

Lake Erie

Our
Water
Resource

Ohio DNR Office of Coastal Management
Erie Soil & Water Conservation District



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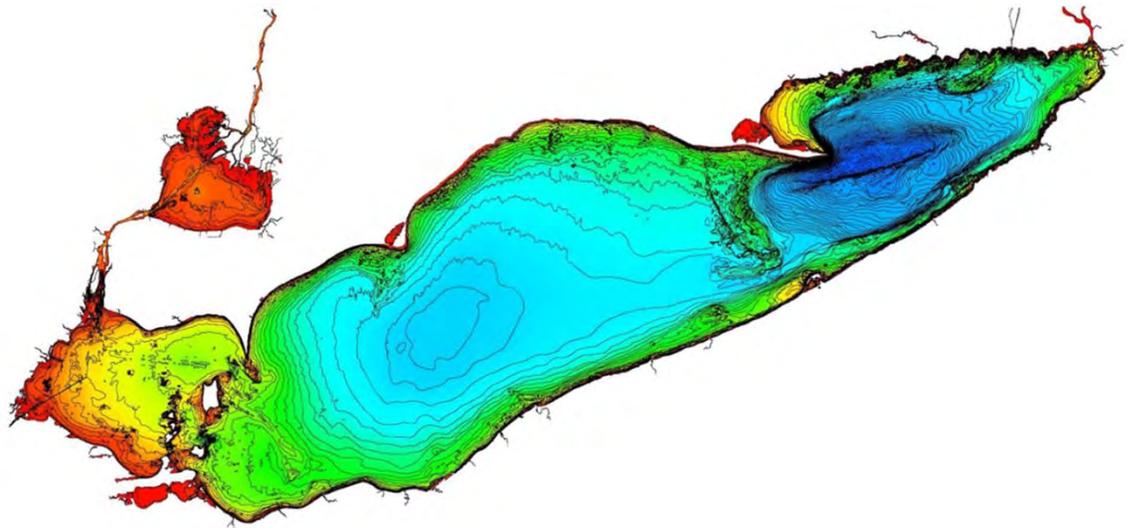




Lake Erie, one of the five Great Lakes, is a body of fresh water with many features.

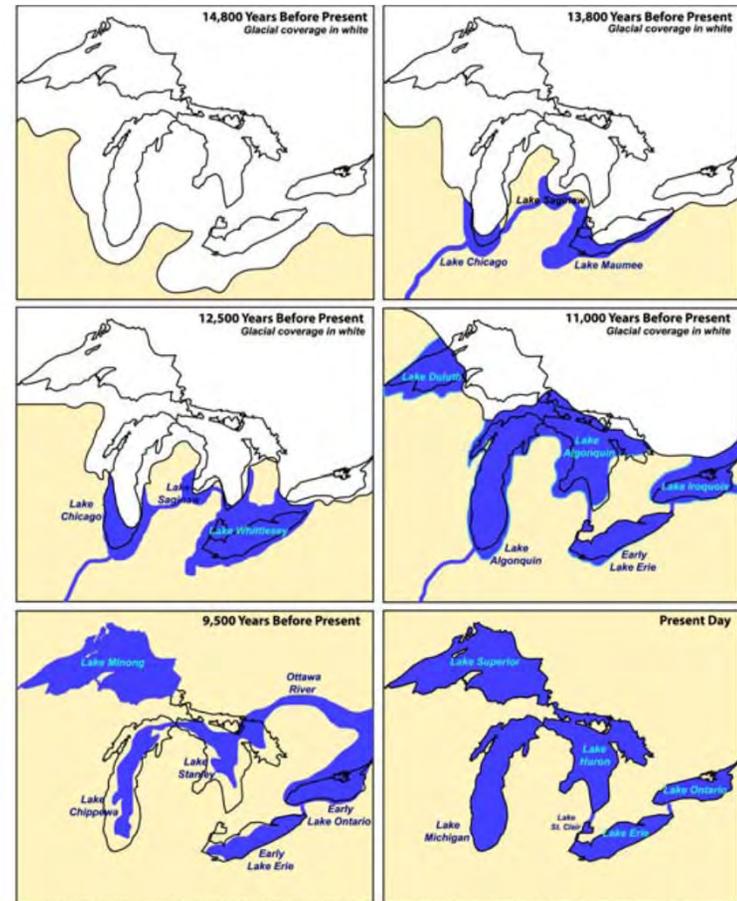
Lake Erie is:

- the shallowest, warmest in summer, first to freeze in winter, and most biologically productive Great Lake.
- connected to the other Great Lakes which together form a watershed that drains to the Atlantic Ocean.
- finite and its resources are limited.



Natural forces formed and continue to shape Lake Erie and its watershed.

- Lake Formation
 - Salt deposits beneath Lake Erie
 - Glacial gouging
 - Isostatic rebound is ongoing
- Lake levels
 - Fluctuate
 - Have been recorded 150+ years
 - can effect erosion and accretion

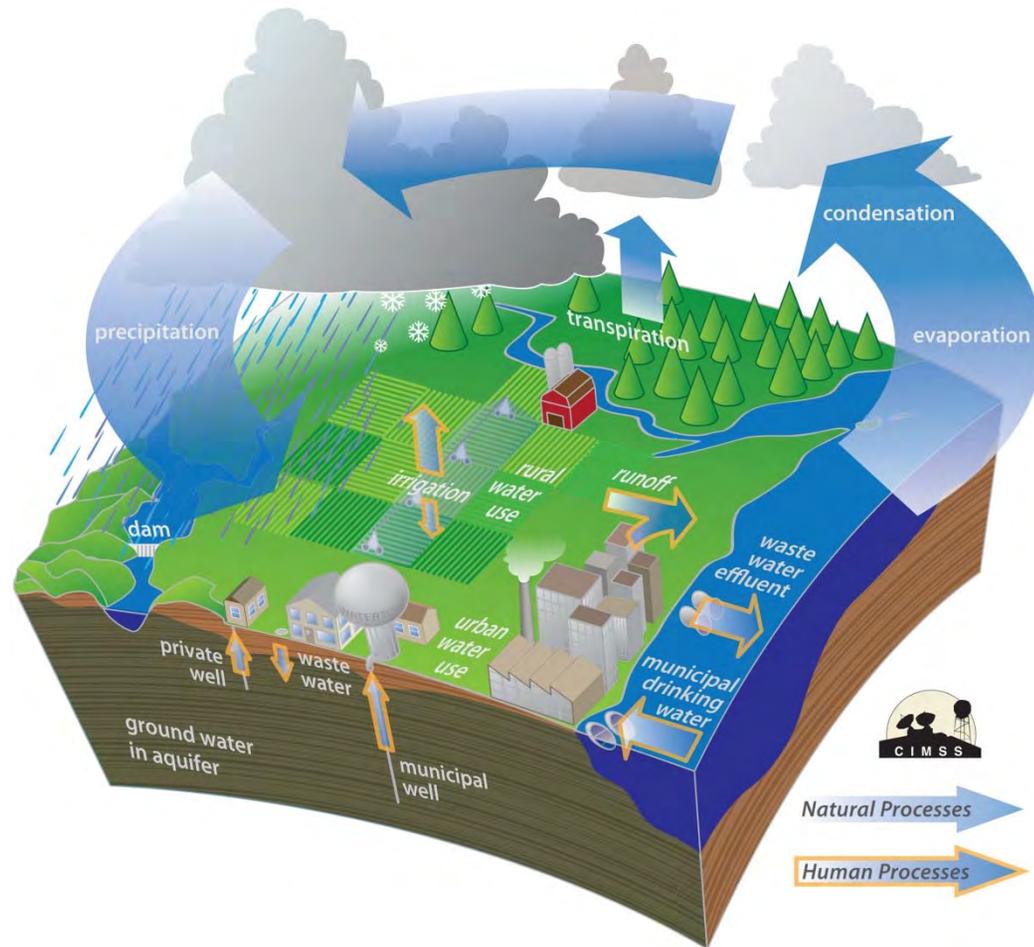


Water Level Changes in the Great Lakes

The difference between the amount of water coming into a lake and the amount going out is the determining factor in whether the water level will rise, fall or remain stable.

Going in: precipitation, runoff and conveyance

Going out: evaporation, consumptive use, conveyance



Lake Erie is influenced by climate changes impacting North American and the world.

- **Natural climate variability** (variations cannot be controlled by humans.)
 - Variations in nature, such as volcanic eruptions, solar variability, El Nia , etc.
 - Changes in the tilt of the Earth, the closeness to the sun during particular revolutions
 - Gradual changes in Earth’s rotation and orbit around the Sun change the intensity of sunlight received in our planet's polar and equatorial regions. For at least the last 1 million years, these changes occurred in the 100,000-year cycles that produced the ice ages and the shorter warmer periods between them. (CL 1.1)
- **Human-induced climate change**
 - Humans changing the rate that energy is transferred in the Earth system which in turn impacts the climate.

Energy is neither created nor destroyed. Earth is constantly changing as energy flows through the system.

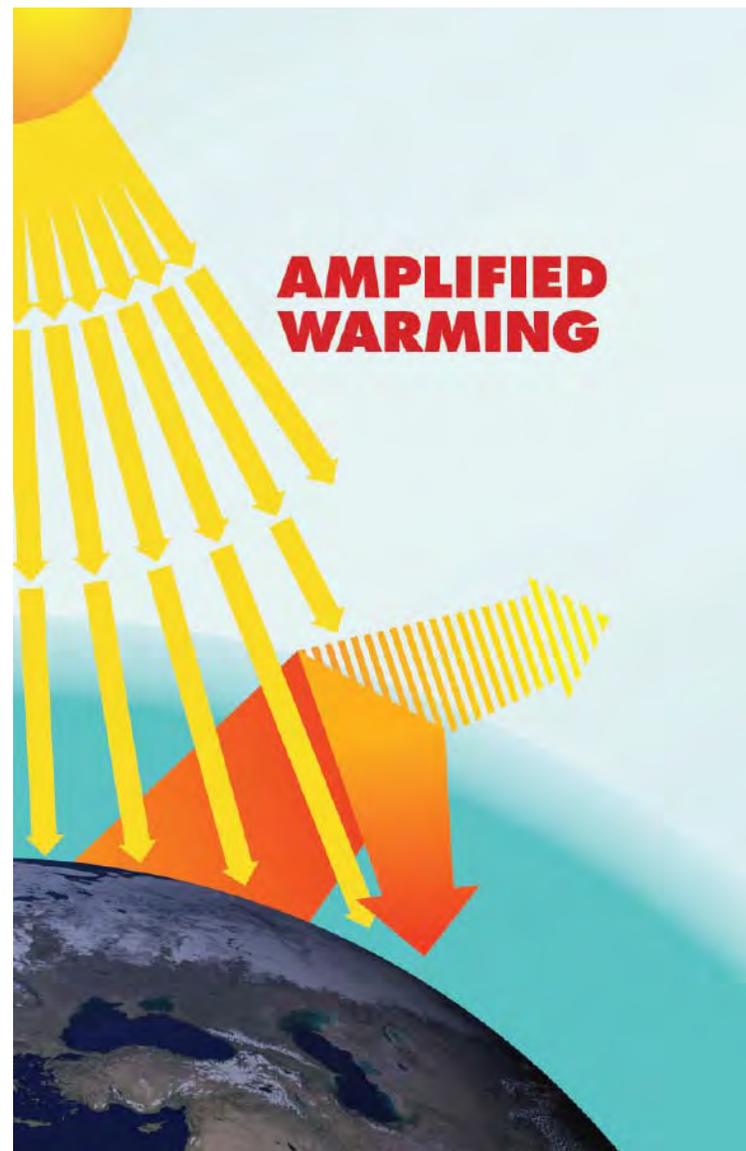


- Carbon dioxide is constantly being exchanged among the atmosphere, ocean, and land surface as it is both produced and absorbed by many microorganisms, plants, and animals.
- Emissions and removal of CO₂ by these natural processes tend to balance.

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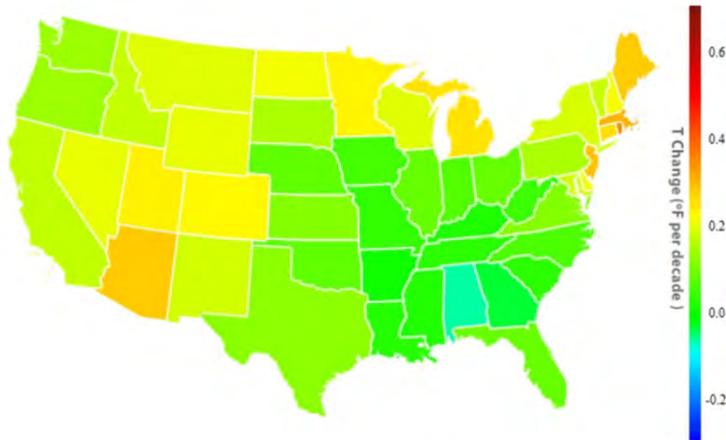
- Since the Industrial Revolution began (~1750), human activities started transferring energy from one state (fossil fuels) to another state (carbon dioxide) at a rate much faster than before.
- Scientists believe this human-induced transfer of energy has contributed substantially to climate change by adding CO₂ and other heat-trapping gases to the atmosphere.

U.S. EPA: In 2010, CO₂ accounted for about 84% of all U.S. greenhouse gas



A Century of Warming

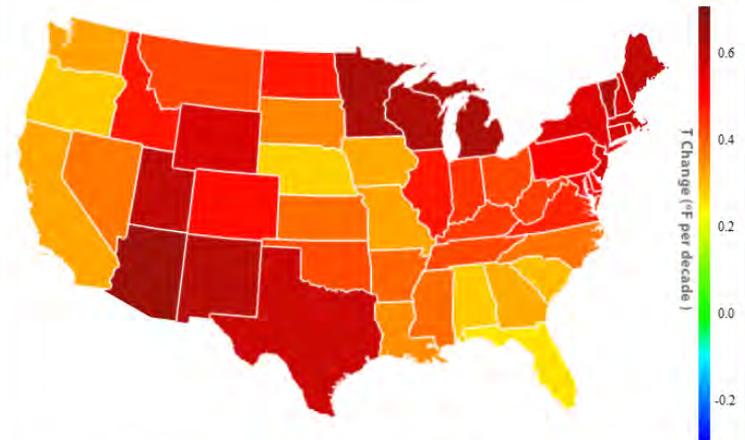
Trends in Average Temperature Changes, 1912-2011



Average annual temperatures have been rising in most states since 1912. This map shows how fast each state has been warming each decade over the past 100 years.

Warming Accelerates after 1970

Trends in Average Temperature Changes, 1970-2011



Average annual temperatures have been rising in every state since 1970. This map shows how fast each state has been warming each decade over the past 42 years.



Michigan - 2

Minnesota - 3

Wisconsin - 4

New York - 15

Pennsylvania - 18

Illinois - 23

Indiana - 25

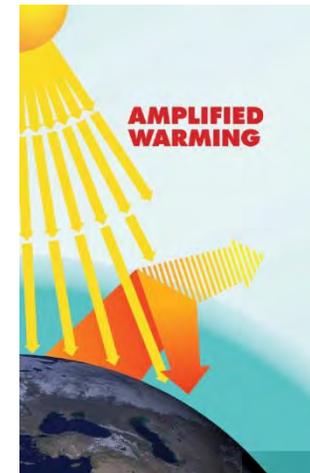
Ohio - 28

Great Lakes are influenced by global weather patterns and climate change



- Lakes warm by absorbing solar radiation. The more heat in the atmosphere, the more they warm. LELP 3.B
- Lake temperatures are also influenced by the heat of inflowing rivers. LELP 3.B

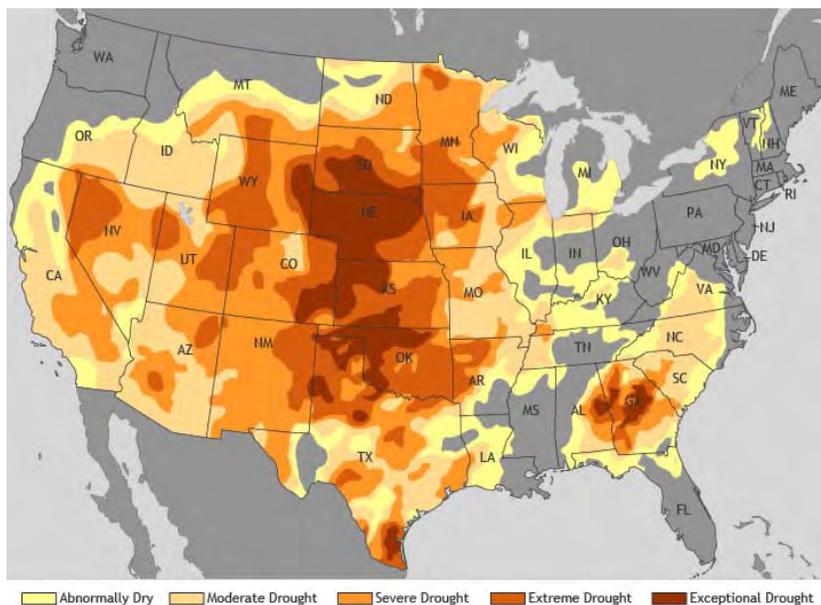
- Lakes get warmer earlier in the spring, then get to a higher temperature in summer, then are warmer when the fall occurs and cooler air masses push over the lake.
- The rate of evaporation is the greatest when the temperature difference between the water and the air is the greatest. [Fall]
- Evaporation continues (lowering lake levels) until ice forms.
- The warmer the water, the longer it takes for ice to form.
- Ice cover helps keep the water cooler as ice reflects more heat than open water.



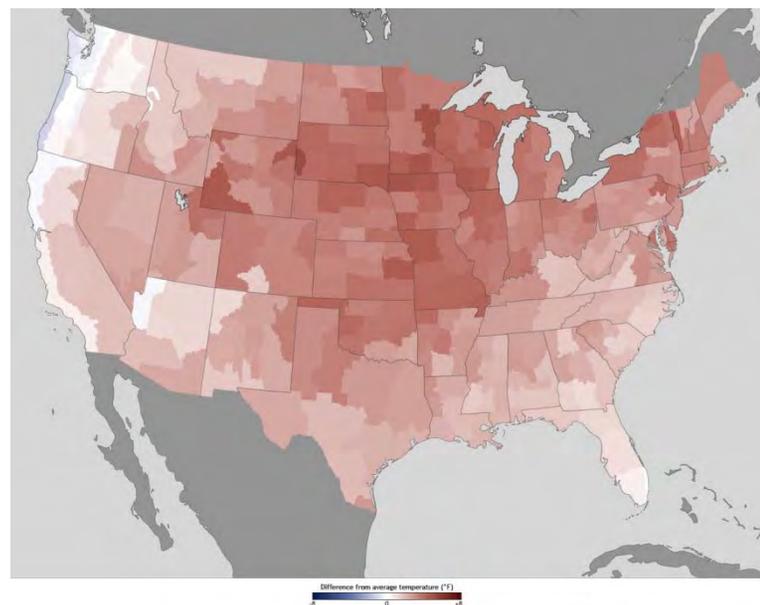
Great Lakes are influenced by global weather patterns and climate change

- NOAA Great Lakes Environmental Research Lab
www.glerl.noaa.gov/data/now/wlevels/dbd
- U.S. Drought Monitor (USDA) <http://droughtmonitor.unl.edu>
- NOAA Climate Data Center www.ncdc.noaa.gov

U.S. Drought Monitor as of February 2012

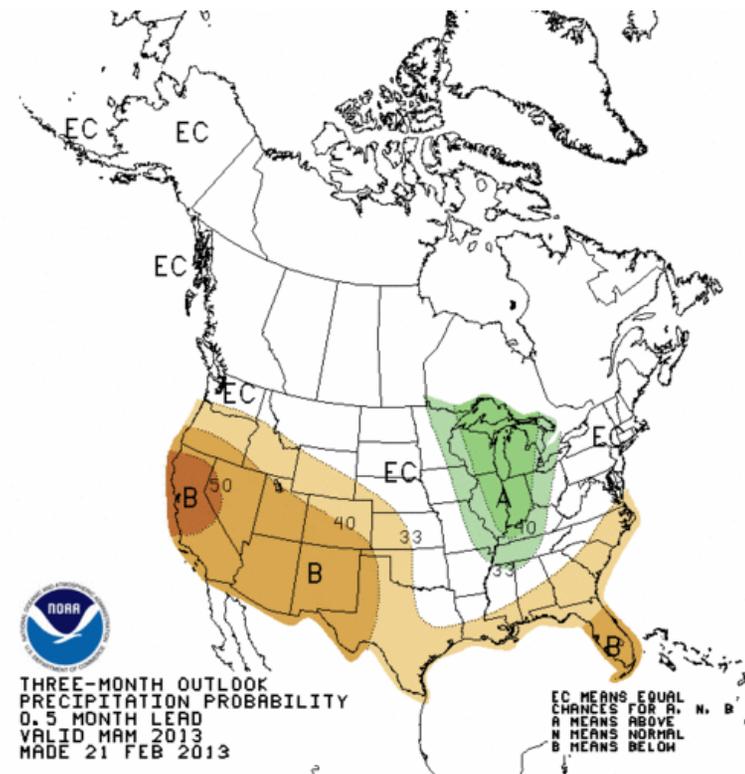


2012 Difference from average temperature in degrees F (scale -8 to +8)

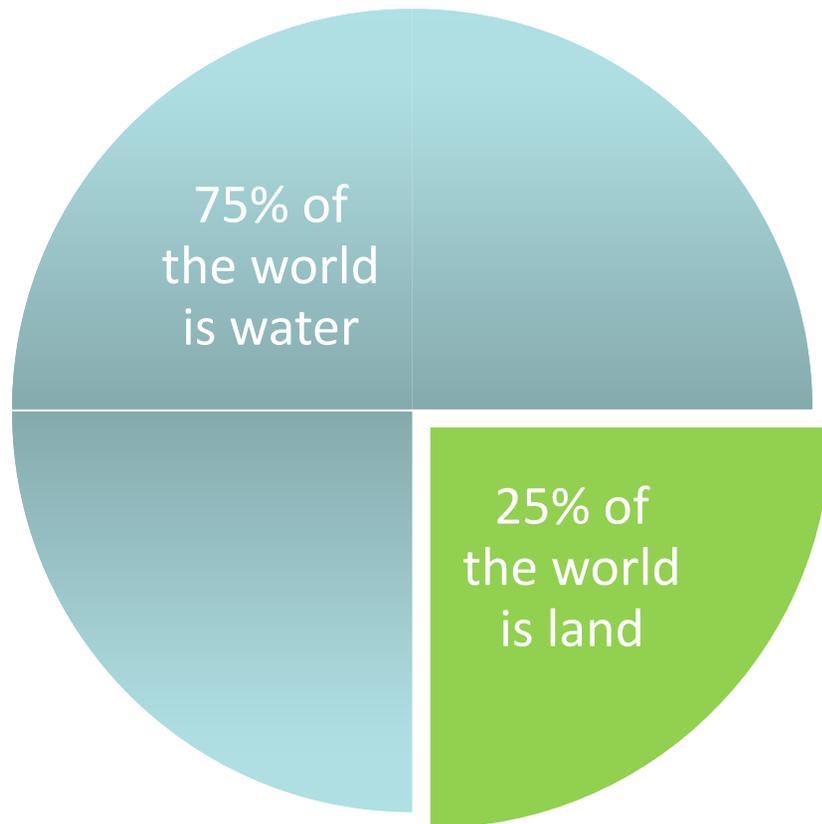


Will the lower water levels in the upper lakes lower the water levels in the lower lakes?

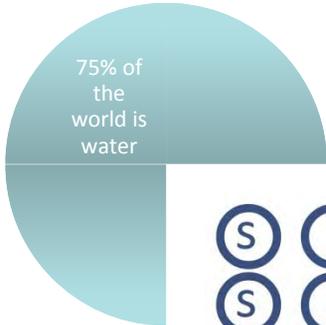
- Maybe.....
 - Approximately 80% of the water flowing into Lake Erie comes from the Upper Great Lakes via the Detroit River.
- BUT**
- Lake Erie is very shallow compared to the other Great Lakes and can recharge quickly when large amounts of over-watershed precipitation occur.
 - If weather conditions that occurred from February to June of 2011 occur again, Lake Erie could experience a rapid rise in water levels in a short period of time.



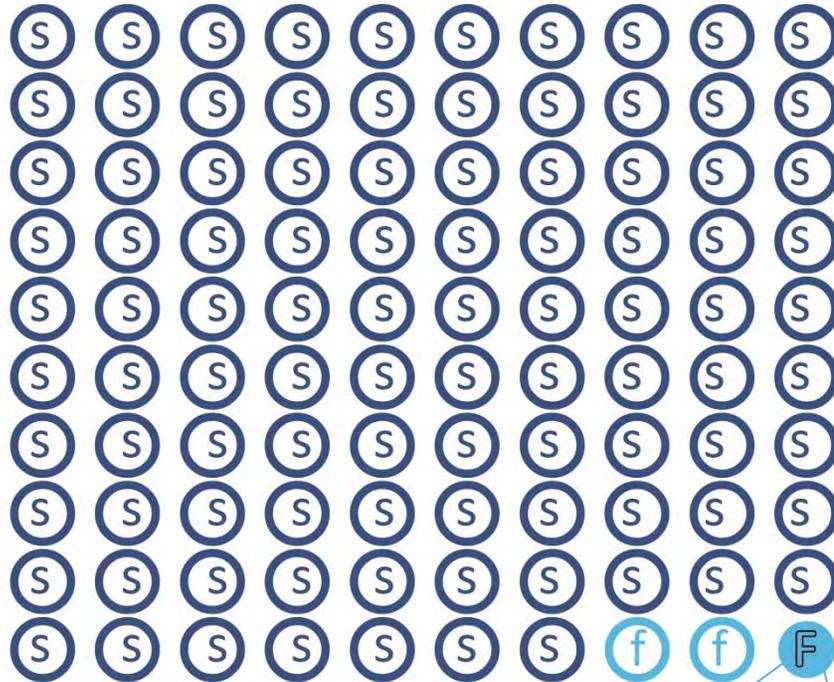
*Water makes Earth habitable;
Fresh Water sustains life on land.*



Water makes Earth habitable; Fresh Water sustains life on land.



s = salt water
f = fresh water
F = Fresh, usable water

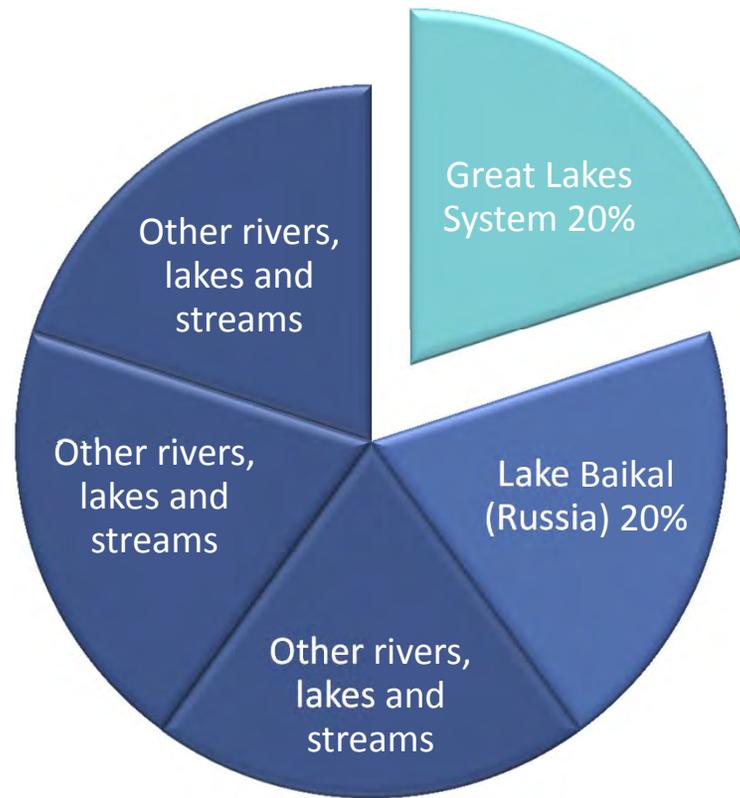


Surface Water

Ground Water



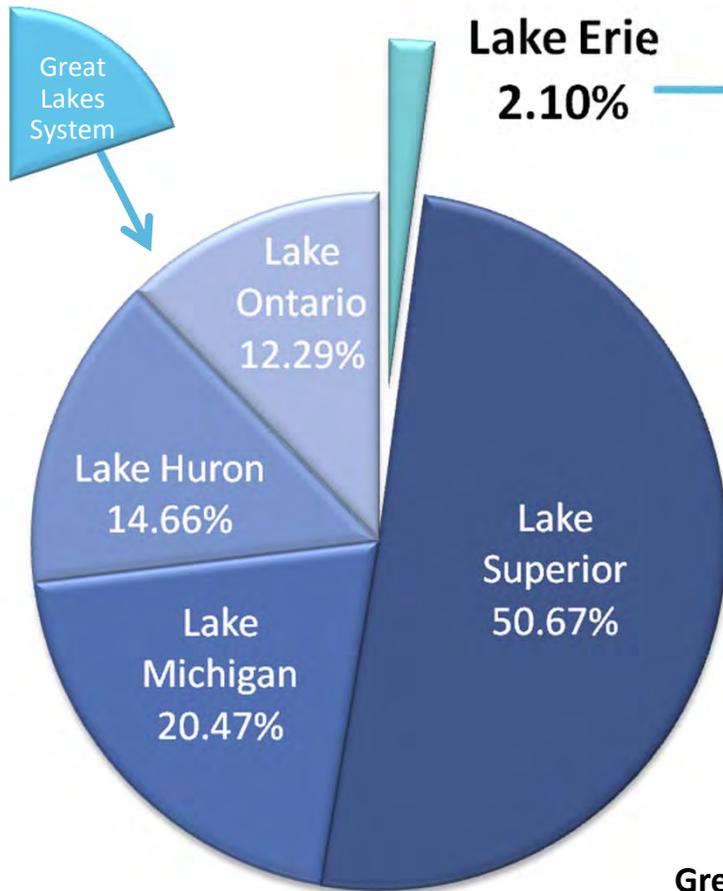
*Water makes Earth habitable;
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Of the **FRESH, USABLE, SURFACE** water, 20% is found in the Great Lakes system



Water makes Earth habitable; Fresh Water sustains life on land.



Lake Erie
2.10%

drinking water for
11 million people

3 million Ohioans

Great Lakes: 6 quadrillion gallons

- Superior – 3 quadrillion
- Erie – 127.7 trillion gallons



Lake Erie supports a great diversity of life and ecosystems.

Life in Lake Erie ranges in size from the smallest blue-green bacteria to the largest animal, lake sturgeon.

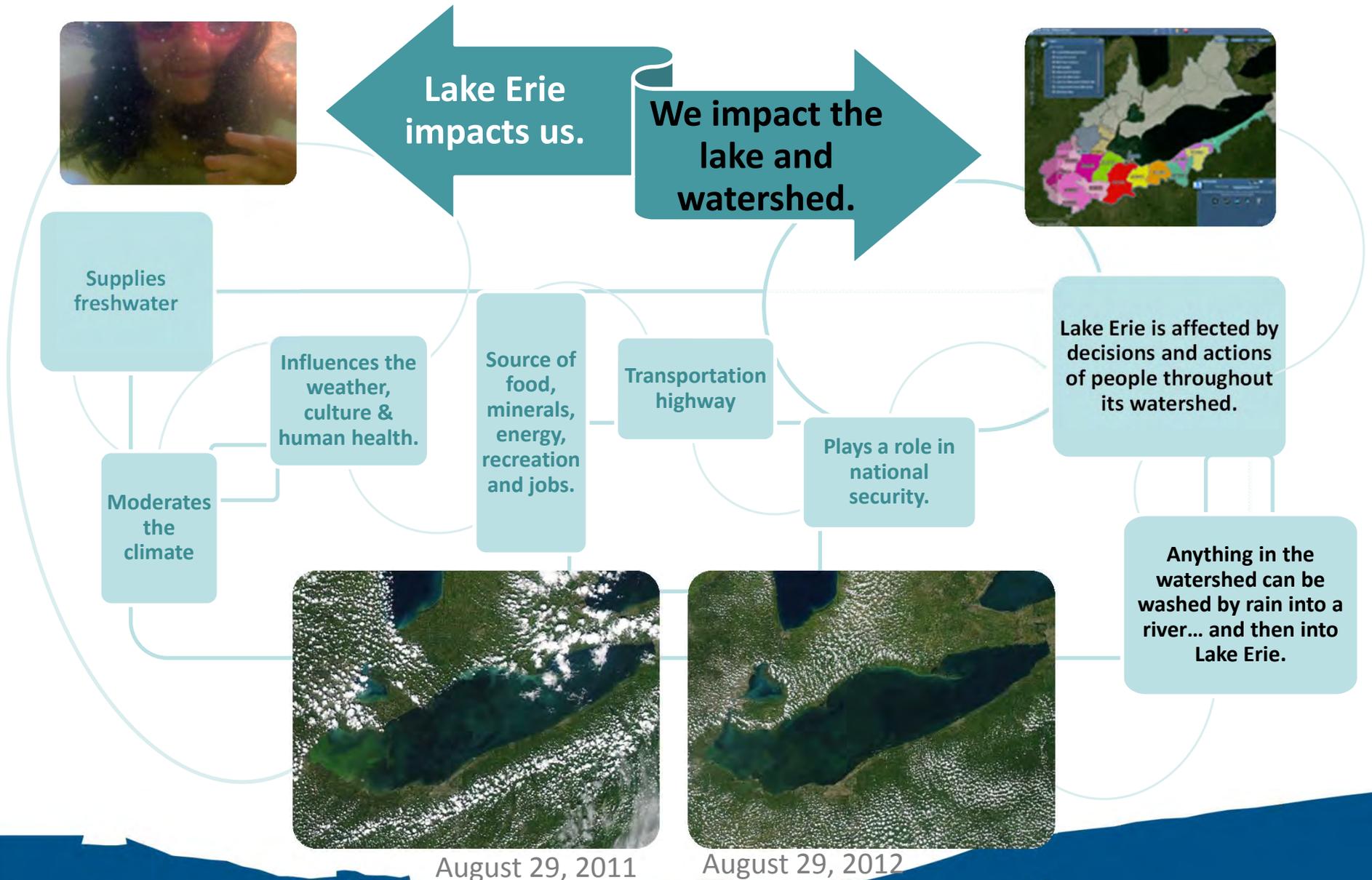
Life cycles in Lake Erie have been altered by invasive plant and animal species.

More fish are caught out of Lake Erie every year than the other four Great Lakes combined.

Lake Erie's ecosystem provides habitat for species to thrive.



Lake Erie and humans in its watershed are connected.



Watersheds and local issues... Storm Water

- After a rain event, water flows through the watershed & either soaks into the ground or runs over the surface
- What is a “Storm Sewer”?
- Point Source vs. Non-Point Source Pollution
- Increased Development = Increased Impervious Surface = Increased Runoff & Pollutants



Different types of pollutants run off the land



Sediments

Nutrients

Fertilizers

Oils

Grease

Heavy Metals

Bacteria

Trash/debris

And more...

What does this all mean to the health of the Lake?



Sediment entering Lake Erie





How Can YOU help??

Addressing the challenges

- Loadings/water quality degradation



HAB

- Harmful algal blooms (HABs)

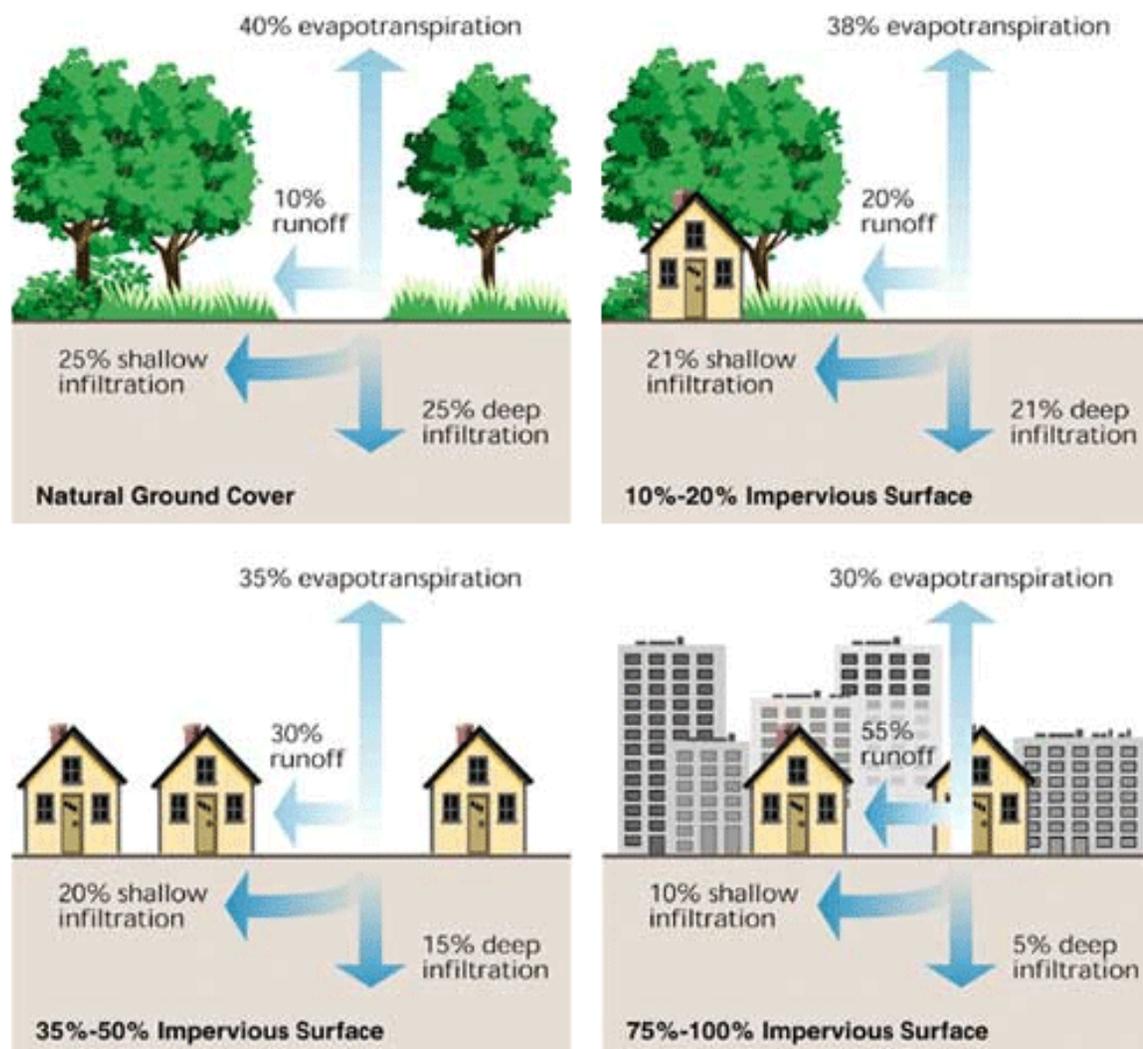


ohioalgaefinfo.com or 1-800-OHBEACH

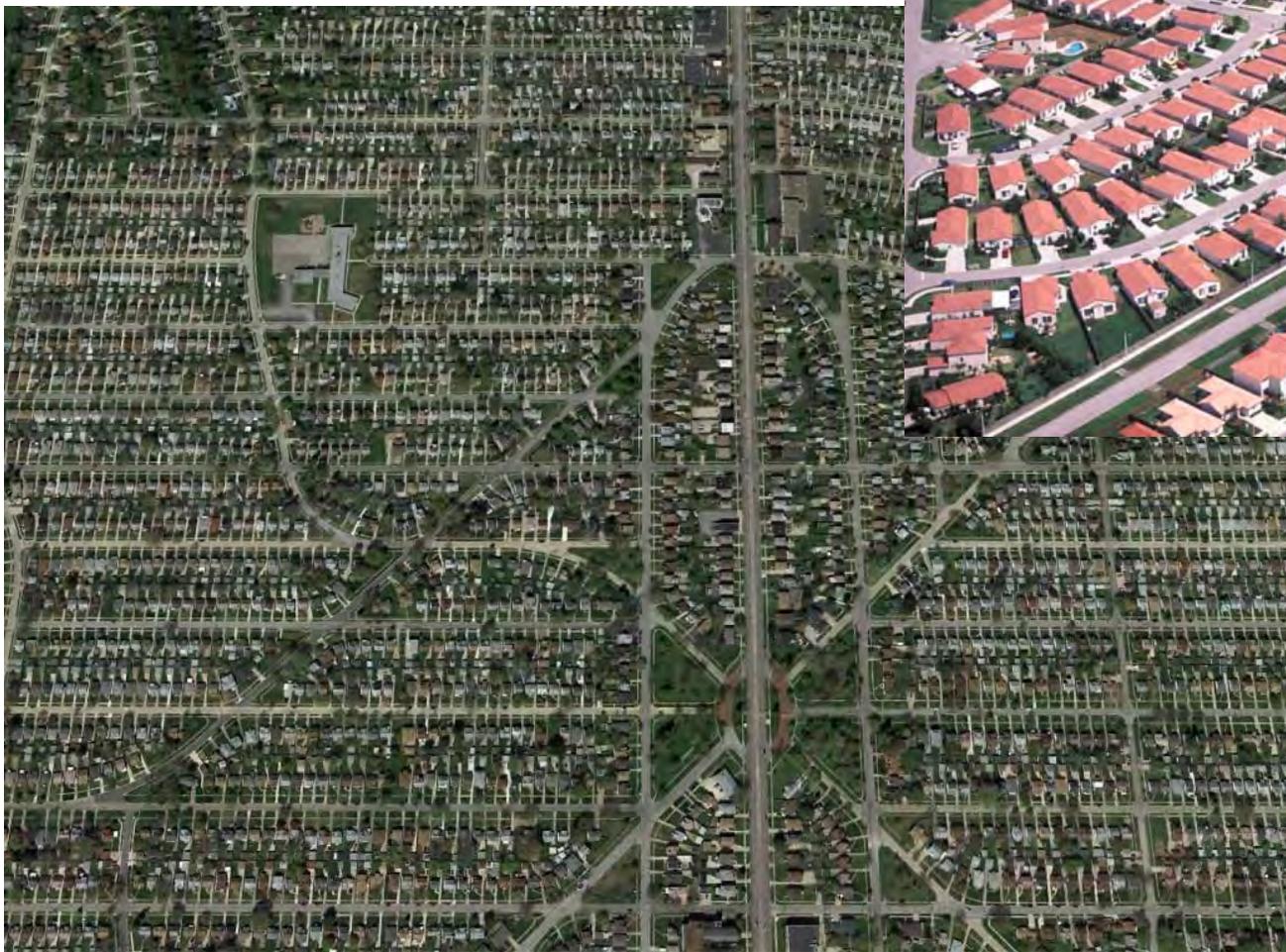


duck weed

Changing our Environment



Land Use & Urbanizing Areas



Low Impact Development



Low Impact Development



Green Construction/Sustainable Building

- U.S. Green Building Council
www.usgbc.org
- Green Roofs
- White Roofs
- Rain water harvesting
- Energy Savings
- Recycled materials



Perkins High School Volunteers:

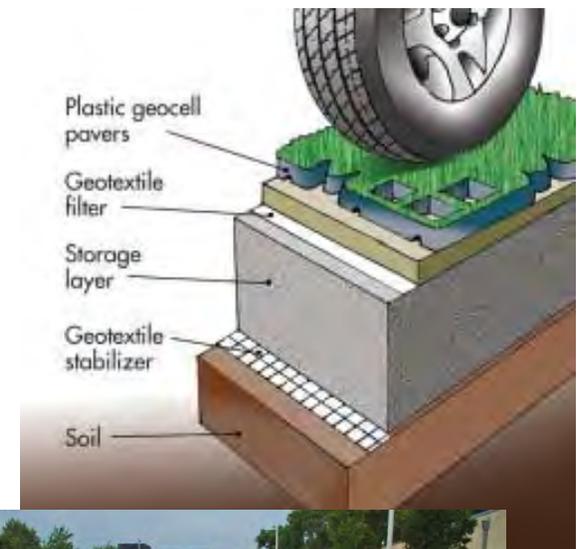
- Green Roof
- Rain Barrels
- Educational Brochure





Control/Limit Water Runoff

- Install rain barrels to collect water from rooftops to use in gardens.
- Pervious paving
- Directing downspouts to areas where runoff can soak into soil such as rain gardens.
- Leave a natural area/filter strip along river.
- Landscaping with native plants.
- Composting yard waste and re-using it in garden landscaping.





Naturescaping

Rain Gardens: A Practical Solution for Water Quality

A rain garden is an attractive, sunken landscape bed of native perennials that captures storm water runoff so it can be absorbed into the ground and cleansed of pollution.

Benefits of Rain Gardens

- Filter storm water runoff before it enters local waterways
- Help alleviate problems associated with flooding and drainage
- Recharge the groundwater supply
- Deep root systems of native plants prevent erosion
- Provide habitat and food for wildlife including birds and butterflies
- Enhance the beauty of yards and communities

Native Plants

Native plants have deeper roots that absorb more water and can tolerate periods of drought. They require less fertilizer and pesticides, are easy to maintain once established, and require little to no watering. Plus, native plants attract beneficial pollinators, birds and butterflies.

For more information about the rain gardens located on the Erie County Services Center grounds or if you are interested in planting your own, please visit the Erie Soil and Water Conservation District.

Keeping It On the Land
Great Lakes Basin Program for Soil Erosion and Sediment Control
www.glc.org/basin

This project was made possible through partial funding provided by the Great Lakes Commission and the USDA.

Local funding and support provided by:

Erie County Commissioners
Erie County Facilities Department
Friends of Old Woman Creek

Special thanks to our volunteers who assisted in the installation of these rain gardens.





Departmental Priorities

Addressing the challenges

- Loadings/water quality degradation



- “4R” program
(source, rate, time, place)
 - www.nutrientstewardship.com
 - Urban and Agricultural



Pollution Prevention



Drain clogged by powder chemical.



Storm drain clogged with oil.



Homeowner dumping paint into drain.



- ◆ Keep prescriptions out of drains
- ◆ Household hazardous waste collections
- ◆ Drug Take Back program
- ◆ Recycling

Clean up Events & Stewardship!



Growing Responsible Environmentally Educated Neighborhoods

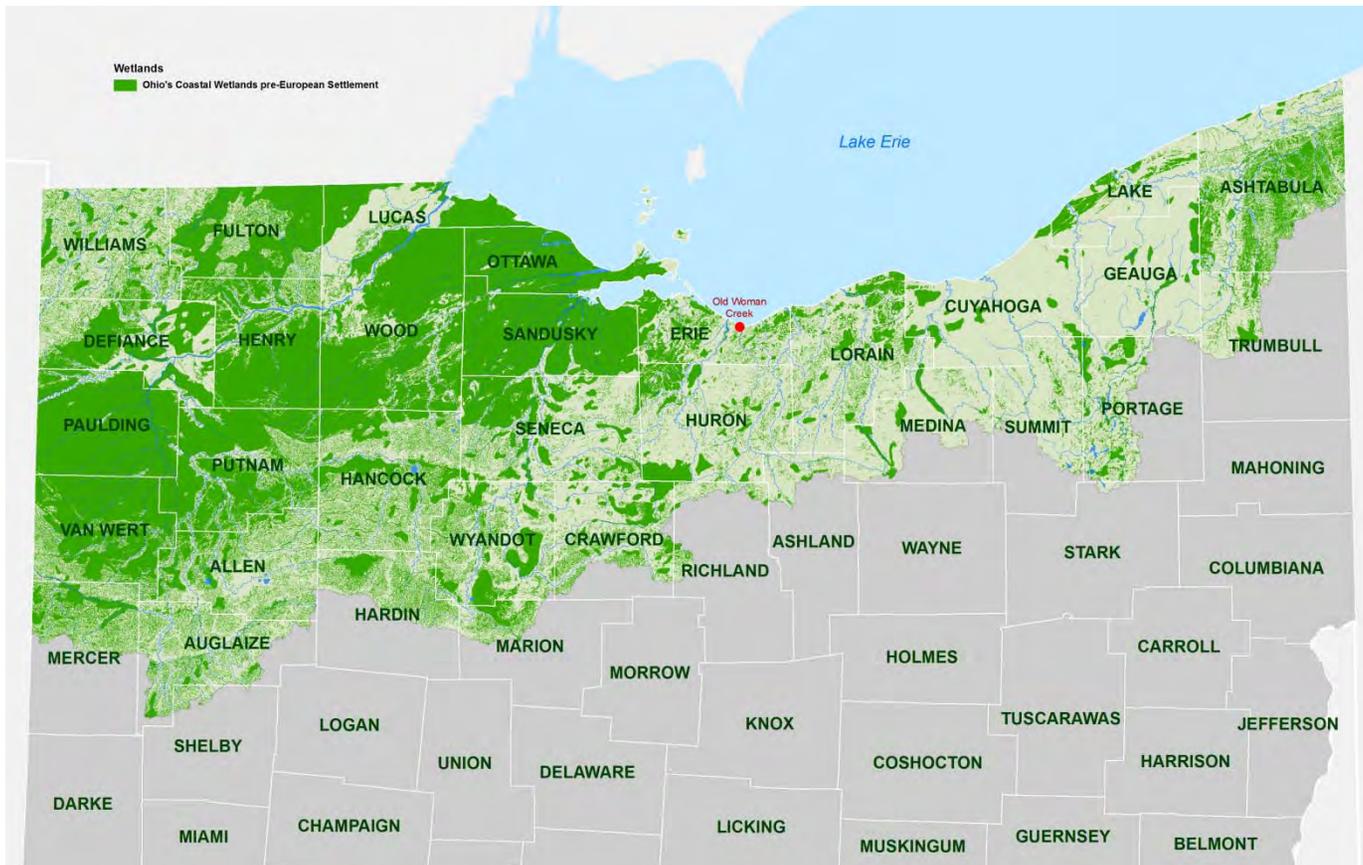




Departmental Priorities

Addressing the challenges

- Habitat loss and degradation → More than 90 percent of Ohio's wetlands have been destroyed.



Wetlands

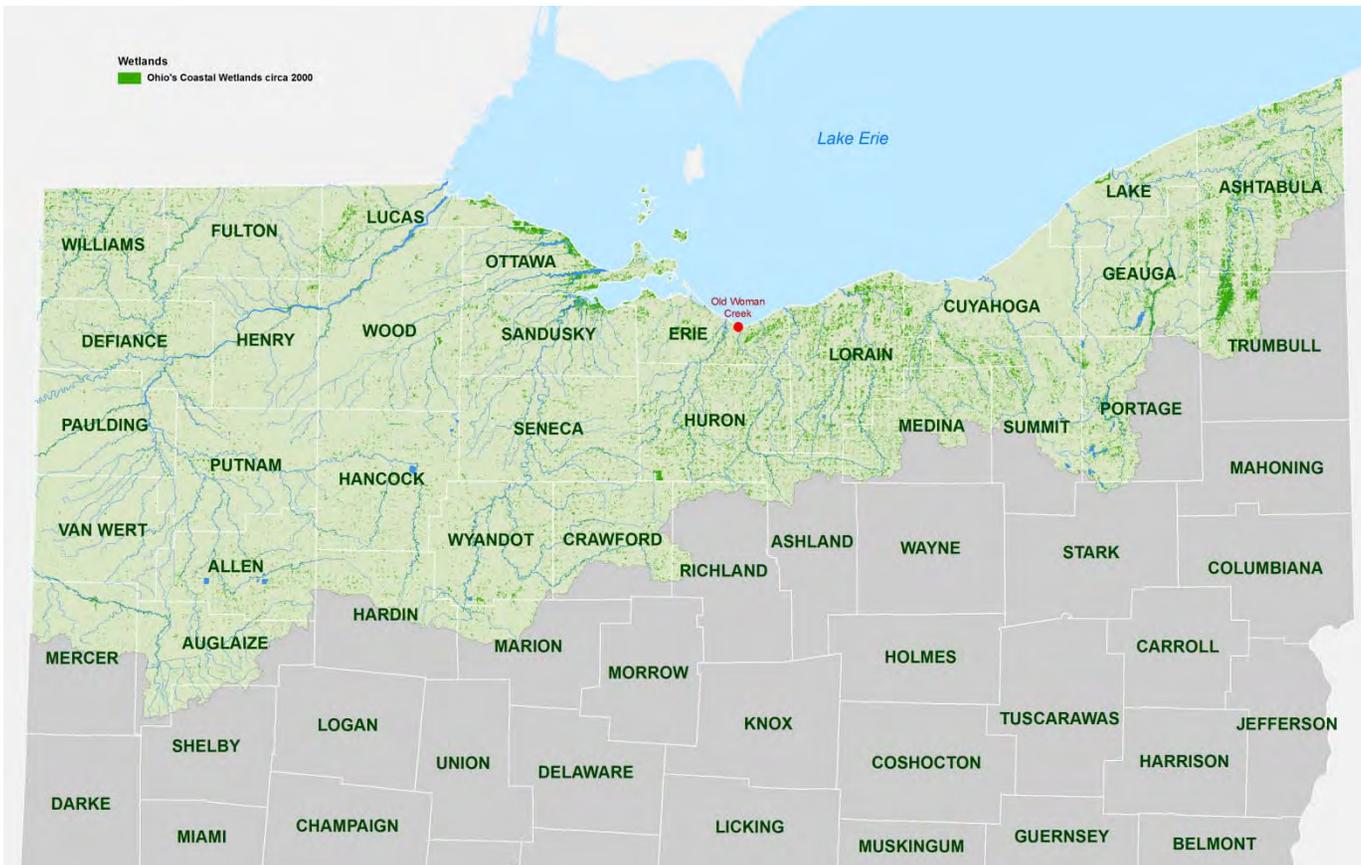
- ecosystem services valued at \$300,000 /acre
- Store flood waters
- Purify water (retain up to 80% nitrates and 92% phosphorus.
- Homes for wildlife and plants.
- Enjoyed by people..



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Create Riparian Wetlands

- Recent study valued wetlands at more than \$300,000 per acre for their services.
- Wetlands have environmental 👍, social 😊 and economic 💰 value.
 - Retain up to 80% of nitrates and 92% percent of phosphorus in surface water 💰 👍
 - Break down contaminants such as pesticides and medications. 💰 👍
 - Homes for wildlife and plants. 😊 👍
 - Nature-based tourism 😊 💰
- Grants may be available for innovative projects 😊 💰





Departmental Priorities

Addressing the challenges

- Invasive species



- eDNA, Asian Carp

- www.ohiodnr.com/tabid/24070/Default.aspx

- Stop Aquatic Hitchhikers: Clean. Drain. Dry.



STOP AQUATIC HITCHHIKERS!

Prevent the transport of nuisance species.
Clean all recreational equipment.
www.ProtectYourWaters.net

- Continue to manage and maintain a world-class sport-fishery

- Ohio's Lake Erie Fishery value: \$800 million annually.



Take home message: Lake Erie and humans in its watershed are connected.

We impact the lake and watershed

- Changing water levels over a range of scales
 - Long-term
 - Seasonal
 - Short-term
- Climate change impacts
 - Water levels
 - Storm frequency and magnitude
 - Temperature
 - Timing
- Water level regulation
- Land-use change
- Loadings/water quality degradation
- Shoreline development
- Erosion and irreversible lakebed downcutting
- Sand management
- Public access
- Habitat loss and degradation
- Invasive species

Lake Erie is socially, economically & environmentally significant.

SOCIALLY:

- A key element in the formation of the United States: Northwest Ordinance, War of 1812 Battle of Lake Erie, Civil War/Underground Railroad.
- Festivals, community celebrations, pro-sports teams
- Recreation, fitness challenges, family outings

ENVIRONMENTALLY:

- A representative model for environmental management
- Smallest Great Lake = problems appear/solutions work first.

ECONOMICALLY:

- More than 117,000 Ohio jobs are directly linked to Lake Erie-region visitors who spend more than \$11.5 billion annually.
 - Birding, Boating, Island visitors, Camping, Fishing
- Shipping – Great Lakes Carriers Association

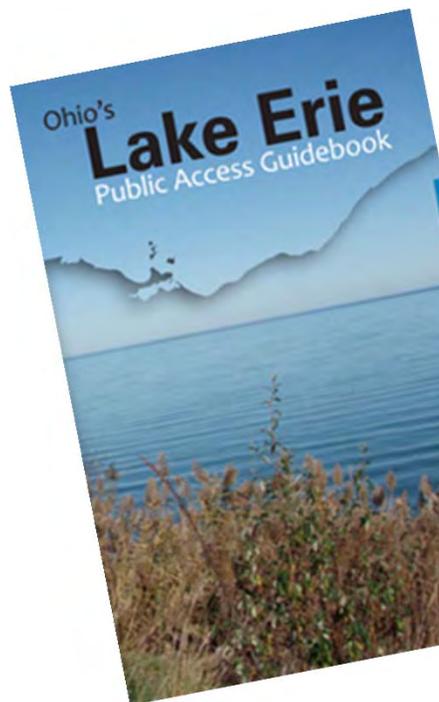




Access to the Coast . . . and Watershed

Coming soon: a companion Document focusing on Public Access Sites on Ohio's main Lake Erie Tributaries:

- Ottawa River
- Maumee River
- Toussaint River
- Portage River
- Sandusky River
- Huron River including West Branch
- Vermilion River
- Black River with East & West branches
- Rocky River with East & West branches
- Cuyahoga River
- Chagrin River
- Grand River
- Ashtabula River
- Conneaut Creek



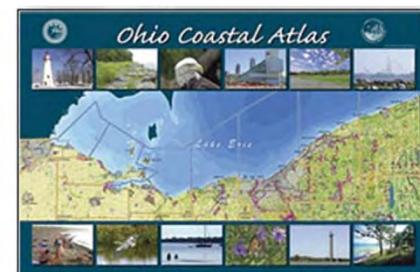
<http://LakeErie.ohiodnr.com/GoCoast>



Ohio Coastal Atlas

Available Data Layers

- [Engineering and Surveying](#)
- [Lake Erie Environment](#)
- [Lake Erie Public Access](#)
- [Lake Erie Shore Erosion Management](#)
- [Lake Erie Watershed](#)
- [Ports, Harbors and Recreational Boating](#)
- [School Districts](#)
- [Population \(census\)](#)
- [More!!](#)



<http://LakeErie.ohiodnr.com/Atlas>

ohiodnr.com/coastal



ESWCD Resources

Eriecleanwater.com

GREEN Bean

Soil Maps

Topographic Maps

Rain Garden & Prairie

Demonstration Plots

Stream Monitoring Kits

Rain Barrel Kits and more..

Clean Water Matters!

LAKE ERIE

Everyone lives, works & plays in a watershed...

As a coastal community clean water matters to our;

- Economy
- Environment
- Quality of life

Lake Erie is the largest freshwater fishery in the world!

Pipe Creek Watershed Keep It Clean

WHERE DOES THE FLOW GO?

A Watershed is an area of land that drains rain and snow to a body of water like Lake Erie. We all live in a watershed! From ditches to streams or rivers...it all flows to the lake!

Logos: NATIONAL ESTUARINE RESEARCH RESERVE OLD WOMAN CREEK, OHIO DIVISION OF WILDLIFE, OhioEPA, CLEAN WATER COALITION, OHIO COASTAL MANAGEMENT PROGRAM, State & Water Conservation District, and others.

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