



Dogs and people navigate their way through the flooded entrance to Montrose Dog Beach on a warm and sunny spring day, May 5, 2019, in Chicago. (Erin Hooley/Chicago Tribune)

TODAY'S WEATHER:

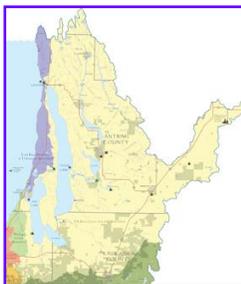
www.wunderground.com/us/mi/kewadin

STORM CENTRAL

www.gtlakes.com/storm-central/

**COAST & WATERSHED PROTECTION
 E.A.S.T.B TEAM ORGANIZED**

Will provide direction to the GT Bay Watershed Protection Plan for the Antrim Coast, Elk Rapids to Norwood (area in purple) – next to Elk River Chain of Lakes (area in yellow).



POLICY

Economy, Community, Property Values

THREATS TO GT BAY COAST

Alongshore Trek – ER to Eastport

CONSERVATION & ENVIRONMENT

Coastal processes

Relationship between Great Lakes water levels, wave energies, coastal damage

Transport of septic-derived nutrients to the Great Lakes through a beach aquifer

Reef assessment and rebuilding from Elk Rapids to Creswell Road

Sand loss assessment and replacement

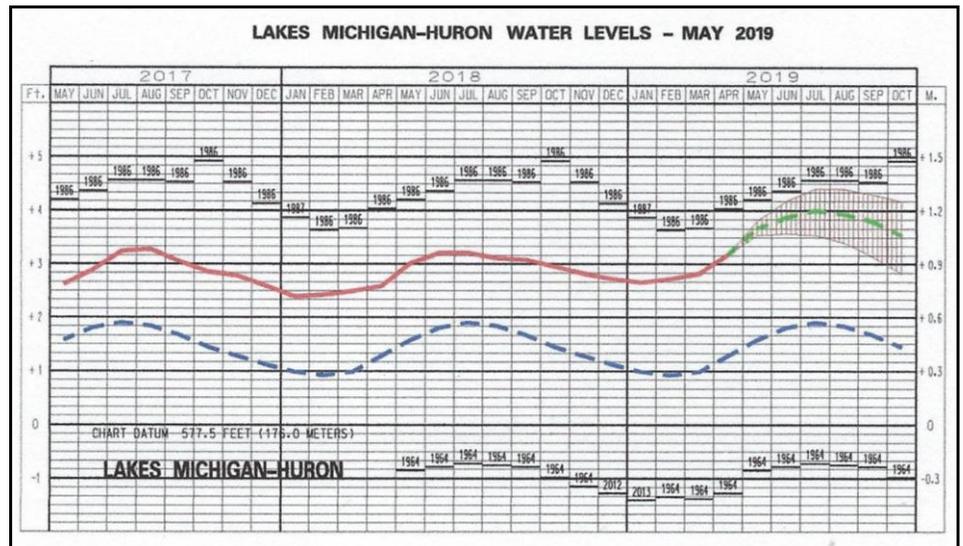
Shore bird population assessment.

Coastal macro-biotic loss from invasive Quagga mussels

Non-point source watershed pollution – required per EPA 319 grant.

LATE BREAKING NEWS - Swollen Great Lakes Flood Shore Towns
 Water levels expected to reach historic highs; docks are submerged, beaches washed-out

BY: Jake Holland - Wall Street Journal May 22, 2019 5:30 AM. Please read entire article at: <https://www.wsj.com/articles/high-water-levels-on-great-lakes-flood-towns-shrink-beaches-11558517400>



LAKE MICHIGAN WATER LEVELS: 'THEY'VE BEEN HIGHER THAN THIS BEFORE, BUT NOT BY MUCH'; MEANWHILE LAKES SUPERIOR AND ERIE SET TO BREAK MAY RECORDS

<https://www.chicagotribune.com/news/local/breaking/ct-met-great-lakes-water-levels-20190507-story.html>

BY: Tony Briscoe Chicago Tribune – Please read the entire article at the link above.

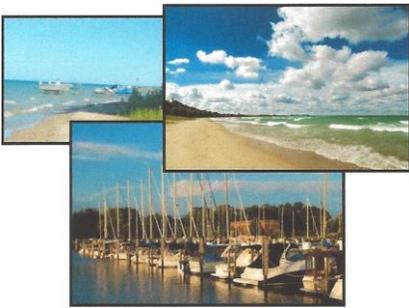
EXCERPT: After a snowy and soggy April, water levels on all five Great Lakes rose by more than a half-foot and are forecast to remain well above their average this summer, with two anticipated to break record highs, according to the U.S. Army Corps of Engineers.

Between April and May, each of the lakes rose at least 6 inches and stands more than a foot above its monthly average. Lakes Michigan and Huron, measured together because they are connected at the Straits of Mackinac, rose 9 inches in a month and are more than 2 feet above their monthly average.

But in a century of record-keeping, lakes Superior and Erie are expected to tie or break their records for the month of May, and Superior is expected to continue to climb several more inches, increasing the likelihood it will eclipse monthly records for June and July. Even under a wettest scenario, Lake Michigan will still be about 3 inches shy of tying the monthly record for June. Great Lakes water levels typically crest in the summer months, but they surpassed forecasts, in part, thanks to wet weather in April.

Even though Lake Michigan is not expected to break any records this summer, that doesn't mean coastal communities will be spared from flooding and damaging waves, Kompoltowicz said.

"The forecast for Lake Michigan, even if it stays in the middle of our forecast band, will be highest levels experienced since the record highs of the 1980s. So, they've been higher than this before, but not by much," Kompoltowicz said. "The high-water impacts — coastal flooding and shoreline erosion when we get large storms and heavy breaking waves — those will continue even though the levels don't break records."



E.A.S.T.B DUNE & FORE-DUNE PRIMER

<http://geo.msu.edu/extra/geo/mich/dunes.html>

Forested residential areas along Bay beaches extend south from Norwood to Elk Rapids. This dune-like setting has beach ridges and large wetlands east of residential roads. A few wetlands lie between beach and bluff. Wetlands water fluctuates seasonally and yearly.

Inland dune ridges repeat. They might have started as a fore-dune that grew in height and stabilized by vegetation. Between these ridges lie large wetlands kept wet by upland farm creeks, surface run-off, rain and snow.

Inland dune ridges are older than the active fore-dune at the beach. A greater variety of vegetation shows that there has been time for tree species to move into dune areas first stabilized by beach grass.

Tree cores in cottonwoods and poplars on an inland dune ridge measure 25-40 years. Cores from hardwoods on a forested dune ridge measure ages of 50-150 years. The dune ridge is older than the ages of the trees on it.



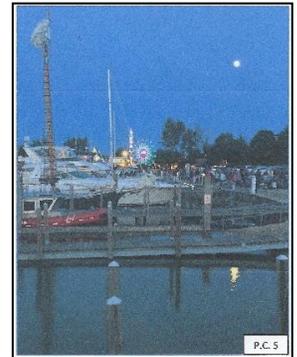
THE ECONOMIC IMPACTS OF ELK RAPIDS' (ANTRIM) WATER-BASED CULTURE

Excerpt from "The Economic and Fiscal Impacts of Michigan's Ports and Harbors."

BY: Vincent Magnini, William E. Boik and John C. Crofts for the Michigan Ports Collaborative.

<https://www.manisteemi.gov/DocumentCenter/View/4052/Revised-40---REPORT---Michigan-Ports-and-Harbors> Please read the complete article at the link. Elk Rapids Harbor begins on page 48

Today, in Elk Rapid's Edward C. Grace Memorial Harbor, there are 153 days open for the season (May 15th – October 15th) of which about 120 of those days are at full occupancy in the marina. There are 265 total slips of which about 77 percent are rented seasonally as opposed to transient. These figures underscore the strong demand for boating in the area.



ECONOMIC IMPACT

Water-based tourism and recreation spending, in these and other categories (at the Antrim County Level), contributed \$53.9M to the gross domestic product (GDP) of Michigan, spawned approximately \$8.1M in federal tax income, and roughly \$6.6M in Michigan state/local tax income

The 2017 economic impact due to water-based tourism and recreation in the Elk Rapids (County-wide) area is estimated at \$96.7M (Table 8). In 2017, economic activity supported roughly 815 full-time equivalent jobs around the state and was associated with roughly \$36.6M in labor income (\$22.2M direct labor income).

TABLE 8:
THE ECONOMIC IMPACTS OF ELK RAPIDS' WATER-BASED CULTURE:
TOURISM AND RECREATION-RELATED COMPONENTS

2017 Water-Based Tourism and Recreation	Economic Impact:	Total: \$96.7M	Direct: \$53.1M	Secondary (Indirect and Induced): \$43.6M	
	Visitors' Largest Spending Categories:	Restaurants: \$8.2M	Lodging / vacation rentals: \$7.8M	Gas: \$3.9M	Groceries: \$2.7M
	Jobs (FTE):	Total: 815	Direct: 543	Secondary (Indirect and Induced): 272	
	Labor Income:	Total: \$36.6M	Direct: \$22.2M	Secondary (Indirect and Induced): \$14.4M	

NOTE 8: The values listed in Table 8 above, derive from visitors to Antrim County who visited during 2017 due to the water-based culture of the area. Analyses were conducted at the county-level for two reasons: 1) being relatively small geographically, visitors to Elk Rapids likely enjoy other attractions in the county – there is only a distance of 13 miles between Torch Lake (north end of county shoreline) and Elk Rapids (south end of county shoreline); and 2) the only accurate visitation data that could be obtained for this location was aggregated at the county-level.

GULLS ON SHORE OF LAKE MICHIGAN

By: John Tracey, U.S. Geological Survey.

The U.S.G.S National Wildlife Health Center, with help from many partners and support from the Great Lakes Restoration Initiative, has established L. Michigan Volunteer AMBLE – "Avian Monitoring for Botulism Lakeshore Events."



AMBLE seeks to empower a network of citizens to monitor bird health and beach conditions along L. Michigan shoreline, to increase knowledge of avian botulism trends. Volunteers monitor selected sections of shoreline every 7 - 10 days, June through November. Data collected on species and numbers of healthy, sick, and dead birds and environmental conditions will be summarized and made available to natural resource managers. Visit the [AMBLE website](#) for more information.

FISH EGGS ARE SUFFOCATING IN LAKE MICHIGAN REEFS.

What will it take to save these nurseries?

<https://www.chicagotribune.com/news/ct-met-cb-climate-change-chicago-midwest-20190408-story.html>

EXCERPT: Please read entire story at the link Many Great Lakes reefs, both man-made and natural, have been smothered by invasive zebra and quagga mussels that have colonized the lake bottom, leaving eggs exposed and more vulnerable to predators.

In other areas near the mouths of rivers and tributaries, scientists say these reefs are being buried by sand and silt, the result of increased precipitation, soil erosion, runoff and climate change

Man-made reefs have proven capable of beckoning large numbers of fish, but it is unclear how much these structures are helping overall wild fish population.

Native fish in the Great Lakes have already faced a gantlet of obstacles to survive; overfishing, pollution, less food availability, competition with invasive species. Researchers are wondering how lake trout and other species — including walleye, lake whitefish, smallmouth bass — will respond to this bout of habitat degradation.



Quagga Mussels Colonizing a Reef

EDITOR'S NOTE: DEQ restored a reef near ER Harbor – Cisco fishing is great. But at least 15 more miles of cobblestone reefs were flattened by ice during polar vortex winters 2013-15. As a result, fish habitat and a barrier to storms were destroyed.

Reported in TNN News - Summer 2017

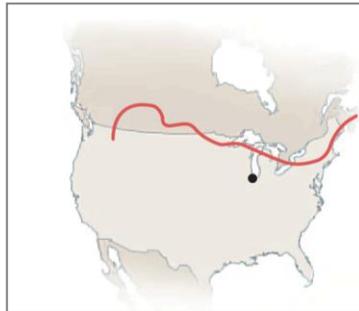
CHICAGO IS SINKING. HERE'S WHAT THAT MEANS FOR LAKE MICHIGAN AND THE MIDWEST

BY: Tony Briscoe Chicago Tribune FEBRUARY 28, 2019 - 7:05 AM

EXCERPT - Please read the complete article at the link.

<https://www.chicagotribune.com/news/ct-met-disappearing-glacier-chicago-sinking-20190220-story.html>

The sightlines at Wrigley Field, the panorama from Navy Pier, the vantage points at the Adler Planetarium observatory — all structures built more than 100 years ago — are at least 4 inches lower now.



HINGE - Regions to the south are generally sinking, regions to the north are generally rising

In the northern United States and Canada, areas that once were depressed under the tremendous weight of a massive ice sheet are springing back up while others are sinking. The Chicago area and parts of southern Lake Michigan, where glaciers disappeared 10,000 years ago, are sinking about 4 to 8 inches each century.

The greatest impact of this imperceptible phenomenon likely won't be inland, however. The contour separating the part of the

continent that is rising from that which is falling bisects the Great Lakes.

In Lake Michigan, that line passes from Death's Door at Green Bay in Wisconsin to Grand Traverse Bay in Michigan, signaling that the far northern end is rising while the rest of the lake is lowering.

Over time, that has created a tilting effect, generally translating into higher lake levels for the southern end of the lakes and lower watermarks for the northern shorelines. (Emphasis added)

Come on in the water's fine!

