

Learn about your environment **NIE**

Where to find marine forecasts, data, more

By ANNA McCARTNEY
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Physical processes have a major impact on environmental, chemical, and biological processes and influence many other types of user activities. Water supply management, waste water management, power plant sitings, shipping, recreational and commercial boating and fishing, shoreline erosion and redistribution of sedimentary material all rely on good forecasts.

NOAA's Great Lakes Environmental Research Laboratory (GLERL) has a long history of addressing a wide range of environmental issues in the Great Lakes and other coastal environments. GLERL is the only NOAA research laboratory that has the breadth of scientific expertise to address complex Great Lakes ecosystem issues. GLERL research and programs provide important information to decision-makers and others to help them make good choices. All of GLERL's long-range research is targeted toward producing a suite of forecasts and forecasting capabilities of physical and ecological conditions that will advance an ecosystem-based approach to management. The Great Lakes Coastal Forecast System, the GLCFS Web site, (www.glerl.noaa.gov/res/glcfs/)

is a useful forecasting system for all users of the Great Lakes coastal waters who require real-time information and forecasts of temperatures, currents, water levels, and waves.

These forecasts provide National Weather Service marine forecasters with a significant source of information, which should lead to considerable improvements both in the accuracy and efficiency of marine forecasts for the Great Lakes.

GLERL also has exceptional resources for teachers to make Great Lakes data more accessible and easy to use with their students. Great Lakes Water Data Sets for Teachers (<http://people.emich.edu/srutherf/NOAA/>) contains real data extracted from on-going and historic GLERL research projects, including temperature, dissolved oxygen and seiche data.

Data is in a format that is easy to use in the classroom. Middle or high school students and teachers can conduct their own inquiries, support guided inquiries, demonstrate limnological concepts or just practice graphing, mapping and mathematics using real data.

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CONTRIBUTED PHOTO

On Dec. 28, the power of waves fueled by steady winds broke up the ice dunes that were protecting the shoreline and created conditions for a seiche in Buffalo. Similar conditions on Jan. 30, 2008, caused high water level and waves of 12 to 16 feet, resulting in a record seiche that caused flooding in Buffalo.

Can you say 'seiche?'

Weather phenomenon creates dramatic effect on Lake Erie

By ANNA McCARTNEY
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The word "seiche" (pronounced saysh) may have no meaning for you. But people who have experienced the phenomena know that it can cause death and destruction in moments.

One of the greatest disasters in Buffalo was caused by a seiche. It was produced by prolonged strong winds pushing the water toward that end of Lake Erie. It occurred at 11 p.m. on Oct. 18, 1844, when a wall of water 22 feet high quickly inundated the commercial and residential districts along the waterfront. Without warning, the water breached the 14-foot sea wall and flooded the waterfront. Seventy-eight people drowned that day, according to newspaper accounts. When the winds stopped, the water moved back in the direction from which it came.

A seiche occurs in an enclosed body of water such as a lake, bay or gulf. Like water sloshing back and forth in a bath tub, the water in the lake is pushed by strong winds and rapid changes in atmospheric pressure, causing the

water level to rise on one side of the lake as it goes down on the opposite side. The waves slosh back and forth between shores of the lake basin and with no warning, cause huge fluctuations where the shoreline and harbor water levels can rise or fall by many feet.

Most seiches go unnoticed and never cause much damage in the Great Lakes because they are relatively subtle and imperceptible, causing water levels on beaches to rise just a foot or less.

However, because Lake Erie is the shallowest of the Great Lakes, the effects of storm-driven waves are amplified and when the wind blows from the southwest to the northeast, seiches are more dramatic.

Another record seiche in Buffalo happened on Jan. 30, 2008. Sustained strong winds following the passage of a cold front caused the Lake Erie water level to rise substantially. The high water levels and waves of 12 to 16 feet resulted in erosion of the lake shore and significant flooding at the extreme eastern end of the lake.

Roads along the lake shore were water-covered or closed be-

cause of spray. Floodwaters inundated the First Ward (west side) of the city of Buffalo, with entire neighborhoods under water. The Lake Erie water level rose 11 feet above its eight-foot flood stage for over three hours. According to the National Oceanic and Atmospheric Administration, this was the second highest lake level on record.

That same day in Erie, the southwest winds blew steady at 35 mph and gusted up to 54 mph throughout the day. As the water was pushed to the northeast, the high water combined with 12-foot waves and caused flooding on the peninsula and lifted docks from their moorings. Harry Leslie, park operations manager at Presque Isle State Park, said: "Presque Isle Bay filled up with five to six feet of water from one of the strongest storms I had witnessed since I started working at the park in 1989."

The power unleashed by the waves and high water toppled ice dunes that had formed on the lake side and broke up the ice on the bay, which had been dotted with anglers before the storm. "One day you saw people ice fish-

ing; the next day you could take a boat out," Leslie said.

A similar storm occurred on Dec. 28 after a record-high temperature of 67. The cold front that whipped across the area that morning brought damaging winds and created the right conditions for another seiche.

Winds, as high as 75 mph, wreaked havoc with the Buffalo Bills game and resulted in power outages to thousands. Three duck hunters were rescued from the Barcelona Harbor when their duck boats were swamped by high winds, rain and waves. A section of Route 5 was closed near Hamburg, N.Y., but fortunately this time the water level in Buffalo did not reach a record high.

The wicked winds that wreak havoc and cause seiches when they whip across the waters of Lake Erie ended 2008 much as they began — stirring up waves that rip out sections of beach, cause flooding and trigger dramatic rescues.

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BY THE NUMBERS

14
hours

The period of a typical seiche across Lake Erie. For other lakes, the period is shorter, for example, in Lake Champlain in upstate New York, it's four hours; Scotland's Loch Ness, about 30 minutes.

06/26/1954

A seiche 2.44 meters (8 feet) high and 40 km (25 miles) wide hit Chicago's lakefront. Eight people were killed, most of whom were swept into the water and drowned while fishing in Montrose Harbor.

1890

The year the term seiche was first promoted by the Swiss hydrologist François-Alphonse Forel who had observed the effect in Lake Geneva, Switzerland. The word originates in a Swiss French dialect word that means "to sway back and forth."

SOURCE: www.fact-archive.com/encyclopedia/Seiche



LEARN MORE

What: Visiting scientist lecture, "The Coyotes of Presque Isle," by Tracy Graziano

When: Tonight at 7 p.m.

Where: The Tom Ridge Environmental Center

For more information, contact: Jeanette Schnars at 835-6975 or visit www.RegSciConsors.com

What: Presque Isle After Dark program, "Night walk at Erie Bluffs State Park"

When: Saturday, Jan. 31, 6 to 8 p.m. If you are not sure how to get to the Bluffs, meet the naturalist at the Tom Ridge Environmental Center; departure is at 5:30 p.m. Bring a flashlight. Dress appropriately for the outdoors. The walk will be about one mile long.

For more information, contact: Brian Gula, environmental education specialist, 217-9632

What: Presque Isle Little Naturalist program, "Critters under cover," for children ages 3 to 6 accompanied by an adult. Be prepared to be outdoors for the full hour.

When: Wednesday, Feb. 4, from 1 to 2 p.m.

Where: Meet at the Rotary Pavilion to explore Presque Isle forests and discover the critters that hide under logs and in other habitats. After the program, join us for hot cocoa at the Ranger Station and warm up by the fire. No fee. No registration required.

For more information, contact: Emily Borcz, environmental education specialist, 838-2454

What: Family fishing at Presque Isle State Park, sponsored by the Pennsylvania Department of Conservation and Natural Resources, the Pennsylvania Fish and Boat Commission and the SONS of Lake Erie.

Where: The Rotary Pavilion at the East Pond,

When: Saturday, Feb. 14, from 11 a.m. to 3 p.m. The SONS will be cooking up hot dogs. All equipment is provided. No fee. No registration. Appropriate for all ages. Dress appropriately for the outdoors. No ice that day, no problem. We will still fish in Waterworks Pond with regular gear.

For more information, contact: Brian Gula, environmental education specialist, 217-9632

What: Build your own pair of traditional wooden snowshoes

Where: Tom Ridge Environmental Center.

When: Saturday, Feb. 21, from 9 a.m. to 3 p.m.

Cost: for the workshop is \$155. Fee includes instruction, adjustable bindings, ash wood frames, nylon lacing, and lunch — everything you need to complete your very own pair of quality snowshoes with confidence and ease. Registration and payment is due by Feb. 1 to ensure that your kit arrives in time for the workshop.

For more information, contact: Kathleen Ryan, environmental education specialist, 833-0793 to register.

Wind-driven waves can damage shorelines

By ANNA McCARTNEY
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Lake Erie is the shallowest of the Great Lakes, reaching a maximum depth of 210 feet in the eastern basin. The axis of Lake Erie runs from southwest to northeast, corresponding to the direction of prevailing winds. Lake topography combined with changing water levels and strong waves can have extreme effects on the shoreline.

Because of the lake's shallowness and elongation, strong winds can push water toward one end of Lake Erie (setup), causing some of the most extreme lake setups observed in the world. A difference in elevation of over 15 feet or more between the ends of the lake can occur. When the wind stops, the water rebounds. This seiche effect can cause the water to move back and forth across the lake for some time.

When seiches of two feet or greater are likely to occur, the National Weather Service issues advisories for portions of the Great Lakes. These rises in water levels can provide a base on which high waves can attack the upper part of a beach and penetrate farther inland. Wind-induced surges accompanied by wave action account for most of the damage to coastal structures and beach areas.

The four factors that influence the formation of waves caused by wind and that determine wave size are:

- Wind speed.
- Fetch or the distance of open water that the wind has blown over.
- Time the wind has blown over a given area.
- Water depth.

The greater each of the above factors, the larger the waves.

Waves are characterized by:

- Wave height (distance from trough to crest).
- Wave length (distance from crest to crest).
- Period (time interval between arrival of consecutive crests at a stationary point).
- The direction of wave propagation or ways in which they travel.

Waves in a given area typically have a range of heights. For weather reporting and for scientific analysis of wind wave statistics, their characteristic height over a period of time is usually expressed as significant wave height. This figure represents an average height of the highest one-third of the waves in a given time period (usually in the range from 20 minutes until 12 hours), or in a specific wave or storm system.

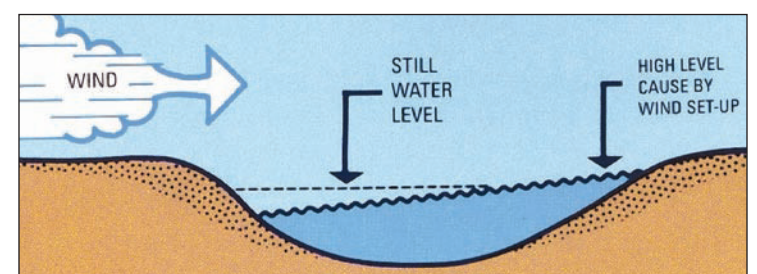
Because the wave height varies, the largest individual waves are likely to be about twice the reported significant wave height for a particular day or storm.

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CONTRIBUTED PHOTO

Because Lake Erie is the shallowest of the Great Lakes, the effects of storm-driven waves are amplified. The high water levels and waves cause erosion of the lake shore and significant flooding.



CONTRIBUTED GRAPHIC

Wind set-up is a local rise in water caused by winds pushing water to one side of the lake. An extreme form of oscillation known as a seiche occurs when there are rapid changes in winds and barometric pressure. This diagram is from www.epa.gov/glnpo/atlas/glat-ch3.html.

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To learn more, check out these Web sites:

www.glerl.noaa.gov/
www.oar.noaa.gov/
www.glerl.noaa.gov/seagrant/glw/photos/Seiche/

Your Erie Times-News has important information about the weather and Lake Erie marine conditions every day. Find the following: The temperature for the day, amount of precipitation, wind speed, waves, water temperature and lake level. Keep track of these for a week and then plot them on a graph.

