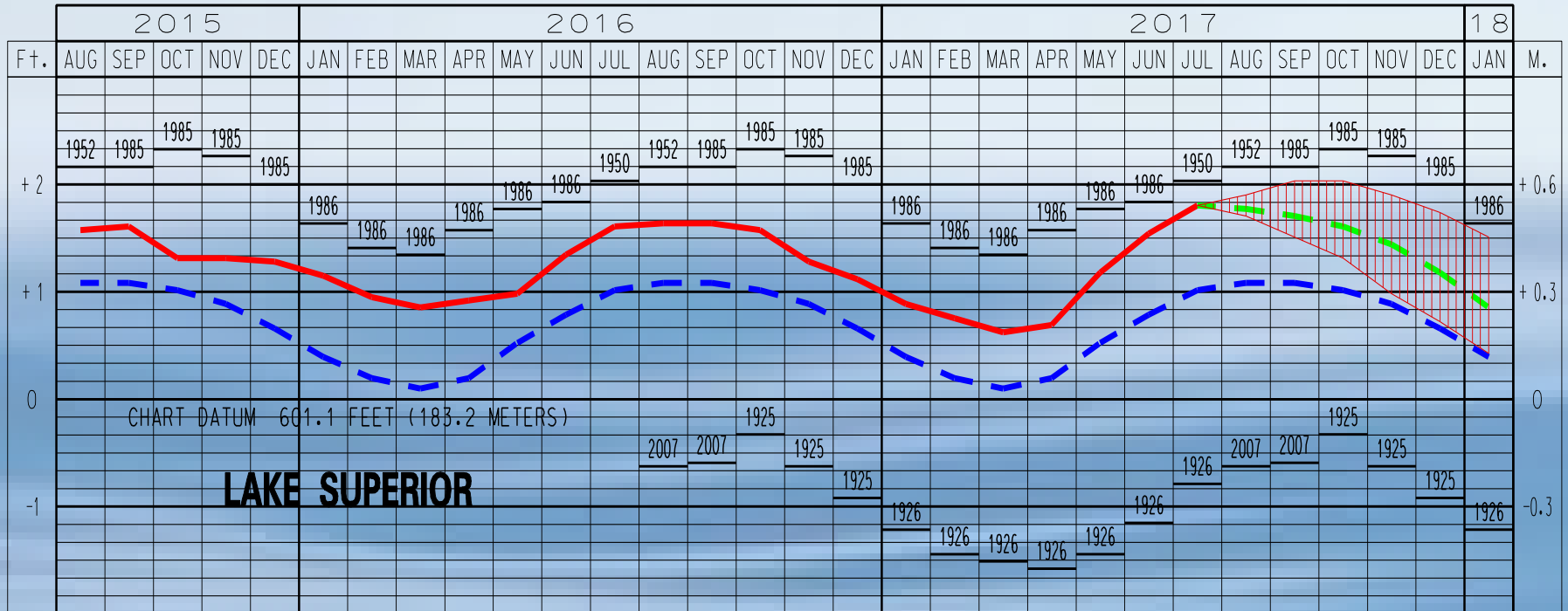
MAXIMUM \*\*

MINIMUM \*\*



\*\* Average, Maximum and Minimum for period 1918-2016

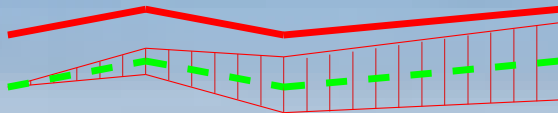
# LAKE SUPERIOR WATER LEVELS - AUGUST 2017



## LEGEND LAKE LEVELS

RECORDED

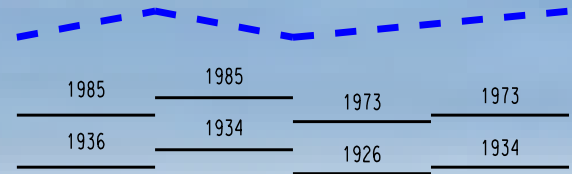
PROJECTED



AVERAGE \*\*

MAXIMUM \*\*

MINIMUM \*\*



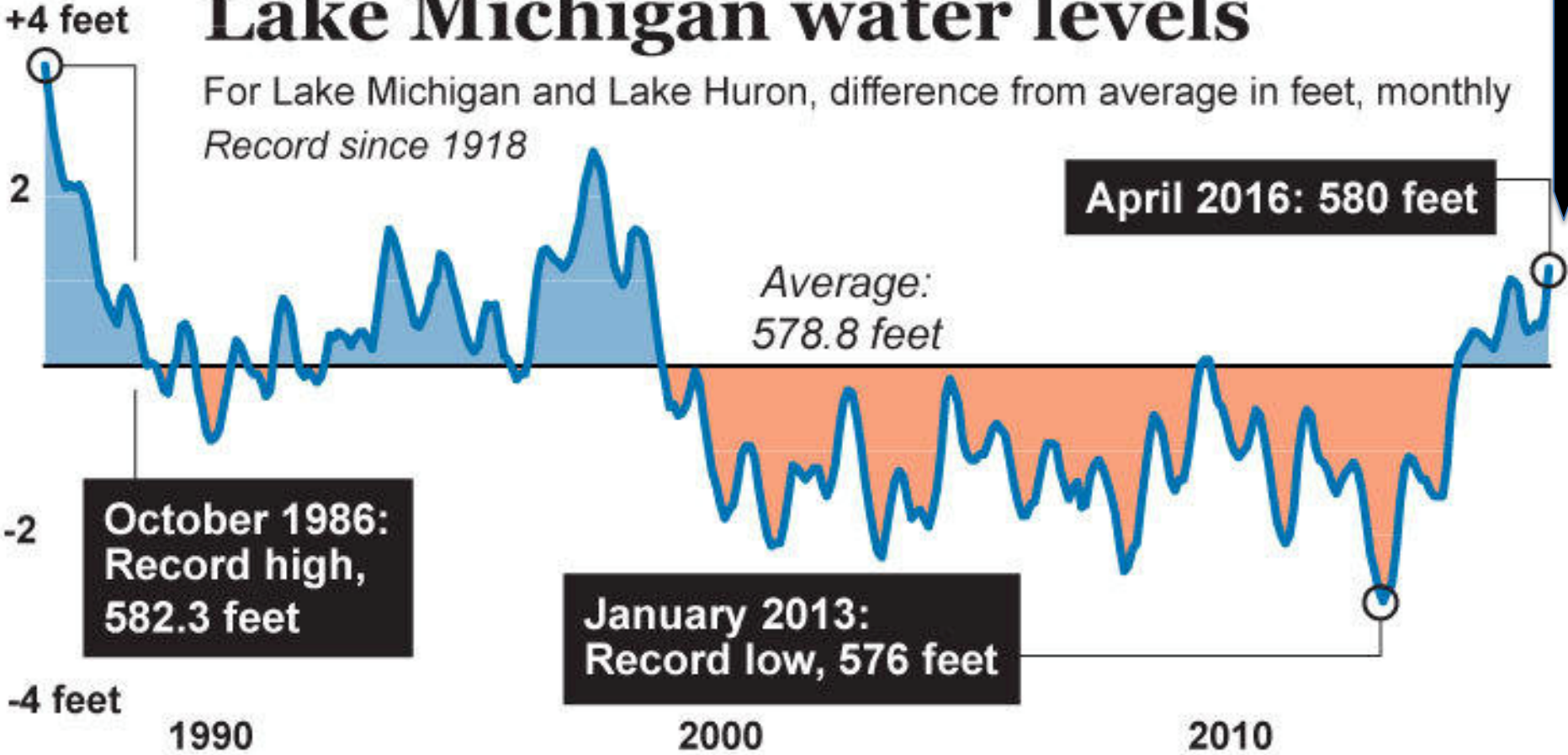
\*\* Average, Maximum and Minimum for period 1918-2016

# Water Levels and FEMA

July 2017: 580.6 feet

## Lake Michigan water levels

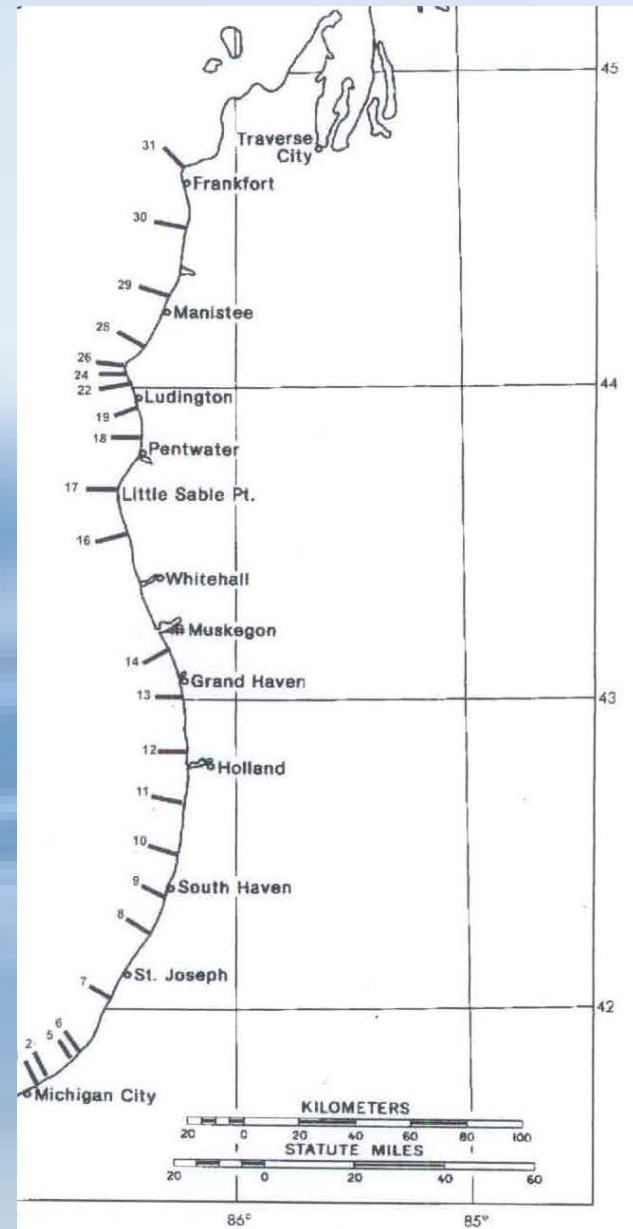
For Lake Michigan and Lake Huron, difference from average in feet, monthly  
*Record since 1918*





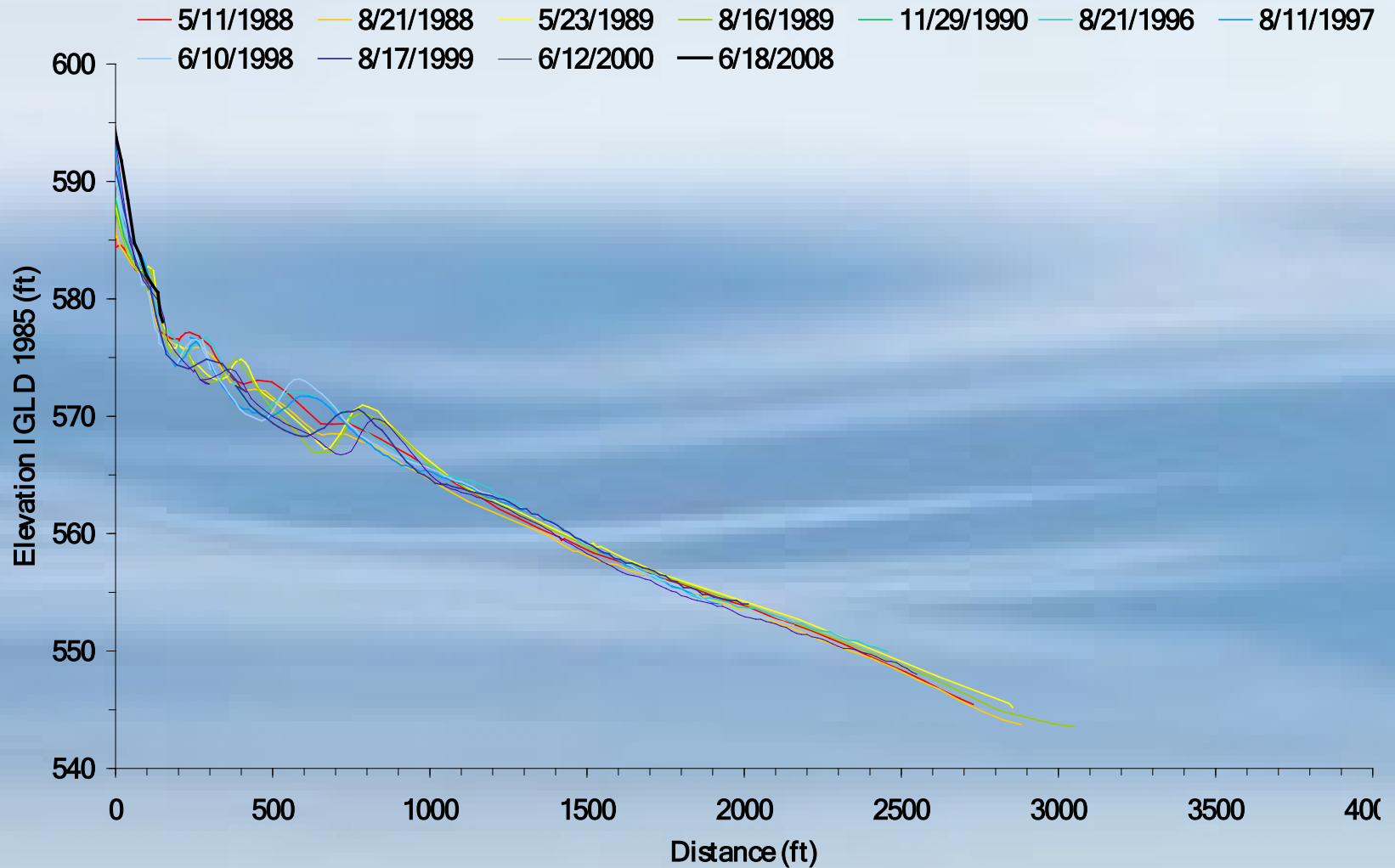
# Historic Survey Data

- 45 Survey Sites
- 31 on Lake Michigan
- 1988-2008 (periodically)
- Primarily MDEQ funded
- Referenced to known bench marks (vertically and horizontally)



# Sample Survey Data

## UM 18 - SUMMIT



# The 1988 Beach

Summit Township Park



October 28, 2008

11



# The 1988 Beach

Chikaming Township Park



October 28, 2008

12



**Great Lakes  
Research Center**  
Michigan Technological University



# The 1988 Beach



October 28, 2008

13



# The 1988 Beach

Buttersville Park - Ludington South



October 28, 2008

14



# Juanita Street 1989 & 2008





# Summit Township Park 1989 & 2008





# The 1988 Beach



October 28, 2008

17



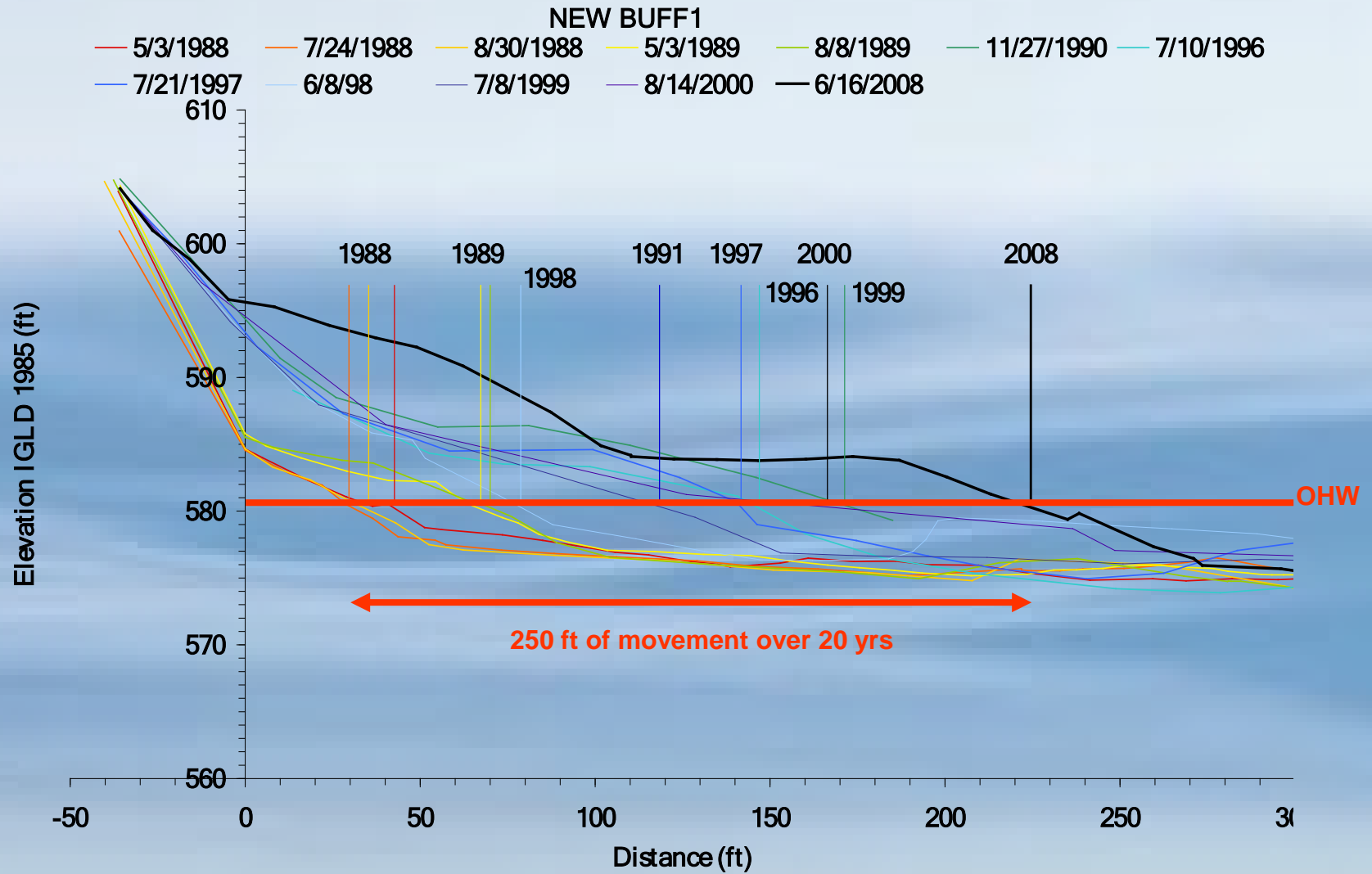
# 2008 Beach



October 28, 2008

18

# UM01

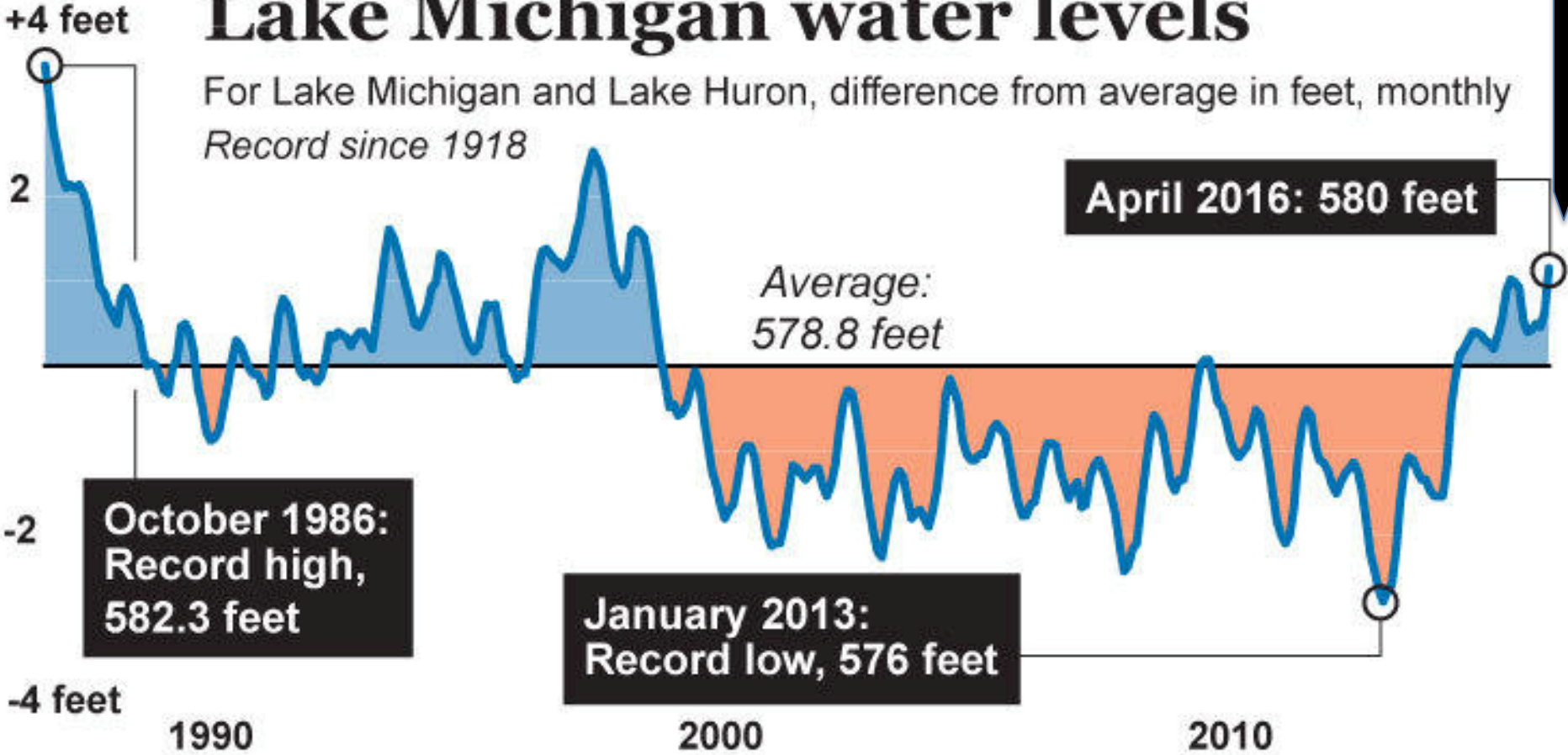


# Water Levels and FEMA

July 2017: 580.6 feet

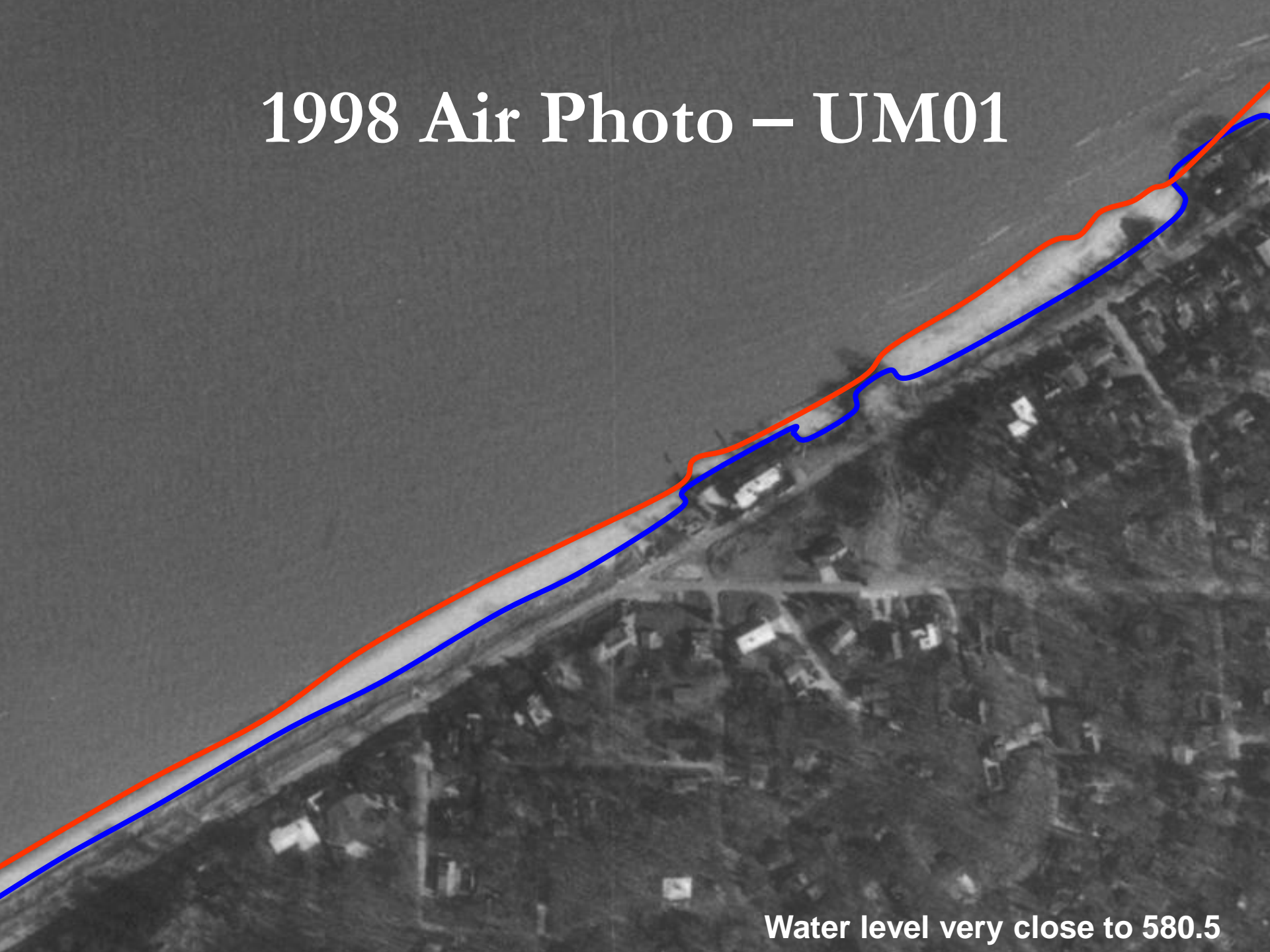
## Lake Michigan water levels

For Lake Michigan and Lake Huron, difference from average in feet, monthly  
*Record since 1918*





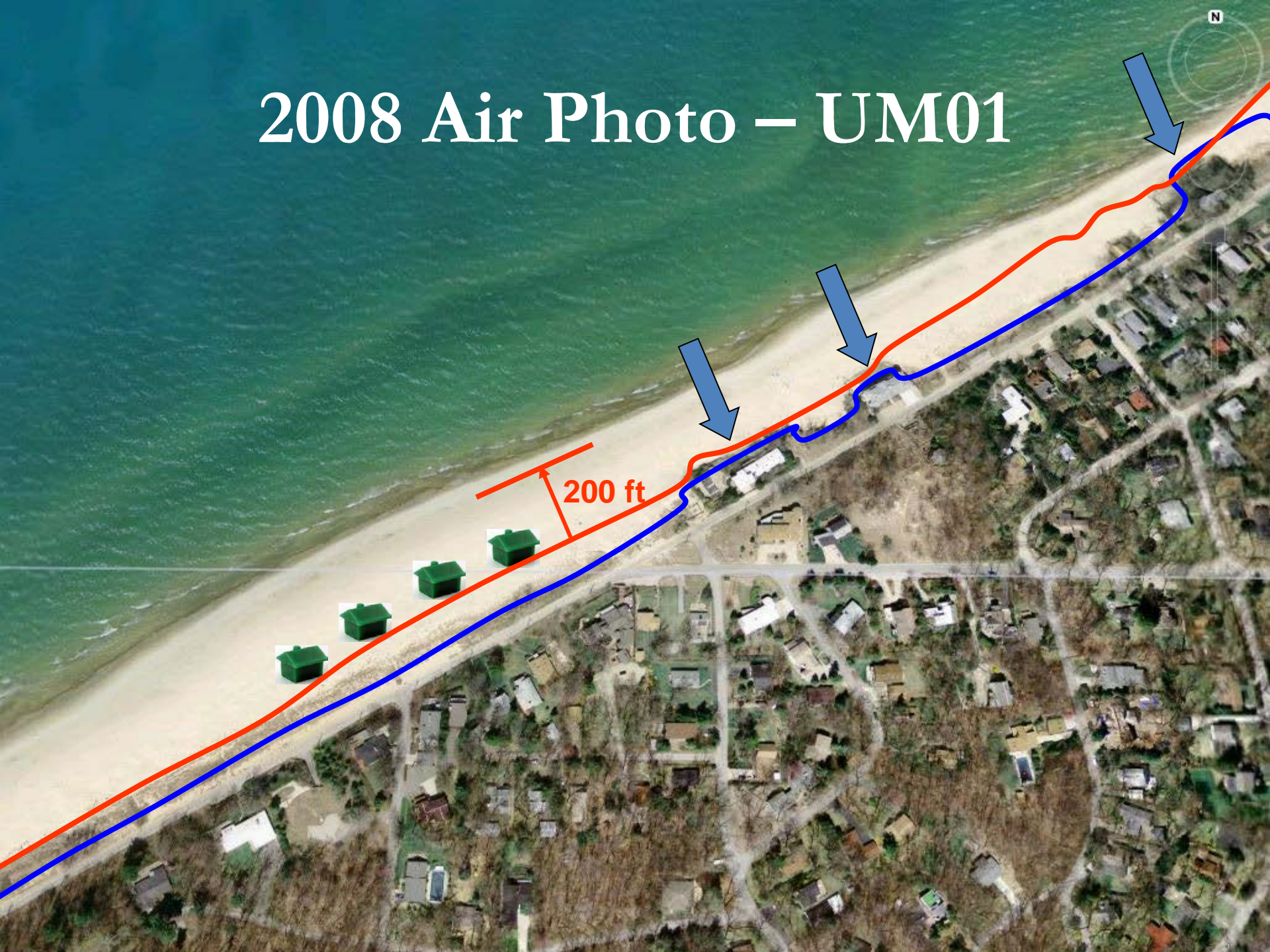
# 1998 Air Photo – UM01



Water level very close to 580.5



# 2008 Air Photo – UM01



# Beaches Change Quickly...And Will Forever Continue to Do So...

- Above the water

- On the water and

- Below the water



**St Joseph, MI**





# Thank You!

## Questions ?



Photo courtesy of FTC&H