Rip Currents, Safety, and Human Health

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and

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Great Lakes SURF RESCUE PROJECT

GLSRP.org

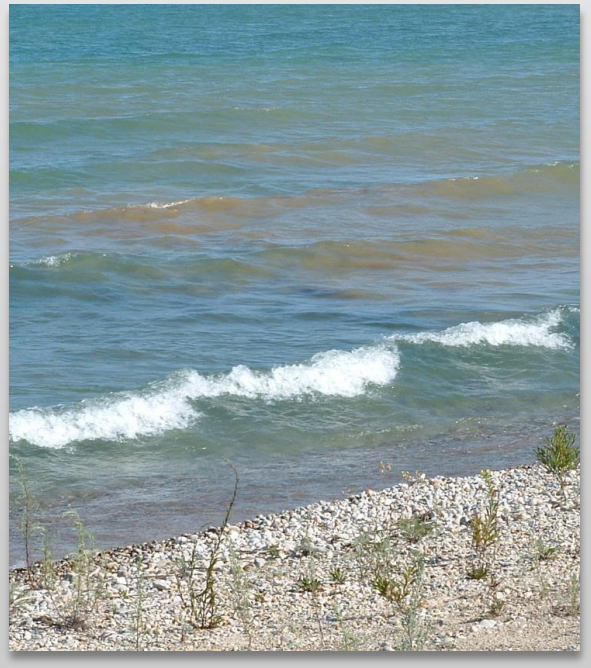
MICHIGAN STATE UNIVERSITY EXTENSION

Dangerous Currents in the Great Lakes

What is a Dangerous Current?

- Technically: 2 mph or faster is considered dangerous. Dangerous Currents pull swimmers out to open water or push them into rocks or structures.
- Dangerous currents do *not* pull a swimmer *under* the water.
- Some dangerous currents are strong enough to pull an Olympic swimmer off course.
- Age, swimming ability and other factors may impact a person's ability to survive a dangerous current or assist a swimmer in distress.
- Areas near structures are dangerous, regardless of the speed of currents or wave heights.

Types of Dangerous Currents

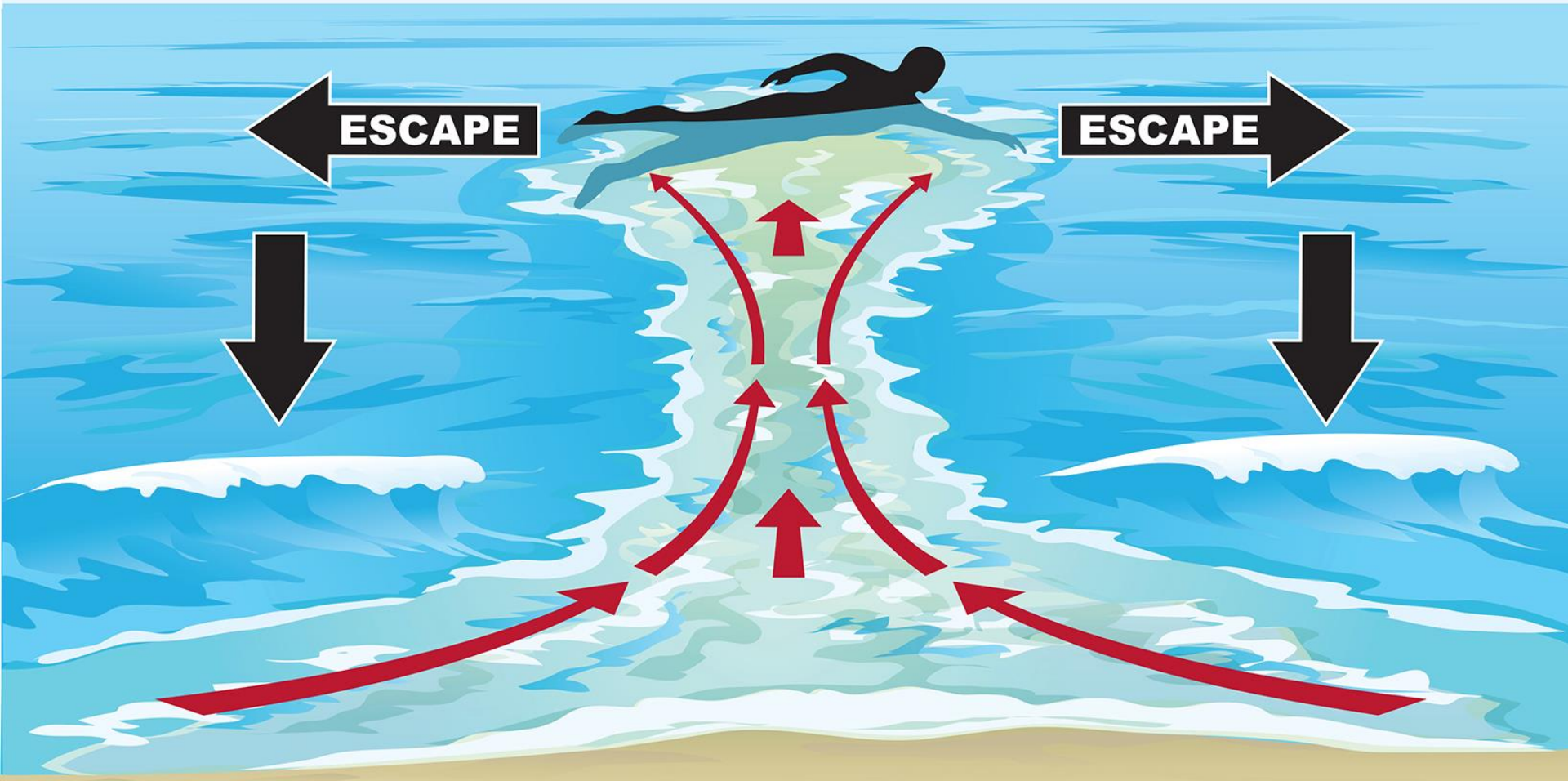


- Rip
- Structural
- Longshore
- Outlet
- Channel

Rip Currents

- Waves break over sandbar near shore, trapping water and energy.
- Water and momentum build, with pressure relieved when water returns to sea.
- Water “rips” away from shore in the form of a narrow-but-powerful stream.
- Vary in size and speed.
- Can be found on many beaches every day around the world including Great Lakes beaches.

RIP CURRENTS



DANGEROUS CURRENTS

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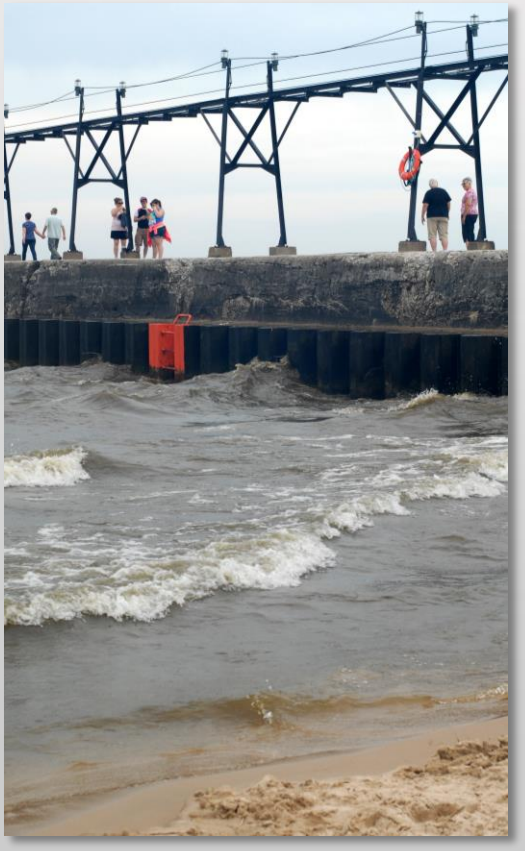
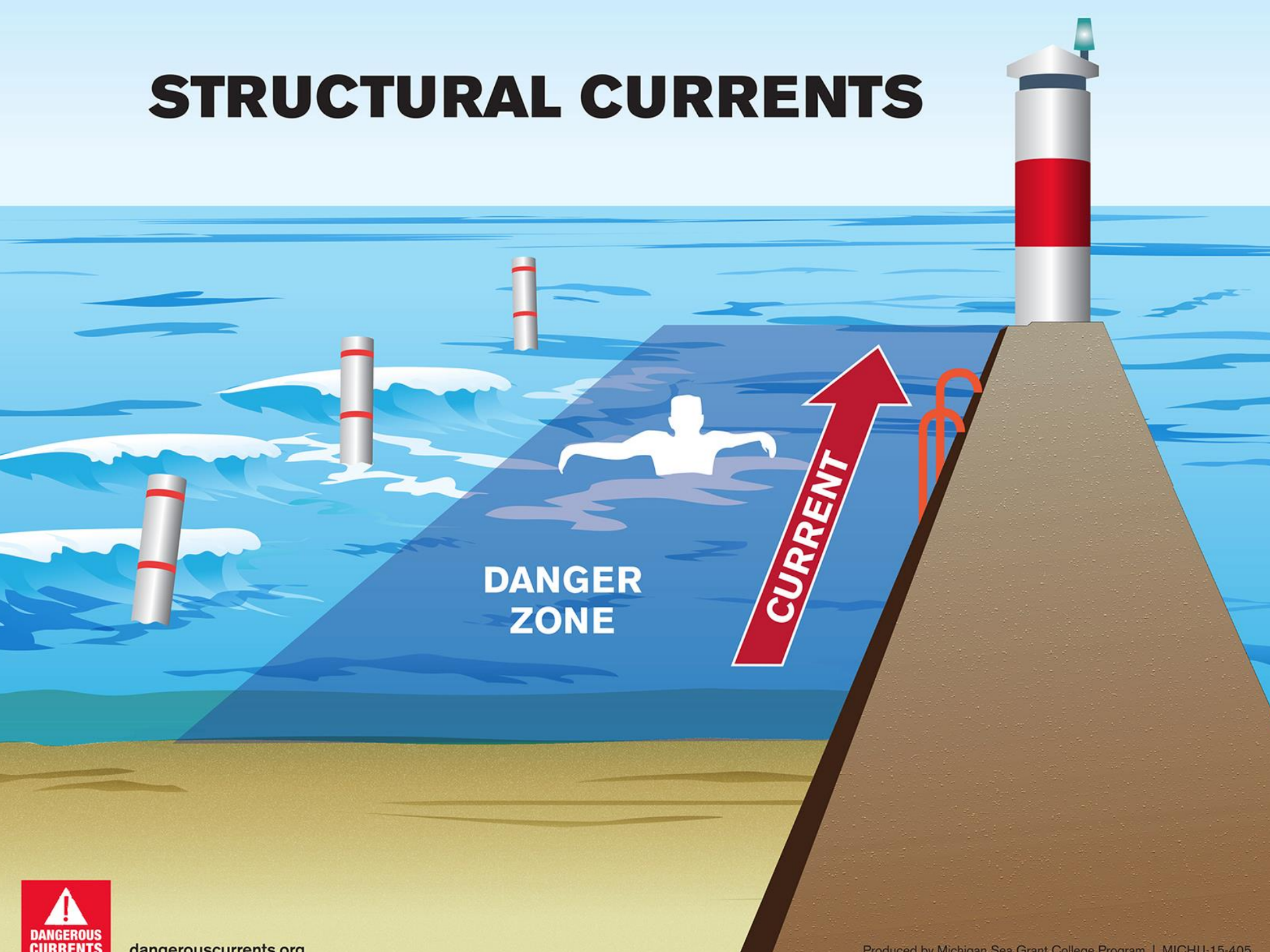
Structural Currents

- Forms alongside or as a result of structures, like piers and breakwalls, and may always be present.
- The combination of currents and high waves crashing into structures, is very dangerous for swimmers.
- Jumping off or swimming near piers can be deadly.
- Stay 100 feet or more away from structures.



STRUCTURAL CURRENTS



DANGEROUS CURRENTS

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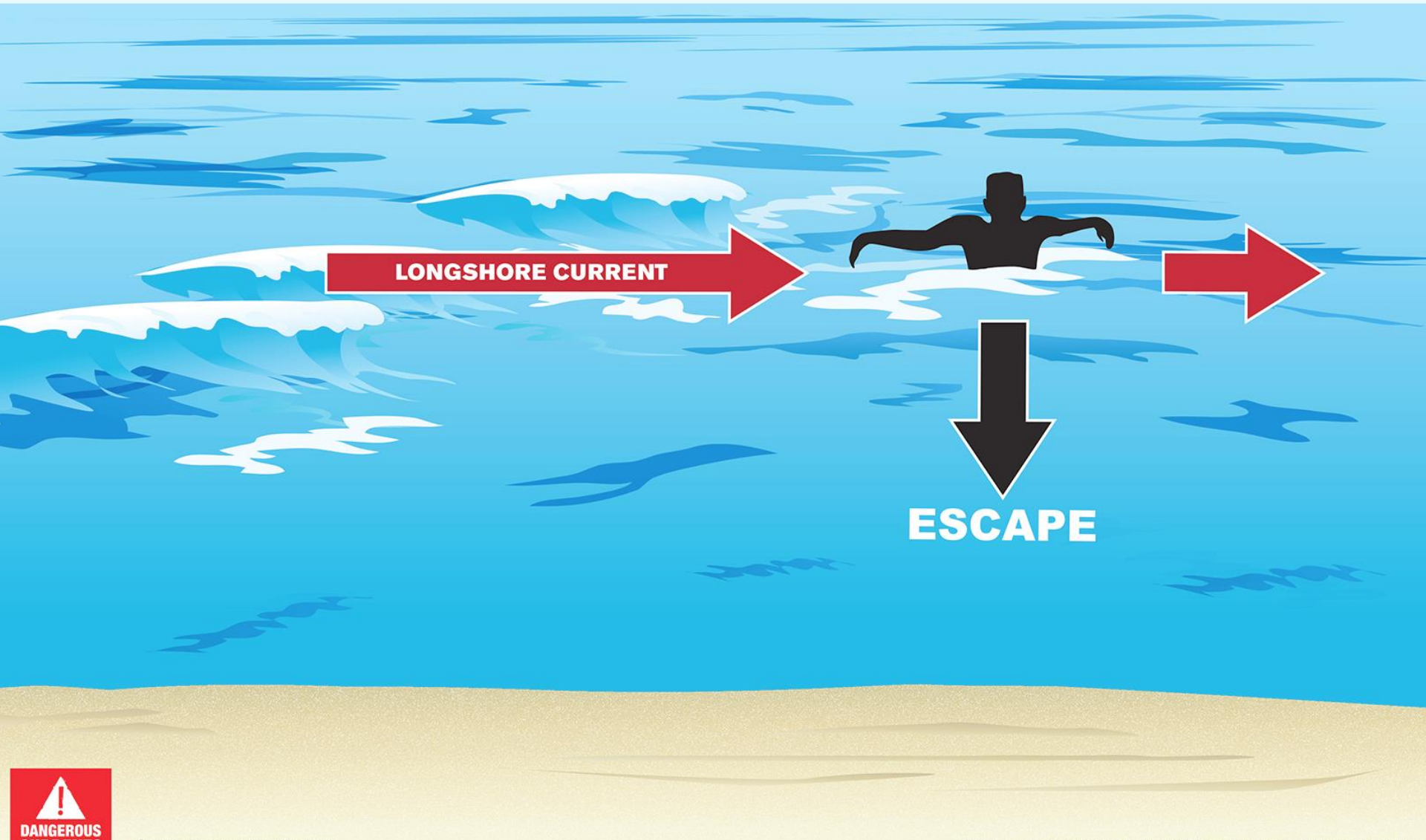
Longshore Currents

- Move parallel (or alongside) to the shoreline.
- Can swiftly move a swimmer down the shore.
- Often happen between first and second sandbars near the shore.
- Become more dangerous when combined with other currents. Can lead a swimmer unaware, into the path of another current or structure.

LONGSHORE CURRENTS

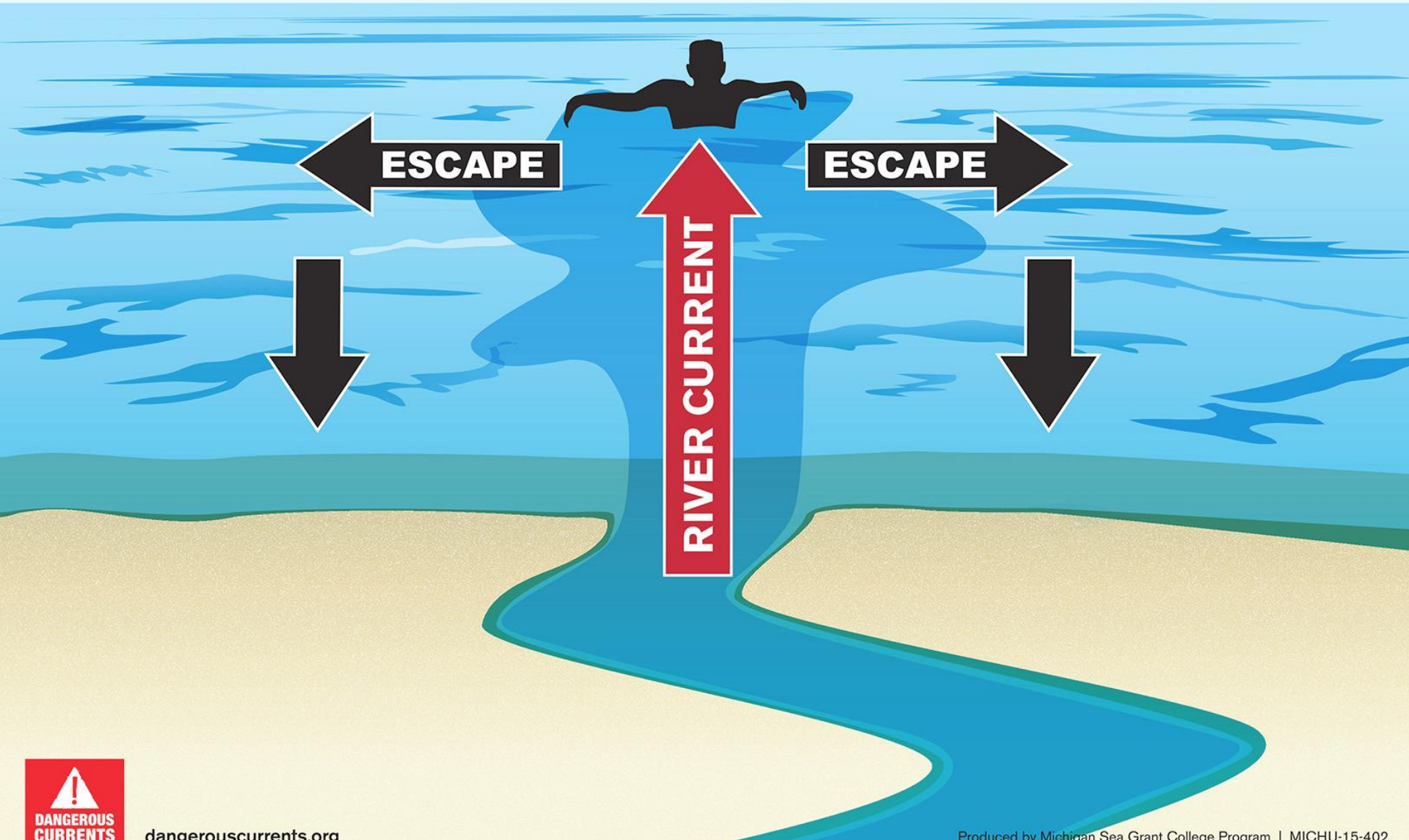


DANGEROUS

Outlet Currents

- Happen where rivers and streams empty into the Great Lakes.
- Water from a river or stream can move quickly. As it enters a lake, it may take time to dissipate.
- Pair river or stream currents with those in the lake, and the situation can become dangerous.
- The drop-off may be severe in areas where the river or stream moves into the lake.

OUTLET CURRENTS



DANGEROUS CURRENTS

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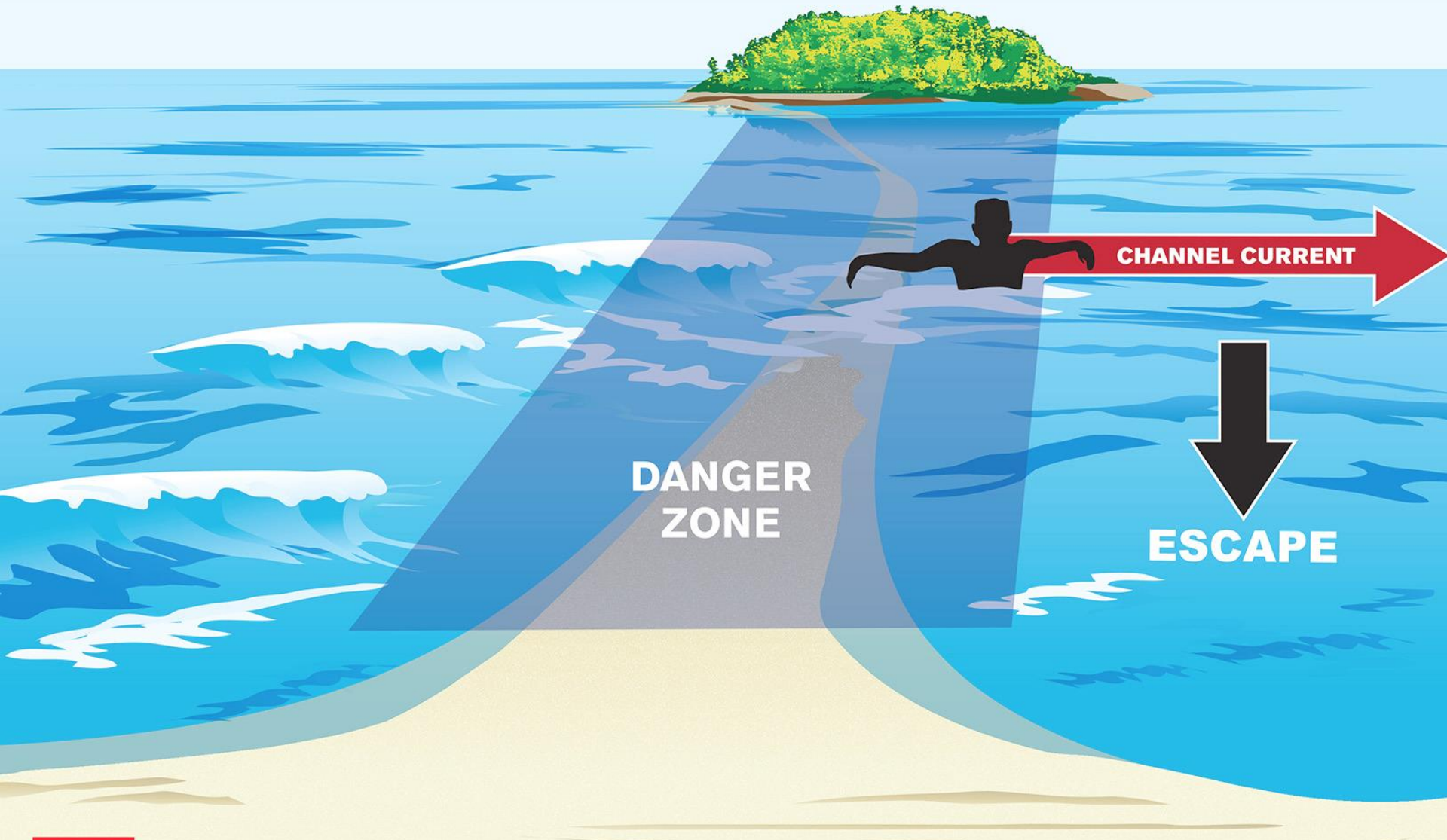
Channel Currents

- Are similar to a fast flowing river between the shore and an island or structure, like a group of rocks.
- Water flows quickly in this channel.
- Swimmers on or near the sandbar are at risk of being swept off these unstable areas and into the swift moving channel current.

- When wind speed increases, waves also intensify and cause currents to move faster and become stronger.

CHANNEL CURRENTS



DANGEROUS CURRENTS

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Science of Great Lakes Currents and Waves

DANGEROUS CURRENTS

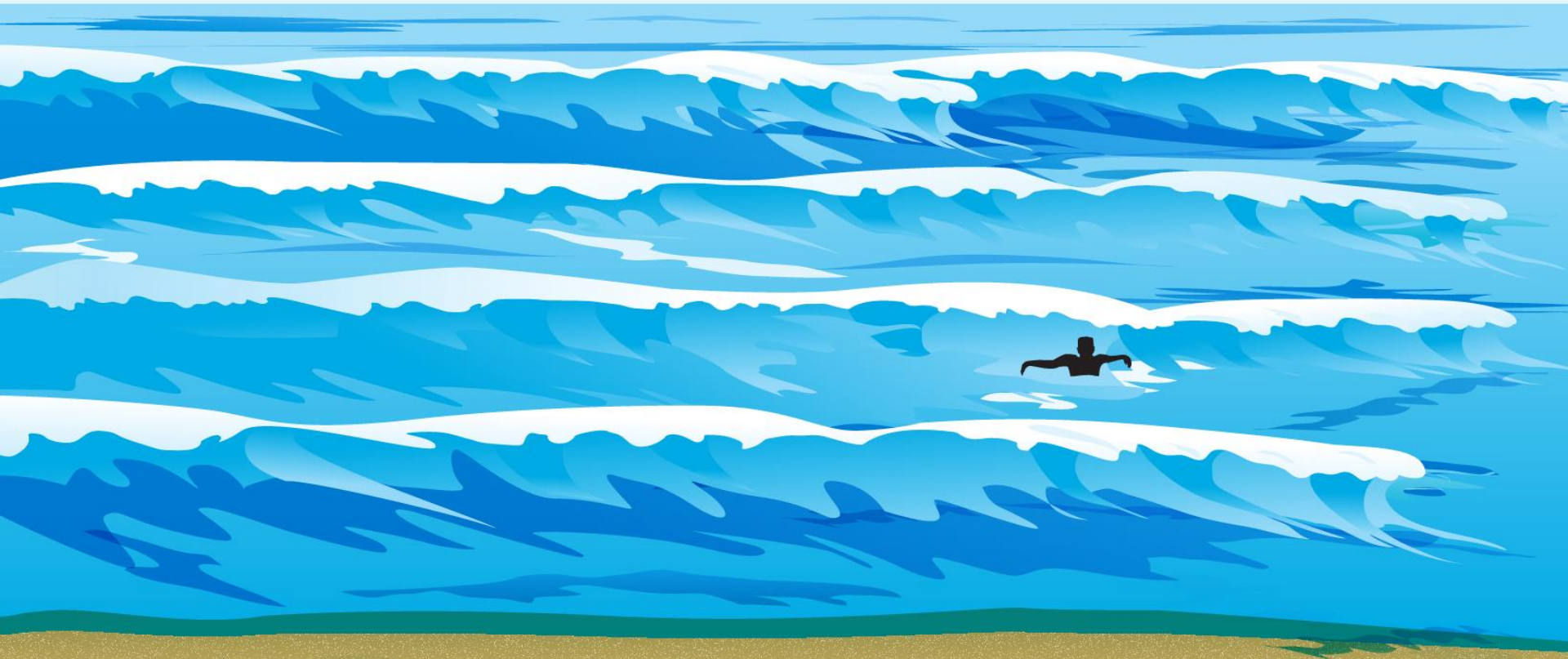
Environmental Factors

Four unique features of the Great Lakes and contribute to the development of dangerous currents:

1. **Breaking Waves**
2. **Structures**
3. **Seiches**
4. **Gently sloping sandy beaches**

GREAT LAKES WAVES

WAVE HEIGHT AND PERIOD



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MICHU-14-401

About Waves

Breaking waves pose a significant risk to swimmers.

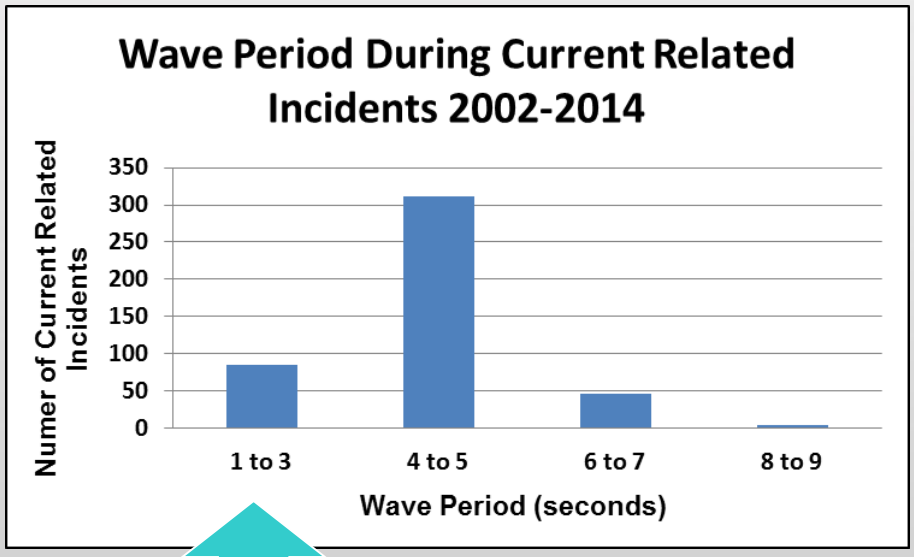
Wave Height Risks:

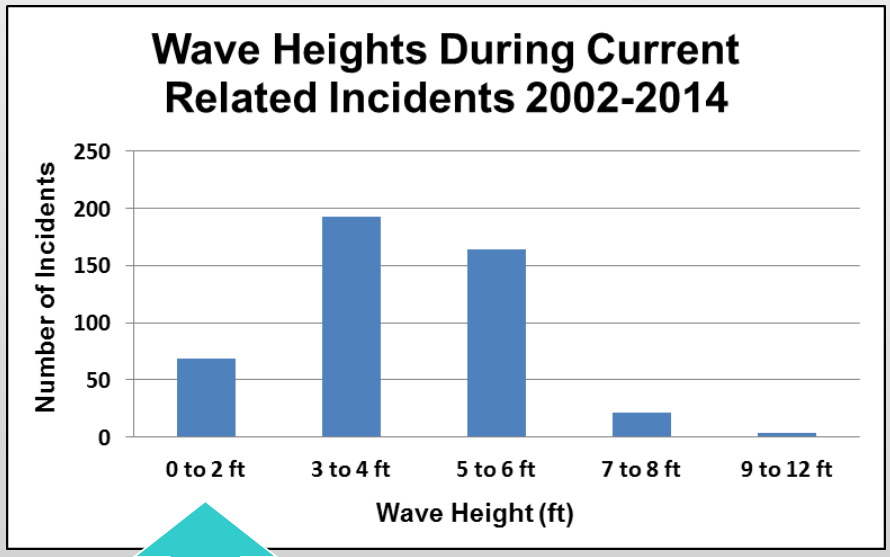
- 2-3 ft. Waves hazardous for small children and weak swimmers, also rip currents may pose a danger
- 4-5 ft. Waves are hazardous for everyone and strong rip currents are expected

Wave Period:

- The distance in time between waves
- Average Great Lakes wave period is 4 seconds, vs. 9+ seconds on the oceans
- Swimmers have reported that a short wave period is “like swimming in a big washing machine”

Wave Height and Period



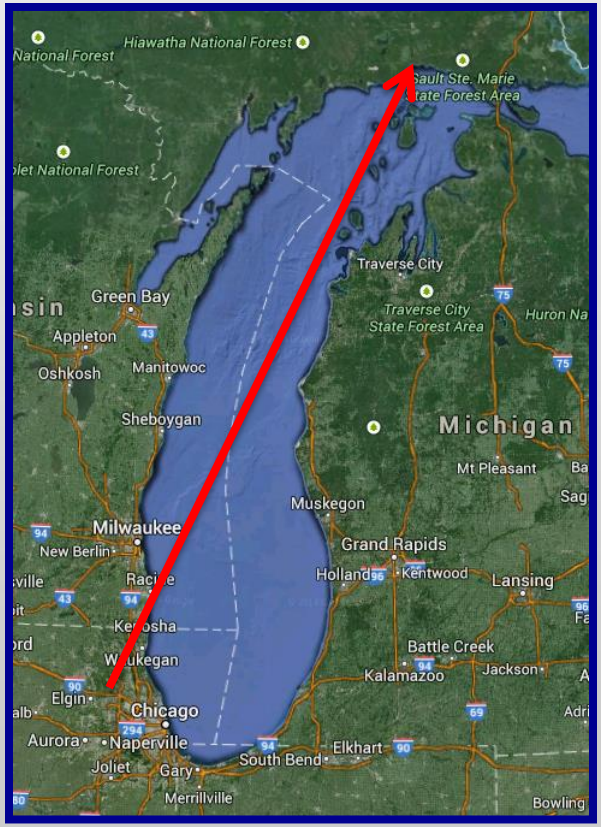


Challenges for Swimmers:

- Great Lakes waves have a short period between each wave
- The time between each wave could be as little as 3-4 seconds, making it difficult for swimmers to recover

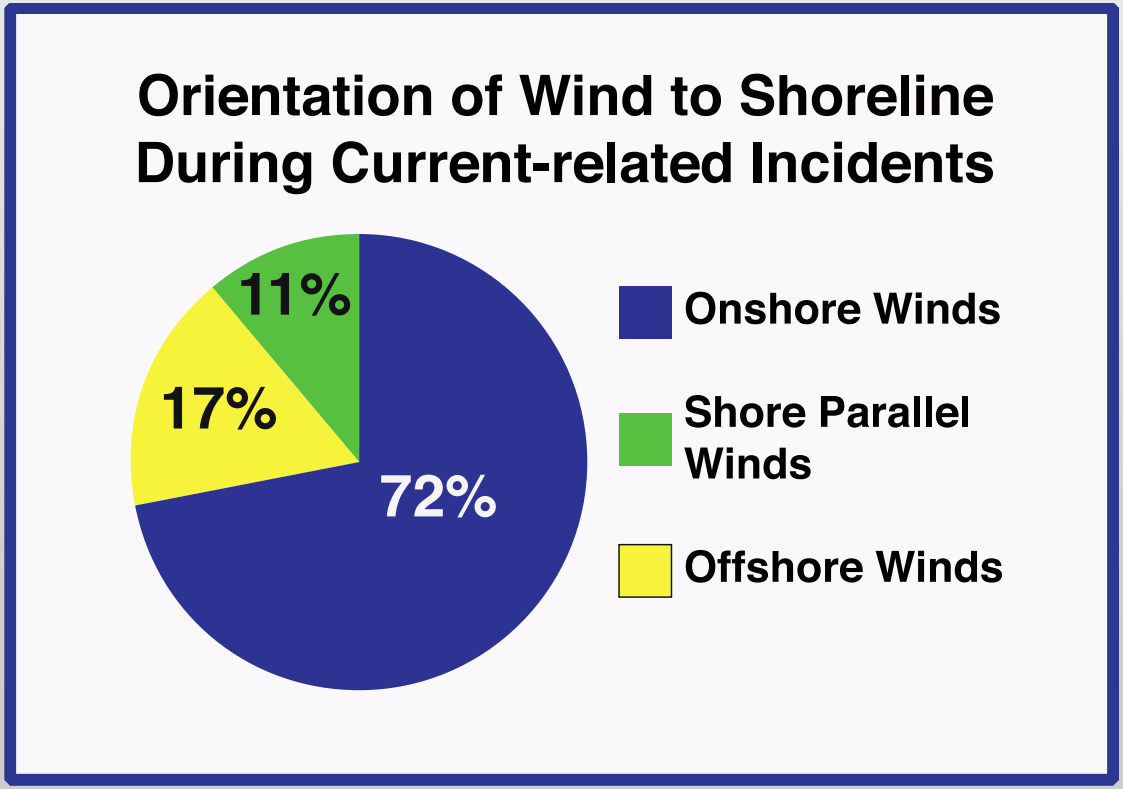
Fetch

- The distance that waves and wind travel across the water.
- The longer the fetch, the larger the waves with a persistent wind direction.
- The longest fetch in the Great Lakes is on Lake Michigan, from northern Illinois to Mackinac County.



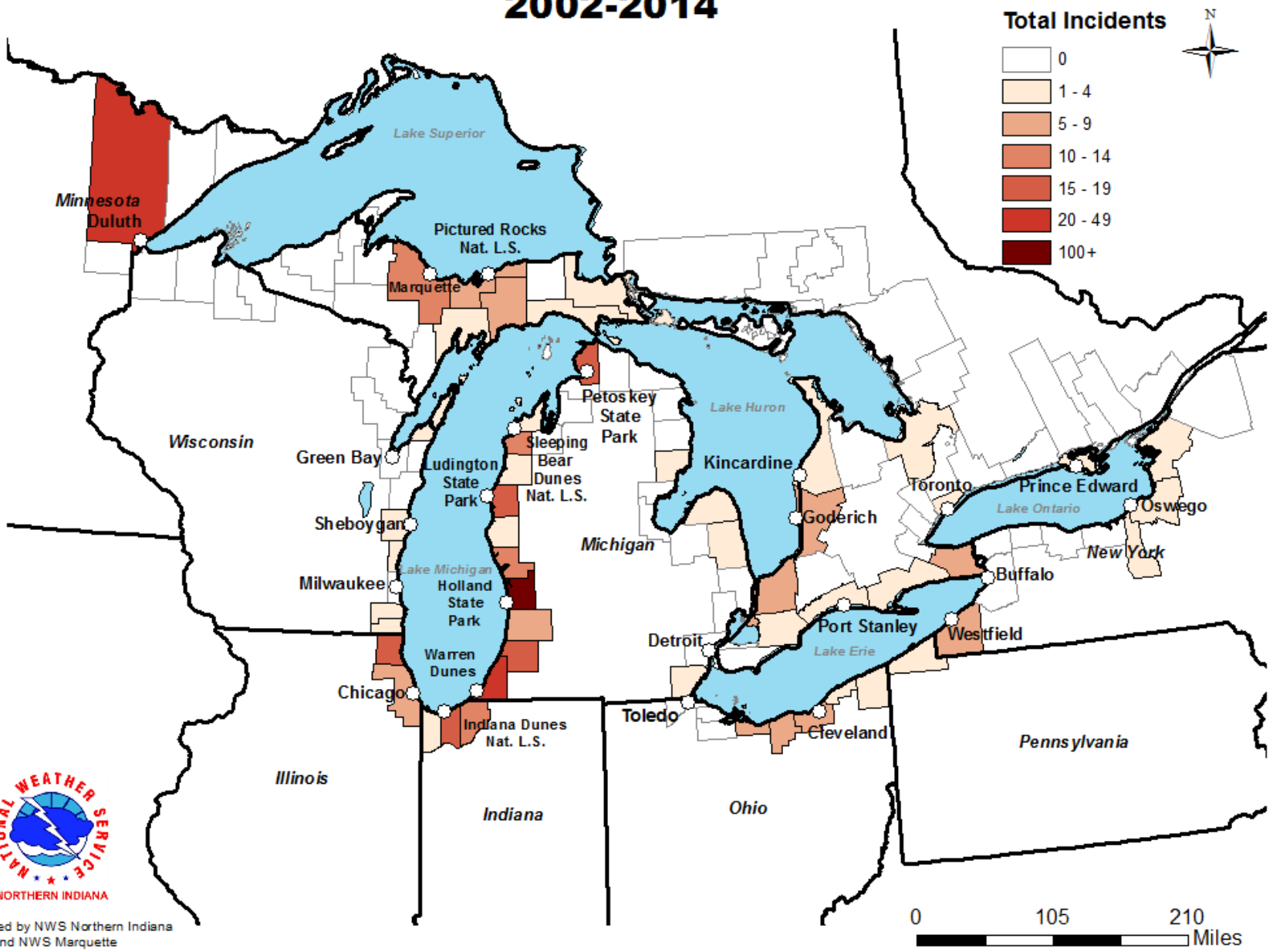
DANGEROUS CURRENTS

Wind Orientation



- The prevailing wind direction in the Great Lakes is westerly, including southwest, west and northwest
- *Winds cause waves*

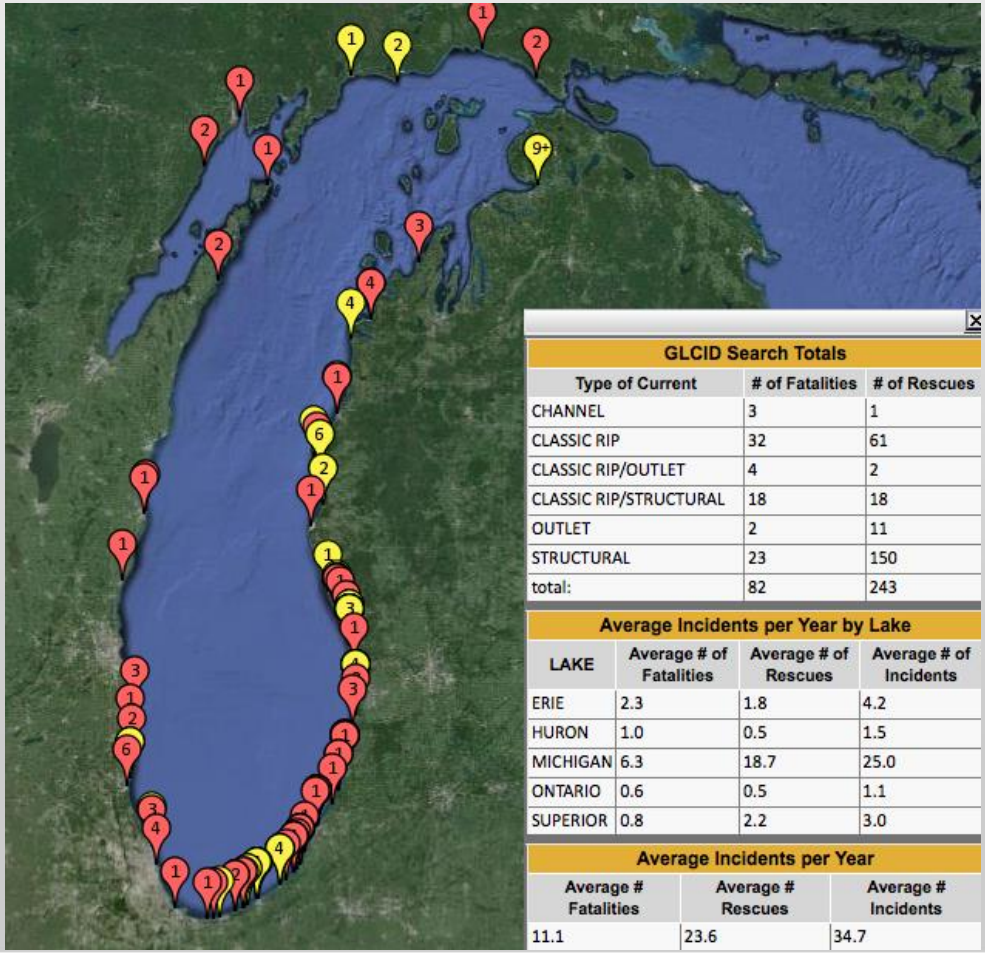
Number of Current Related Incidents on the Great Lakes 2002-2014



NATIONAL WEATHER SERVICE
NORTHERN INDIANA

Map created by NWS Northern Indiana and NWS Marquette
October 2014

Hot Spots - Popular Beaches



GLCID Search Totals

Type of Current	# of Fatalities	# of Rescues
CHANNEL	3	1
CLASSIC RIP	32	61
CLASSIC RIP/OUTLET	4	2
CLASSIC RIP/STRUCTURAL	18	18
OUTLET	2	11
STRUCTURAL	23	150
total:	82	243

Average Incidents per Year by Lake

LAKE	Average # of Fatalities	Average # of Rescues	Average # of Incidents
ERIE	2.3	1.8	4.2
HURON	1.0	0.5	1.5
MICHIGAN	6.3	18.7	25.0
ONTARIO	0.6	0.5	1.1
SUPERIOR	0.8	2.2	3.0

Average Incidents per Year

Average # Fatalities	Average # Rescues	Average # Incidents
11.1	23.6	34.7

- **Hot Spot:** Southeast Lake Michigan, but there are many other areas with reported incidents and fatalities.
- **Beaches:** Petoskey, Ludington, Mears, Muskegon, Grand Haven, Holland, Warren Dunes

Structures Are Dangerous

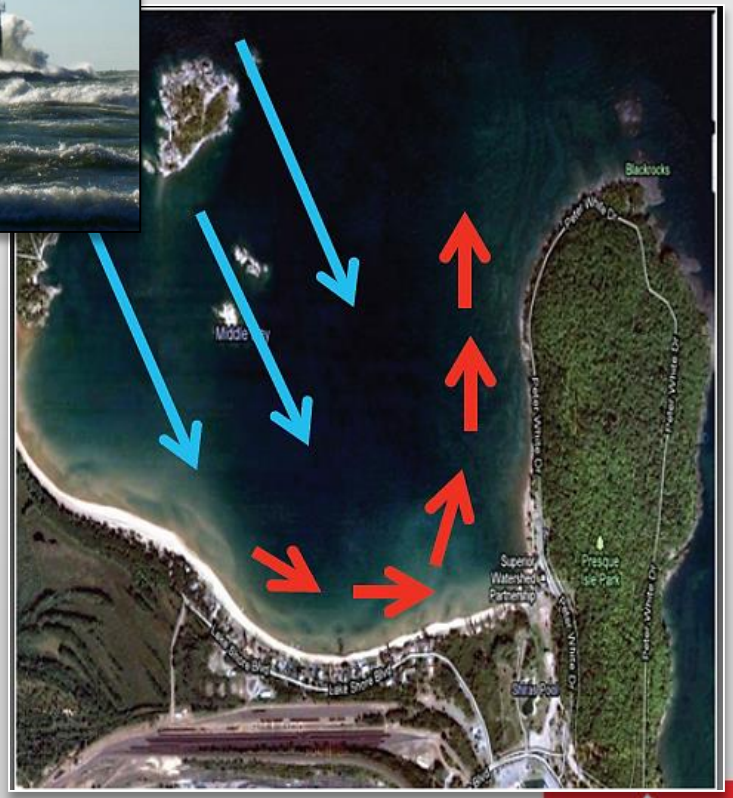
- Structural currents occur near piers and breakwalls, even during periods with slow wind speed and low wave heights.

- These are permanent currents (National Weather Service).

- Areas near structures are particularly dangerous because:
  1. Escape routes for swimmers are extremely limited
  2. Current speed
  3. Possible combination of currents
  4. Waves near structures
  5. Large rocks that surround and support structures

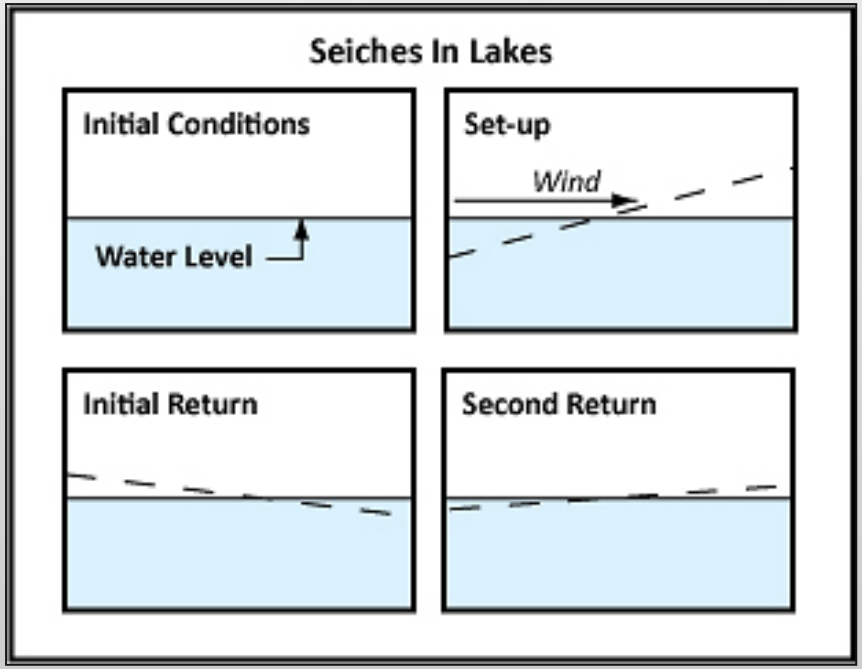
Structures


Main St
Grand Haven State Park
Lake Michigan


Blackrocks
Presque Isle Park

Seiches

- French word meaning to sway back and forth.
- Occur in lakes when strong low pressure systems move across the lake. This results in strong onshore winds that move water from one side of the lake to the other. This back-and-forth is similar to ocean tidal motion.
- When water moves to one side and then retreats, seiches often enhance the development of rip currents.



Gently Sloping Shorelines

- Southeast shore of Lake Michigan = many **gently sloping beaches**.
- **Medium to fine grain** sand, common throughout the Great Lakes region, is conducive to rip currents, as the sand is easily swept away.
- **Sandbars** parallel to the shore can trap water near the beach, leading to the generation of rip currents. Nearshore sandbars can also enhance the speed of longshore currents, leading to stronger currents.

Other Factors

Fluctuating Water Levels:

- Low water levels may contribute to increased wave energy and the development of dangerous currents.

Three Major Types of Water Level Fluctuations:

- Short-term
- Long-term
- Seasonal

Research & Field Study

Meadows, G., and L. Meadows. Rip Currents in the Great Lakes: Advancing Forecasting Through Perishable Data Recovery and Analysis. The team used combination of GPS, radar and satellite to gather data before, during and after weather events that may contribute to rip currents.

Field Study:

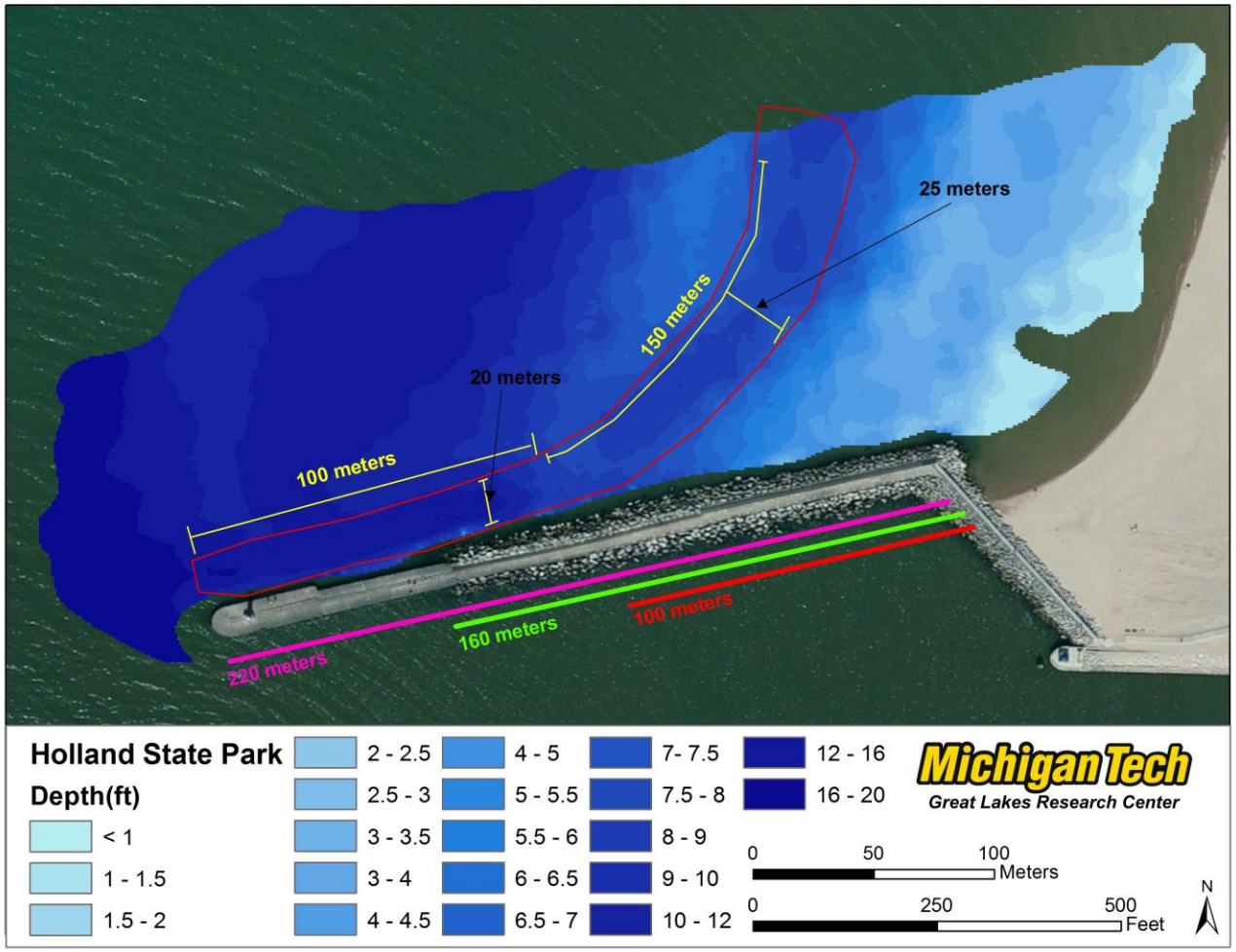
- Rip Currents in the Great Lakes: Advancing Forecasting through Perishable Data Recovery.

Remote Sensing:

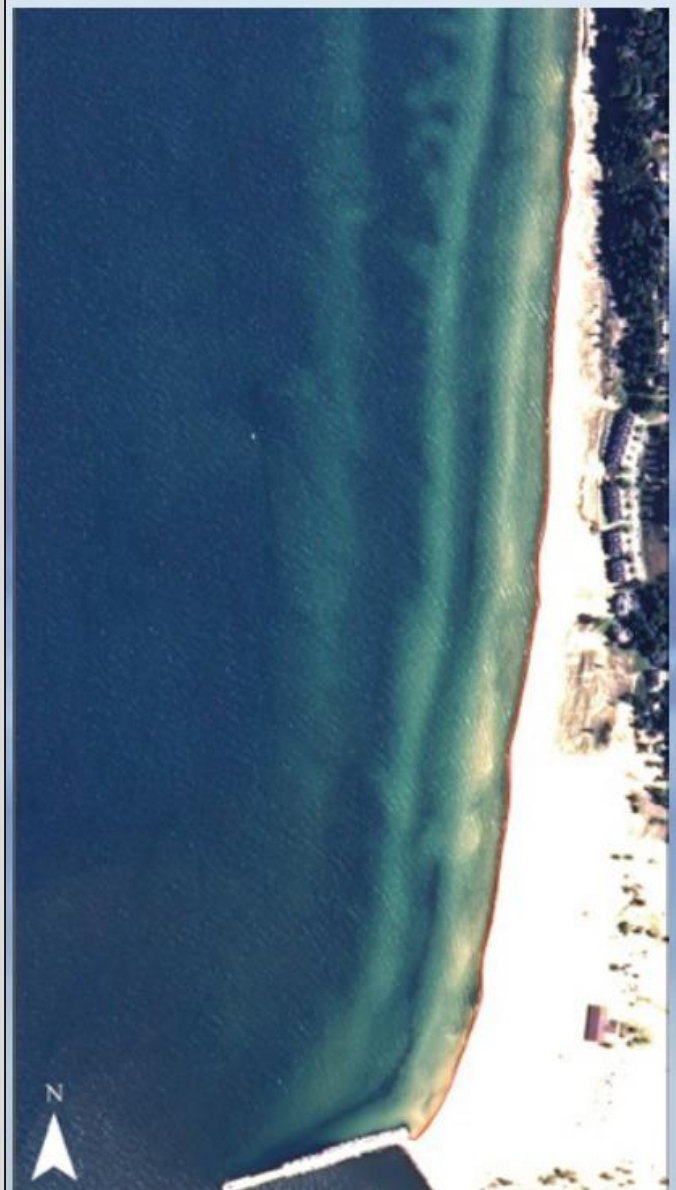
- Remote Sensing-based Detection and Monitoring of Rip Currents in the State of Michigan.

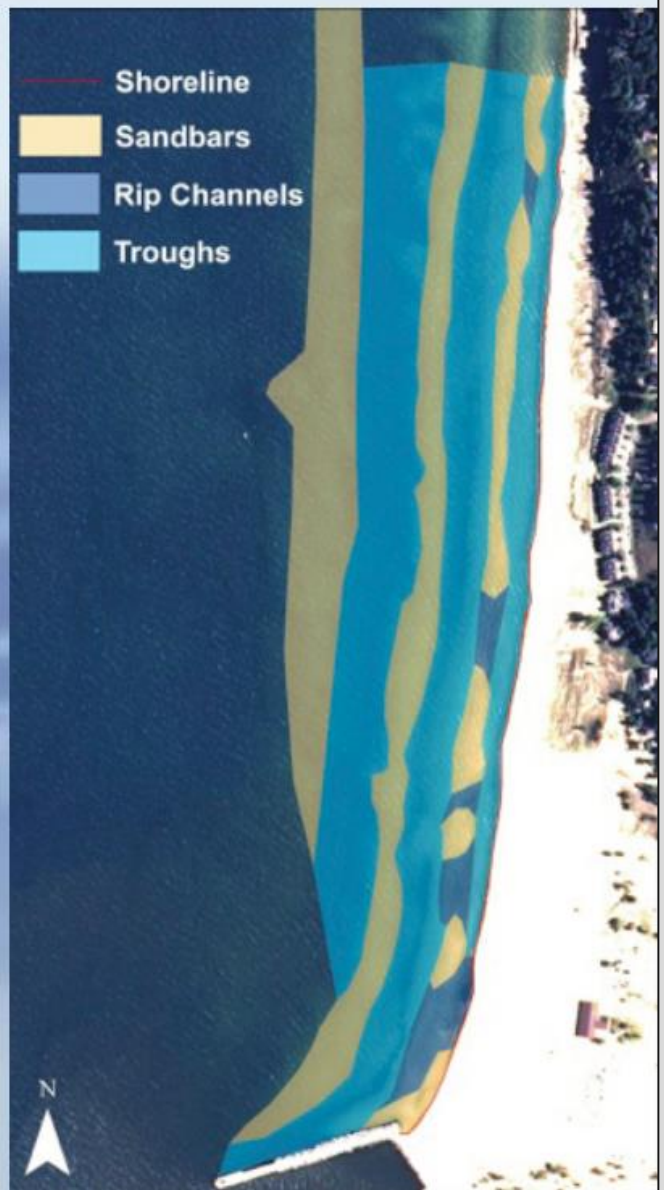
Impact: Research results are informing improvements to the designated beach policy.

Current Research



Holland State Park 2010





Social Science Research

2014 Report: *Great Lakes Swim Safety Risk Communication for 18-24 year-old Males,* Lapinski, M., and Viken, G., Michigan State University

Key Findings of Interest:

- Many participants had first-hand experience with water safety events. “Stay calm, don’t fight the current” and “swim parallel” were the most common behaviors described to help remove oneself from a current.

- Groups regularly raised the use of alcohol while pier or cliff jumping and swimming. Many participants reported swimming on red flag days or seeking out red flag conditions, as well as diving and jumping off piers.

Research

Overarching Recommendations:

- Using multiple media and communication methods is a more effective risk communication strategy than relying on just signs, publications or flags to reduce risks.

- Focus efforts on developing high-quality graphics with fewer but descriptive words.

- Promoting information about preferred behavior related to specific risks is preferable with this target audience, as opposed to information seeking messages (e.g., “Know Before you Go”).

Lapinski, M., and Viken, G., 2014 report

Research

Overarching Recommendations, continued:

- Addressing information to parents is important, as families and particularly, mothers, play a key role in the communication of risk information to boys and young men.

- The clarity of messages is extremely important in light of the fact that swimming while drinking is something that was discussed regularly by participants and cannot be ignored.

- Signs and flags are a valuable sources of information about swimming risks. It's important to remember that despite reading and understanding the information on the signs, young males use other factors in deciding whether to jump off structures.

Lapinski, M., and Viken, G., 2014 report

Public Outreach and Education

Before You Get to the Beach

Check the weather:

- Forecasts - NWS
- Beach Apps

MIZ071-052015-VAN BUREN-
INCLUDING THE BEACHES OF...NORTH BEACH...SOUTH BEACH
VAN BUREN STATE PARK
1125 AM EDT SUN AUG 5 2012

...BEACH HAZARDS STATEMENT IN EFFECT THROUGH LATE T

HIGH.

FEET.

E...77 DEGREES.

RTLY SUNNY UNTIL 5 PM...THEN SUNN

..AROUND 74.

RTHWEST WINDS 15 TO 25 MPH.

RY HIGH.

MING HAZARDS MEANS THAT DANGERO
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ENING TO ANYONE ENTERING THE WATI

GHS IN THE UPPER 70S. SOUTHWEST WINDS AROUND5 MPH.
SS.
UNNY. HIGHS IN THE LOWER 80S. SOUTHWEST WINDS AROUND
3 FEET.
Y SUNNY. HIGHS AROUND 80. NORTH WINDS AROUND 5 MPH.
SS.
SUNSET: 8:60 PM EDT

While At the Beach

- **Pay attention to warning flags.**
- A red flag means that swimmers are in danger of drowning due to rip currents and other hazards.

DANGEROUS CURRENTS

Water Safety Tip

- Stay away from structures.
- Dangerous currents are often present near structures, regardless of weather conditions.

DANGEROUS CURRENTS

Search Database:

From Year:

To Year:

Lake:

Beach Name:

Additional Search Criteria:

State/Prov.:

County:

Type of Current:

Fatalities: =

Rescues: =

Search

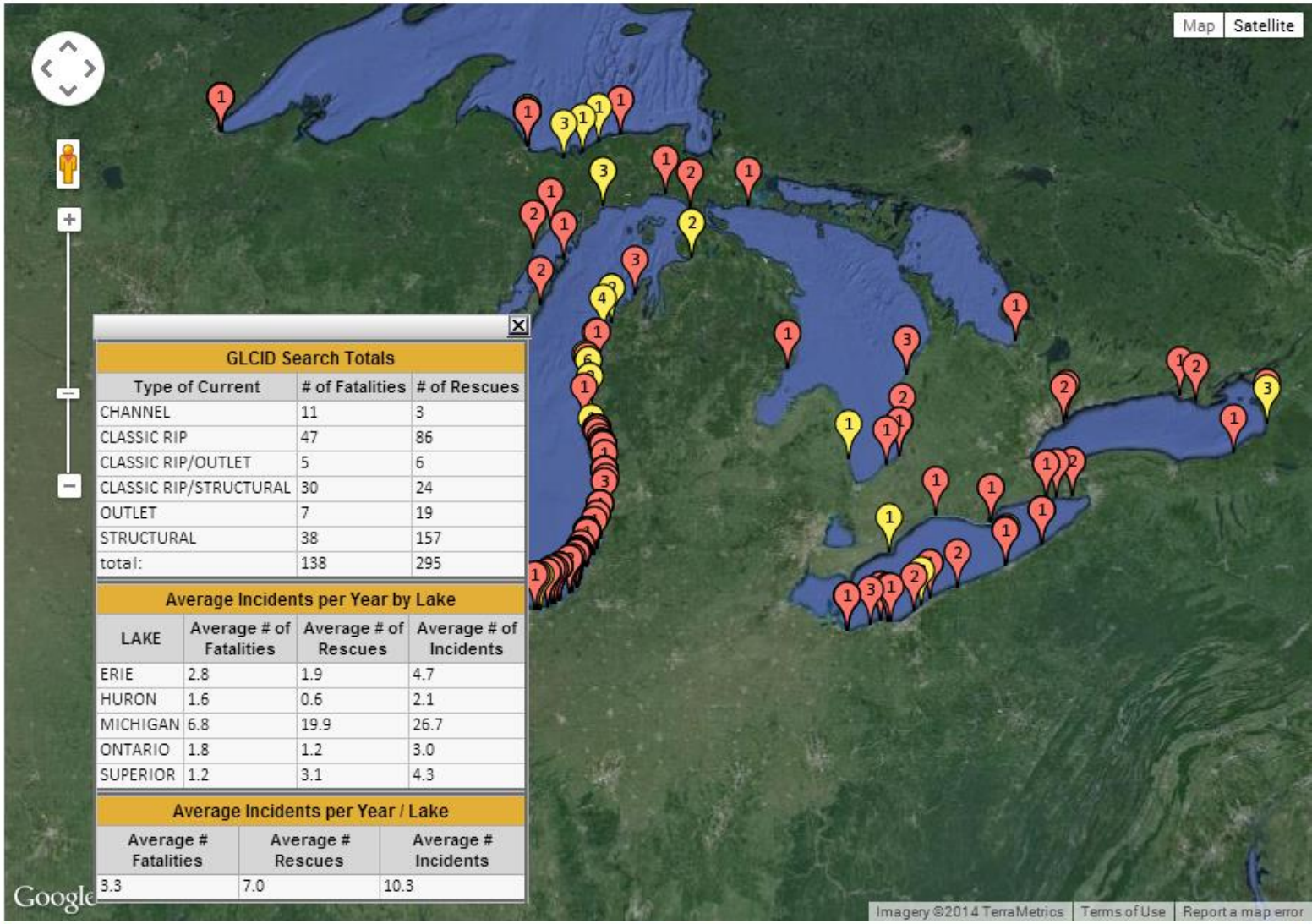
Export to Excel

Clear

Search Tips:

- Leave search boxes blank to retrieve all incident records.
- Click the date for more information on that specific incident.
- Information has been collected since 2002 and is updated annually.
- Some records are more complete than others.

Learn more about the database with the Dangerous Currents Database Users Guide (PDF)



GLCID Search Totals

Type of Current	# of Fatalities	# of Rescues
CHANNEL	11	3
CLASSIC RIP	47	86
CLASSIC RIP/OUTLET	5	6
CLASSIC RIP/STRUCTURAL	30	24
OUTLET	7	19
STRUCTURAL	38	157
total:	138	295

Average Incidents per Year by Lake

LAKE	Average # of Fatalities	Average # of Rescues	Average # of Incidents
ERIE	2.8	1.9	4.7
HURON	1.6	0.6	2.1
MICHIGAN	6.8	19.9	26.7
ONTARIO	1.8	1.2	3.0
SUPERIOR	1.2	3.1	4.3

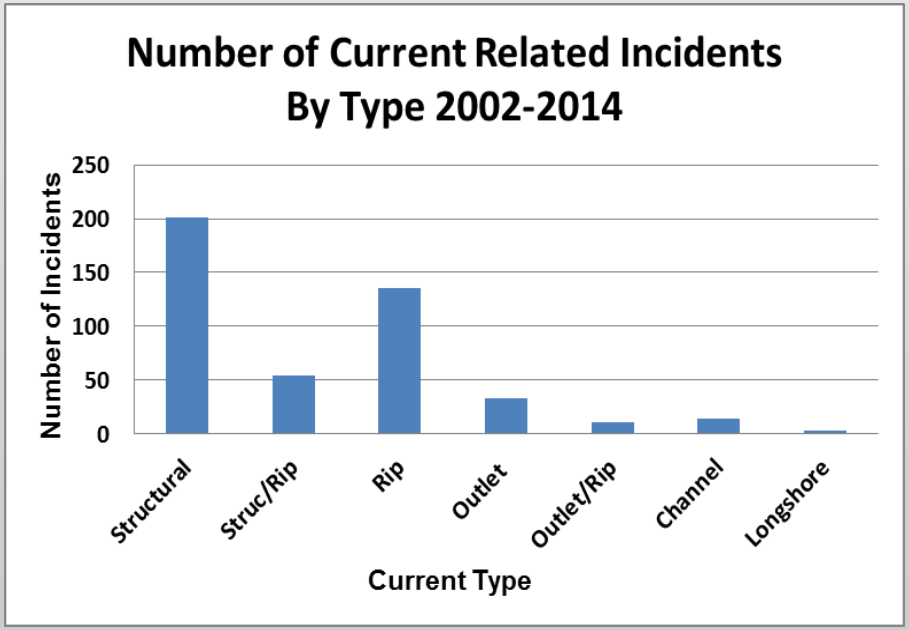
Average Incidents per Year / Lake

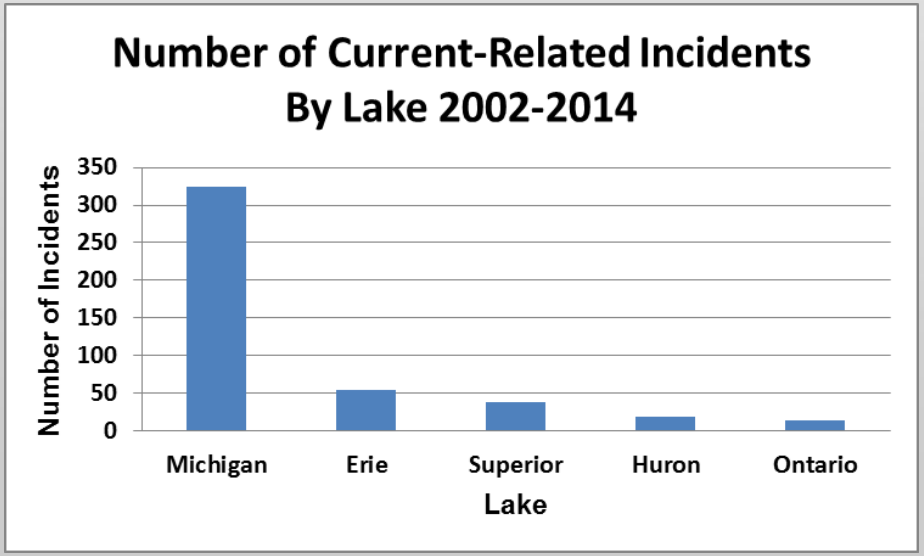
Average # Fatalities	Average # Rescues	Average # Incidents
3.3	7.0	10.3

GLCID Search

ID	Year	Date	Fatalities	Rescues	Beach Name	County	State/Province	Lake	Type Of Current	Wave Direction	Wave Height (ft)	CWA	GPS Lat	GPS Lon
1	2003	08-20-2003	1	1	GRAND HAVEN STATE PARK	OTTAWA	MICHIGAN	MICHIGAN	STRUCTURAL	S	3 TO 4	GRR	43.0597	-86.2517
2	2002	06-08-2002	0	1	GRAND HAVEN STATE PARK	OTTAWA	MICHIGAN	MICHIGAN	STRUCTURAL	S	3 TO 4	GRR	43.0597	-86.2517
3	2002	06-11-2002	0	1	GRAND HAVEN STATE PARK	OTTAWA	MICHIGAN	MICHIGAN	STRUCTURAL	S	3 TO 4	GRR	43.0597	-86.2517
4	2002	07-10-2002	1	0	NICKLE PLATE BEACH	ERIE	OHIO	ERIE	CLASSIC RIP	NE	5 TO 6	CLE	41.3963	-82.5438

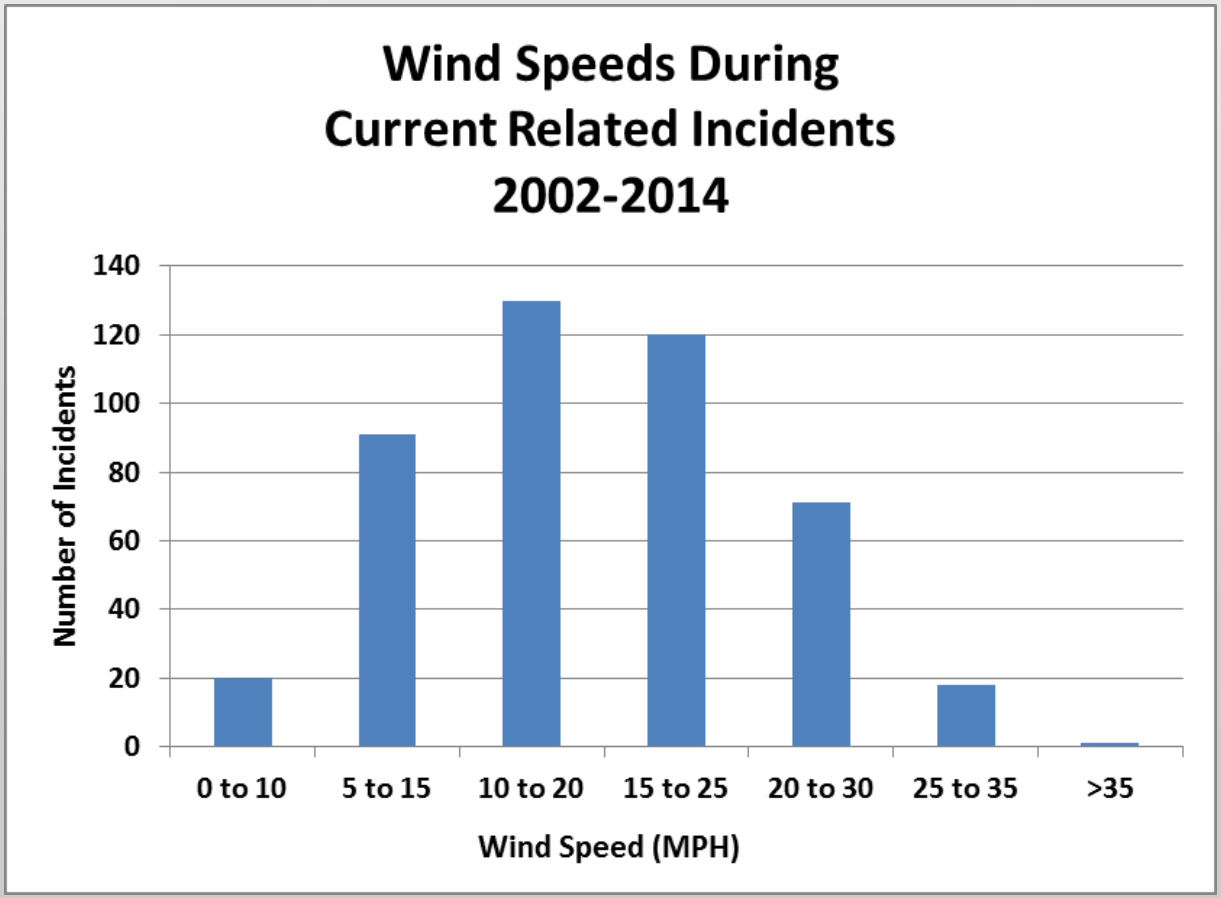
Incidents by Current Type and by Lake





DANGEROUS CURRENTS

Incidents and Wind Speed

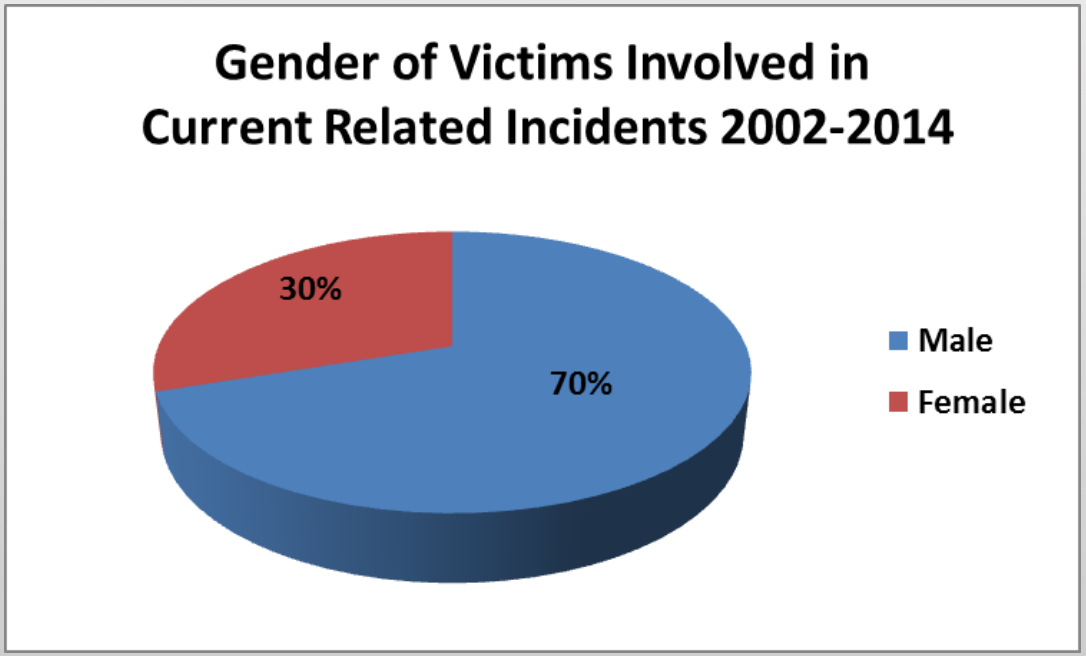


DANGEROUS CURRENTS

Victim Demographics

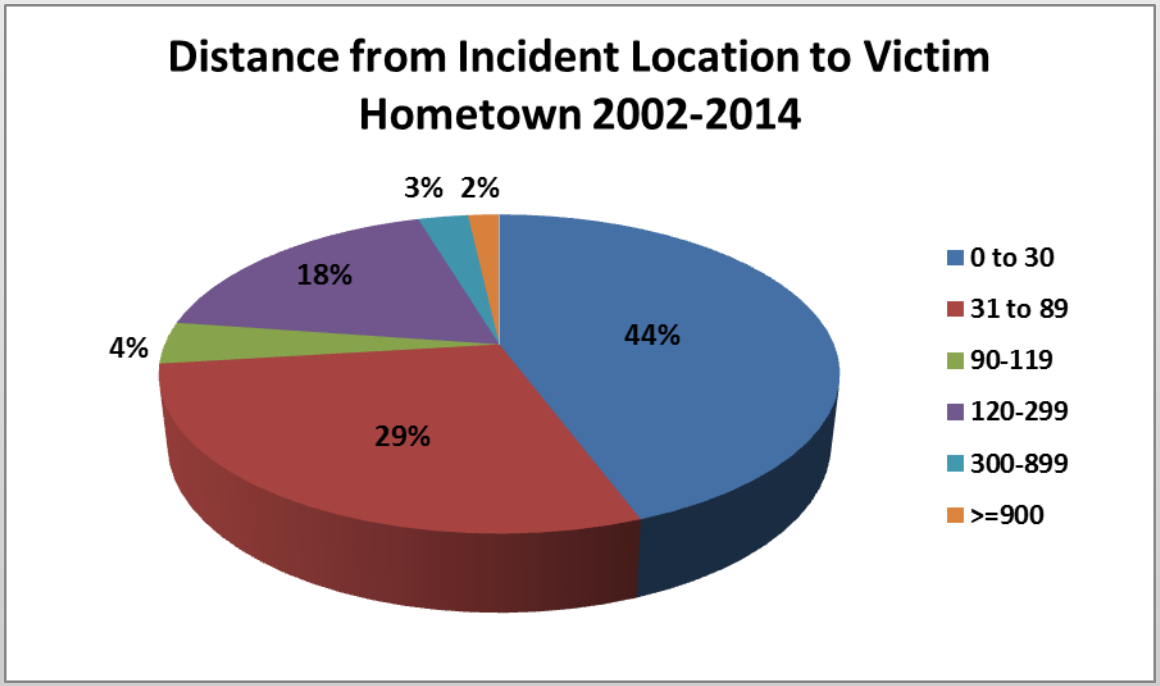
- All but one of the 2014 victims in the Great Lakes were male. Similar to drowning incidents in the nation.
- Half lived within 60 miles of the beach, and half lived between 90 and 300 miles from the beach.
- Age of the 2014 victims ranged from 7-50 years, with most victims in adolescent and young adult age groups.
- Majority of victims on the Great Lakes are between the ages of 15 to 25 years or are parents.

Gender of Victims



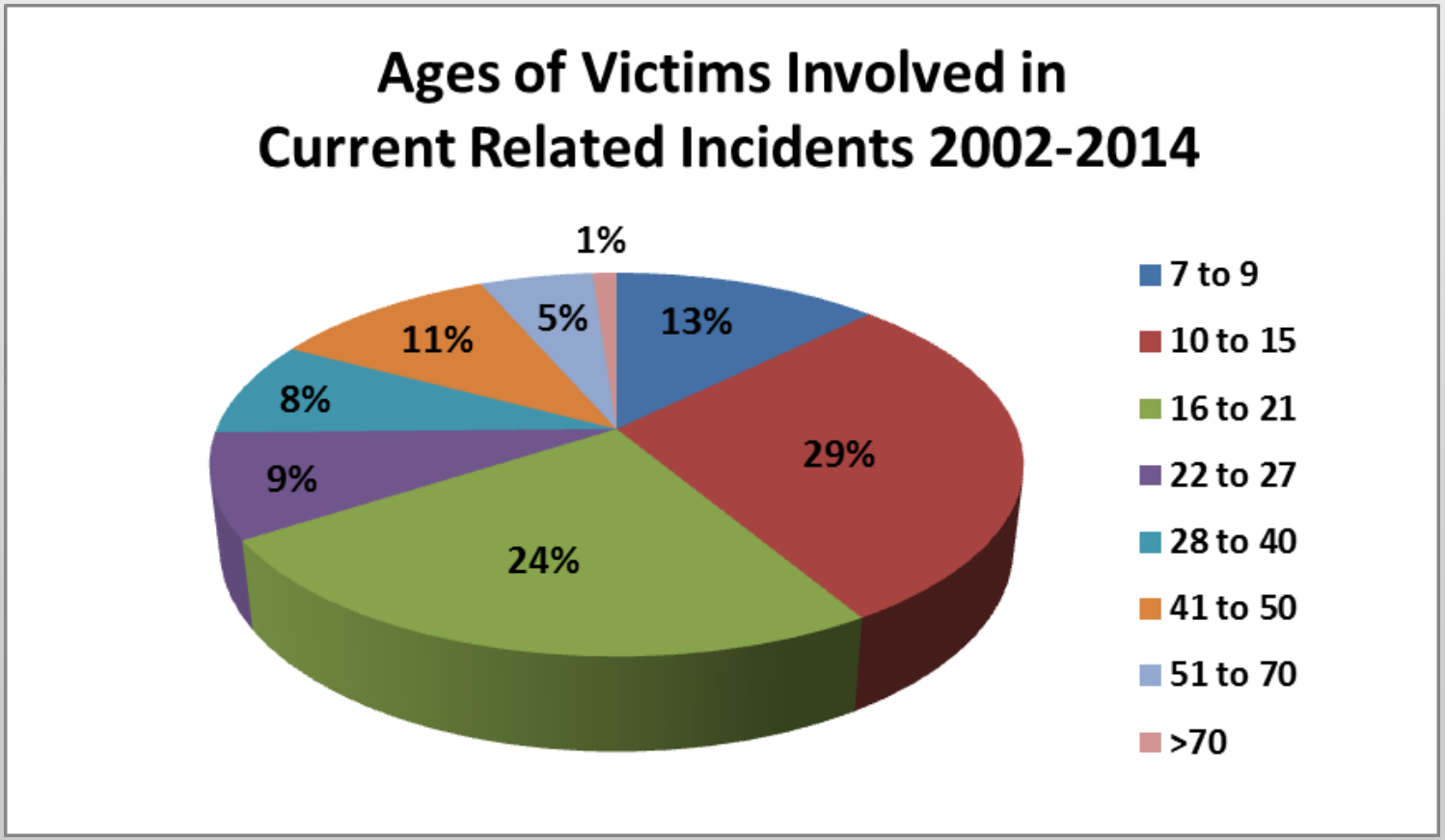
Percentage based on Dangerous Currents Incident Database, reflects only incidents with complete data (319 total incidents with missing data).

Distance of Location



The majority of fatalities occurred in the victim's home state.
Total Incidents with hometown distance data: 282/451 (DB total incidents)
Incidents missing distance data (unavailable): 169.

Age of Victims



Resources

Dangerous Currents Regional Website: *www.dangerouscurrents.org*

- *Key resources:*
  - Great Lakes Dangerous Currents Incident Database: http://www.miseagrant.umich.edu/dcd/dcdsearch.php
  - Types of Currents
  - Currents 101: The Science of Currents
  - Be Safe at the Beach: Tips for Swimmers
- Dangerous Currents Outreach Project: http://www.miseagrant.umich.edu/dangerous-currents-outreach-project/

Diagrams, graphics and publications tailored for the Great Lakes:

- Publication Templates
- Illustrations of the Types of Dangerous Currents
- Articles and Fact Sheets

Resources

- **National Weather Service**
  Annual Incident Statistics, see:
  http://www.crh.noaa.gov/mqt/?n=glcidyearlystats

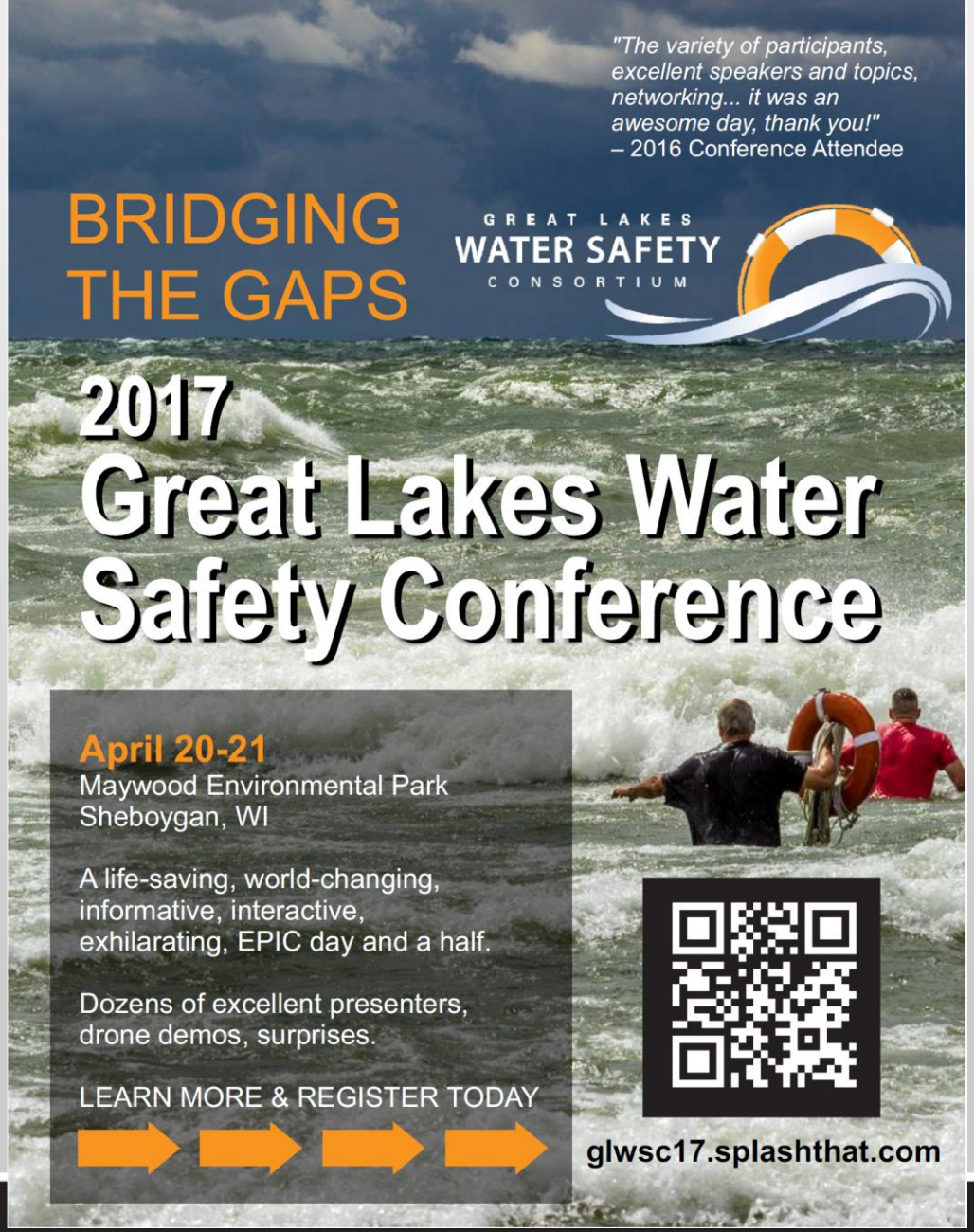
- New central Beach Hazards Forecast webpage, coming soon.

- **Teaching Great Lakes Science** (K-12 lessons and activities)
  - See: www.greatlakeslessons.com
  - Dangerous Currents 101
  - Surges and Seiches
    - *Activities:*
      - Investigating Wind and Water
      - Storm Behavior
  - Dangerous Currents: Don't Get Swept Away
    - *Activities:*
      - Who is Drowning in the Great Lakes?
      - What Does Drowning Look Like?

Resources

Reports:

- Kinnunen, R., LaPorte, E. *Implementing the Michigan Department of Environmental Quality Coastal Management Program's Section 309 Strategy*, (July 2014) Project Report 12-RIP-001, Michigan Sea Grant.
- Lapinski, M., Viken, G., *Great Lakes Swim Safety Risk Communication for 18-24 year Old Males: Review of Key Literature and Results of a Focus Group Study*, (June 2014), Michigan State University.
- Meadows, G.A., H. Purcell, D. Guenther, L. Meadows, R.E. Kinnunen, and G. Clark, (2011) Rip Currents in the Great Lakes: An Unfortunate Truth, *Rip Currents: Beach Safety, Physical Oceanography, and Wave Modeling,* S. Leatherman and J. Fletemeyer, Eds., CRC Press, 199-214.
- Meadows, G., and L. Meadows. *Rip Currents in the Great Lakes: Advancing Forecasting Through Perishable Data Recovery and Analysis,* Coastal Zone Management Project, 2014.


"The variety of participants, excellent speakers and topics, networking... it was an awesome day, thank you!"
– 2016 Conference Attendee
BRIDGING THE GAPS
GREAT LAKES WATER SAFETY CONSORTIUM
2017
Great Lakes Water Safety Conference
April 20-21
Maywood Environmental Park
Sheboygan, WI
A life-saving, world-changing, informative, interactive, exhilarating, EPIC day and a half.
Dozens of excellent presenters, drone demos, surprises.
LEARN MORE & REGISTER TODAY
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DROWNING PREVENTION

Bob Pratt
Great Lakes Surf Rescue Project

SCOPE

ANR
anrweek.canr.msu.edu
WEEK

RECOGNIZE

RESPOND

RESUSITATE

RECOGNIZE

RESPOND

RESUSITATE

WHAT DROWNING LOOKS LIKE:

American Red Cross

Troubled Waters: Many Americans Lack Basic Water Safety Skills

Many of those polled in a recent American Red Cross survey believe the myths about water safety...

67% believe "water wings" keep kids safe in the water

63% of families with children will swim somewhere without a lifeguard on duty

93% were unable to identify the correct order of steps for helping a swimmer in danger

11% think it's OK to read or talk on the phone when supervising children in the water

How many Americans have taken swimming lessons?

Whites	Hispanics	African Americans
56%	49%	32%

Almost half

say they've had an experience where they were afraid they might drown.

What to do:

If you see a swimmer in distress, shout for help, reach or throw the person a rescue or floatation device, tell them to grab on to it and call 9-1-1 if needed. Give care as needed.

For 1 in 5 households with children 3-17, none of the children can swim.

Be water safe this summer.
Learn more at redcross.org/watersafetytips

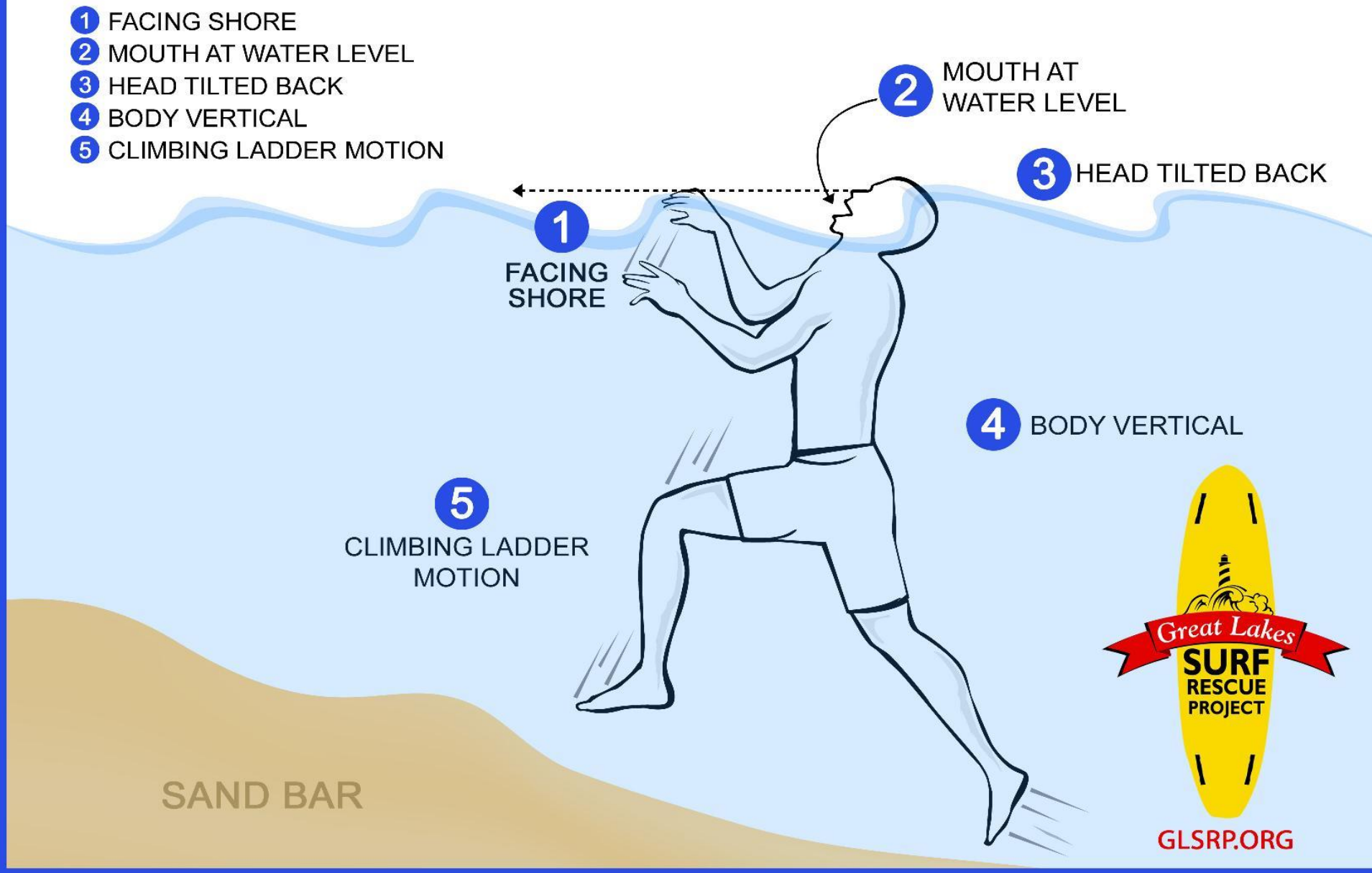
Note: All findings based on a telephone survey of 1,011 U.S. adults 18 years and older on April 11-14, 2013. Comparison findings based on a telephone survey of 1,002 adults 18 years and older on March 20-23, 2009.


JULY 17, 1987
KENS 5
MySA.com

WHAT DOES DROWNING LOOK LIKE?

THE SIGNS OF DROWNING

1. FACING SHORE
2. MOUTH AT WATER LEVEL
3. HEAD TILTED BACK
4. BODY VERTICAL
5. CLIMBING LADDER MOTION



Great Lakes SURF RESCUE PROJECT

GLSRP.ORG

RECOGNIZE

RESPOND

RESUSITATE

WATER RESCUE:

REACH

THROW

ROW

TOW

GO

SELF-RESCUE

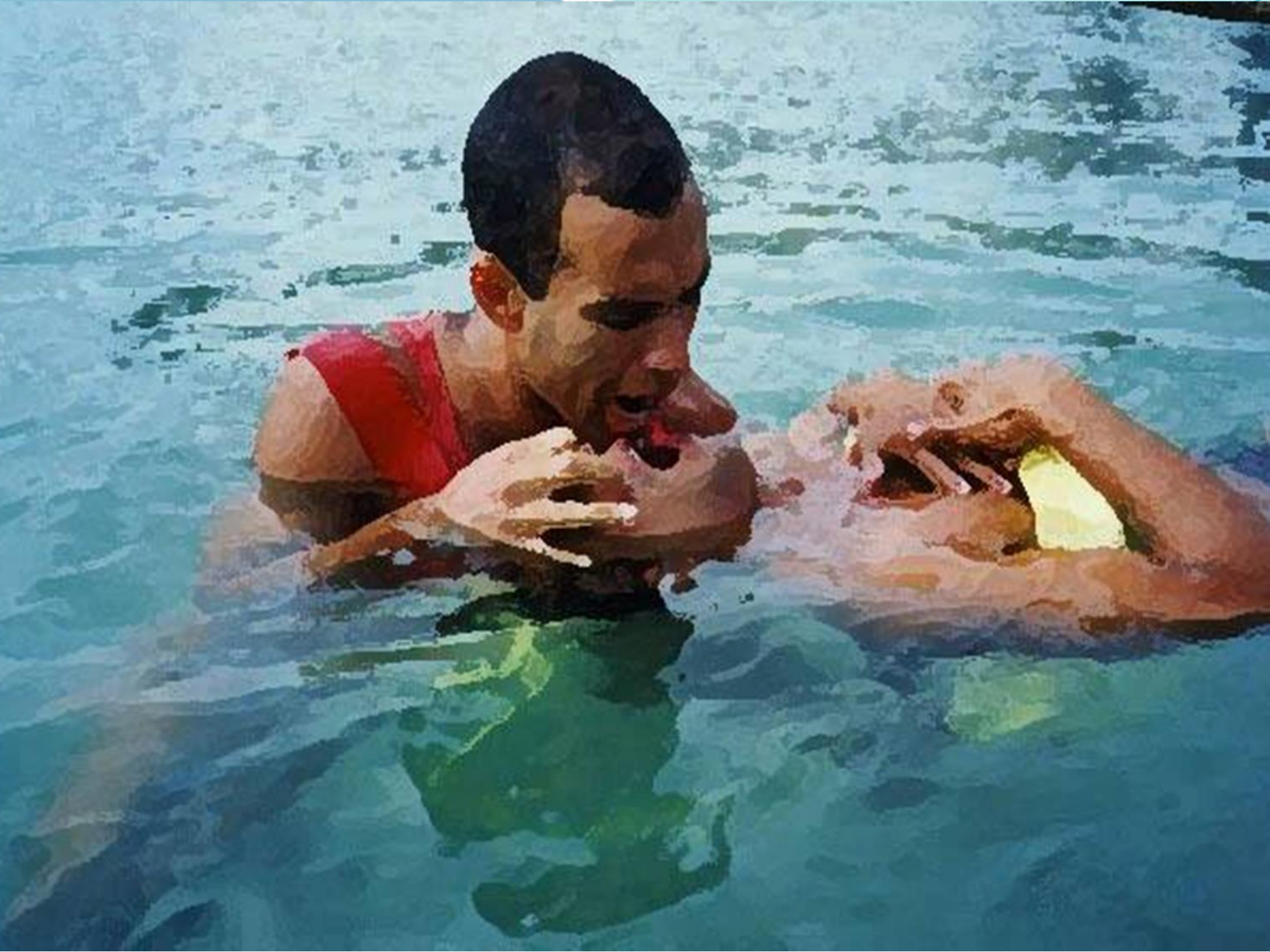

DELTA

RECOGNIZE

RESPOND

RESUSITATE

DROWNING IS DIFFERENT



QUESTIONS/ COMMENTS??

THANK YOU!!

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Great Lakes
SURF
RESCUE
PROJECT