Coastal Outreach and Partnerships in the Upper Great Lakes

26 October 2017

Jim Selegean¹, Josh Friend¹ and Linda Lillycrop²

¹Detroit District, ²ERDC
Coastal Outreach and Partnerships in the Upper Great Lakes

- Lake levels and erosion
- Sand supply and shore protection
- Beach Walks with a Scientist
- Coastal Roundtable
### Lakes Michigan–Huron Water Levels - October 2017

<table>
<thead>
<tr>
<th>Year</th>
<th>Ft.</th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
<th>MAY</th>
<th>JUN</th>
<th>JUL</th>
<th>AUG</th>
<th>SEP</th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Legend**

- **Recorded**
- **Projected**
- **Average**: 1985, 1985
- **Maximum**: 1985, 1934
- **Minimum**: 1936, 1926

**Note**: Average, Maximum and Minimum for period 1918-2016

**Chart Datum**: 577.5 feet (176.0 meters)
The Rest of the Lakes

1. Lake Superior
2. Lake Erie
3. Lakes Michigan-Huron
4. Lake Ontario
5. Lake St. Clair
Great Lakes Water Levels (1918-2016)

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 (1958).
Lake Levels and Erosion

1997

2004
Waves Cause Erosion
(Not Lake Levels!)

US Army Corps of Engineers
Detroit District
Erosion in the Last Two Years
Erosion in the Last Two Years

Mini cabin road

3/9/2016
Erosion in the Last Two Years
Erosion in the Last Two Years
An Elevator to Nowhere
Coastal Outreach and Partnerships in the Upper Great Lakes

- Lake levels and erosion
- Sand supply and shore protection
- Beach Walks with a Scientist
- Coastal Roundtable
Source of Most of Lake Michigan Littoral Sand is Eroding Coastal Bluffs
Questionable Development Requires Immediate Shore Protection
A Pandemic of Shore Protection
Evidence of Reduced Sand Supply

Shore Protection South of St. Joseph

Table 4.3 Shore Protection Development

<table>
<thead>
<tr>
<th>Date of Air Photo</th>
<th>Reach 1 (5,450 m)</th>
<th>Reach 2 (4,225 m)</th>
<th>Reach 3 (2,700 m)</th>
<th>Reach 4 (1,660 m)</th>
<th>Total (13,500 m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>1938</td>
<td>1,308</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1,308</td>
</tr>
<tr>
<td>1960</td>
<td>2,889</td>
<td>592</td>
<td>0</td>
<td>0</td>
<td>3,481</td>
</tr>
<tr>
<td>1996</td>
<td>3,815</td>
<td>1,521</td>
<td>1,408</td>
<td>564</td>
<td>7,308</td>
</tr>
<tr>
<td>2002/03</td>
<td>4,524</td>
<td>1,563</td>
<td>1,408</td>
<td>621</td>
<td>8,116</td>
</tr>
</tbody>
</table>
Apr 1991
Water Level: **Average**

Pump Station
Apr 1991 vs. Aug 2014
Water Level: **Average**
July 1984
Water Level: **Above Average**
Evidence of Reduced Sand Supply
Same Scale

1997 – High Water

2011 – Low Water

Oldest and newest photo on Google Earth – This analysis could be expanded using our photo data base (1983, 1989-2002 (14 continuous years) and Regulatory’s data base)
Coastal Outreach and Partnerships in the Upper Great Lakes

- Lake levels and erosion
- Sand supply and shore protection
- Beach Walks with a Scientist
- Coastal Roundtable
Outreach Was Needed to Tell This Story

Beach Walk
With a Scientist

Take a stroll down the beautiful beaches at Van Buren State park with a coastal scientist as he discusses coastal processes and erosion.

Some of the topics to be discussed:

- The effect of lake levels on coastal erosion (and the lake level forecast for the next 6 months)
- What other things affect coastal erosion
  - Waves
  - Harbors
  - Shore protection structures
  - Ice
- The role of dunes in protecting coastal bluffs
- Coastal geology and erosion

When: Thursday, May 26, 2016
7:00—8:30 pm (rain or shine)

Where: Van Buren State Park
23960 Ruggles Rd
(Meet at northwest corner of middle parking lot)

About the Speaker:
Dr. S. Johnson, Ph.D., is a coastal scientist with expertise in coastal processes.
Outreach Was Needed to Tell This Story

Great Lakes Coastal Processes

Meet at the beautiful beaches of Hoffmaster State Park with U.S. Army Corps of Engineers coastal scientists and engineers as we discuss coastal processes, erosion and Corps programs.

Some of the activities and topics to be discussed:

- The effect of lake levels on coastal erosion (and the lake level forecast for the next 6 months)
- What other things affect coastal erosion
  - Waves
  - Harbors
  - Shore protection structures
  - Ice
- The role of dunes in protecting coastal bluffs
- Coastal geology and erosion
- Summary of Corps Regulatory Program and permitting requirements
- Brief overview of Corps Planning Programs and Authorities (specifically Section 14 and 206)
- An interactive beach walk to illustrate these coastal processes

When: Tuesday, September 12, 2017
7:00–9:00 pm (rain or shine)

Where: Hoffmaster State Park
6585 Lake Harbor Rd, Muskegon, MI 49441
(Meet by the concessions in the parking lot)

About the Speaker(s):
Coastal Outreach and Partnerships in the Upper Great Lakes

- Lake levels and erosion
- Sand supply and shore protection
- Beach Walks with a Scientist
- Coastal Roundtable
Coastal Roundtable

- Meet Quarterly
- Composed of local, state and federal agencies with an interest in coastal sustainability
  - MDEQ Coastal Zone Management
  - MDEQ Water Resources Division
  - MDEQ Office of Great Lakes
  - MSU Geography Dept
  - MSU Geology Dept
  - WMU Geology Dept
  - Calvin College, Geology Dept
  - USGS, Michigan WSC
  - USGS, Great Lakes Science Center
  - Michigan Sea Grant
  - U of Waterloo, Geology Dept
  - U of Michigan, Urban and Regional Planning
  - Michigan Geological Survey
  - USACE Detroit District
  - Michigan Tech University
  - ASBPA Great Lakes Chapter

- Needed an issue to all rally around – resurrect the Lake Michigan sand supply
- Share field and training experiences
- Build trusting relationships
- Education
- Agency update of activities
Questions

Jim Selegean, Ph.D., P.E., P.H.
Hydraulic Engineer
USACE – Detroit

James.p.selegean@usace.army.mil
Monitoring Sand Supply
Sub-bottom Profiling
Monitoring Sand Supply

- Cores
- Grab Samples
- Jet Probing
- Underwater Video