

Out of Breath and Nowhere to Go: How Low Oxygen Zones Put the Squeeze on Fish Habitat

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Lake Erie Central Basin Sport Fish Summit

Aug 2008

Oxygen-starved waters kill thousands of Lake Erie fish



By D'Arcy Egan, The Plain Dealer

on August 29, 2008 at 10:45 AM, updated August 29, 2008 at 10:50 AM

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Brisk east winds have pushed oxygen-starved waters from Lake Erie's "Dead Zone" to the Ohio shoreline, killing thousands of sheepshead and smallmouth bass this week. Beaches from Cleveland to Ashtabula are littered with dead fish, although the prized walleye and yellow perch seem to have escaped.

"The area of anoxia stretches from Ashtabula to Eastlake," said **Kevin Kayle** of the Ohio Division of Wildlife's Fairport Harbor Fisheries Unit. "The kill was triggered by a few days of east winds that pushed warm shoreline waters out to the middle of the lake and caused an upwelling of cold, anoxic water along the shoreline."

A large deep-water area in the Central Basin has been dubbed the "Dead Sea" because of low or non-existent oxygen levels in the fall. It seems more severe than in previous years, said Kayle.

The oxygen-depleted waters of the "Dead Zone" are triggered by dying algae, which consumes oxygen as it sinks to the lake bottom. The larger-than-normal algae blooms have been triggered by an influx of phosphate into Lake Erie from agricultural fertilizer, household detergents and from filter-feeding quagga and zebra mussels. The bottom-dwelling invasive species spew large amounts of phosphate, aggravating the anoxic condition.

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Tens of thousands of fish die in Lake Erie; lack of oxygen cited



Ontario Ministry of Environment

These fish are among the tens of thousands found dead on 25 miles of Lake Erie beaches in Canada's Ontario Province.

By Miguel Llanos, NBC News

Tens of thousands of dead fish that washed up on Lake Erie beaches in Ontario, Canada -- and had locals wondering if something or someone had poisoned the water -- were likely killed by a lack of oxygen caused when lake sediment was stirred up, the province reported Friday.

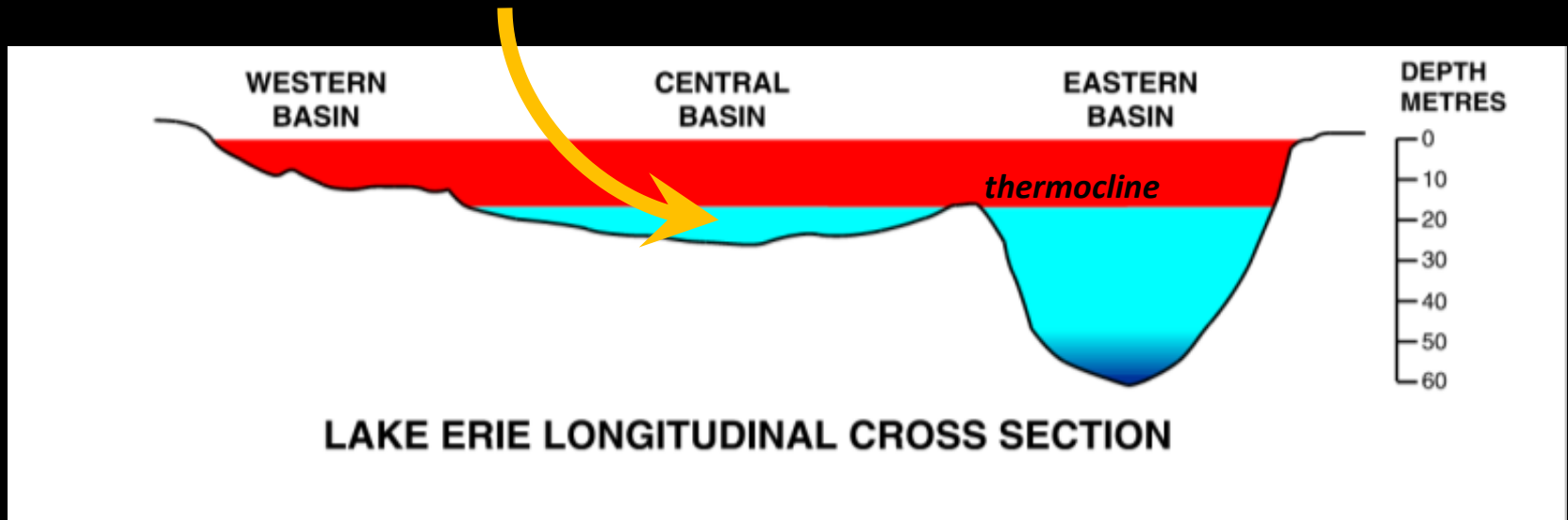


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Water samples "do not show evidence of a manure spill or anything unusual in terms of contaminants," Ministry of Environment spokeswoman Kate Jordan told NBC News.

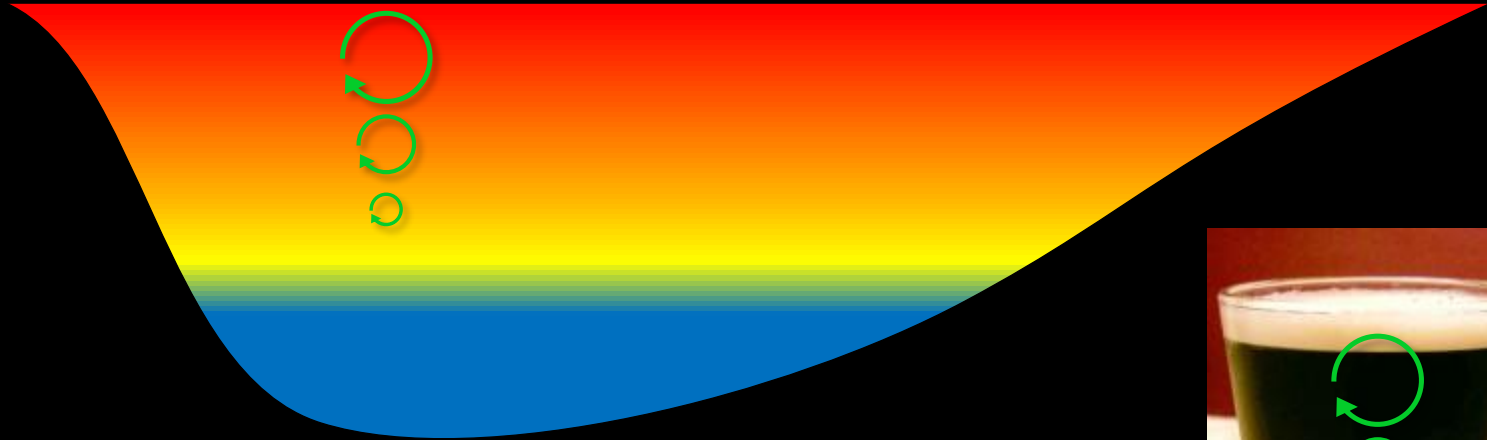
Where is Lake Erie's low oxygen zone?

Seasonal Low Oxygen Zone Development

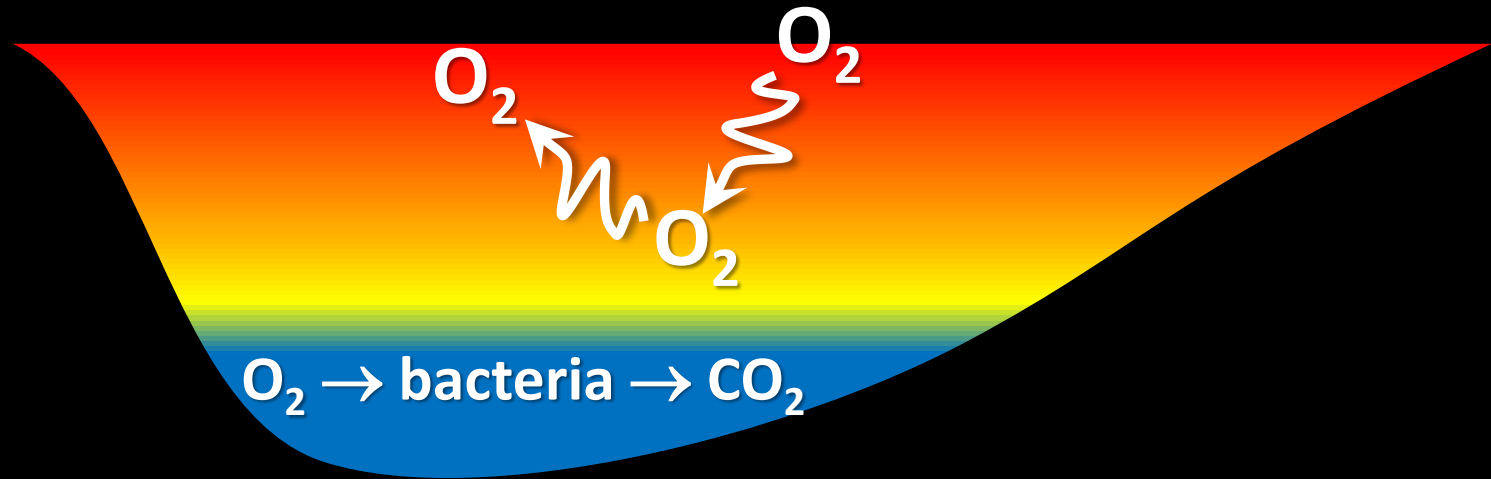


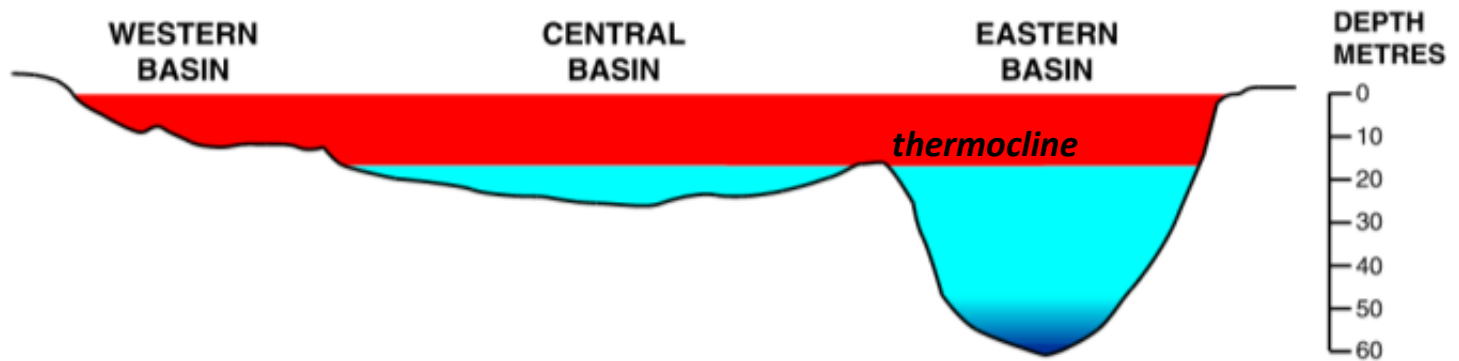
What causes low oxygen zones?

Wind energy



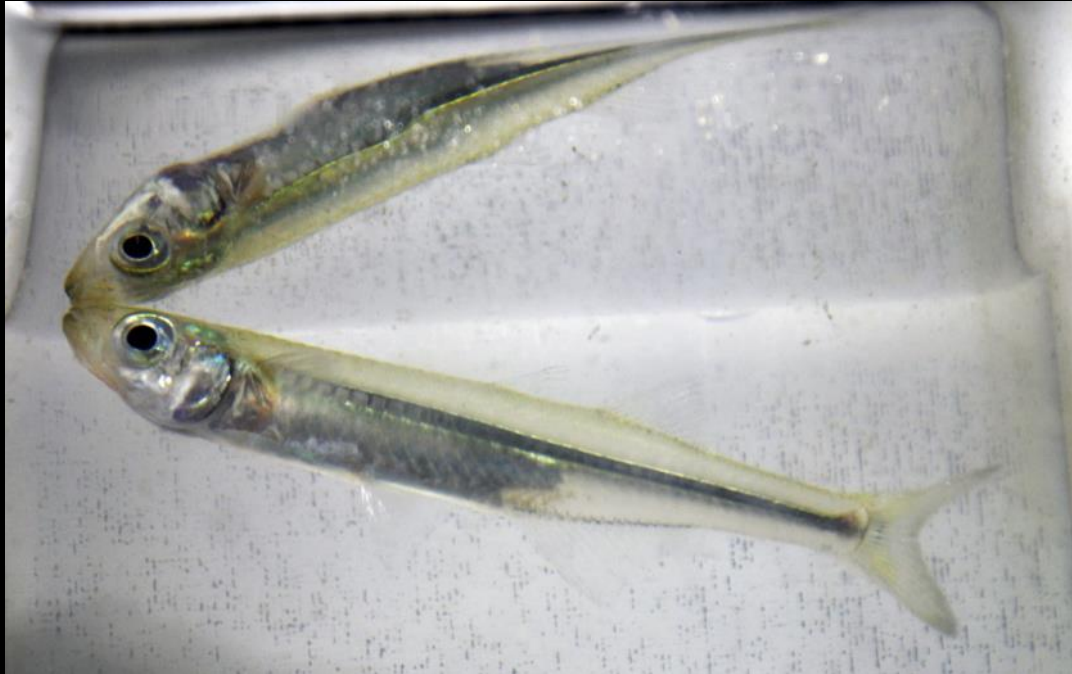
What causes low oxygen zones?





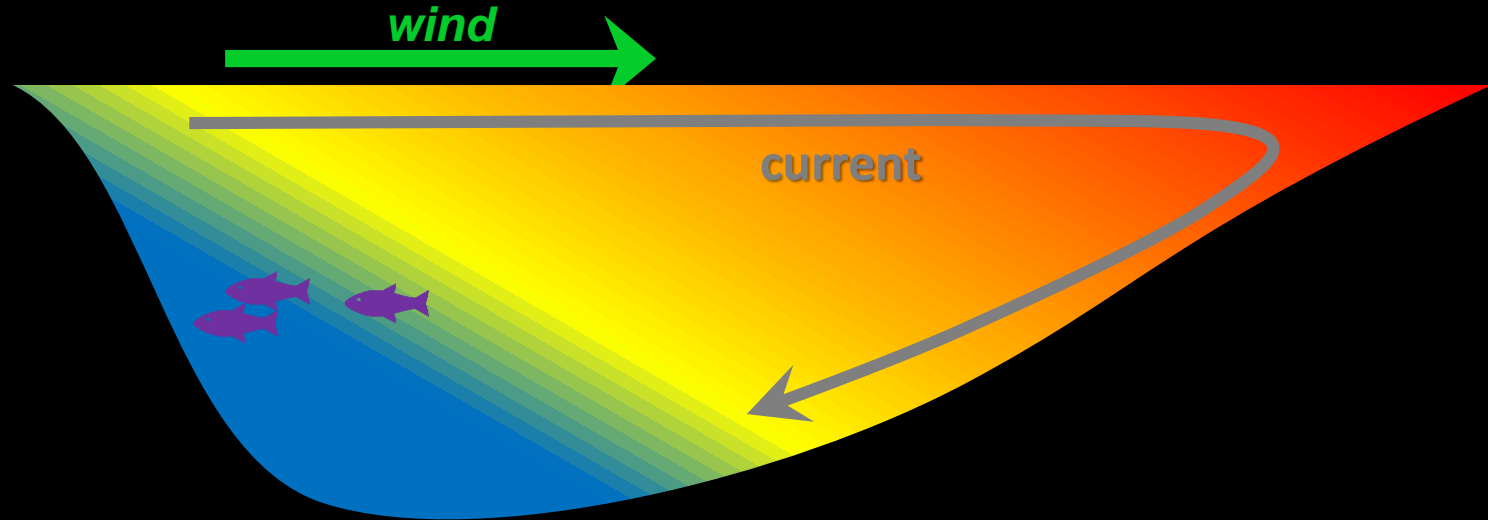
LAKE ERIE LONGITUDINAL CROSS SECTION

How do low oxygen zones affect fish?



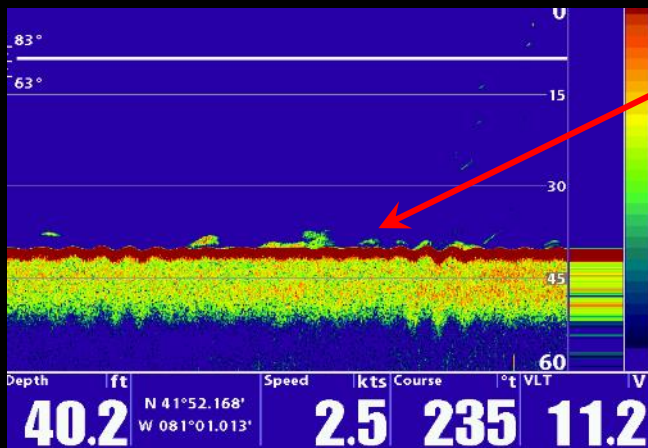
- **Aquatic Surface Respiration**

How do low oxygen zones affect fish?

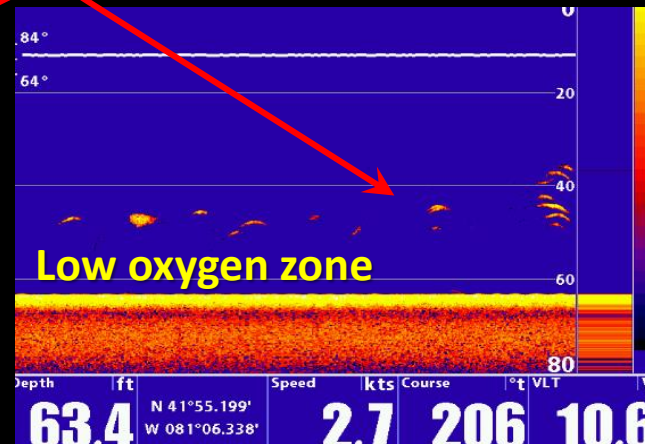


- Fish kills are sometimes associated with upwelling events

How do low oxygen zones affect fish?



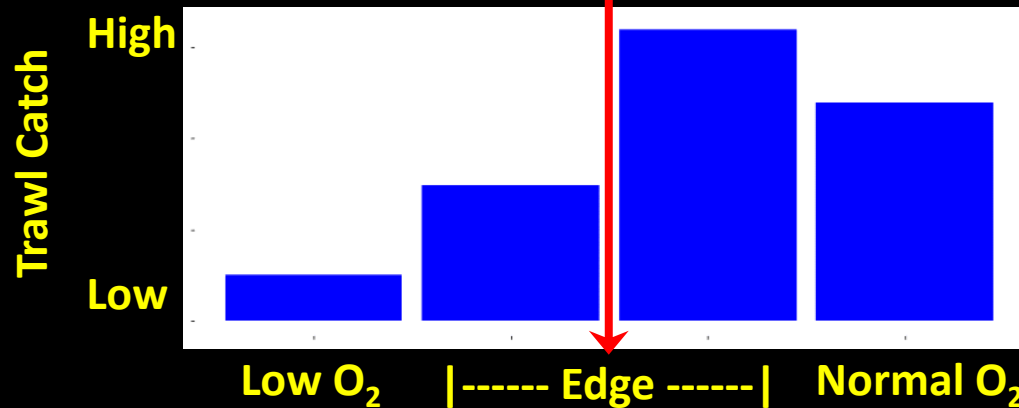
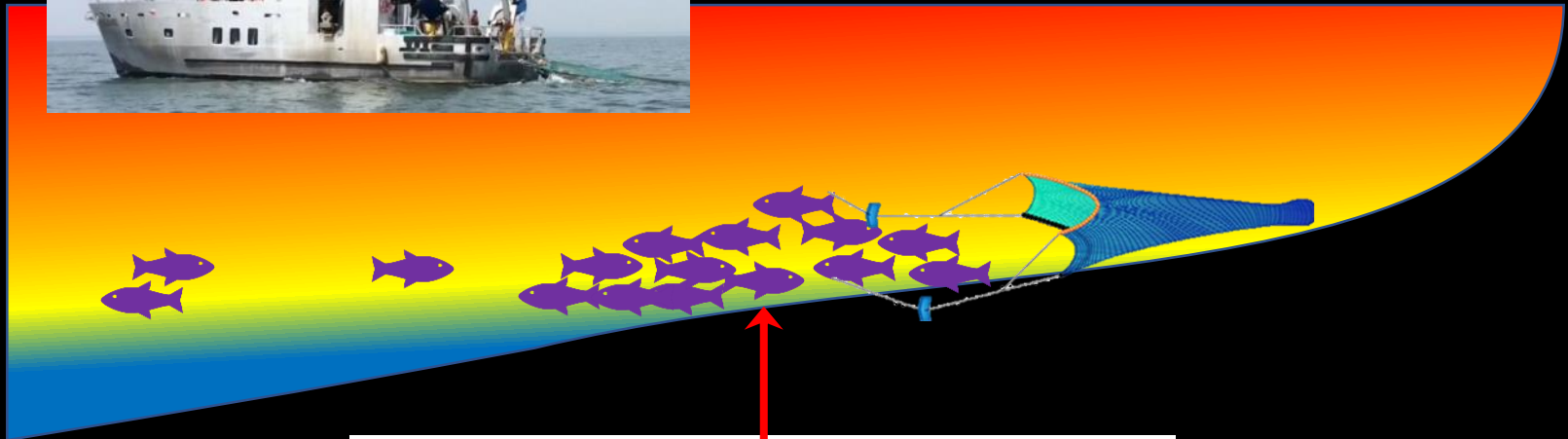
Fish targets



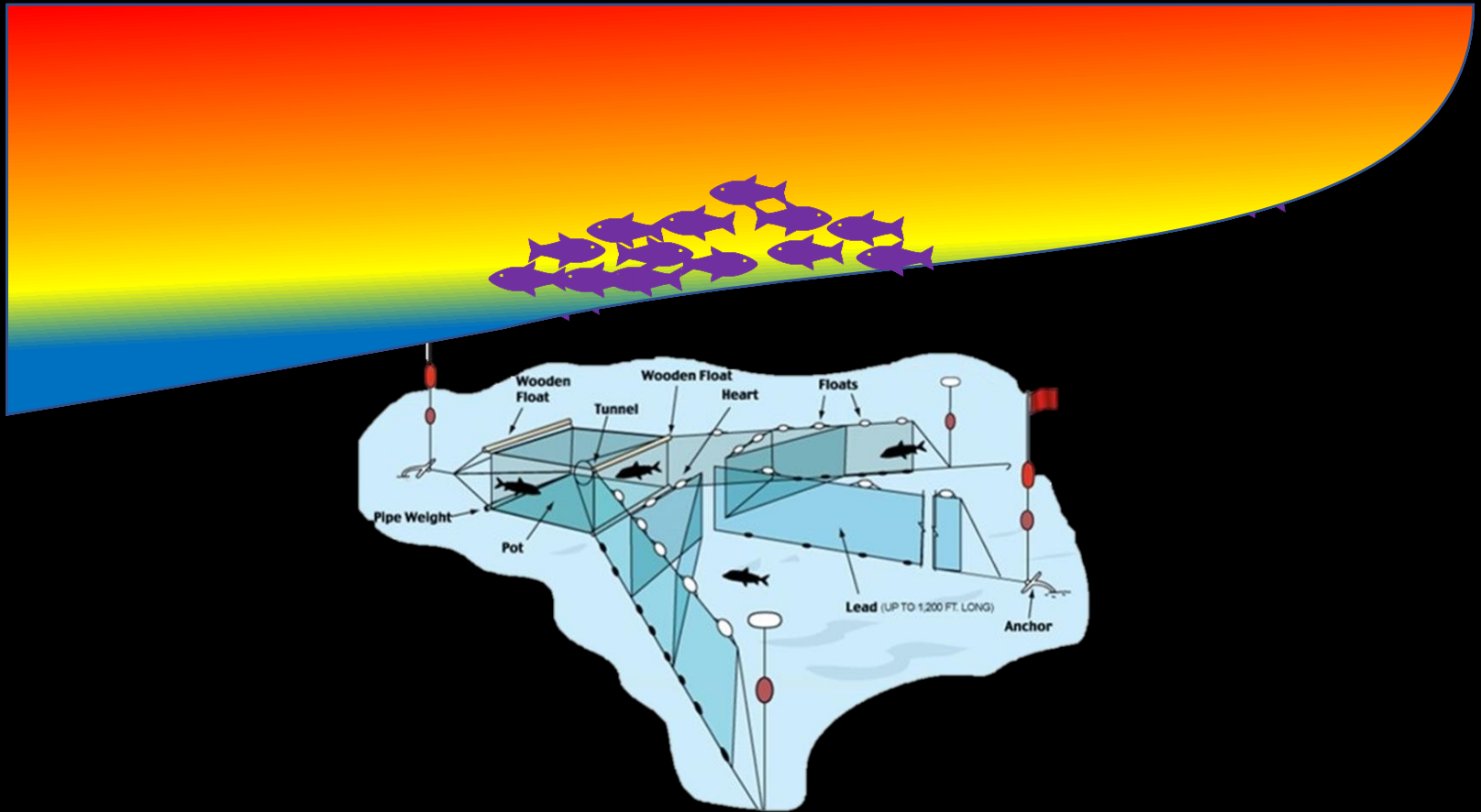
Thermocline depth

- Coolwater species (perch and walleye) also avoid unsuitably warm surface temperatures.

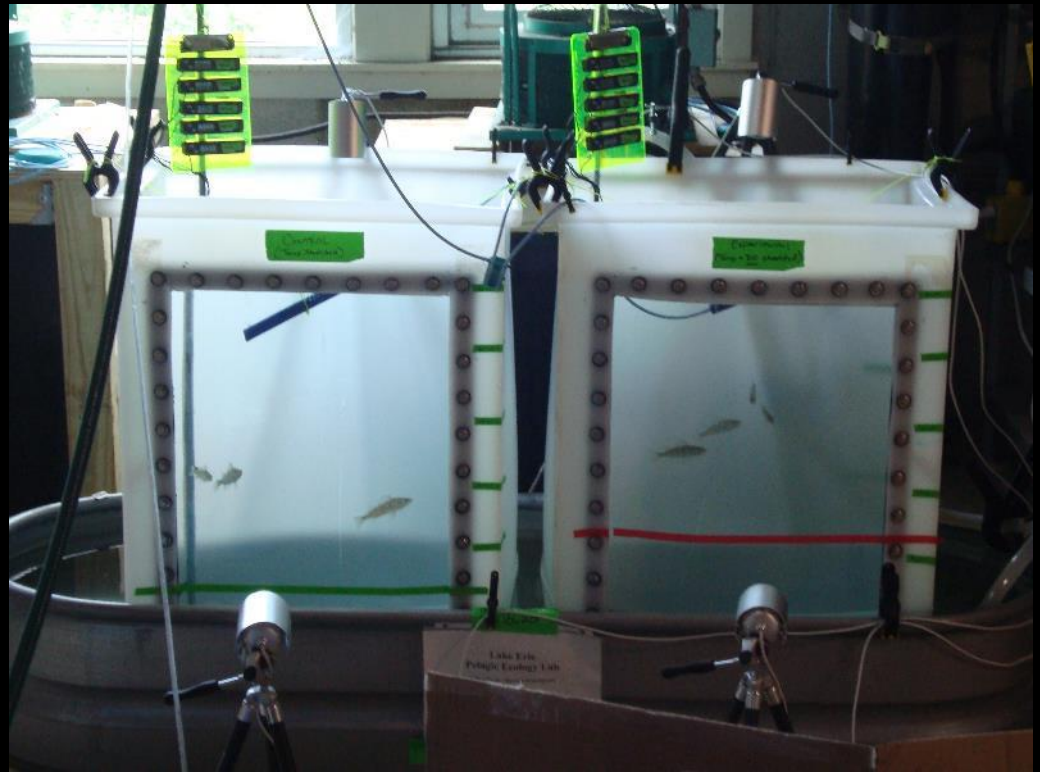
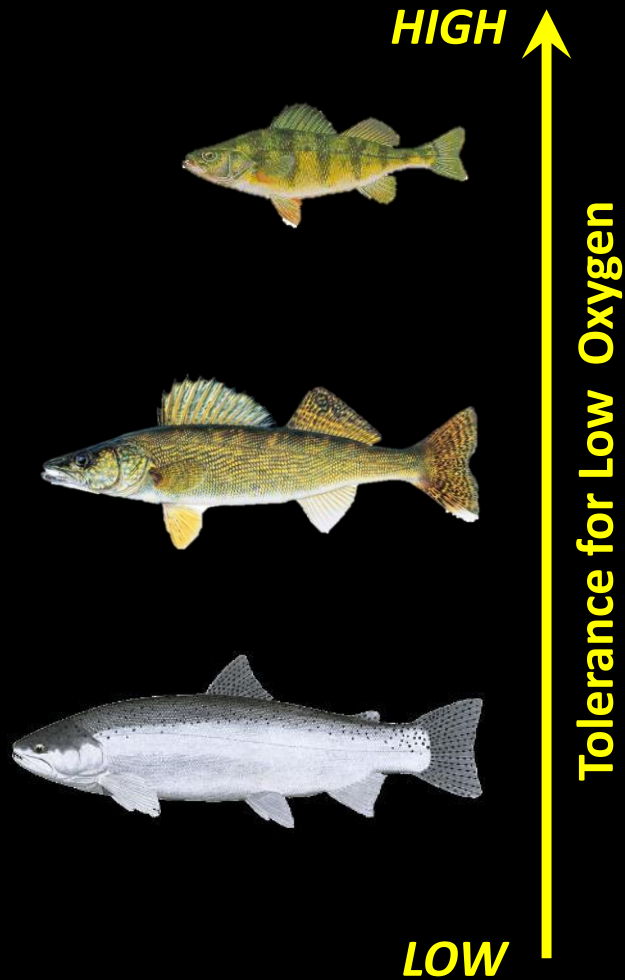
How do low oxygen zones affect fishing?



How do low oxygen zones affect fishing?

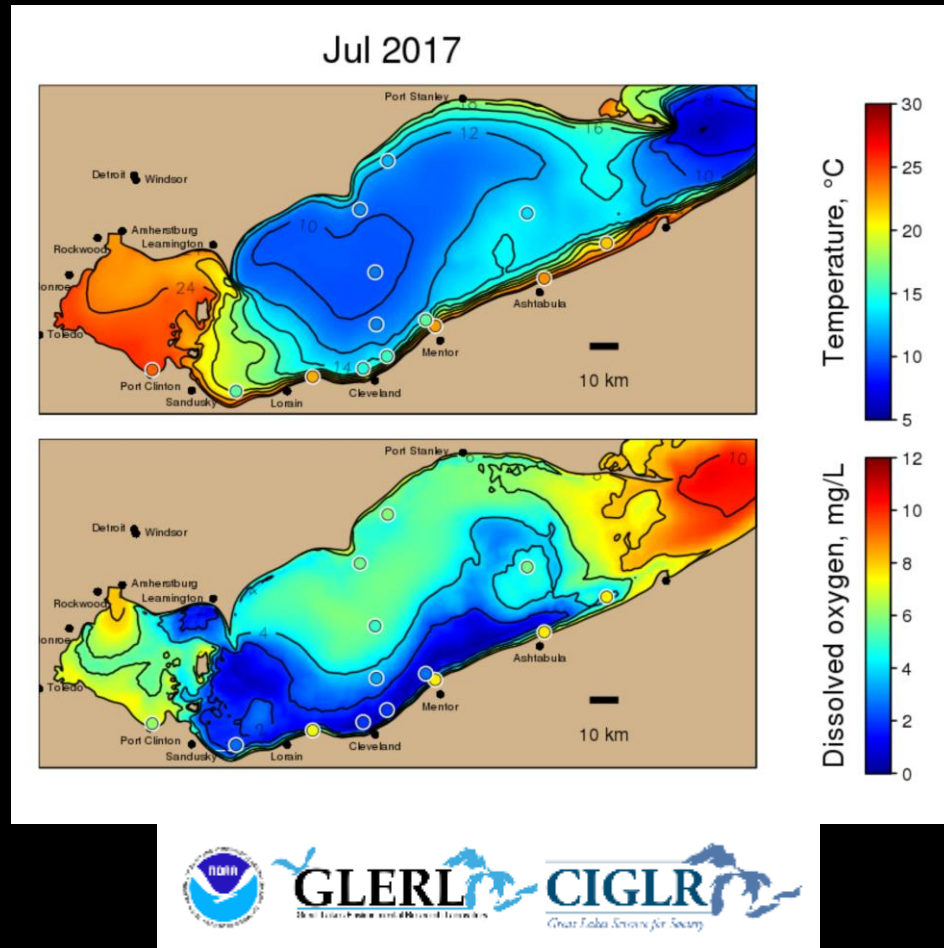


Which species are affected by the “squeeze”?



University of Toledo, laboratory experiments

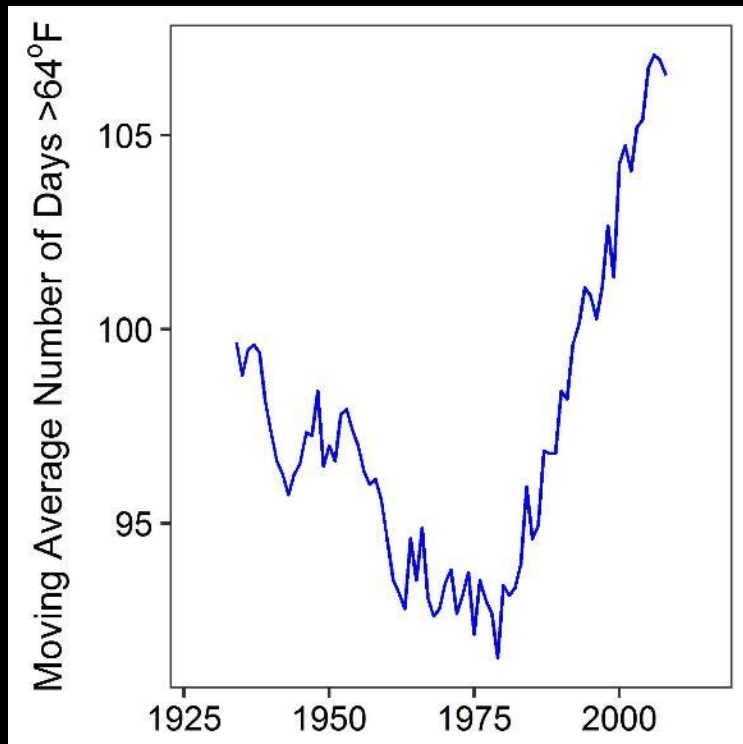
Can we predict low oxygen zones?



Search: GLERL Hypoxia Warning System

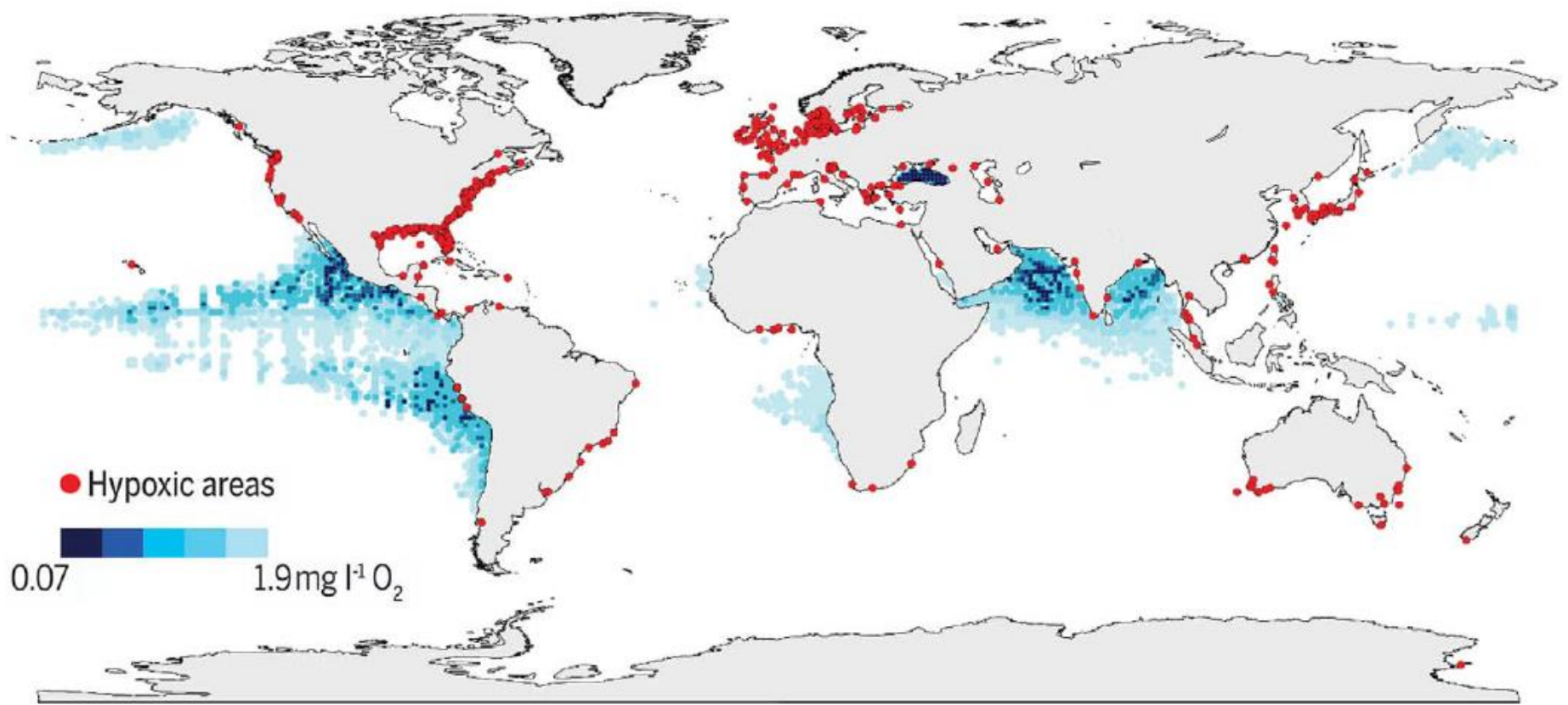
What can we do about low oxygen zones?

Water temperature at Buffalo



Blue-Green Algae Bloom 2011





Brietburg et al. 2018, Science