CITIZENS AGAINST WIND TURBINES IN LAKE ERIE

TECH PRESENTATION

ADDING UNACCEPTABLE CHALLENGE

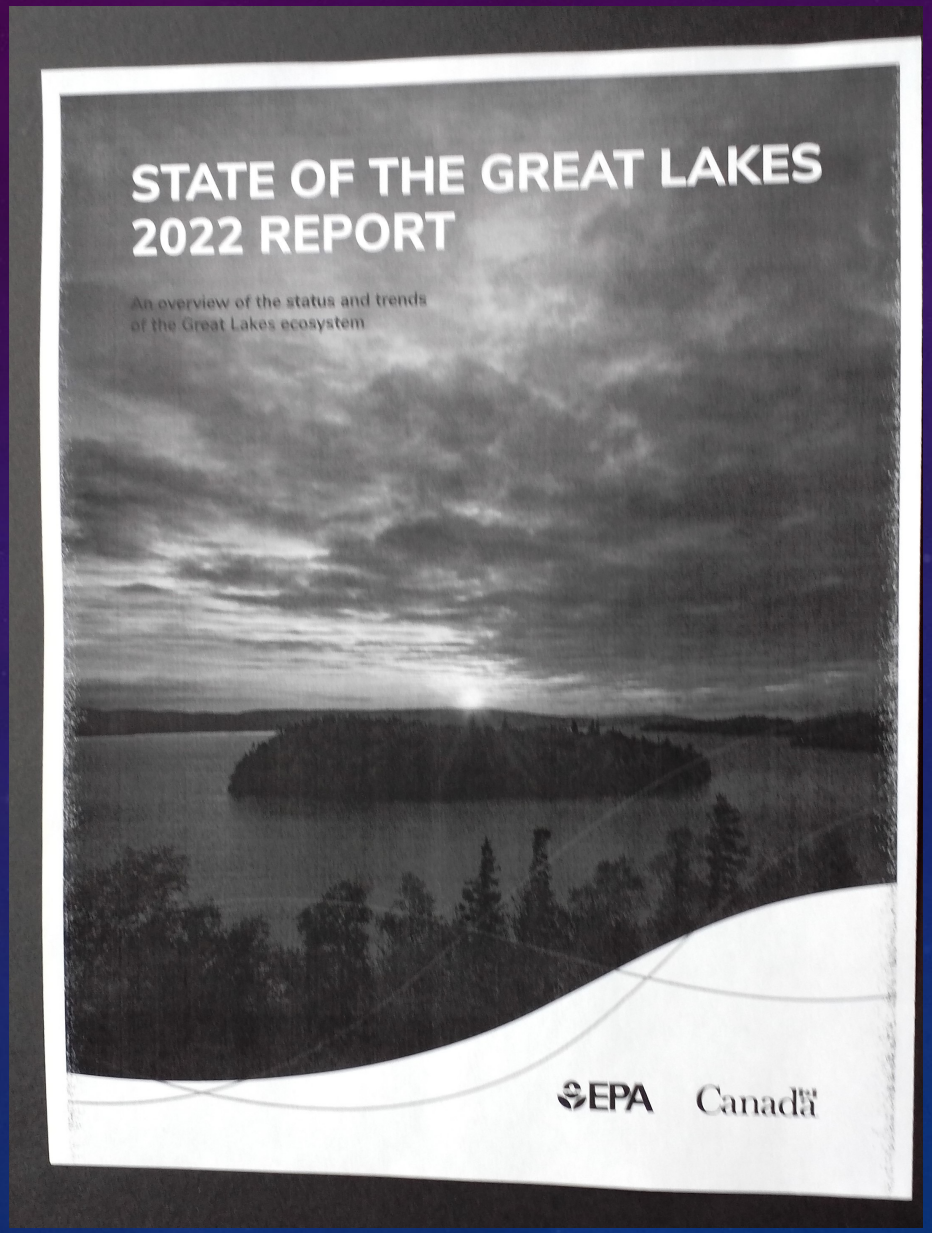
TO

AN IMPROVING YET FRAGILE ECOSYSTEM

CITIZENS AGAINST WIND TURBINES IN LAKE ERIE

DECEMBER FIFTH, TWENTY-TWENTY TWO

Mark Twitchell


STATE OF THE GREAT LAKES
2022 REPORT
An overview of the status and trends
of the Great Lakes ecosystem
EPA
Canada

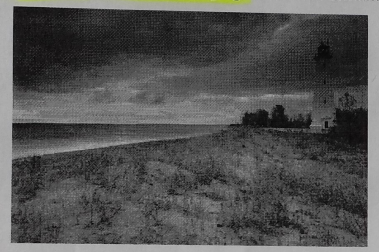
Lake Erie

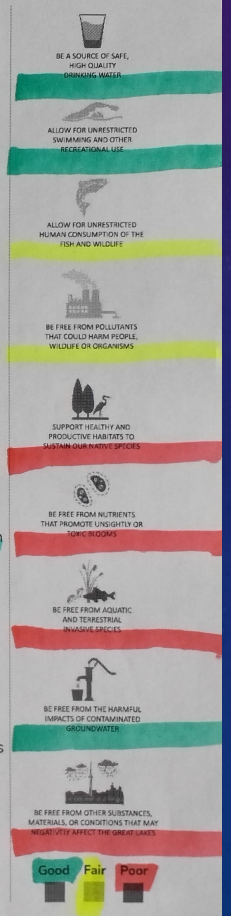
Bi National

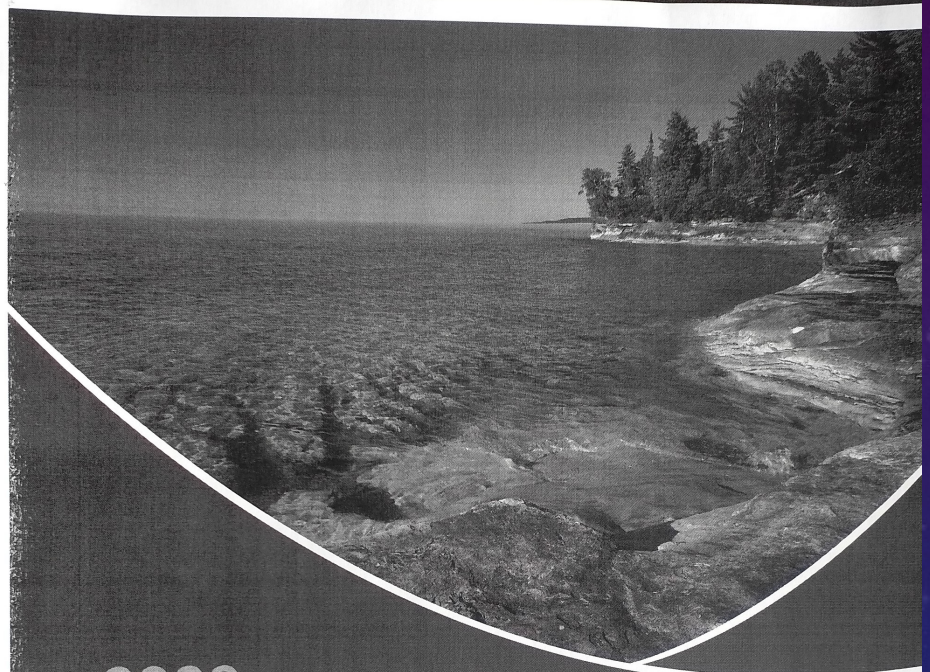
State of the Great Lakes 2022 Report

Lake Erie supports a productive Walleye fishery, but elevated nutrient concentrations and algal blooms are persistent problems.

Lake Erie continues to be a good source of high-quality drinking water. Toxic chemicals monitored in Lake Erie are assessed as **Fair**; while overall long-term trends indicate that concentrations are **Unchanging**, declines in contaminant concentrations in fish filets are being observed. Lake Erie fish continue to be a nutritious food source, however, restrictions on consumption of certain species of fish continue to be advised in certain areas. Lake Erie's beaches and nearshore waters provide **Fair** opportunities for swimming and other recreational use for the majority of the swimming season. Nutrients and algae continue to be a significant issue and are assessed as **Poor**. Harmful algal blooms resulting from high concentrations of nutrients occur regularly in the western basin of Lake Erie during the summer months. These blooms can produce toxins, which are harmful to humans and wildlife. Excessive growth of *Cladophora* continues to be a problem in the eastern basin of the lake which can cause fouling of beaches and shorelines, clog municipal water intakes, and impact tourism and recreational fishing. Coastal wetland conditions range from **Fair** to **Poor** as a result of several factors, including the impacts of invasive species like *Phragmites* and Hybrid Cattail. The lower food web is generally in **Poor** condition. However, zooplankton are in **Good** condition, helping to support abundant prey and predator fish. Prey fish diversity and the proportion of native prey fish species have declined, but despite a changing prey fish community, Lake Erie supports the largest self-sustaining Walleye population in the world. Lake Trout abundance has increased due in part to declines in Sea Lamprey populations. Lake Trout populations in Lake Erie have been entirely supported by stocking for many decades, however, several wild Lake Trout hatchlings were captured in the New York waters of Lake Erie in 2021 providing the first evidence of natural reproduction of Lake Trout in the lake in over 60 years. Self-sustaining populations of Lake Sturgeon are found in St. Clair River, Detroit River and the Upper Niagara River. Increased aquatic habitat connectivity due to dam removal and mitigation projects is further supporting the increasing predator and prey fish populations in the lake. The status of invasive Sea Lamprey is **Good** with the number of adult Sea Lamprey being maintained below the target, and the trend is **Improving**. Invasive mussels are impacting nutrient cycling by retaining and recycling nutrients in nearshore and bottom areas of the lake through their filtering and excretion activities. Lake Erie has the highest number of aquatic non-native species as the warmer, highly productive waters provide a more hospitable environment for these species. Groundwater quality is assessed as **Good** based on nitrate and chloride concentrations. Land-based stressors continue to impact Lake Erie. Shifts in climate trends such as earlier onset of stratification and decreasing ice cover, may also have ecosystem implications. **Based on the assessments of the nine State of the Great Lakes indicators, the overall status of the Lake Erie basin ecosystem is Poor and the trend is Unchanging.**







2022 PROGRESS REPORT OF THE PARTIES

Pursuant to the 2012 Canada-United States Great Lakes Water Quality Agreement

Canada

STATE OF NEW YORK
PUBLIC SERVICE COMMISSION

Application of Cassadaga Wind LLC
Request for Trade Secret/Confidential
Protection

AFFIDAVIT IN SUPPORT OF REQUEST

Case No. 14-F-0490

STATE OF TEXAS)
: ss.:
COUNTY OF TRAVIS)

John Franklin, being duly sworn deposes and says as follows:

1. I am Executive Vice President-Operations for RWE Renewables Development, LLC, a Delaware limited liability company, which is a wholly-owned subsidiary of RWE Renewables Americas, LLC (collectively referred to as "RWE"), Cassadaga Wind LLC's parent company. I am based in Austin, Texas. I attended the University of Massachusetts-Lowell and graduated with a BSEE degree in Power Engineering in 1976. I have worked for RWE (and its predecessor, E.ON Climate and Renewables North America Inc.) for 14 years. Prior to RWE I worked at Florida Power & Light Company. As EVP-Operations for RWE I am responsible for all aspects of operations and maintenance of RWE's renewable assets in North America.

2. On January 17, 2018, the Siting Board issued an Order granting a Certificate of Environmental Compatibility and Public Need, with Conditions ("Certificate") to Cassadaga Wind LLC ("Cassadaga Wind"). The Certificate authorizes construction of 48[1] wind turbines to be located in the Towns of Cherry Creek, Charlotte, and Arkwright, capable of producing up to 126 megawatts (hereinafter referred to as the "Facility").

3. I submit this affidavit in support of Cassadaga Wind LLC's appeal of the Records Access Officer's determination denying trade secret protection for the Monthly Blade Inspection Reports which can contain confidential details related to the Facility's turbines.

15. I have also reviewed the April 11, 2022, letter by Concerned Citizens of Cassadaga Wind Project ("CCCWP"). CCCWP raises two concerns related to blade damage (1) noise generated by damaged blade and (2) microplastic shedding. Cassadaga Wind's Article 10 Certificate has sound limits and requirements for sound testing; therefore, the Monthly Blade Inspection Reports do not address any sound issues. Sound issues would be contained in separate reports that are required to be filed with the Public Service Commission per Cassadaga's Certificate (Conditions 71-73). With respect to microplastic shedding there is no scientific evidence that wind turbines increase microplastic pollution. Wind turbines do not contain the kind of plastics found in microplastics, as wind turbine blades are not composed of thermoplastics.

08.07.2021

Leading Edge erosion and pollution from wind turbine blades

5 th. Edition - English

Asbjørn Solberg, Bård-Einar Rimereit and Jan Erik Weinbach

"THE TURBINE GROUP" JULY 2021

Vestas

Project 8: Modelling of leading edge erosion patterns

Student Project Proposal

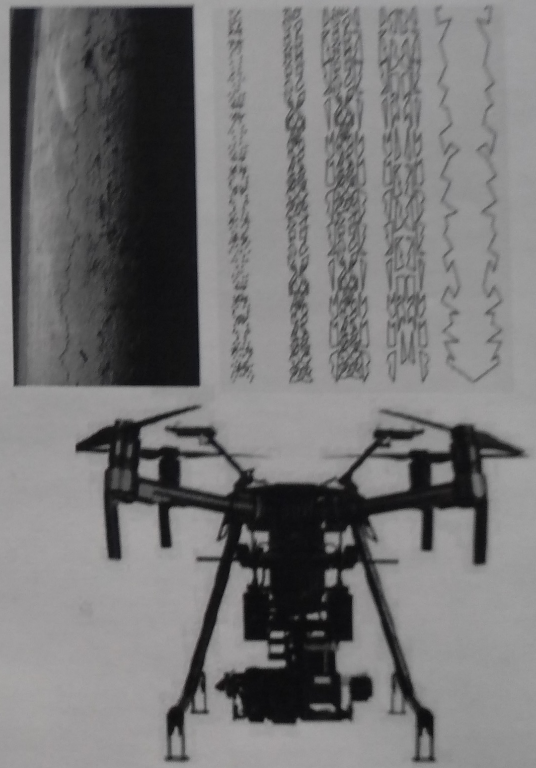
APPLY

Contact person:
Tomas Vronsky

E-mail:
tvr@vestas.com

Background

Leading edge erosion of wind turbine blades is a high priority topic for the wind industry. Degradation of the blade leading edge is caused by continual impacts from airborne particulates (primarily raindrops) during turbine operation. Even minor disturbances to the surface quality can result in premature boundary layer transition which results in lower aerodynamic performance. More severe degradation can result in a significant drop in performance. Vestas has developed a range of leading edge erosion categories, based on 3D laser scans of real-world erosion patterns. The performance impact of these categories has been quantified through wind tunnel testing. Vestas routinely uses drones to carry out leading edge assessments.



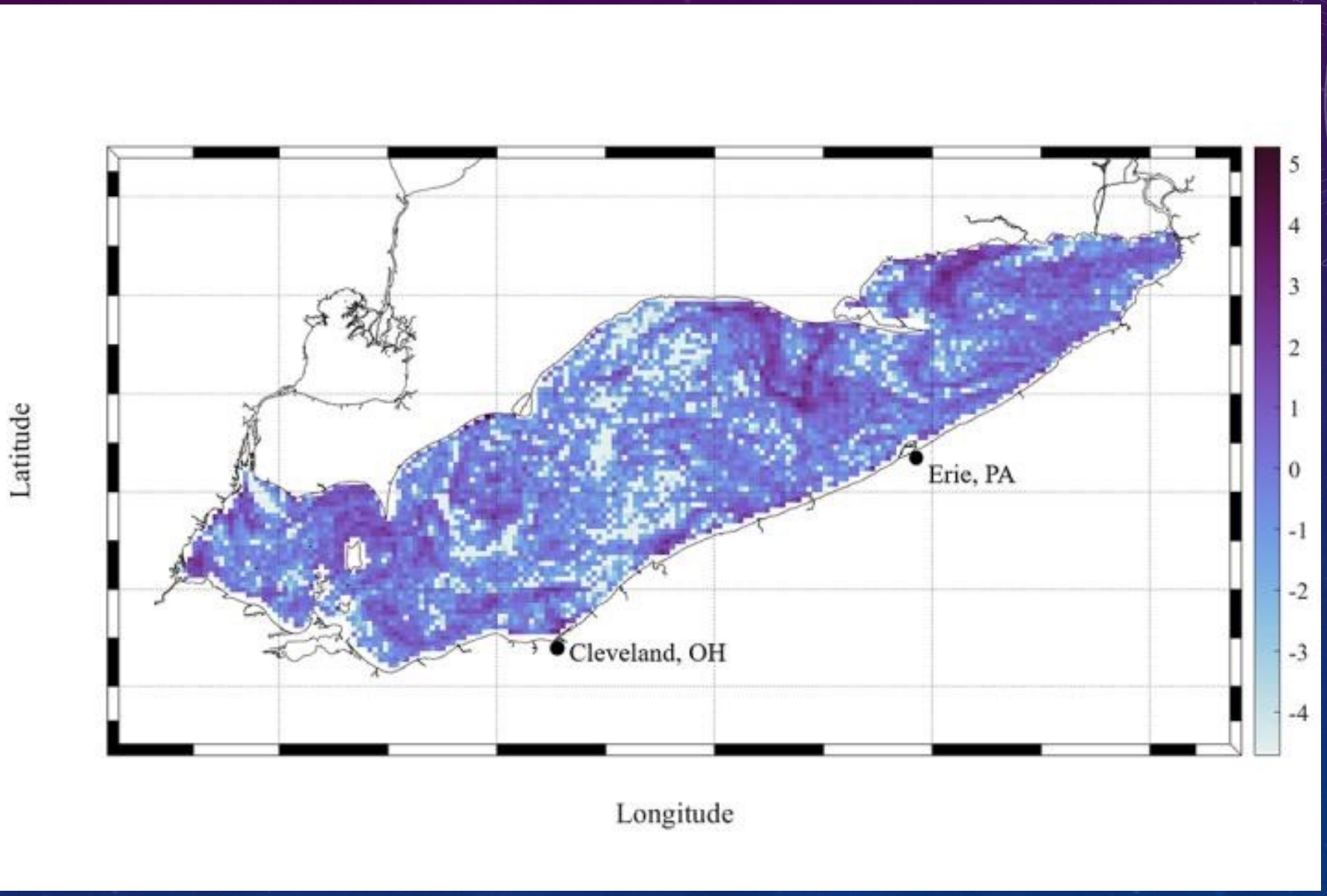
Scope

The aim of the project will be to further develop an empirical tool which uses the generalised erosion pattern categories to apply performance degradation effects based on the real-world drone analysis to make an assessment on the AEP impact. Several real world drone assessments will be provided and should be analysed in comparison to the current erosion categories. The erosion categories and aerodynamic impacts should be refined and included in the tool.

The tool should be validated either by simulation or wind tunnel testing (depending on competencies and availability at the academic partner).

Either commercial (CFX/Fluent) or open source (OpenFOAM) code could be used for the simulations. If wind tunnel testing is to be used for the validation the tests should be carried out in a High-Re capable wind tunnel.

Keywords
Wind turbine aerodynamics, CFD, Wind Tunnel testing, leading edge erosion


Latitude
Longitude
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Cleveland, OH
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ScienceDirect

Renewable Energy
Volume 178, November 2021, Pages 1435-1455

A probabilistic rainfall model to estimate the leading-edge lifetime of wind turbine blade coating system

Amrit Shankar Verma [a, d], Zhiyu Jiang [b], Marco Caboni [c], Hans Verhoef [c], Harald van der Mijle Meijer [c], Saullo G.P. Castro [a], Julie J.E. Teuwen [d]

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Abstract

Rain-induced leading-edge erosion of wind turbine blades is associated with high repair and maintenance costs. For efficient operation and maintenance, erosion models are required that provide estimates of blade coating lifetime at a real scale. In this study, a statistical rainfall model is established that describes probabilistic distributions of rain parameters that are critical for site-specific leading-edge erosion assessment. A new droplet size distribution (DSD) is determined based on two years' onshore rainfall data of an inland site in the Netherlands and the obtained DSD is compared with those from the literature. Joint probability distribution functions of rain intensities and droplet sizes are also established for this site as well as for a coastal site in the Netherlands. Then, the application of the proposed model is presented for a 5 MW wind turbine, where the model is combined with wind statistics along with an analytical surface fatigue model that describes lab-scale coating degradation. The expected lifetime of the blade coating is found three to four times less for the wind turbine operating at the coastal site than for the inland site - primarily due to rainfall at higher wind speeds. Further, the robustness of the proposed model is found consistent with varying data periods used for the analyses.

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Published online 2020 Oct 30. doi: 10.1039/d0em00291g

PMCID: PMC7784712
NIHMSID: NIHMS1650485
PMID: 33125022

An overview of the uses of per- and polyfluoroalkyl substances (PFAS)

Juliane Glüge,[a,*] Martin Scheringer,[a] Ian T. Cousins,[b] Jamie C. DeWitt,[c] Gretta Goldenman,[d] Dorte Herzke,[e1,e2] Andrew B. Lindstrom,[f] Rainer Lohmann,[g] Carla A. Ng,[h] Xenia Trier,[i] and Zhanyun Wang[j]

Abstract

Per- and polyfluoroalkyl substances (PFAS) are of concern because of their very high persistence and impacts on human and environmental health. Currently, many different PFAS (on the order of several thousands) are used in a wide range of applications and there is no comprehensive source of information on the many individual substances and their functions in different applications. Here we provide a broad overview of many use categories where PFAS have been employed and for which function; we also specify which PFAS have been used and discuss the magnitude of the uses. Our compilation is not exhaustive, but it was still possible to demonstrate that PFAS are used in almost all industry branches and many consumer products. In total, more than 200 use categories and subcategories were identified for more than 1400 individual PFAS. The identified use categories include many categories not previously described in the scientific literature but also a lot of well-known categories such as textile impregnation, fire-fighting foam, and electroplating. Besides a detailed description of use categories, the present study also contains a list of the identified PFAS per use category. On this basis, a database of exact masses of 1400 PFAS is provided that is intended to facilitate the analytical detection of many more individual PFAS in the future.

3. Introduction

Per- and polyfluoroalkyl substances (PFAS) are a class of thousands of substances[1,2] that have been produced since the 1940s and used in a broad range of consumer products and industrial applications.[3] Based on concerns regarding the high persistence of PFAS[4] and the lack of knowledge on properties, uses, and toxicological profiles of many PFAS currently in use, it has been argued that the production and use of PFAS should be limited.[5] However, there are specific uses that make an immediate ban of all PFAS impractical. Some specific uses of PFAS may currently be essential to health, safety or the functioning of today's society for which alternatives so far do not exist. On the other hand, if some uses of PFAS are found to be non-essential, they could be eliminated without having to first find alternatives that provide an adequate function and performance.

Feedback

ScienceDirect

Renewable Energy
Volume 178, November 2021, Pages 1435-1455

A probabilistic rainfall model to estimate the leading-edge lifetime of wind turbine blade coating system

Amrit Shankar Verma [a, d], Zhiyu Jiang [b], Marco Caboni [c], Hans Verhoef [c], Harald van der Mijle Meijer [c], Saullo G.P. Castro [a], Julie J.E. Teuwen [a]

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Abstract

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Previous Next

LAKE ERIE – A COMPLICATED PLACE TO LIVE

Lake Erie Basin Statistics

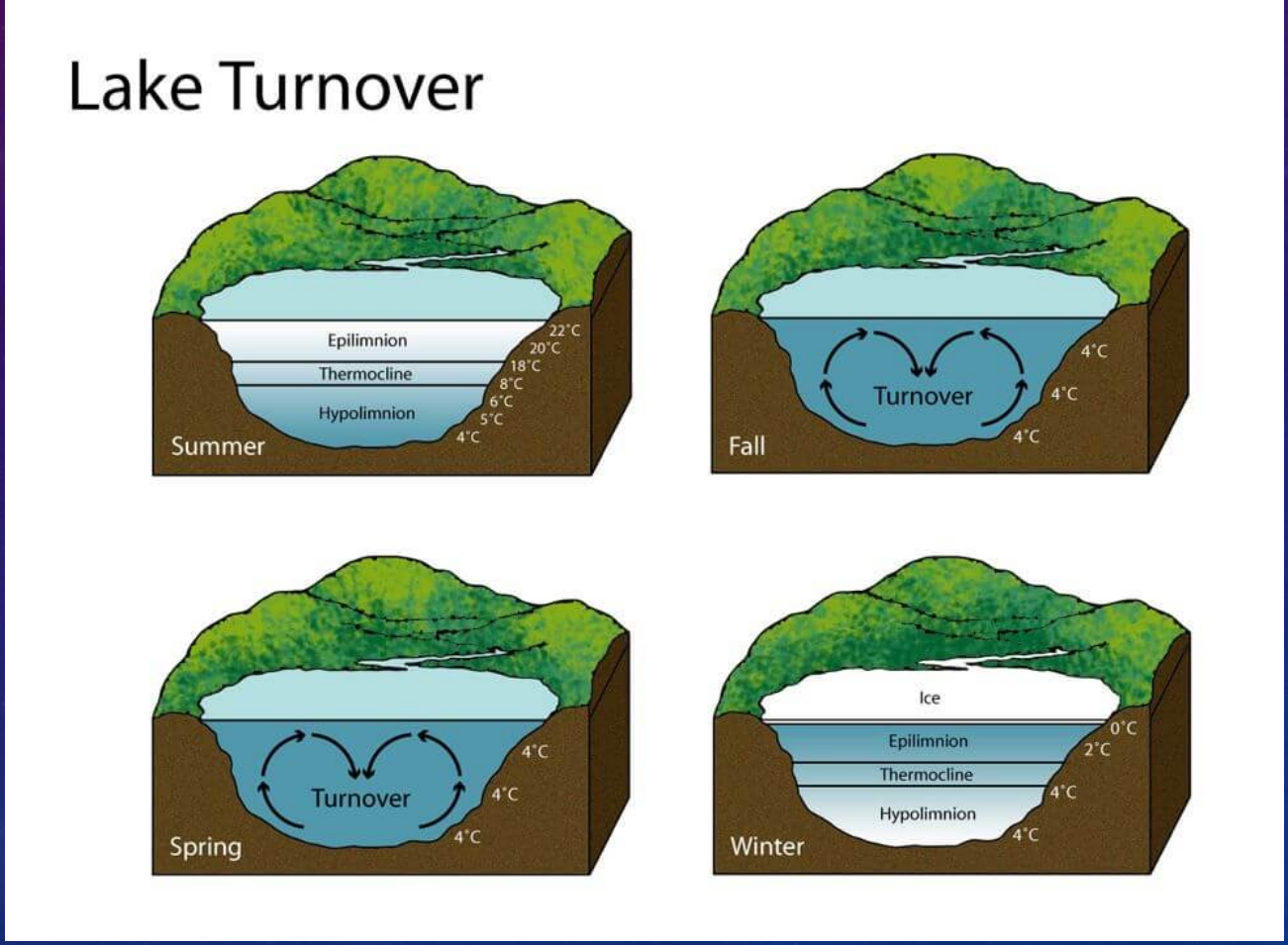
- Length: 241 mi (388 km)
- Breadth: 57 mi (92 km)
- Elevation: 569.2 ft (173.5 m)
- Depth: 62 ft (19 m) average; 210 ft (64 m) maximum
- Volume: 116 cubic mi (483 cubic km)
- Water surface area: 9,910 square mi (25,655 square km)
- Drainage basin area: 22,700 square mi (58,788 square km)
- Shoreline length: 871 mi (1,402 km), including islands
- Outlets: Niagara River and Welland Canal
- Retention or replacement time: 2.7 years
- U.S. population: 10.6 million
- Canada population: 1.9 million

LAKE ERIE MIXING AND TROPHIC STATUS

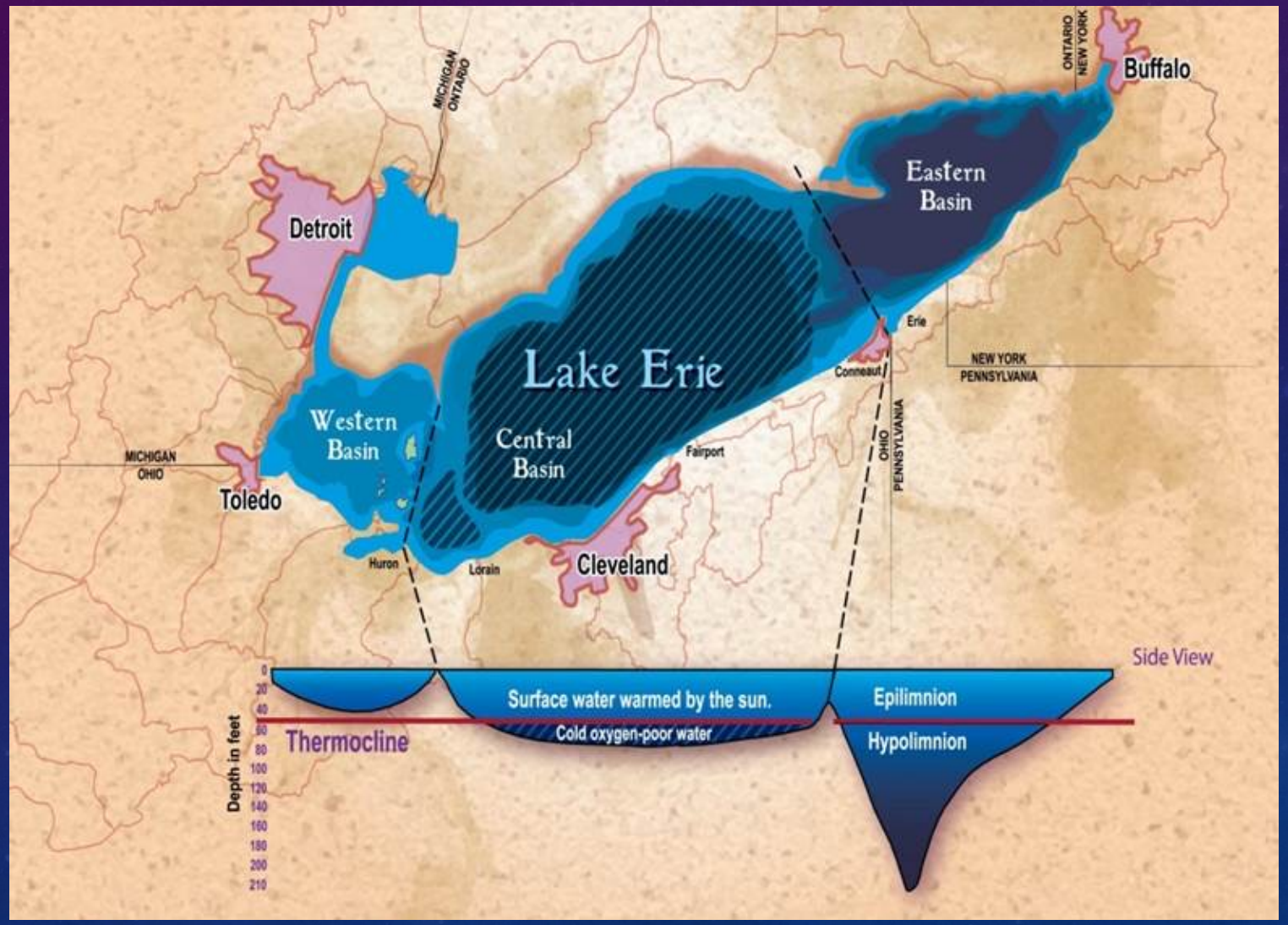
- Dimictic – Mixes top to bottom twice per year (Freezes in Winter)

- Eutrohic in Western Basin
- Oligotrophic in Eastern Basin

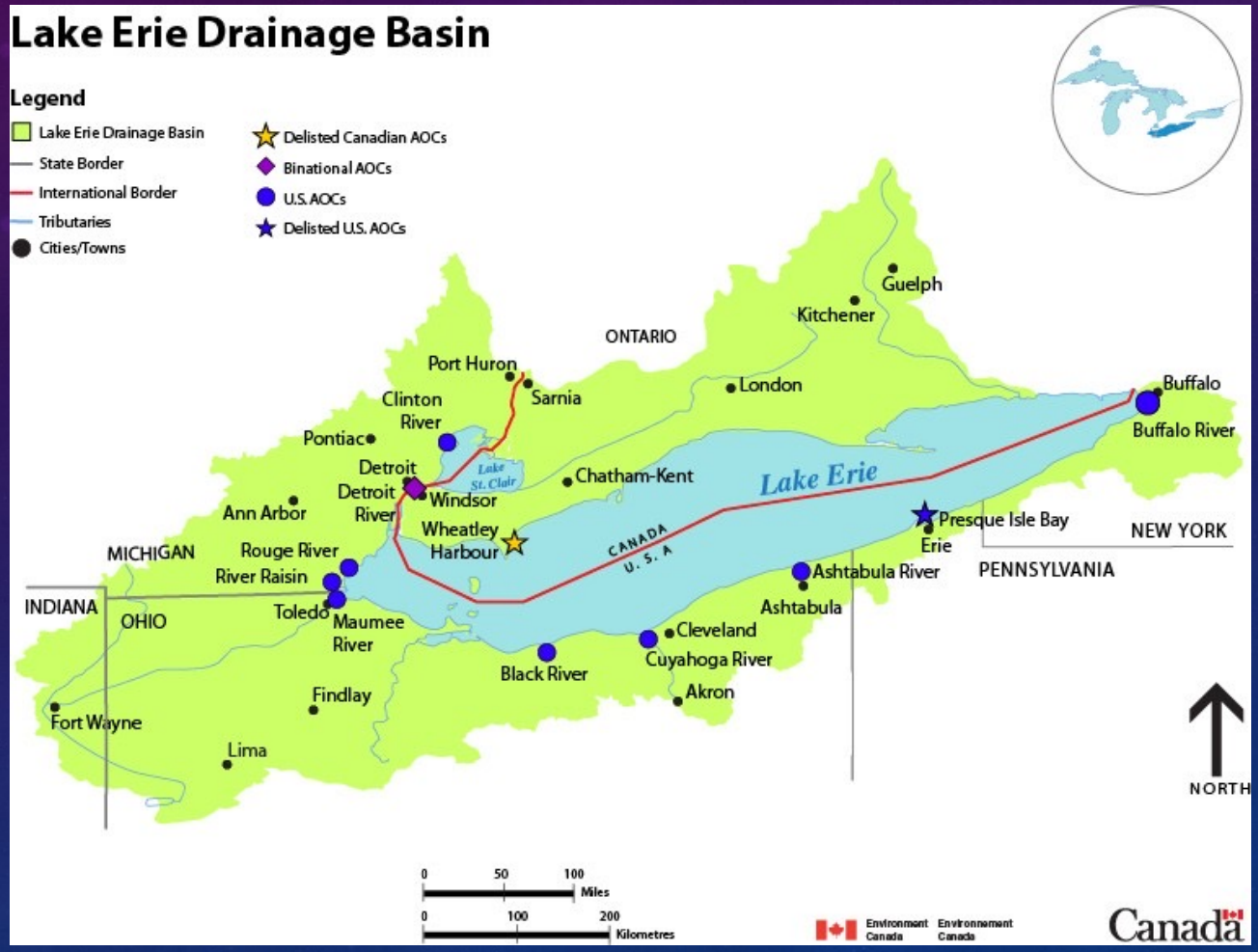
DIMICTIC LAKE CYCLE



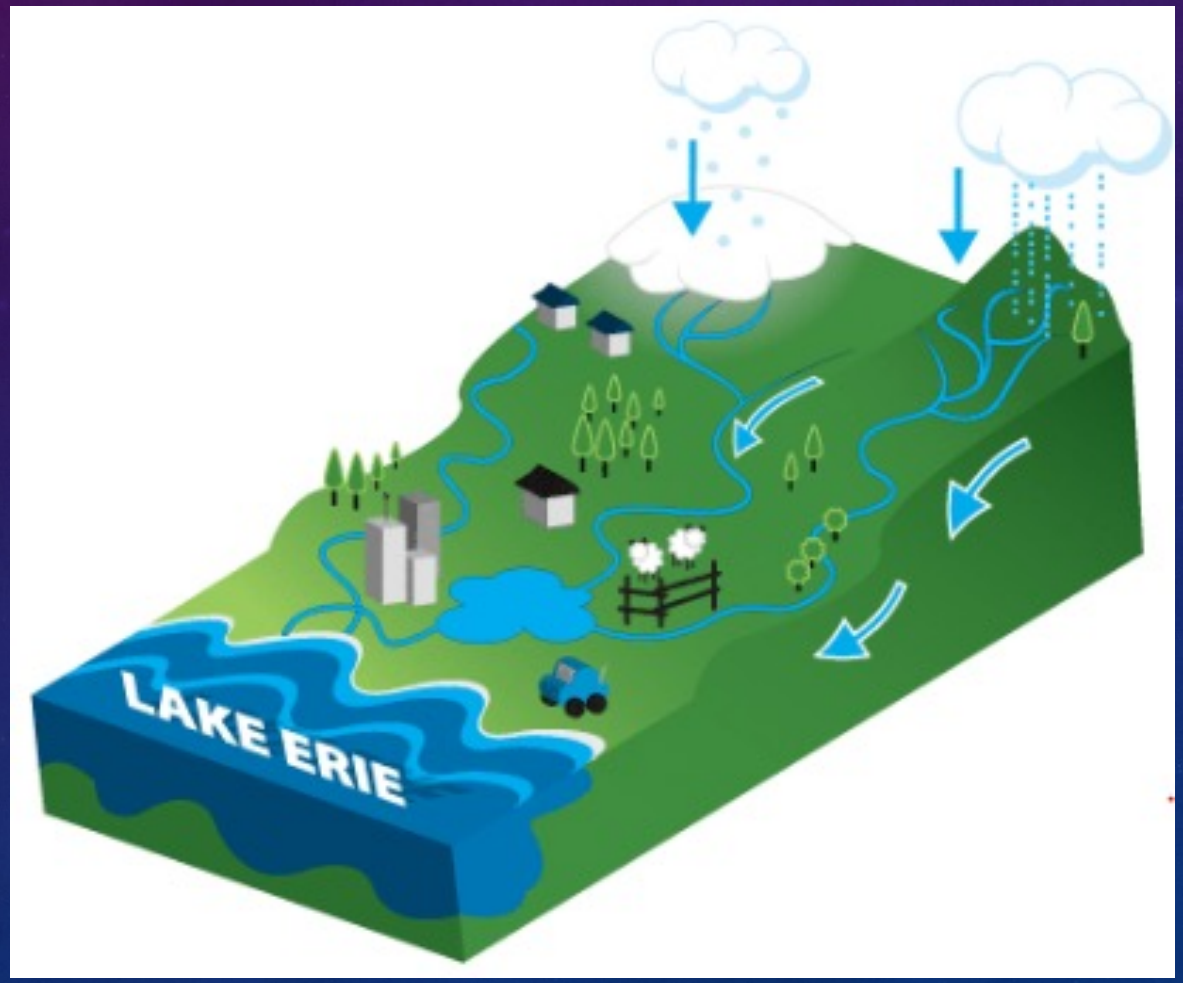
STRATIFICATION LAKE ERIE



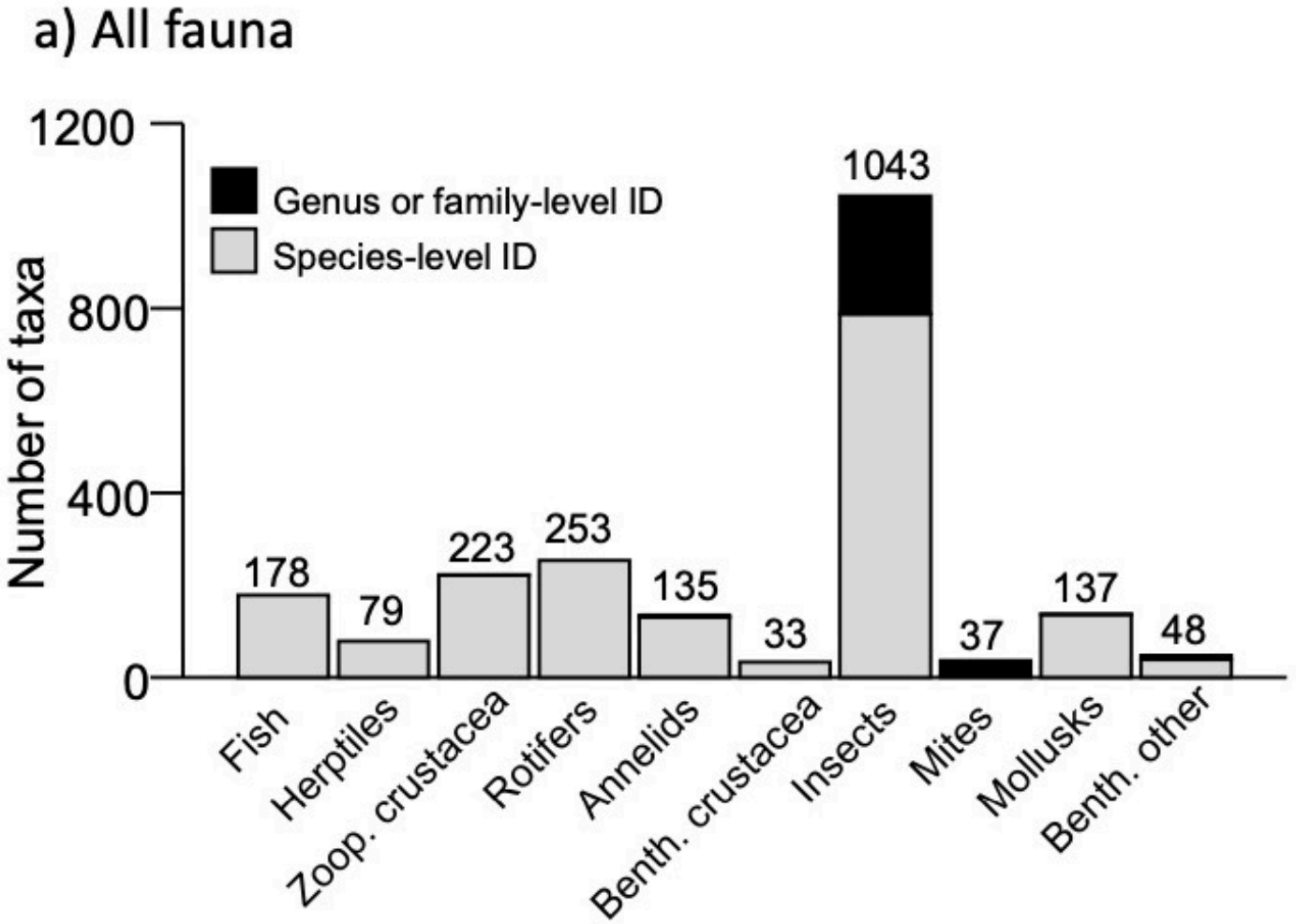
LAKE ERIE DRAINAGE BASIN



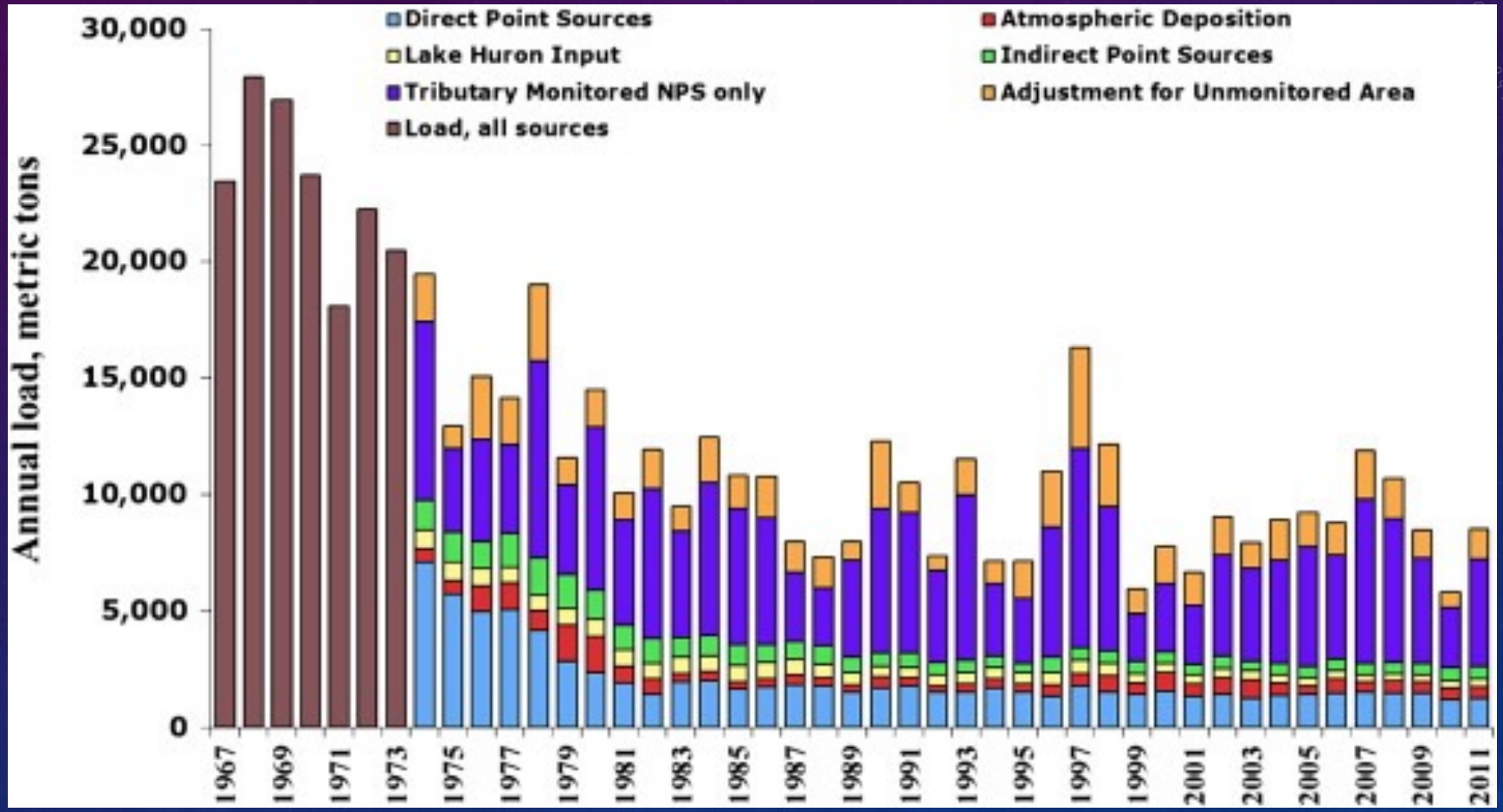
WATERSHED SOURCES INTO LAKE ERIE



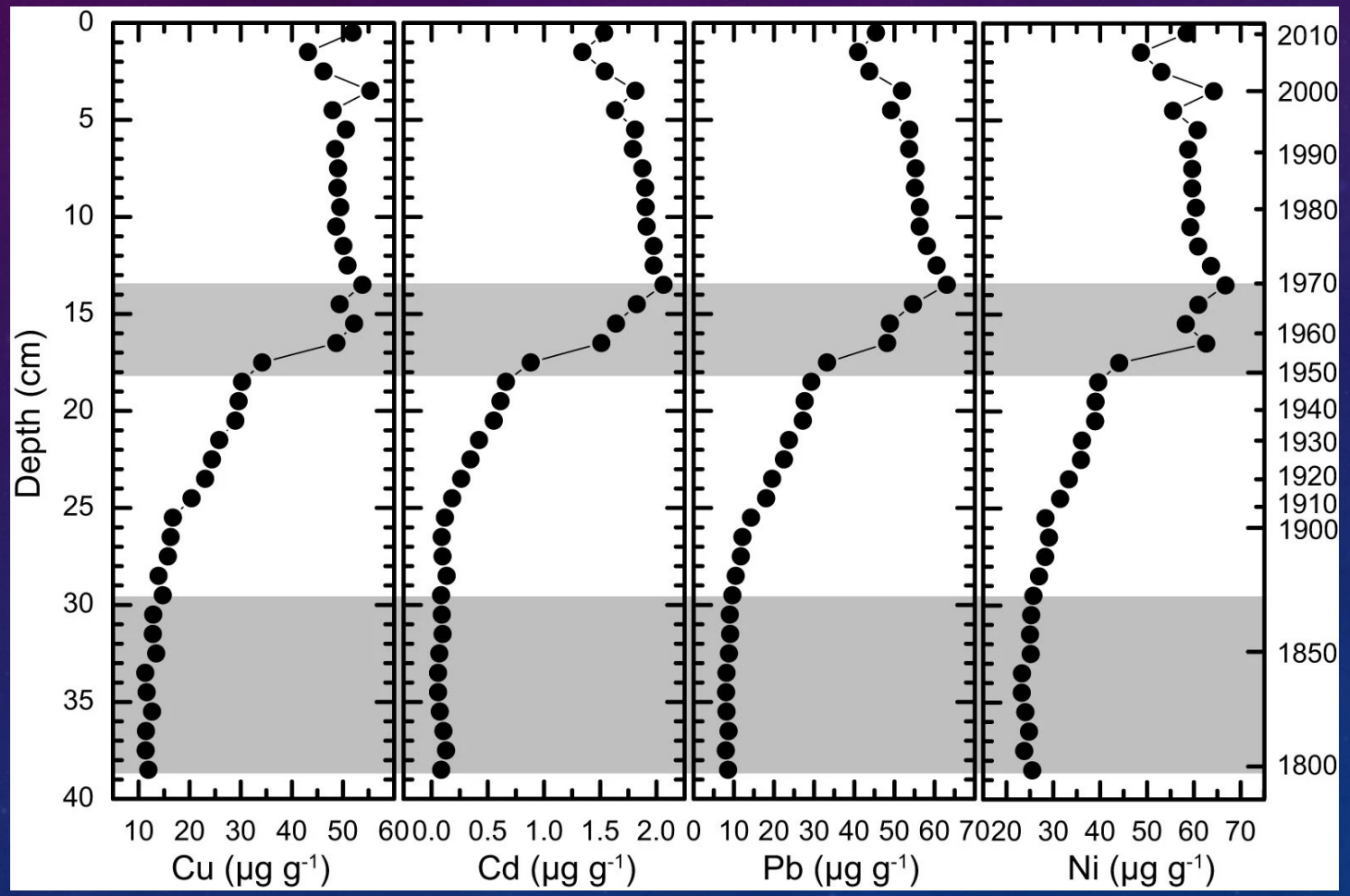
SPECIES COMPOSITION – LAKE ERIE



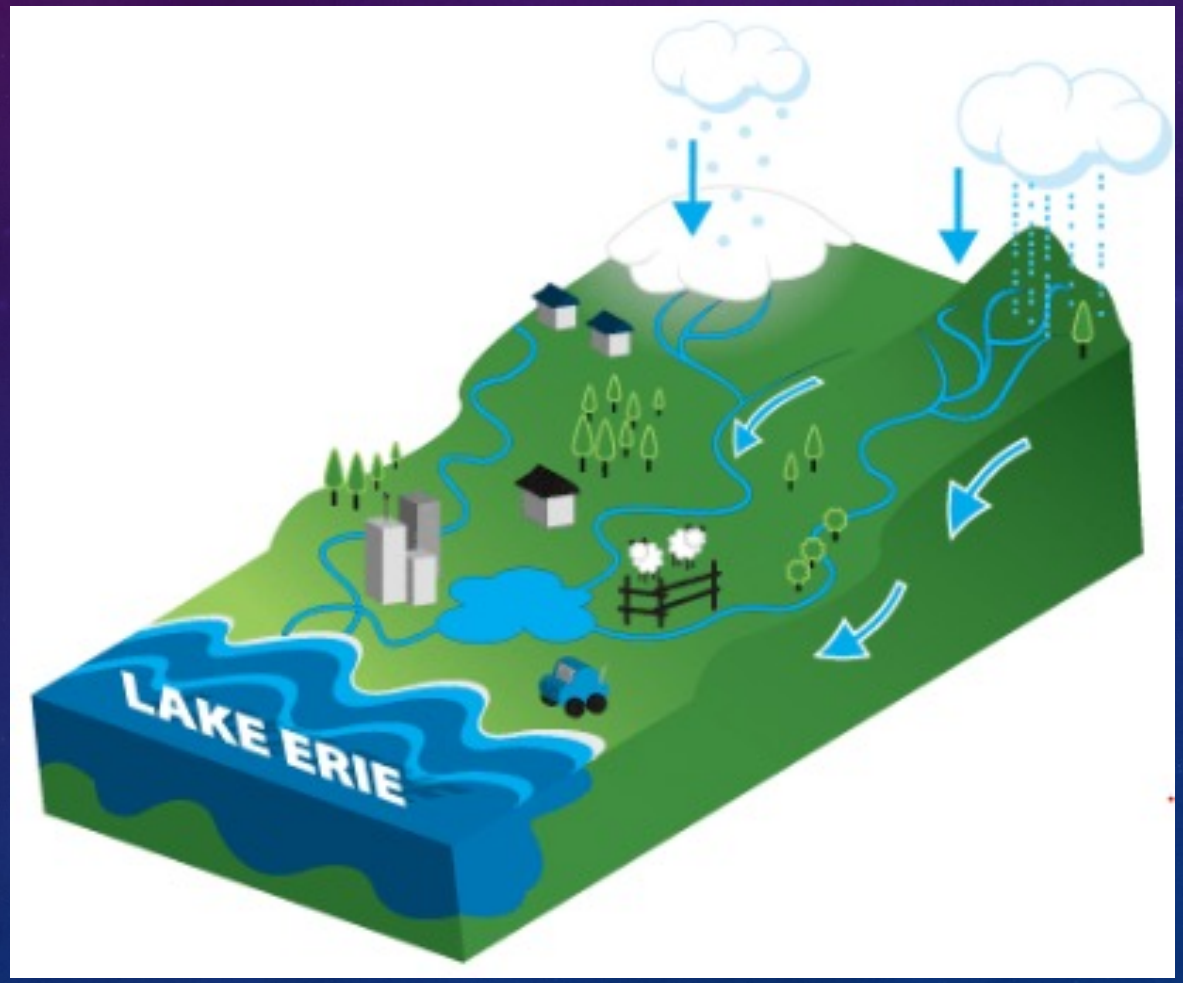
PHOSPHORUS, LEAD LOADING OVER TIME



HEAVY METALS OVER TIME IN LAKE ERIE



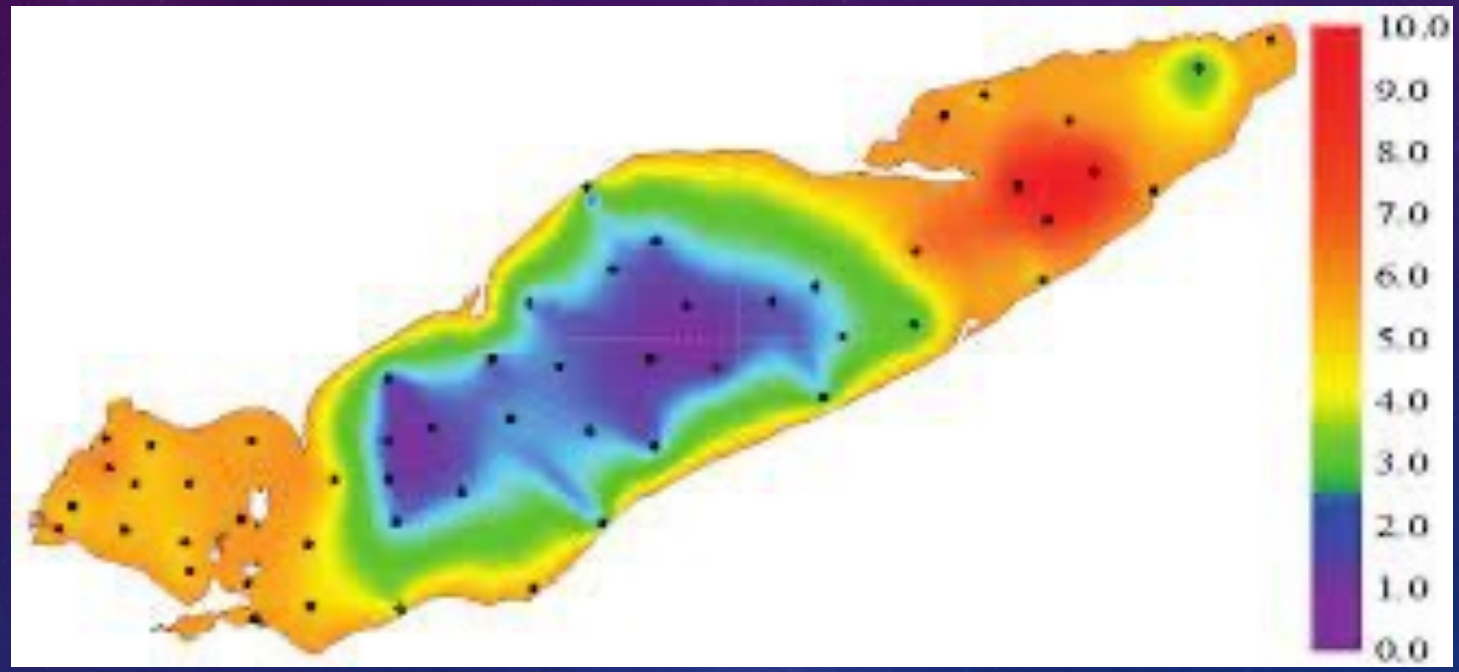
WATERSHED PHOSPHORUS SOURCES INTO LAKE ERIE



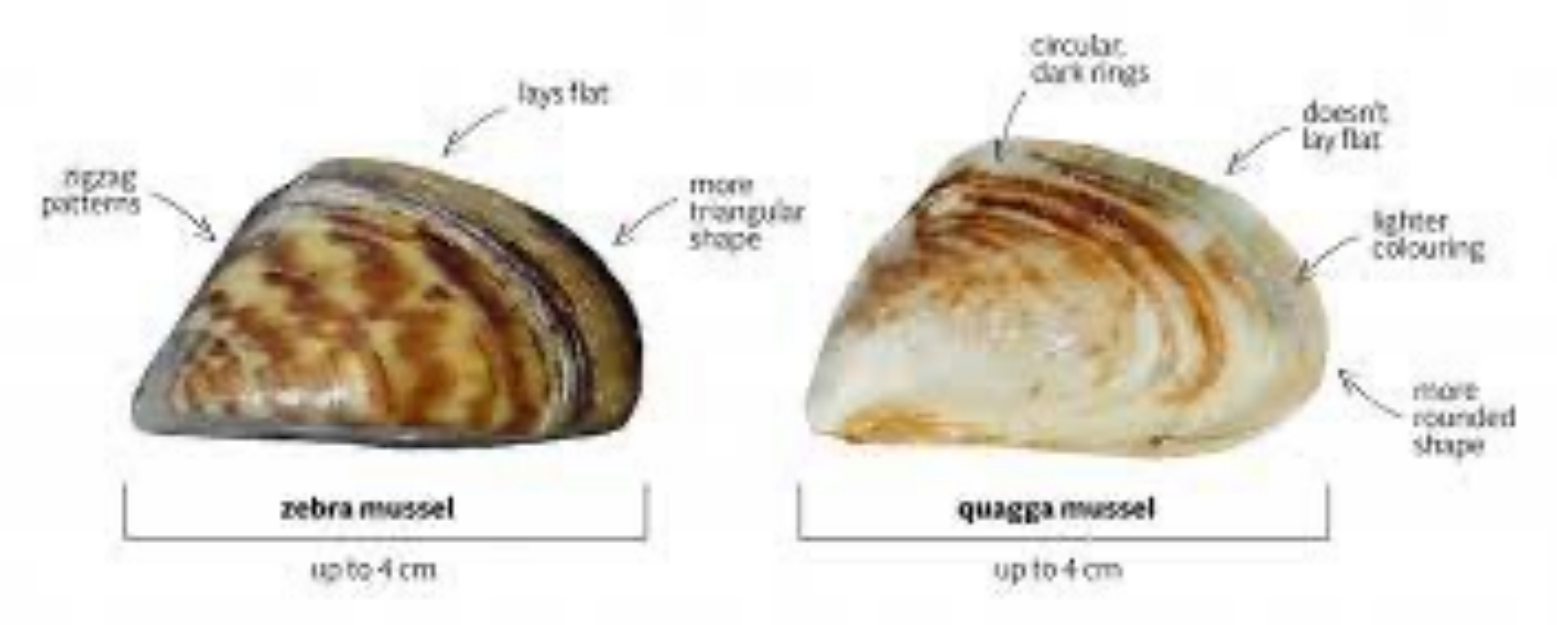
PLANKTONIC (BLUE-GREEN) ALGAE BLOOMS IN LAKE ERIE

PLANKTONIC (BLUE-GREEN) ALGAE BLOOMS IN LAKE ERIE

DEAD ZONES IN LAKE ERIE



ENTER…. THE ZEBRA MUSSEL



ENTER…. THE ZEBRA MUSSEL

- Arrived in 1986 on commercial vessel from Europe

ENTER…. THE ZEBRA MUSSEL

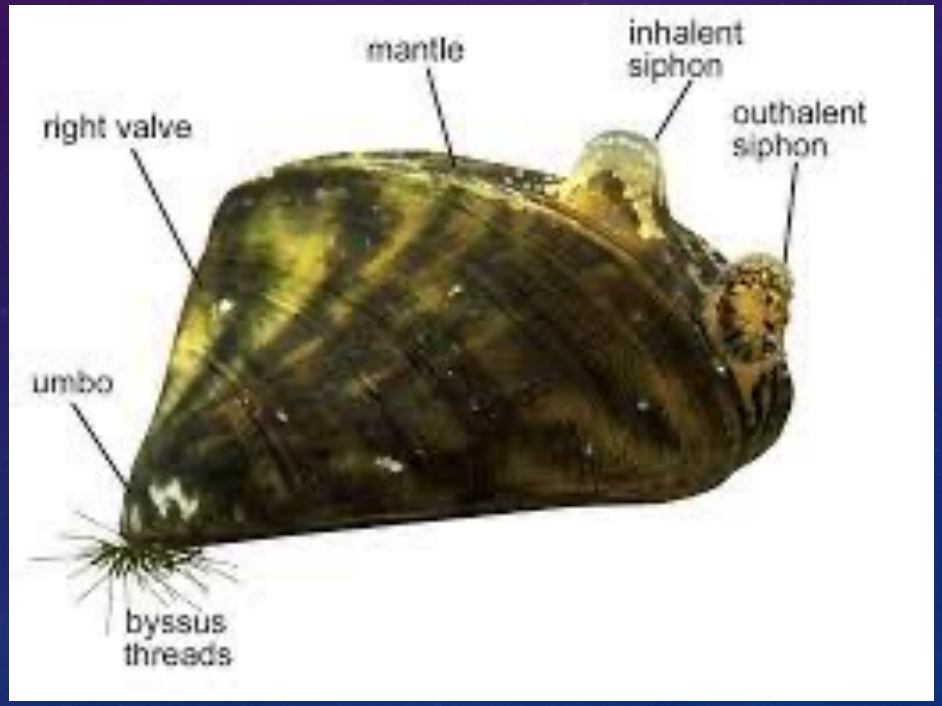
- Arrived in 1986 on commercial vessel from Europe
- First detected in 1988 in Lake St. Clair

ENTER…. THE ZEBRA MUSSEL

- Arrived in 1986 on commercial vessel from Europe
- First detected in 1988 in Lake St. Clair
- Detected in Lake Erie 1989

ENTER…. THE ZEBRA MUSSEL

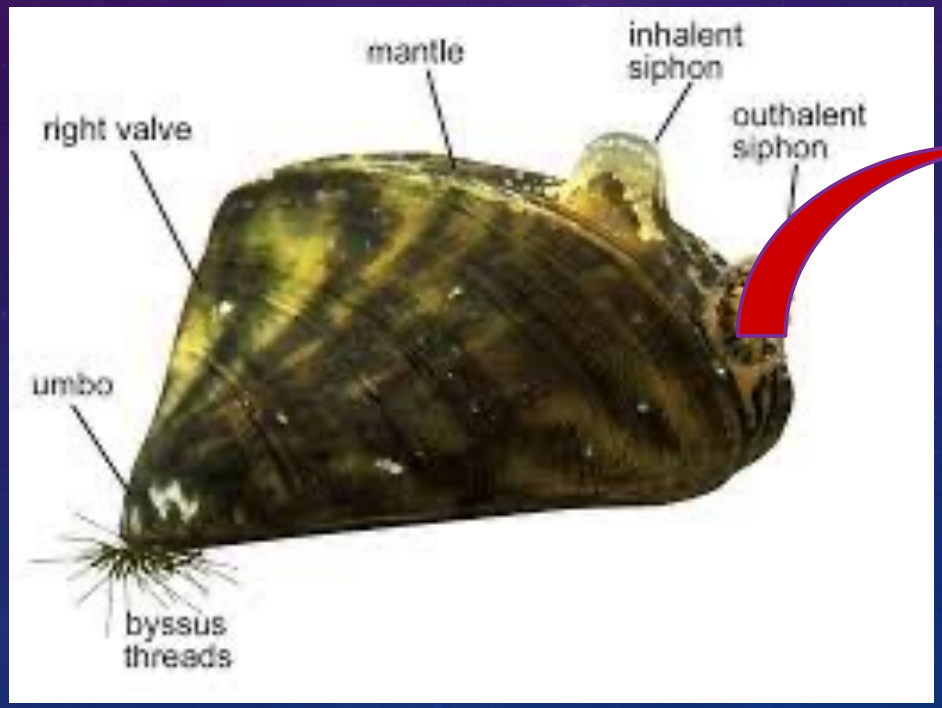
- Filter Feeders (Inhalent Syphon – Exhalent Syphon



ENTER…. THE ZEBRA MUSSEL

- Filter Feeders (Inhalent Syphon – Exhalent Syphon

Psuedofeces



Psuedofeces

FILTER FEEDERS….

- Each zebra mussel filters up 40 LITERS (10 Gallons) per DAY

FILTER FEEDERS….

- These zebra mussels filter up (150 Gallons) per DAY

FILTER FEEDERS….

- Form colonies up 700,000 per square meter (10.7 Square Feet)!!!!

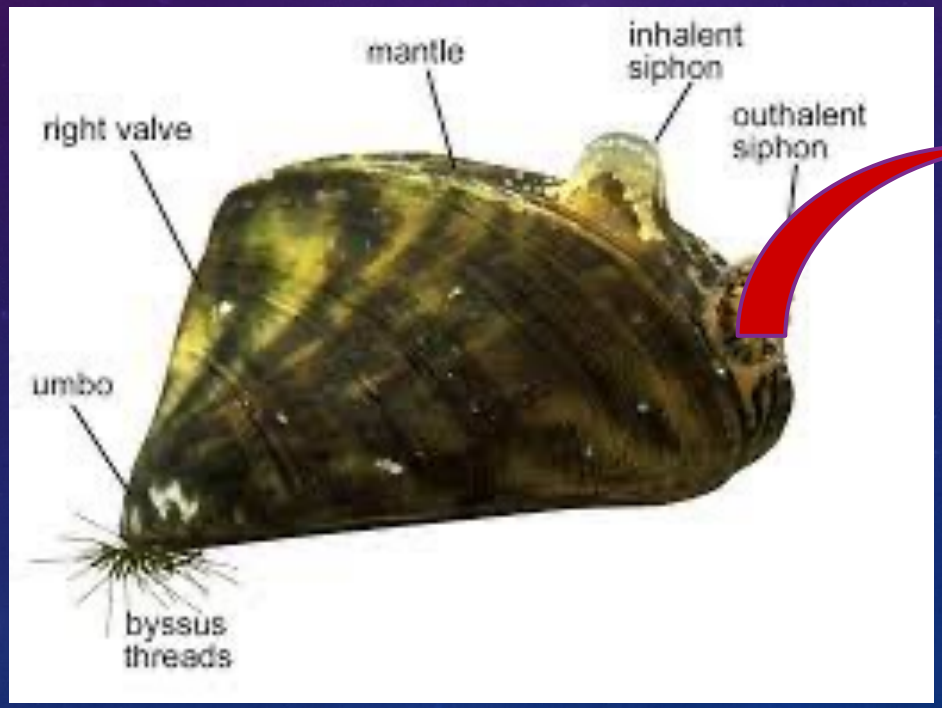
FILTER FEEDERS….

- Form colonies up 700,000 per square meter!!!!
- That’s 7 Million Gallons per Day!!!!!!!!!!!

ENTER…. THE ZEBRA MUSSEL

- Filter Feeders (Inhalent Syphon – Exhalent Syphon

Psuedofeces

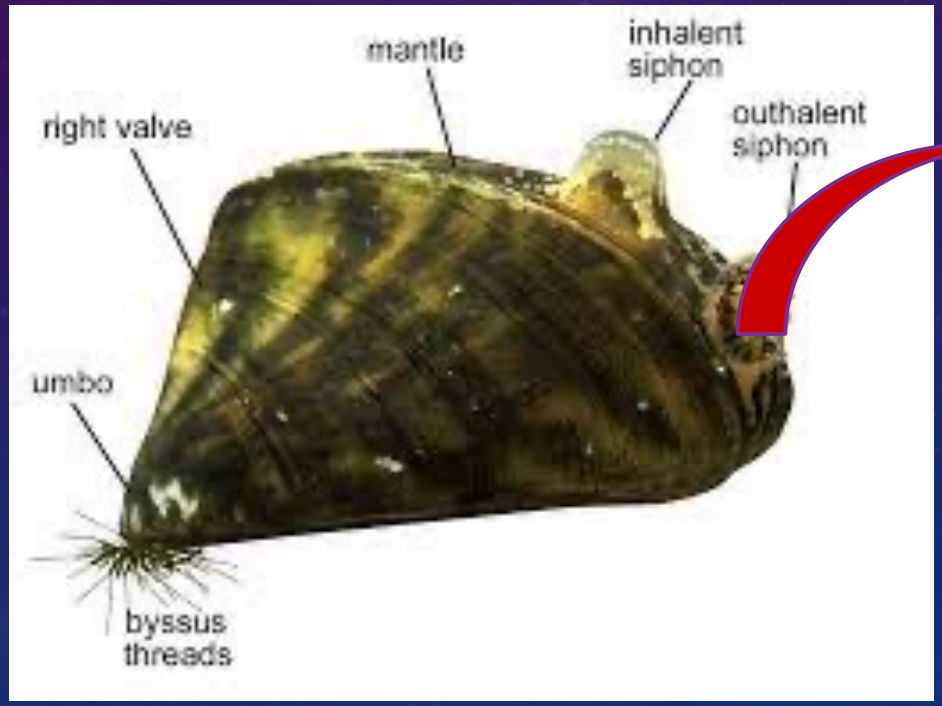


Psuedofeces

ENTER…. THE ZEBRA MUSSEL

- Filter the contaminants and deposit them on the bottom…

Psuedofeces



Psuedofeces

ENTER…. THE ZEBRA MUSSEL

- Filter the contaminants and deposit them on the bottom…

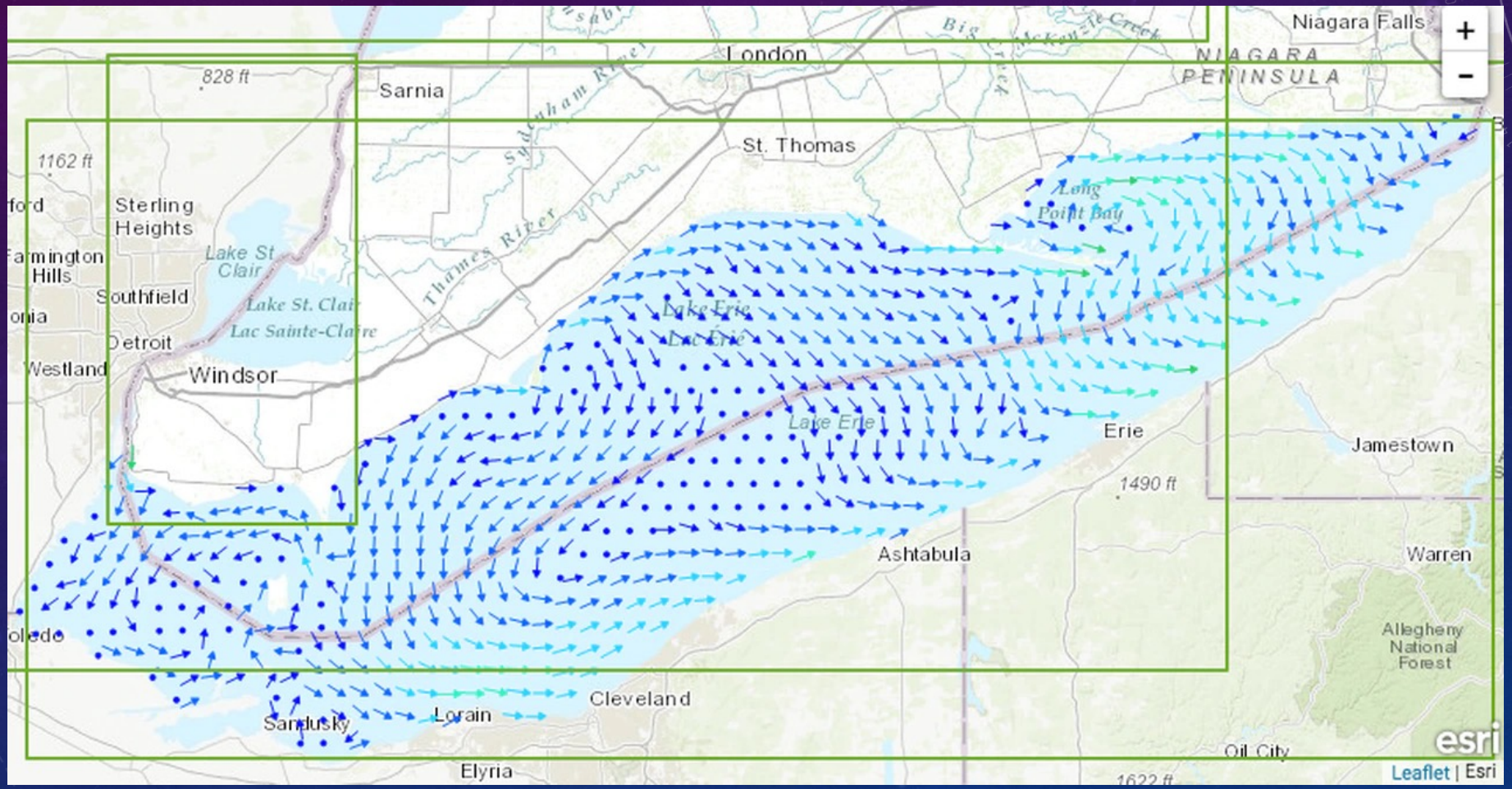
Psuedofeces

"Furthermore, the contaminants sorbed onto suspended sediment particles were quickly removed from the water and deposited as pseudofeces."

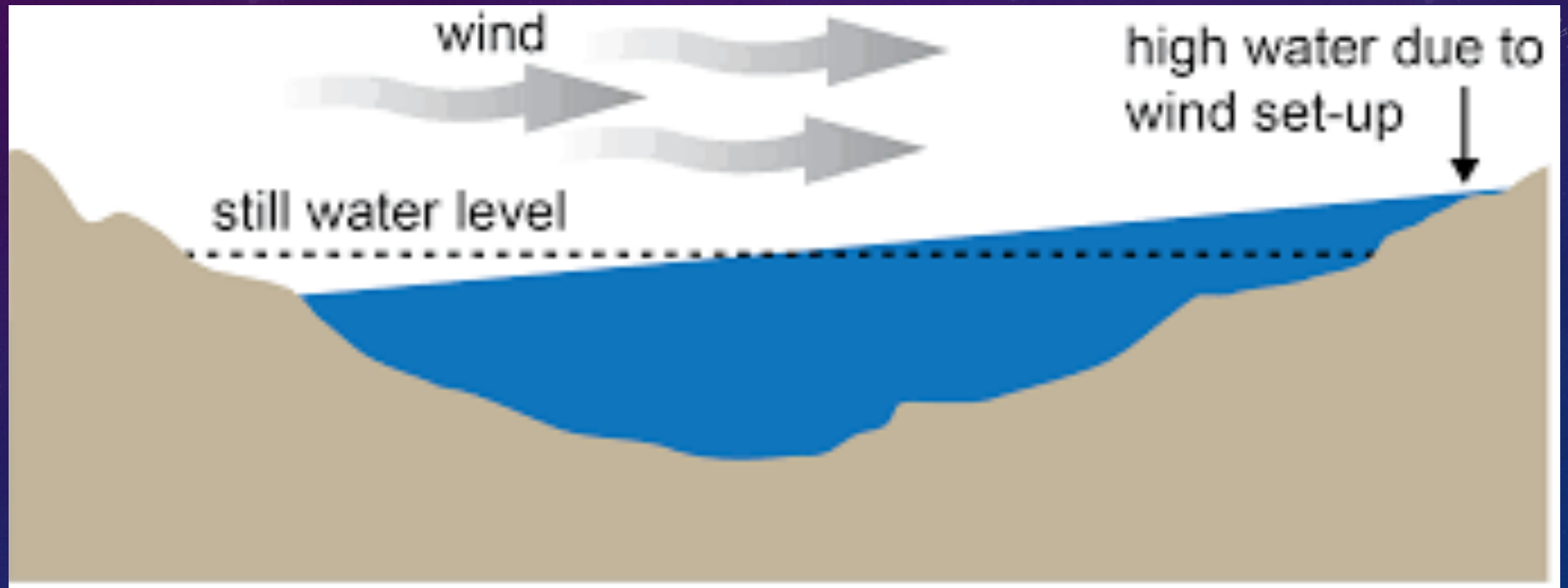
Duane C.Gossiaux[1]Peter F.Landrum[1]Susan W.Fisher[2] 1998
The assimilation of contaminants from suspended sediment and algae by the zebra mussel, *Dreissena polymorpha*

CURRENTS AND SEICHES

CURRENTS AND SEICHES



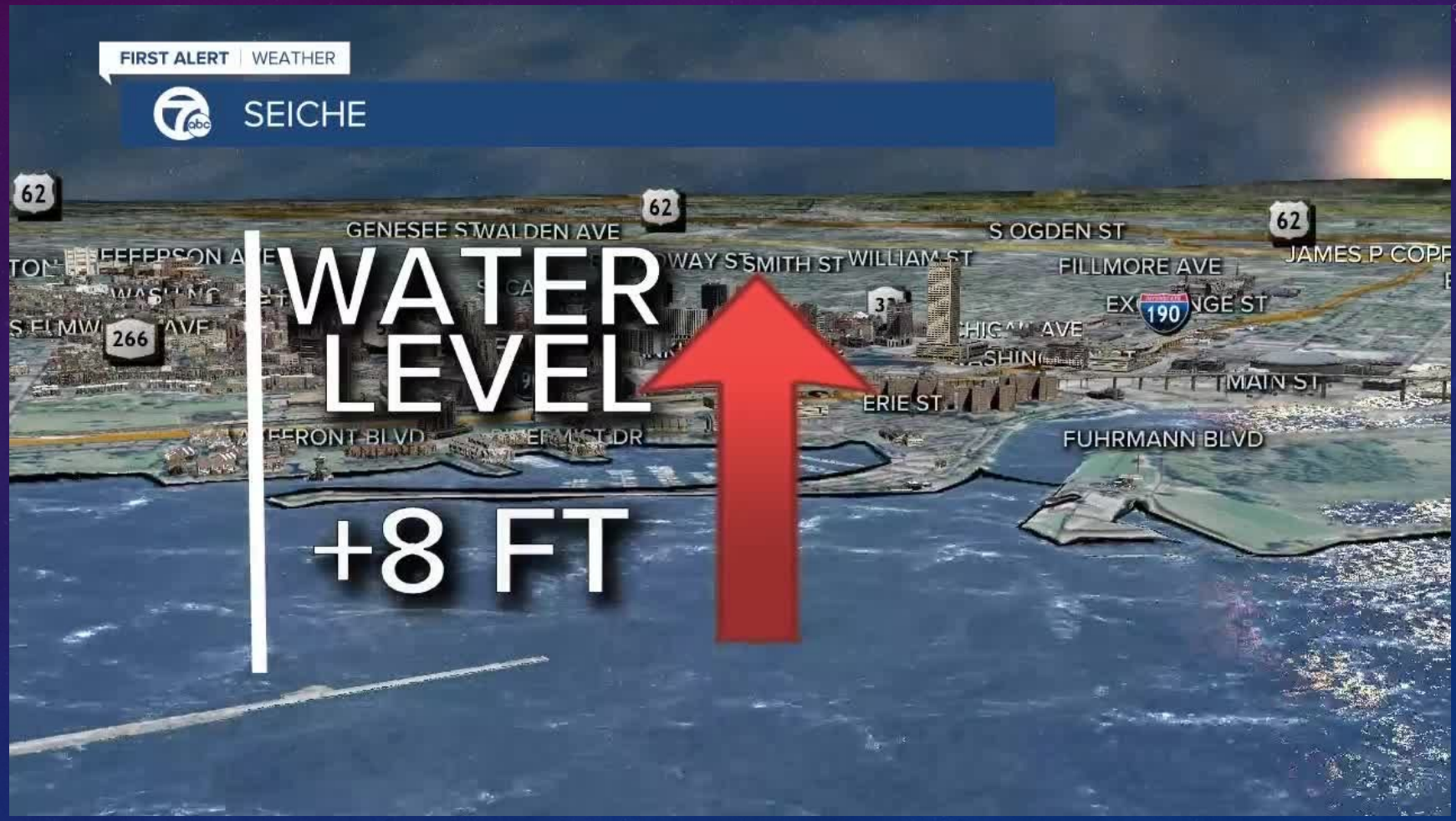
CURRENTS AND SEICHES



Wind setup is a local rise in water level caused by wind.

CURRENTS AND SEICHES

CURRENTS AND SEICHES



OK…. IT'S COMPLICATED….WHY DO WE CARE??

OK…. IT'S COMPLICATED….WHY DO WE CARE??

- Extremely sensitive to both outside and inside influences

OK…. IT'S COMPLICATED….WHY DO WE CARE??

- Extremely sensitive to both outside and inside influences
- Contaminants settle in the sediments

OK…. IT'S COMPLICATED….WHY DO WE CARE??

- Extremely sensitive to both outside and inside influences
- Contaminants settle in the sediments
- EVERYTHING FLOWS OUR WAY!!!!

CAWTILE.COM

Thank You

INDUSTRIALIZATION AND POLLUTION