Seiche & Winter Preparedness

Roy Widrig

Great Lakes Coastal Processes and Hazards

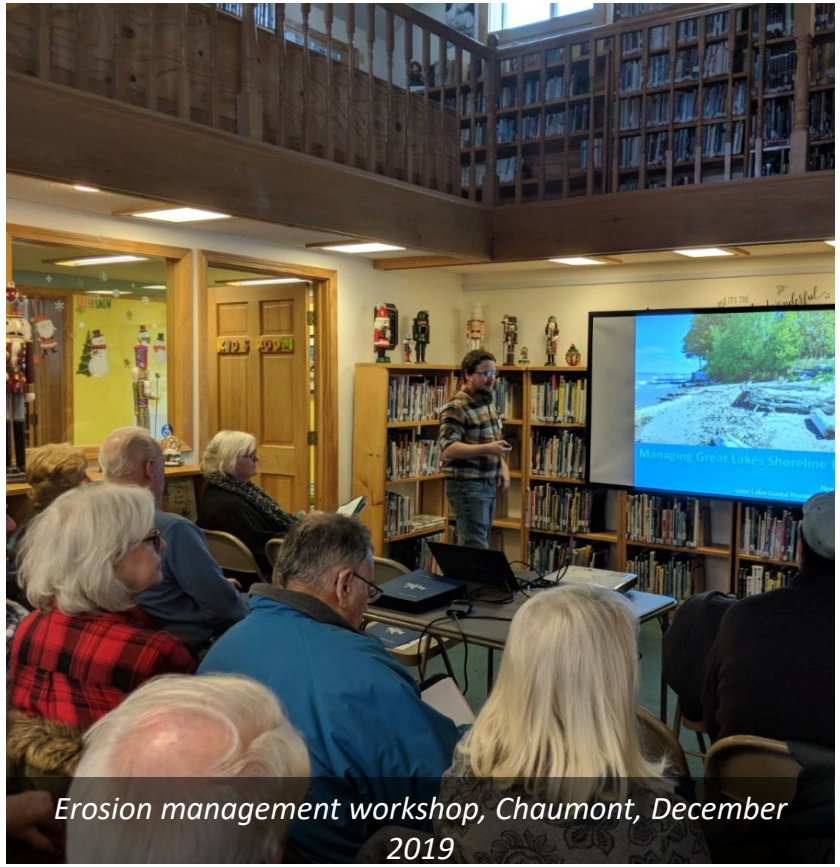
Sea Grant NEW YORK

Agenda

- Introduction
- Judith Levan – National Weather Service Buffalo (Retired)
  - Lake Erie Seiches
- Roy Widrig – New York Sea Grant
  - Seiche & Winter Preparedness
- Shaimus Ryan – NYS Department of Environmental Conservation
  - Coastal Erosion Hazard Areas
- Questions & Discussion Until 8:00 PM

About NYSG

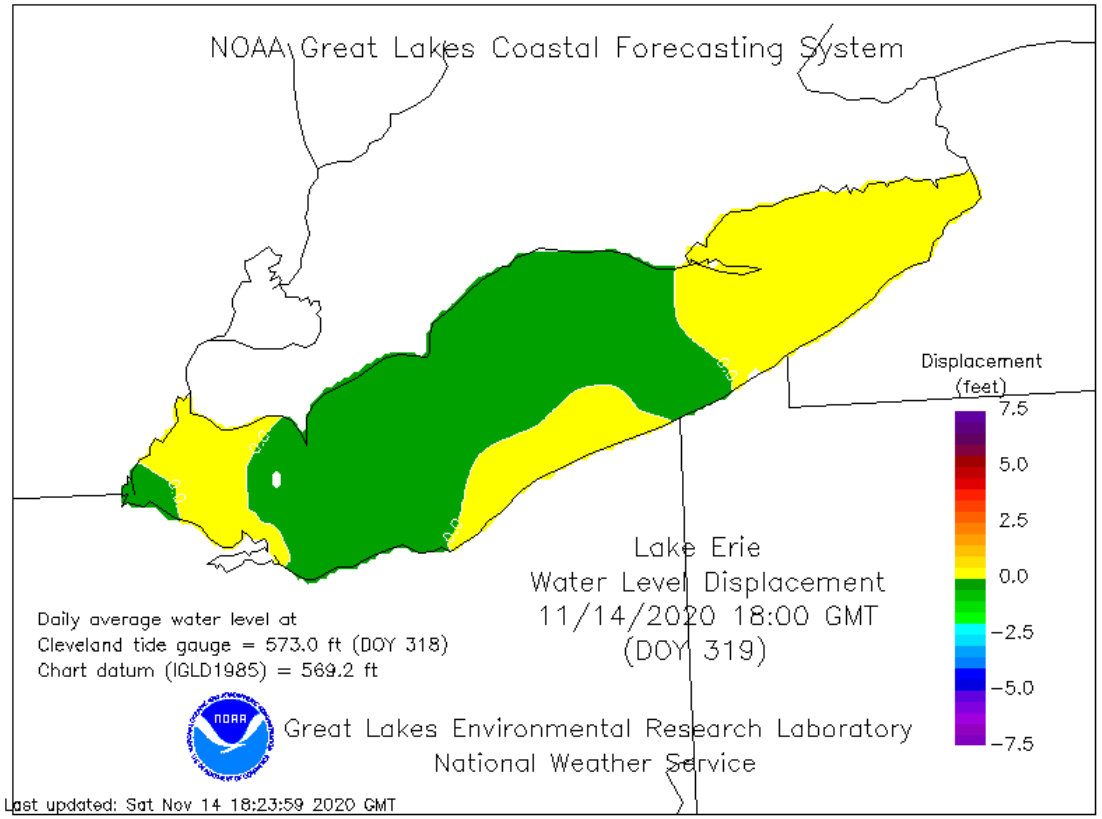
- New York Sea Grant is part of a nationwide network of 34 university-based programs working with coastal communities through NOAA
- Sea Grant research and outreach programs promote better understanding, conservation and use of America's coastal resources.
- Coastal Hazards:
  - Shoreline flooding and erosion, shoreline change, dam safety, science communication
- Funding for this webinar is provided by the New York State Environmental Protection Fund under the Authority of the New York Ocean and Great Lakes Ecosystem Conservation Act, through cooperative agreement with NYSDEC's Great Lakes Program.



Erosion management workshop, Chaumont, December 2019

Seiche in WNY

- Increase the amount of suspended sediment in the nearshore
- Seiche events account for a significant source of nearshore erosion yearly
- Waves influence deeper into the lake, wash farther up the shoreline
- Can move sediment from the nearshore and deposit it further out into the lake



Water Level Data | Meteorological Data | Top-10 Water Levels | USACE Lake Forecast

NOS/NOAA/CO-OPS
Top-10 Highest Water Levels
9063020, Buffalo NY

Units: Standard | Datum: IGLD | JSON Link | XML Link

Date	Height (Feet above IGLD)	Event	Source
November 15, 2020	580.35	Seiche & Cold Front Passage	Observed Peak Water Level
December 2, 1985	580.03	Low Pressure & Seiche	Observed Peak Water Level
April 6, 1979	579.85	Low Pressure	Observed Peak Water Level
January 30, 2008	579.84	Seiche & Cold Front Passage	Observed Peak Water Level
December 23, 2022	579.73	Seiche & Cold Front Passage	Observed Peak Water Level
December 11, 2021	579.52	Seiche & Low Pressure	Observed Peak Water Level
November 10, 1975	579.51	Low Pressure	Observed Peak Water Level
November 1, 2019	579.37	Seiche & Cold Front Passage	Observed Peak Water Level
January 12, 2020	579.09	Low Pressure	Observed Peak Water Level
December 15, 1987	579.03	Seiche & Low Pressure	Observed Peak Water Level

Listing of the top historical water levels, along with the associated weather event (if known). Most values are based on the 6-minute peak water level observed at the tide gauge. Top historical water levels prior to 1996 are typically based on hourly observations. At times where observed water levels are unavailable, values may be taken from high water marks. For additional information or data, please visit the Extreme Water Levels website.

https://tidesandcurrents.noaa.gov/inundationdb/inundation.html?id=9063020

Weathering Seiche

Reducing the Impact of Seiche

- You can't change:
  - Climate
    - Wind, wave strength
  - Nearshore bathymetry*

- You can change:
  - Shoreline shape
  - Shoreline slope
  - Drainage
- You may be able to change:
  - Building & utility elevation
  - First floor inundation
  - Distance from crashing waves & debris
  - Location **& mobility** of shoreline structures
    - Docks, boat lifts, stairs, etc.

Verticality

- Often - Vertical, concrete walls along the shoreline
- Waves impact the shoreline at high strength – no dispersal
- Nearshore scouring
- Often a lack of drainage (waves overwash and cannot dissipate over a beach)

Shoreline resident submission through Virtual Site Visit

Drainage

- Pressure builds behind walls
- Seiche overwash unable to drain naturally
- Accelerated by runoff from storm events (heavy rain, snowmelt) and lakeshore roads
- Proper drainage extends the life of shoreline armor, prevents standing water


Shoreline resident submission through Virtual Site Visit

Drainage

- Build into original designs – preparedness
- Limit soil compaction behind walls – utilize vegetation
- Avoid vertical shoreline protection measures

Debris

Debris

- Woody debris, plastic, concrete, rocks, sand
  - Have a community plan for removal
- Site by site and event by event
  - Could it be locally beneficial?
- Shoreline shape, exposure, specific storm events
- Winter preparedness – window boarding, shoreline vegetation*

Irving, NY

Working with Residents

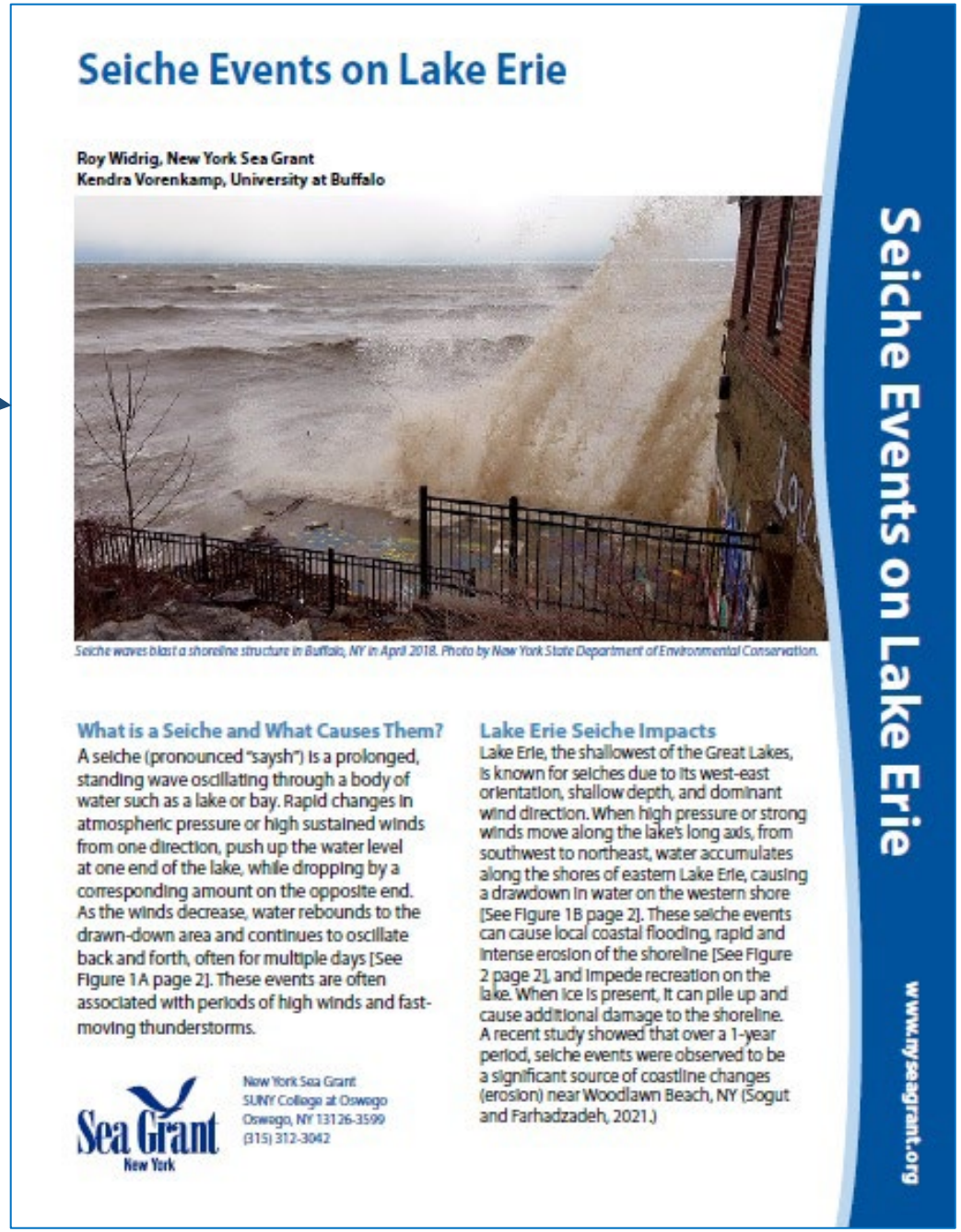
- Seiche Fact Sheet
- Virtual Site Visits, Consultations
- Seiche Preparedness Webinar
- Shoreline/Coastal Monitoring
- We might not have *all* the answers but may know someone who does

May 2022

October 2023

Resources

- Seiche Fact Sheet
- Shoreline Resident Folders
- Great Lakes Portal
  - https://www.weather.gov/greatlakes/
- Beach Hazards
  - https://www.weather.gov/greatlakes/beachhazards
- Ice Cover
  - https://www.glerl.noaa.gov/data/ice/#currentConditions
- **MyCoast – Storm and flooding reporting**



Seiche Events on Lake Erie

Roy Widrig, New York Sea Grant
Kendra Vorenkamp, University at Buffalo

Seiche waves blast a shoreline structure in Buffalo, NY in April 2018. Photo by New York State Department of Environmental Conservation.

What is a Seiche and What Causes Them?

A seiche (pronounced "saysh") is a prolonged, standing wave oscillating through a body of water such as a lake or bay. Rapid changes in atmospheric pressure or high sustained winds from one direction, push up the water level at one end of the lake, while dropping by a corresponding amount on the opposite end. As the winds decrease, water rebounds to the drawn-down area and continues to oscillate back and forth, often for multiple days [See Figure 1A page 2]. These events are often associated with periods of high winds and fast-moving thunderstorms.

Lake Erie Seiche Impacts

Lake Erie, the shallowest of the Great Lakes, is known for seiches due to its west-east orientation, shallow depth, and dominant wind direction. When high pressure or strong winds move along the lake's long axis, from southwest to northeast, water accumulates along the shores of eastern Lake Erie, causing a drawdown in water on the western shore [See Figure 1B page 2]. These seiche events can cause local coastal flooding, rapid and intense erosion of the shoreline [See Figure 2 page 2], and impede recreation on the lake. When ice is present, it can pile up and cause additional damage to the shoreline. A recent study showed that over a 1-year period, seiche events were observed to be a significant source of coastline changes (erosion) near Woodlawn Beach, NY (Sogut and Farhadzadeh, 2021.)

Sea Grant New York
New York Sea Grant
SUNY College at Oswego
Oswego, NY 13126-3599
(315) 312-3042

Seiche Events on Lake Erie

www.nyseagrant.org

Angola
Erie County, NY

Flood Watch Report
by **Joanna Panasiewicz**

11/16/2020 | 9:20 am

11/16/2020 | 9:20 am

Great Lake Overview

Data from STURGEON POINT (5.4 miles away)

Water Level (at time of report): 574.5'

Weather Overview

Wind Speed: 17.5 MPH

Wind Direction: W (263°)

Temperature: 42°F

Rainfall (Calendar Day): 0"

Rainfall (Past 24 Hours): 0.27"

(Click here for full weather details)

Riverine Overview

Data from BIG SISTER CREEK AT EVANS CENTER NY (3.9 miles away)

Water level: 4.02' (NWS Flood Status: Not defined)

Discussion