Beach Safety & Forecasting

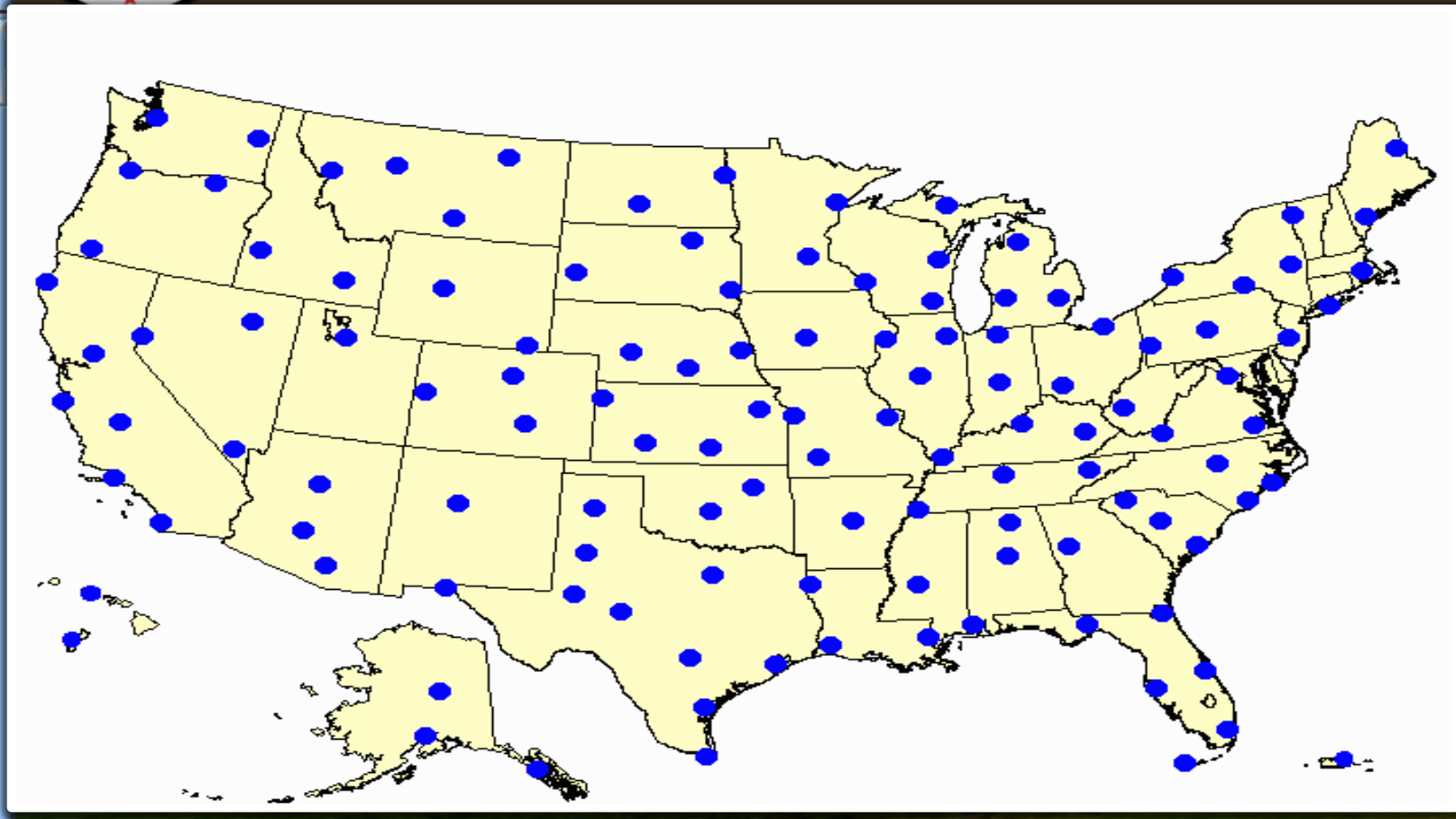
Applications of the Great Lakes Current Incident Database

Megan Dodson
NWS Northern Indiana

9th Biennial State of Lake Michigan/15th Annual GLBA Joint Conference 2015

National Weather Service

Building a Weather Ready Nation



NWS Mission

To the Protection of Life & Property

Impacts of Extreme Weather & Water Events

Enhancement of the National Economy

122 Weather Forecast Offices

Open 365 Days per Year, 24-7

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National Weather Service

More than Just your Daily Forecast

Education & Outreach

Beach Hazards Program

Marine Hazards

- Dangerous Currents
- High Wind & Waves
- Lakeshore Flooding
- Harmful Algal Blooms

Ready * Responsive * Resilient

To The Impacts of Extreme Marine Events

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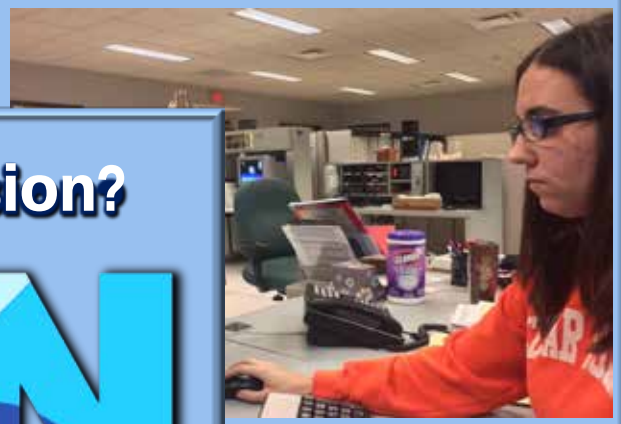
Weather Nerd, Water Safety Enthusiast

Forecasts & Warnings



Educ
& Outreach

My Personal Mission?

WRN

WATER Ready Nation

Ensuring partners have the forecasts, data, and support they need to make water safety decisions

Great Lakes Current Incident Database

- Managed by M. Dodson at NWS Northern Indiana
- Available online courtesy of:
  - Michigan Office of the Great Lakes: Coastal Zone Management
  - Michigan Sea Grant/Michigan Dept. Of Environmental Quality

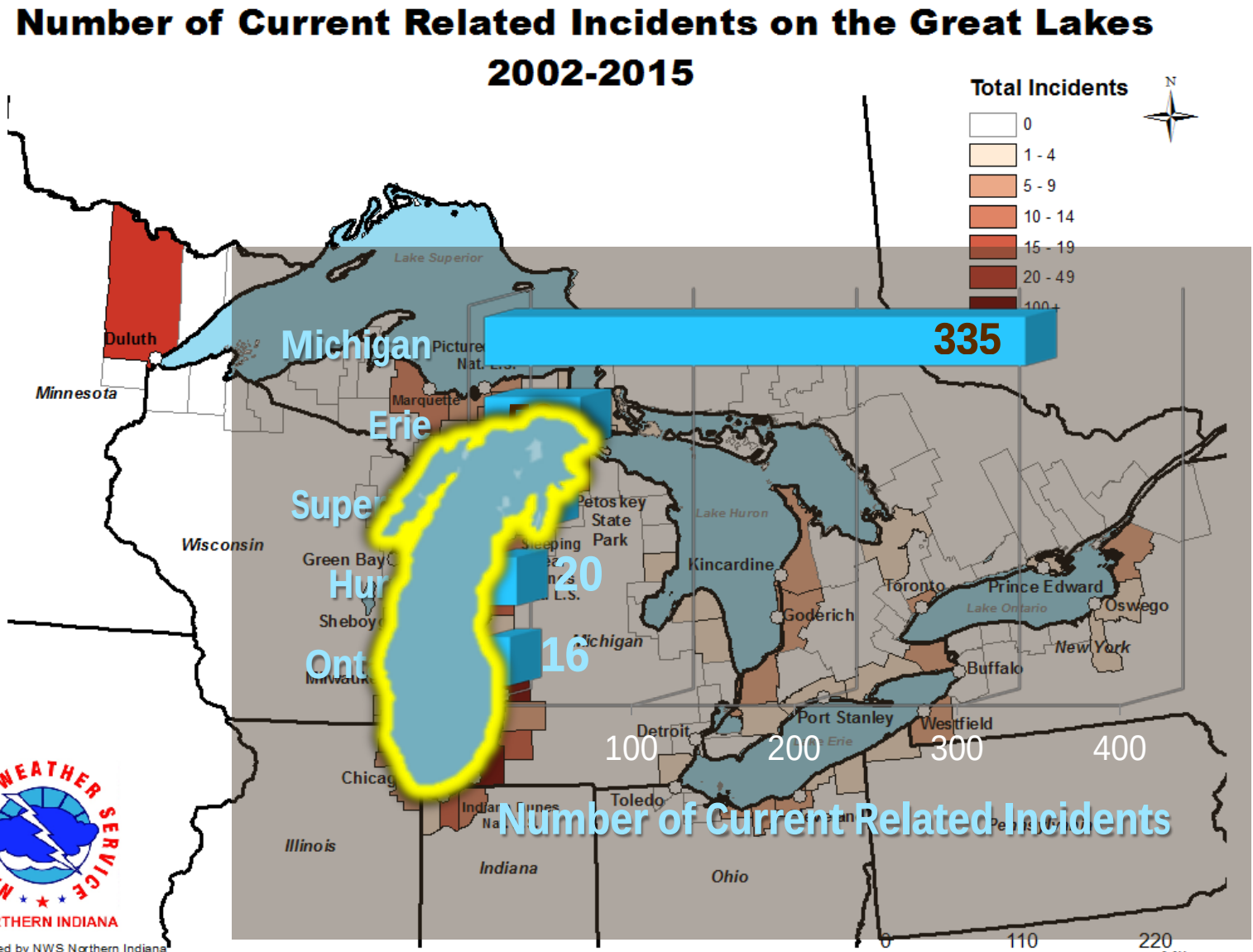
Current-Related Incidents

Great Lakes: 2002-2015

Dangerous Currents & Waves

Current-Related Incidents

Great Lakes: 2002-2015



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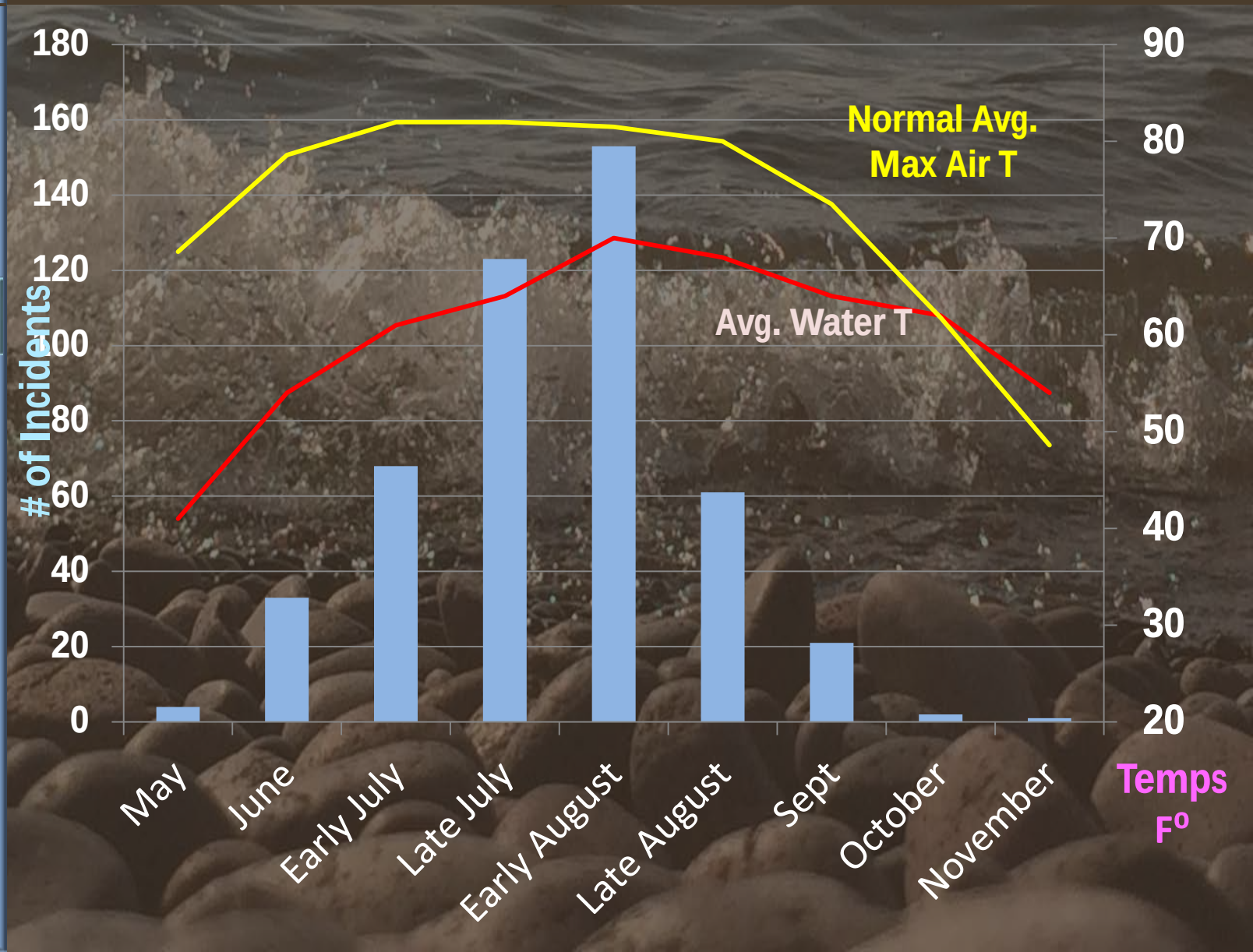
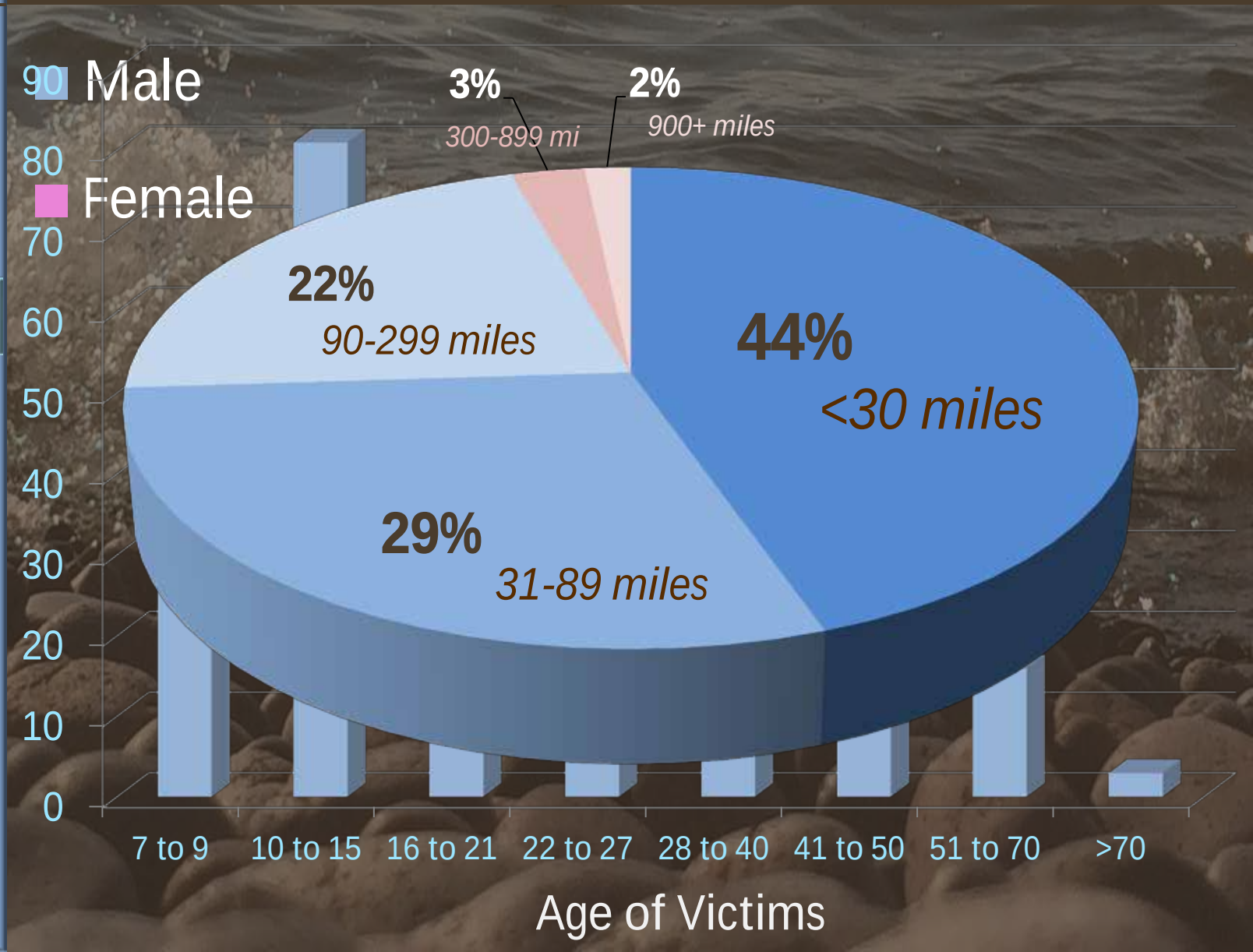
Current-Related Incidents

Great Lakes: 2002-2015



Current-Related Incidents

Great Lakes: 2002-2015



Dangerous Currents

Form when water 'piles up' near the beach

- Larger wave heights, longer wave periods lead to more water piling up
- Gentle sandy beach slope, sandbars

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Locations of Incidents

Shoreline structures, sandbars, water outlets

Structures | Outlets | Sandbars

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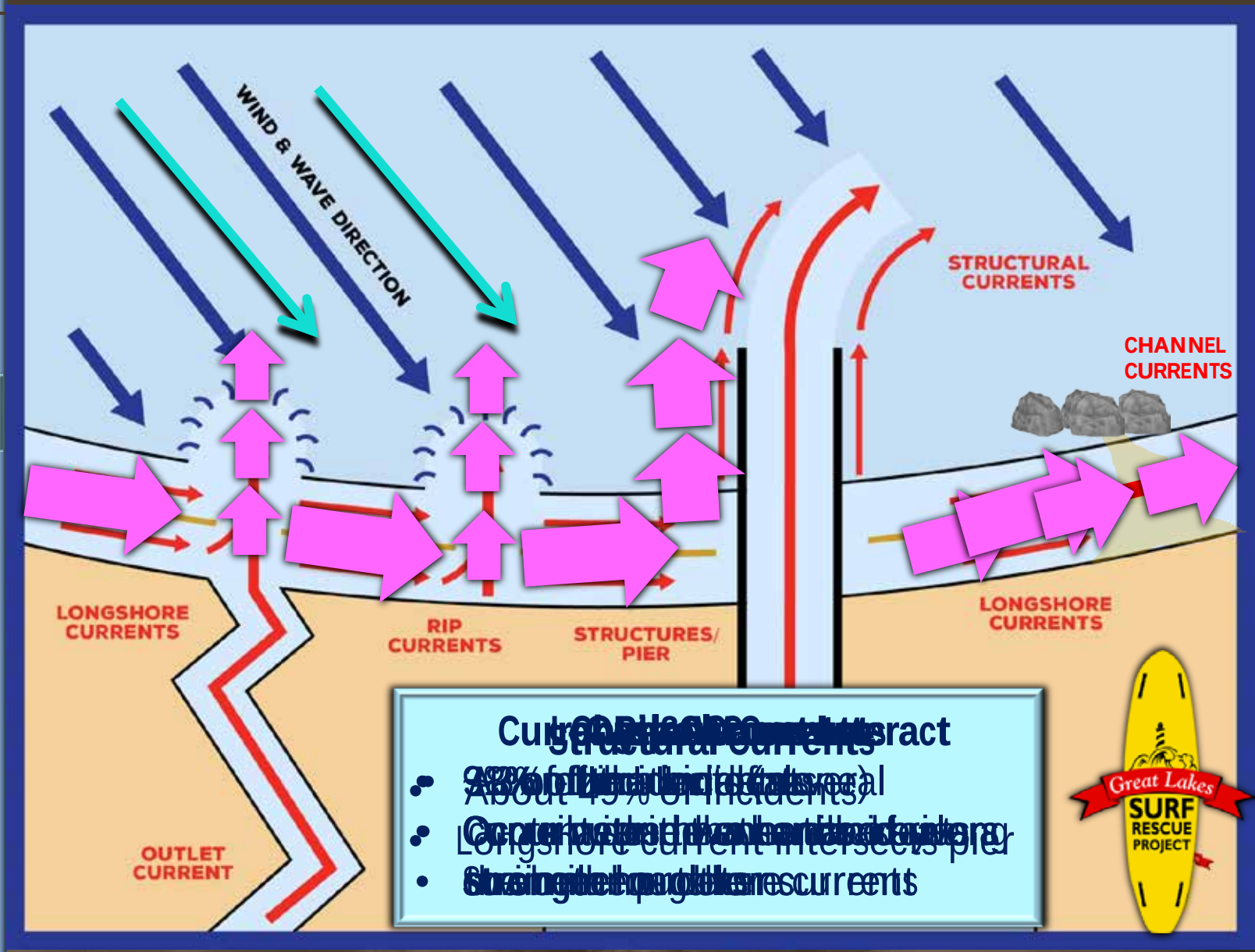
Types of Currents

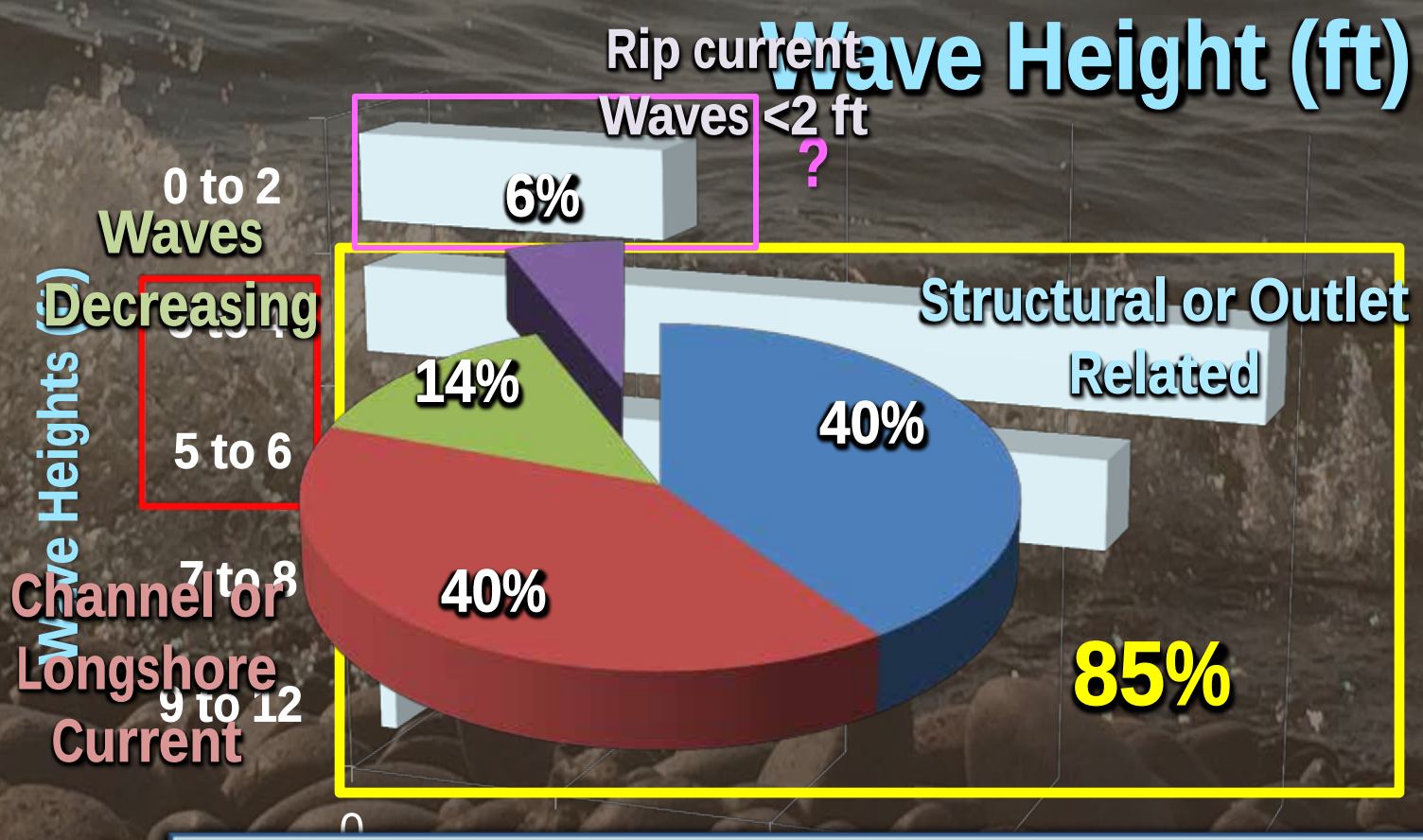


Current Type Abstract

- About 45% of incidents
- Longshore current intersects pier

Wave Heights During Incidents

Great Lakes: 2002-2015

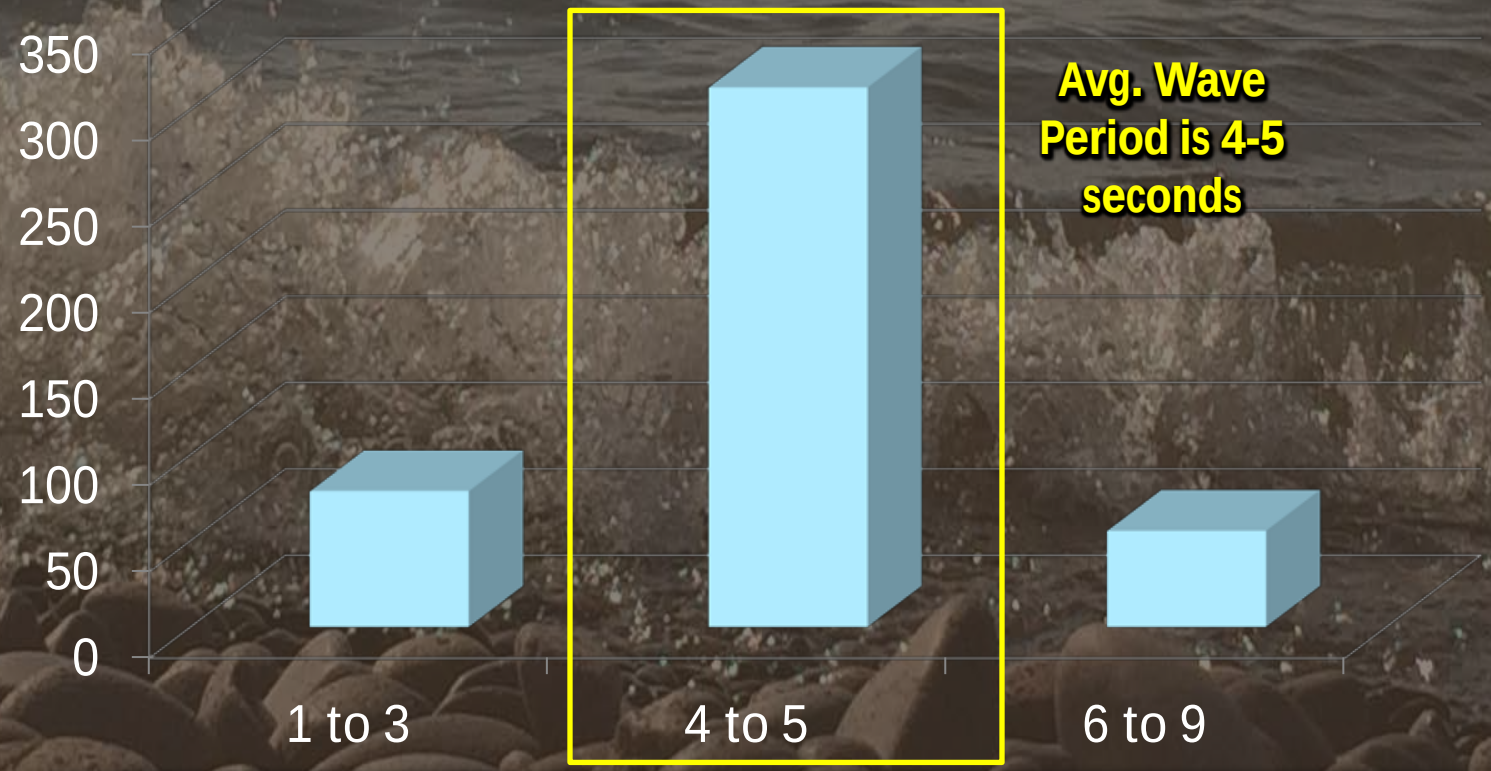


Stay Away from Shoreline Structures & River Outlets

Rip currents can occur under 1-2 ft waves, especially if waves are DECREASING from an earlier event

Wave Period During Incidents

Outward Flowing Currents: Great Lakes: 2002-2015

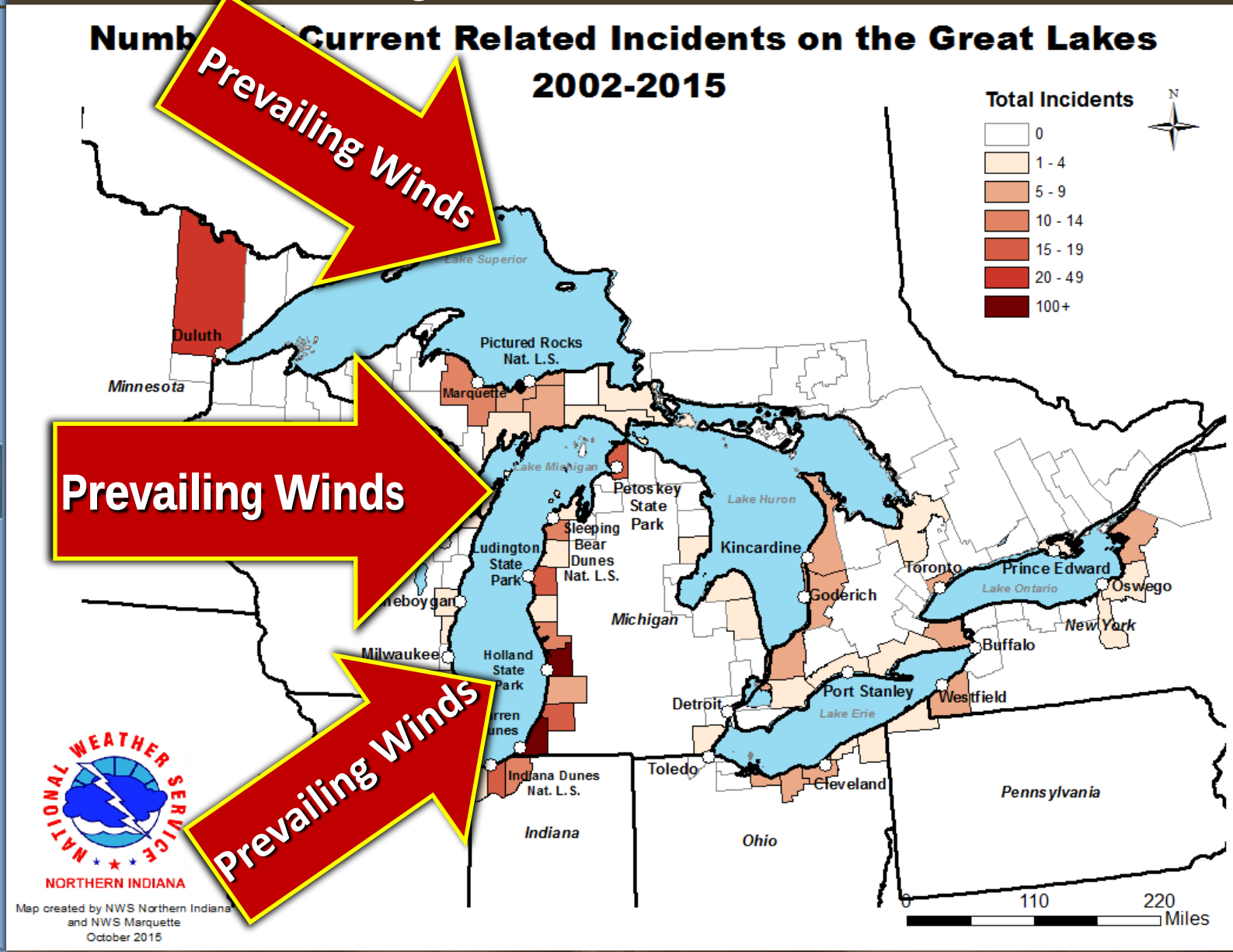


Shorter wave periods=hard for swimmer to recover if knocked down

Longer wave periods mean larger volume of water on shore, high risk of current development

Wave Direction Relative to Shore

Outward Flowing Currents: Great Lakes: 2002-2015



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How Can We Help You Make Beaches Safer?

NWS & Park Staff

- -Observations
- -Forecast awareness and/or improvement
- -More accurate incident database
- -Annual training/outreach

NWS Beach Forecasts

How We Can Help

Daily Swim Risk: Beach Forecasts

Dangerous waves and currents are not expected. However, dangerous currents can exist near piers, breakwalls, and river outlets. Always use caution and never swim alone.

NWS Beach Forecasts: Daily Swim Risk

Issued Twice Daily, Memorial Day Through ~Labor Day

Beach Hazards Statements

How We Can Help

NATIONAL WEATHER SERVICE NORTHERN INDIANA

413 AM EDT MON SEP 1 2014

BERRIEN-

413 AM EDT MON SEP 1 2014

...BEACH HAZARDS STATEMENT REMAINS IN EFFECT FROM 11 AM EDT THIS MORNING THROUGH THIS EVENING...

*High wave action...expected

*Structural currents...expected...especially on the north sides of piers and breakwalls.

*Rip currents....expected.

* OVERVIEW/POTENTIAL IMPACTS...

Waves of 3 to 4 feet will continue to diminish into the afternoon hours as north-northwest winds of 10 to 15 mph lighten to less than 10 mph. Current activity may persist for several hours after winds and waves have subsided.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

DANGEROUS POUNDING WAVES AND LIFE-THREATENING CURRENTS ARE EXPECTED AT THE BEACHES. PEOPLE VISITING THE BEACHES SHOULD STAY OUT OF THE WATER

RIP CURRENTS ARE POWERFUL CHANNELS OF WATER FLOWING QUICKLY AWAY FROM SHORE...WHICH OCCUR MOST OFTEN AT LOW SPOTS OR BREAKS IN SANDBARS. RIP CURRENTS CAN SWEEP YOU INTO DEEPER WATER.

STRUCTURAL CURRENTS FORM ALONG PIERS WHERE LONGSHORE CURRENTS AND WAVE ACTION FLOW INTO THE STRUCTURE. STRUCTURAL CURRENTS CAN SWEEP YOU OUT INTO DEEPER WATER ALONG THE PIER STRUCTURE.

Beach Hazards Statement

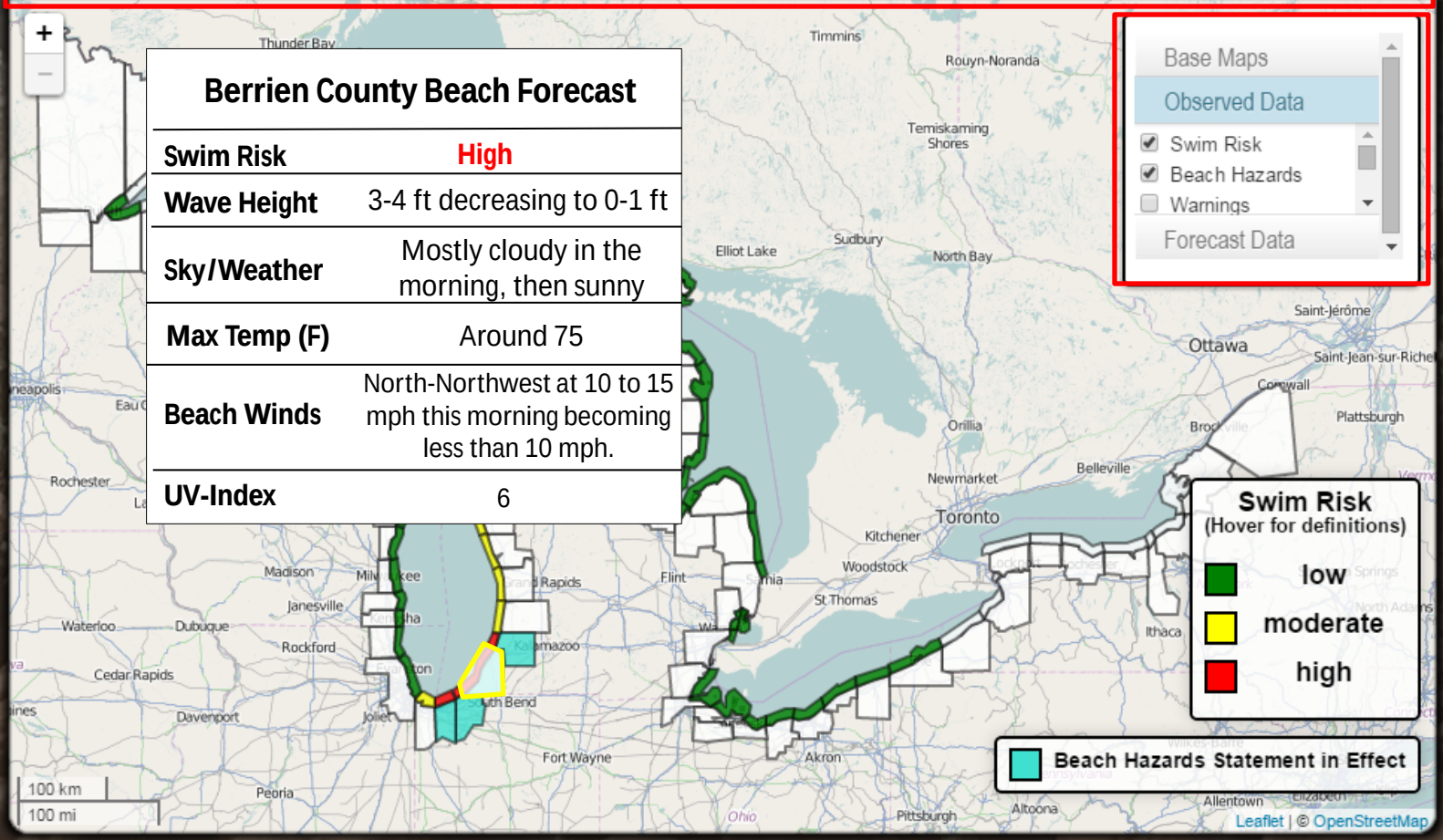
Issued During High Swim Risk

Gives additional details on hazards, timing

Decision Support Tools

How We Can Help

Beach Forecasts | Incident Database & Stats | Beach Safety | Great Lakes Water Quality | Additional Information



Berrien County Beach Forecast	
Swim Risk	High
Wave Height	3-4 ft decreasing to 0-1 ft
Sky/Weather	Mostly cloudy in the morning, then sunny
Max Temp (F)	Around 75
Beach Winds	North-Northwest at 10 to 15 mph this morning becoming less than 10 mph.
UV-Index	6

Visit www.weather.gov/greatlakes/beachhazards

Decision Support Tools

How We Can Help

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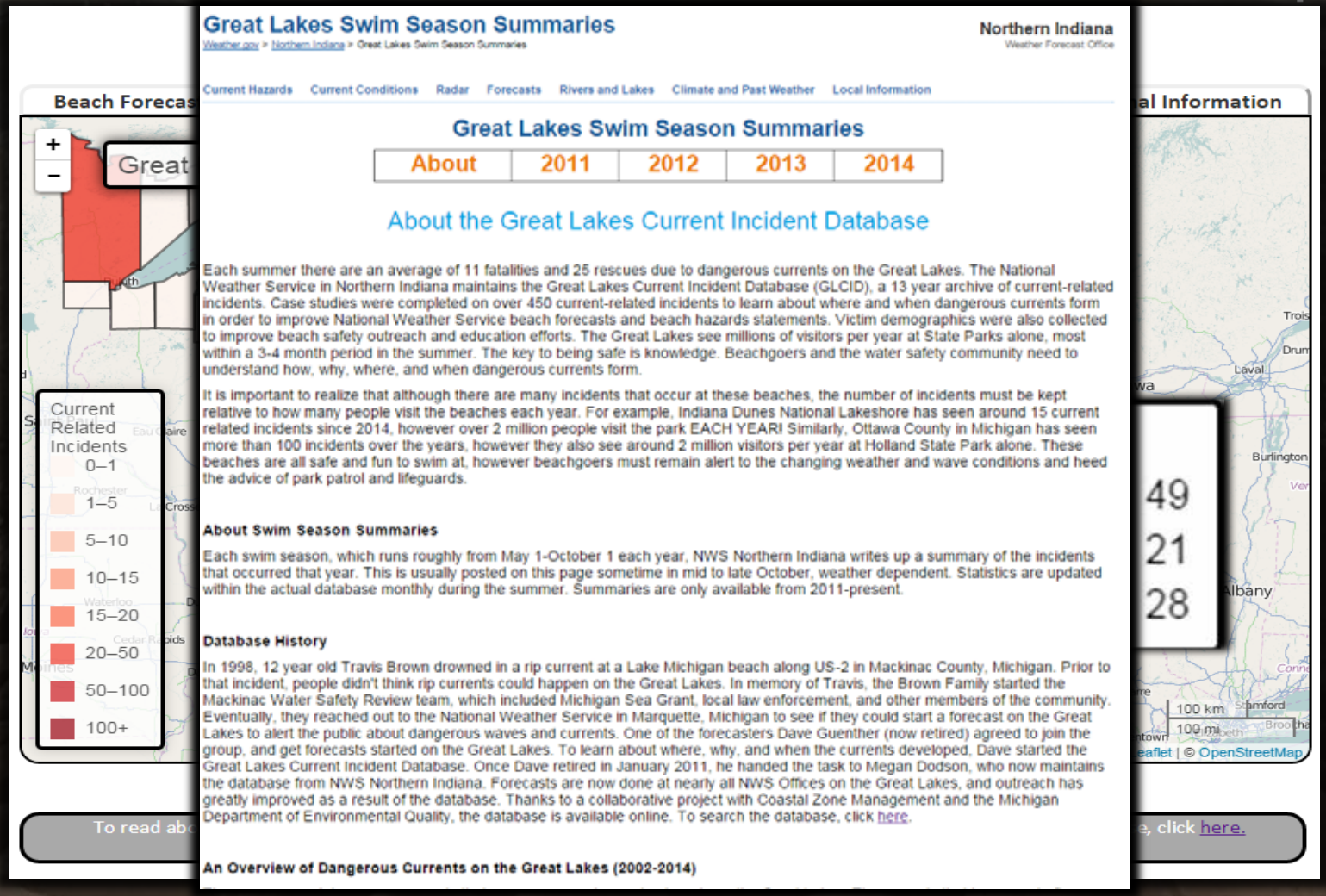

Great Lakes Swim Season Summaries

Weather.gov > Northern Indiana > Great Lakes Swim Season Summaries

Northern Indiana
Weather Forecast Office

Current Hazards | Current Conditions | Radar | Forecasts | Rivers and Lakes | Climate and Past Weather | Local Information

Great Lakes Swim Season Summaries

About | 2011 | 2012 | 2013 | 2014

About the Great Lakes Current Incident Database

Each summer there are an average of 11 fatalities and 25 rescues due to dangerous currents on the Great Lakes. The National Weather Service in Northern Indiana maintains the Great Lakes Current Incident Database (GLCID), a 13 year archive of current-related incidents. Case studies were completed on over 450 current-related incidents to learn about where and when dangerous currents form in order to improve National Weather Service beach forecasts and beach hazards statements. Victim demographics were also collected to improve beach safety outreach and education efforts. The Great Lakes see millions of visitors per year at State Parks alone, most within a 3-4 month period in the summer. The key to being safe is knowledge. Beachgoers and the water safety community need to understand how, why, where, and when dangerous currents form.

It is important to realize that although there are many incidents that occur at these beaches, the number of incidents must be kept relative to how many people visit the beaches each year. For example, Indiana Dunes National Lakeshore has seen around 15 current related incidents since 2014, however over 2 million people visit the park EACH YEAR! Similarly, Ottawa County in Michigan has seen more than 100 incidents over the years, however they also see around 2 million visitors per year at Holland State Park alone. These beaches are all safe and fun to swim at, however beachgoers must remain alert to the changing weather and wave conditions and heed the advice of park patrol and lifeguards.

About Swim Season Summaries

Each swim season, which runs roughly from May 1-October 1 each year, NWS Northern Indiana writes up a summary of the incidents that occurred that year. This is usually posted on this page sometime in mid to late October, weather dependent. Statistics are updated within the actual database monthly during the summer. Summaries are only available from 2011-present.

Database History

In 1998, 12 year old Travis Brown drowned in a rip current at a Lake Michigan beach along US-2 in Mackinac County, Michigan. Prior to that incident, people didn't think rip currents could happen on the Great Lakes. In memory of Travis, the Brown Family started the Mackinac Water Safety Review team, which included Michigan Sea Grant, local law enforcement, and other members of the community. Eventually, they reached out to the National Weather Service in Marquette, Michigan to see if they could start a forecast on the Great Lakes to alert the public about dangerous waves and currents. One of the forecasters Dave Guenther (now retired) agreed to join the group, and get forecasts started on the Great Lakes. To learn about where, why, and when the currents developed, Dave started the Great Lakes Current Incident Database. Once Dave retired in January 2011, he handed the task to Megan Dodson, who now maintains the database from NWS Northern Indiana. Forecasts are now done at nearly all NWS Offices on the Great Lakes, and outreach has greatly improved as a result of the database. Thanks to a collaborative project with Coastal Zone Management and the Michigan Department of Environmental Quality, the database is available online. To search the database, click here.

An Overview of Dangerous Currents on the Great Lakes (2002-2014)

Current Related Incidents
0–1
1–5
5–10
10–15
15–20
20–50
50–100
100+

Visit www.weather.gov/greatlakes/beachhazards

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Beach Safety Applications

Images from Biztechnology solutions, phoenix.k12.or.us, and biospectrumindia.com

We've Come a Long Way Since the Late 90's

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But We Need to Go Further

Collaboration

Next Steps

GREAT LAKES WATER SAFETY CONSORTIUM

- Leadership Team Web Conference
  - Draft Strategic Plan
  - Determine meeting frequency
- Advisory Team Web Conference
  - Determine collaboration tactics, e.g.:
    - Face-to-face Conferences – how many, where?
    - Member opinion surveys – SurveyMonkey? Qualtrics?
    - Exclusive social media group – Facebook? LinkedIn? Google+?
    - Cloud document sharing – Google Drive? DropBox?

Stop the Cycle

GREAT LAKES WATER SAFETY CONSORTIUM

Advisory Team:

YOU!

ARE YOU IN

OR ARE YOU OUT?

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Thank You For Your Time!

References

References

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Special Thanks to: Don Rolfson and Steven Fleegel *at NWS Marquette for their photos of rip currents at the Grand Sable Dunes (Slides 10 and 6, respectively).*

Current Development & Outreach References

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Weather Ready Nation (NWS): http://www.nws.noaa.gov/com/weatherreadynation/about.html#.ViBeIi5VhBc

NWS Beach Hazards Page & Contacts

Great Lakes NWS Offices and Email Address for Each Marine/Beach Hazards Program Manager

NWS Grand Rapids, MI (GRR)
Bob.Dukesherer@noaa.gov

NWS Northern Indiana (IWX)
NWS Current-Incident Database
Megan.Dodson@noaa.gov
John.Taylor@noaa.gov

NWS Chicago, IL (LOT)
Richard.Castro@noaa.gov

NWS Gaylord, MI (APX)
Brian.Adam@noaa.gov

NWS Detroit, MI (DTX)
Richard.Pollman@noaa.gov
Bryan.Tilley@noaa.gov

NWS Marquette, MI (MQT)
Keith.Cooley@noaa.gov

NWS Duluth, MN (DLH)
Dean.Packingham@noaa.gov

NWS Milwaukee, WI (MKX)
Marc.Kavinsky@noaa.gov

NWS Green Bay, WI (GRB)
Mike.Cellitti@noaa.gov

NWS Buffalo, NY (BUF)
Anthony.Ansuini@noaa.gov

NWS Cleveland, OH (CLE)
Kirk.Lombardy@noaa.gov

Beach Hazards Forecasts & Statements:
Weather.gov/greatlakes/beachhazards
Page Development: Evan Bentley, Megan Dodson, Todd Holsten

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You can also find us on social media using the full office name: US National Weather Service (office name)

Great Lakes Water Safety Consortium Contacts:
Clarence Fullard: cfullard@umich.edu ; Jamie Racklyeft: jracklye@med.umich.edu