

Chapter 7

Habitat is defined as the physical location or type of environment in which an organism or biological population resides or occurs. Wildlife communities depend on the natural setting – their habitat – for food and water, security, reproduction, parenting, protection from predators, shelter and other survival essentials. Habitat characteristics and conditions may contrast between species, animal types and life stages.

The Lake Erie Region comprises a vital resource that dynamically influences the landscape, flora, fauna and general ecological network, thus creating and maintaining suitable habitat for an abundance of diverse aquatic and terrestrial species. This section of the atlas highlights the ecologic biodiversity of Northern Ohio's natural habitats and aims to promote the need for environmental awareness, recognition, conservation, restoration, preservation and protection.

Wetland Habitat

Wetlands are lands that are seasonally or permanently covered by shallow water, or land where the water table is close to or at the surface. The presence of water causes the formation of hydric soils and allows the dominance of water tolerant plant species.

Wetlands are an integral part of the Great Lakes ecosystem because they store water and act as reservoirs, reducing the risk of flooding. They also help to improve the quality of water by filtering sediment, nutrients and contaminants. Wetland veg-

etation along lakes and rivers can reduce shore erosion by providing a physical buffer and reducing wind and wave energy.

Wetlands also play an important biological role in the ecosystem. They provide habitats for many kinds of plants and animals, some of which are found nowhere else. For ducks, geese and other migratory birds, wetlands are the most important part of the migratory cycle providing food, resting places and seasonal habitats. Wetlands, particularly shore and river mouth wetlands, are important spawning and nursery grounds for many species of fish.

Main types of Great Lakes coastal wetlands

Marshes are wetlands that are almost always flooded and are characterized by a mixture of cattails, reeds and other aquatic vegetation. Ninety percent of the wetlands located in Great Lakes coastal areas are marshes.

Swamps are wetlands dominated by trees and shrubs, with standing water, limited drainage and often neutral or slightly acidic soils. The Morgan Swamp area, in Ashtabula County, is a 2000-acre remnant of a five-square-mile swamp that existed at the time of European settlement.

Bogs are peat-accumulating wetlands that trap precipitation as the only water source, typically have acidic soils and water, and often contain Sphagnum mosses. Portage County's Kent Bog began in glacial times as a deep kettle-hole lake about 50 acres in size but has since entirely filled

with peat and now supports the largest, southernmost stand of tamarack in the continental United States.

Fens are peat-accumulating wetlands with groundwater as the dominant water source and support a variety of specialized plant species, including orchids, sedges and grasses. If the groundwater flow is diverted, a fen will become a bog. Once destroyed, it can take a fen 10,000 years to develop again.

Barrier-Protected Wetlands are those that, due to coastal processes, have become physically separated from the Great Lakes by a barrier beach or a series of beach ridges. Barrier beach wetlands are connected to the lake through ground water and/or periodic direct channel flow. Some barrier beach and other barrier wetlands are also influenced by the drainage of the wetland's individual watershed.

Vernal pools are natural depressions covered by shallow water for variable periods from winter to spring. They are typically dry for most of summer and fall, and may be forested or covered by herbaceous vegetation. Vernal pools are considered required breeding habitat for certain species of frogs, salamanders and invertebrates, some of which are threatened or of special concern.

Vernal pools are a unique habitat that is at risk for several reasons. They are likely to be overlooked because they are small (generally less than 99 feet in diameter), difficult to recognize during the dry season

(if one is not aware of the habitat type), and likely to occur outside of areas typically recognized as wetland habitat (e.g., they are found in forests or agricultural lands often far from a floodplain or swamp). However, areas that contain vernal pool habitat are likely to be richer in the overall diversity of species, unusual species, and ecological processes such as nutrient cycling.

Aquatic Habitat

Organisms are adapted to living in all areas of Lake Erie's water and bottomlands. But some of the most biologically interesting habitats have developed at boundaries. Estuaries, rocky shores and benthic habitats such as reefs, shoals and sediment are all productive aquatic habitats located on boundaries.

Estuaries are the portion of the river mouth that are open to the larger body of water where the two different types of water meet and mix. In marine estuaries, there is a transition between the fresh water of the river and the salt water of the ocean. In freshwater estuaries there may still be a significant change in water chemistry that creates a distinct boundary. Aquatic organisms may travel between the two types of aquatic habitat to maximize their needs for food and shelter. Freshwater estuaries found at each river mouth on Ohio's coast are also critical to the health of Lake Erie as they serve as the last line of defense for filtering out sediments and pollutants present.

Reefs are rocky outcrops that rise to or near the water's surface. Reefs and rocky shores provide stable structures that allow attachment and refuge for organisms. The abundant food sources and availability of shelter on a reef tend to attract large numbers of fish. Some species of fish, such as lake trout and walleye, also use reefs as spawning areas. Fish that spawn on reefs typically deposit the eggs in the spaces between the rocks on the reef and do not guard a nest.

Shoals are sandy or gravelly (not rocky) areas in relatively shallow water. Shoals provide soft, well-oxygenated substrates for burrowing organisms. Therefore, they provide a ready food source and are also good spawning sites for many species of fish including smallmouth bass. Fish that spawn in shoals often create nest areas that are guarded by one or both parents.

Sediments are the soft, mucky particulate matter that accumulates on the bottom of the lake. Because the sediment material is a much finer grain than sand, not as much oxygen is present in between the particles. Some organisms are adapted to live in this environment including mayfly and midge larvae. The larvae burrow into the sediments for refuge from feeding fish but come to the sediment/water interface to obtain food and oxygen.

Prime Habitat

The Ohio Department of Natural Resources (ODNR) has designated many

prime habitat locations along Ohio's Lake Erie coast for research, preservation and protection. Wildlife communities flourish at ODNR's various nature preserves, wildlife areas and other facilities. Old Woman Creek State Nature Preserve, Mentor Marsh State Nature Preserve, Magee Marsh State Wildlife Area, Metzger Marsh State Wildlife Area and Maumee Bay State Park constitute only a handful of premium habitat sites protected by ODNR along the coast. Additionally, ODNR manages the 2.24 million acres of Lake Erie in Ohio as aquatic habitat for many economically and ecologically important species. For additional comprehensive information regarding the location of ODNR's protected facilities, as well as the location of non-ODNR protected lands, refer to the "Land Use and Protected Lands" chapter of the Atlas.

The "Habitat" chapter of the Atlas divides information into several categories including:

Eco-Regions are geographic areas that exhibit similar ecosystem traits and that have comparable types, qualities, quantities and integrities of environmental resources. The map illustrates these unique ecological areas as outlined by Omernik.

Wetlands and Forests examines the 2003 land cover data from Ohio EPA and the University of Cincinnati and showcases wetlands and forests in northern Ohio. The map also shows the former general extent of the Great Black Swamp to compare it to the much smaller wetlands of today. Arcola Creek text is also featured beside this map.

Pre-European Vegetation focuses on the habitat that existed at the time prior to Ohio's settlement. Data used to compile the map was collected by Ohio's first land surveyors, who noted witness trees near the corners of the newly laid out townships and sections.

Great Black Swamp features the history of the once expansive wetland that existed in northwest Ohio. Goll Woods State Nature Preserve information is also presented.

Rare Species Concentrations represents the compilation of thousands of observations of rare species from 1950 to 2004 and provides a general locations of the known distribution of rare species across Ohio's coastal region. Lake Erie water snake information is also presented.

Significant Bird Habitat in the Lake Erie and coastal area of the Great Lakes Region are a vital resource to birds. The maps and graphics highlight the areas important for bird migration, breeding and nesting.

Dike 14 discusses the history and potential future use of the dredged material site that is located just east of downtown Cleveland and adjacent to Gordon State Park.

The Oak Openings Region is a former ancient beach ridge made of sandy soil where western prairie and eastern forest meet. More rare plants and animals live in this region west of Toledo in Lucas, Fulton and Henry counties than in any other part of the state.

Walleye Spawning Habitat focuses on Lake Erie tributaries that are suitable spawning areas for Lake Erie's most popular game fish – the walleye. The Western Lake Erie Reef Complex is also discussed.

Walleye Nursery Habitat areas are connected to spawning areas by flow regimes in the tributaries and water current patterns in the lake. This map illustrates known suitable areas for walleyes to grow. The ecology

of Lake Erie yellow perch is also discussed.

Adult Walleye Habitat focuses on where walleyes live for the remainder of their life, showing where the majority of adult walleye are caught. The ecology of smallmouth bass is also presented.

Ottawa National Wildlife Refuge is a 4,683-acre refuge and is the publicly-accessible part of the Ottawa National Wildlife Complex that also contains Cedar Point National Wildlife Refuge and West Sister Island National Wildlife Refuge.

Terrestrial Habitat features a few other birds, animals, fish, insects, invertebrates and plants that exist throughout the Lake Erie Region.

For more information:

ODNR Division of Natural Areas and Preserves
2045 Morse Road, Building F-1
Columbus, OH 43229-6693
Tel: 614-265-6453
www.ohiodnr.com/dnap/

ODNR Division of Forestry
2045 Morse Road, Building H-1
Columbus, Ohio 43229-6693
Tel: 877-247-8733
www.ohiodnr.com/forestry

ODNR Division of Wildlife
2045 Morse Road, Bldg. G
Columbus, OH 43229-6693
Tel: 1-800-WILDLIFE
www.ohiodnr.com/wildlife

ODNR Division of Wildlife
Sandusky Fish Research Unit
305 E. Shoreline Drive
Sandusky, Ohio 44870
Tel: 419-625-8062
www.epa.gov/glnpo/lakeerie/lamp2000/

Lake Erie Lake-wide
Management Plan;
Habitat Projects 2000

Eco-Regions

Wetland and Forested Habitat

Arcola Creek Estuary

Pre-European Vegetation

Mentor Marsh State Nature Preserve

Great Black Swamp

Goll Woods State Nature Preserve

Rare Species Concentrations

Lake Erie Water Snake

Significant Bird Habitat

The Mystery of Migration

Bald Eagle

Peregrine Falcon

Dike 14

Oak Openings

Walleye Spawning Habitat

Western Lake Erie Basin Reef Complex

Walleye Nursery Habitat

Yellow Perch Habitat

Adult Walleye Habitat

Smallmouth Bass Habitat

Ottawa National Wildlife Refuge

Terrestrial Habitat

Monarch Butterflies

Background photo: Old Woman Creek National Estuarine Research Reserve and State Nature Preserve, Erie County

Eco-Regions



Hach-Otis State Nature Preserve, Lake County



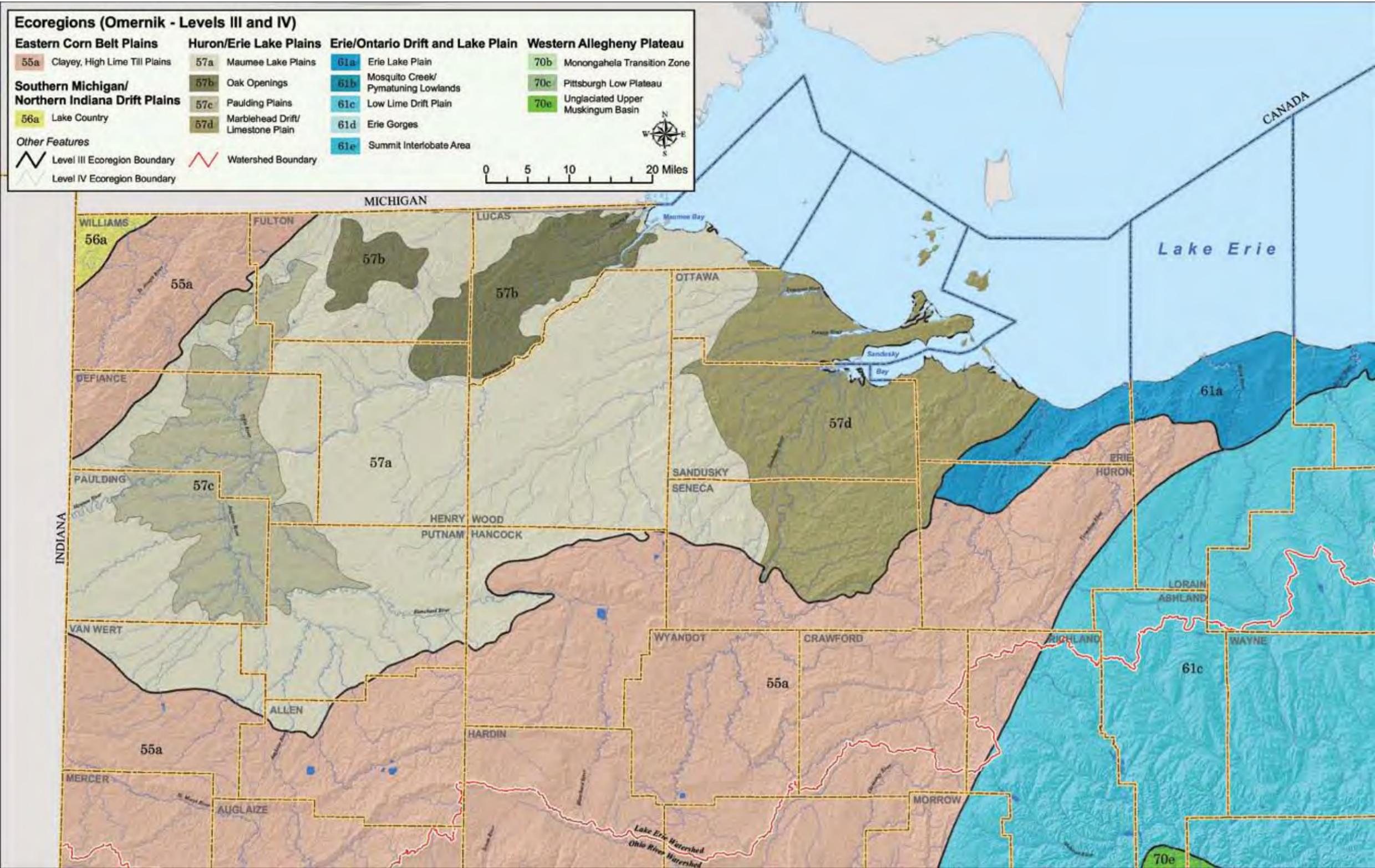
Maumee Bay State Park, Lucas County



Grand River in Ashtabula County

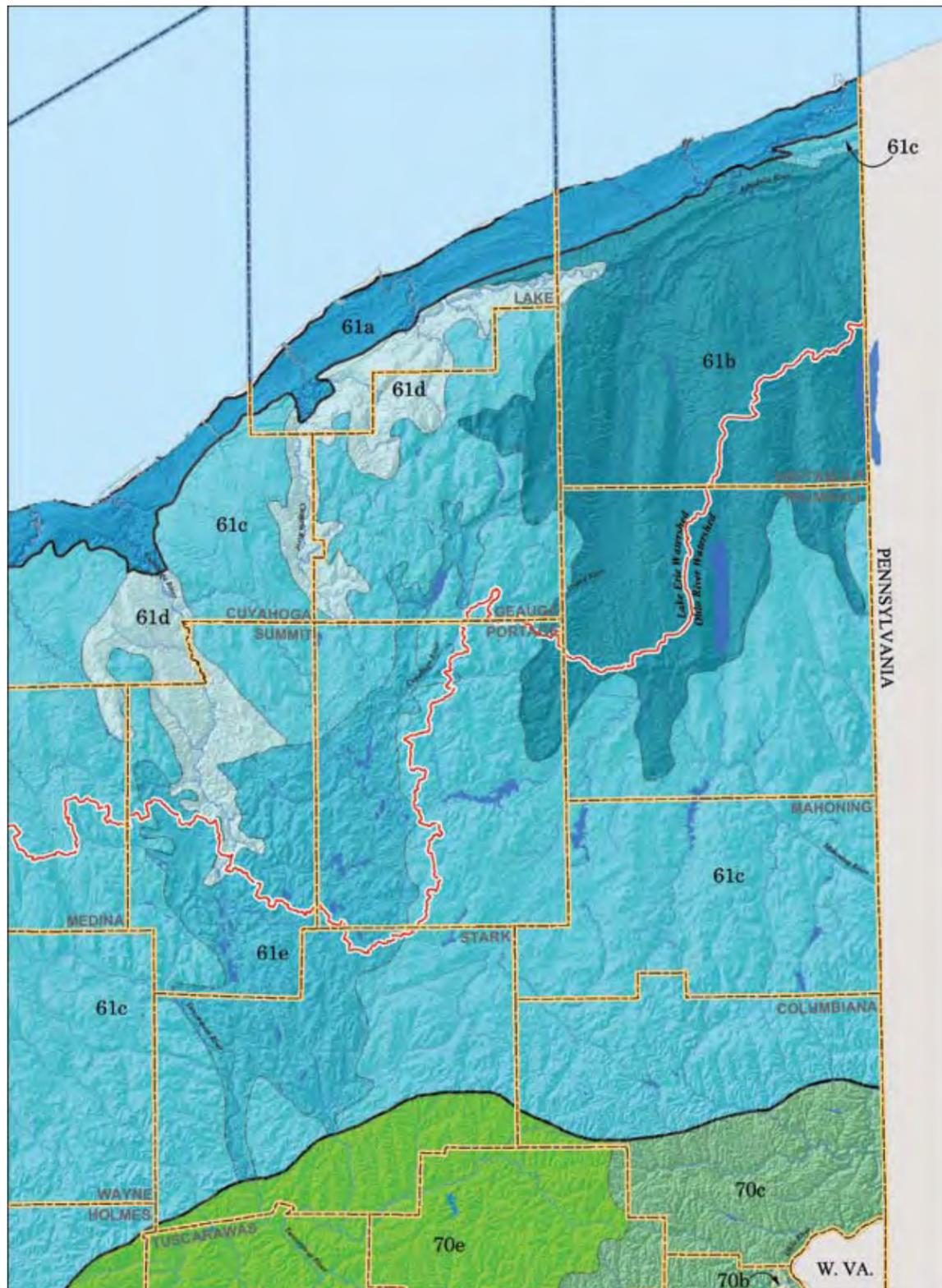


Kitty Todd State Nature Preserve, Lucas County



Map 20 GIS data citation in Appendices

Eco-Regions



Map 20 GIS data citation in Appendices

Eco-regions are large areas that include similar ecosystems and that have comparable types, qualities, quantities and integrities of environmental resources.

Ecosystems are complex communities of organisms, their environment and their inter-relationships in a particular unit of space. An ecosystem's non-biological (abiotic) elements include minerals, climate, soil, water, sunlight, and all other nonliving elements; its biotic elements consist of all its living members. Two major forces link biotic and abiotic components: the flow of energy and the cycling of nutrients.

Eco-region boundaries are determined by examining patterns of vegetation, animal life, geology, physiography, soils, water quality, climate, human land use, and other living and non-living ecosystem components. Eco-regions serve as a spatial framework for research, assessment, management and monitoring of ecosystems and ecosystem components. Eco-regions are used by state agencies for projects such as the development of biological criteria and water quality standards and the establishment of management goals for non-point source pollution. Eco-regions are also relevant to integrated ecosystem management goals of many federal and state resource agencies.

The Omernik eco-region system is a hierarchical structure developed by James Omernik, that spatially classifies ecological patterns into similar regions. The hierarchy has four levels. Level I is the coarsest level, dividing North America into 15 ecological regions, followed by Level II, which further divides the continent into 52 regions.

Level III divisions are smaller ecological areas nested within Level II regions. At Level III, the continental United States is broken into 99 regions, five of which are found in Ohio. Level IV is a subdivision of Level III. Level III and IV eco-regions allow local characteristics to be identified specifically for strategic management practices. This map illustrates Level III boundaries (thick black lines) and Level IV delineations (individually colored polygons).

Characteristics of Level IV Eco-regions

Clayey, High Lime Till Plains (55a) – Soils in this region are less productive and more artificially drained than those south and west and support fewer swamp areas than the Maumee Lake Plains

to the north. Corn, soybean, wheat and livestock farming dominate current land use, replacing the original beech forests and scattered elm-ash swamp forests. No exceptional fish communities exist in the muddy, low gradient streams of this eco-region.

Maumee Lake Plains (57a) – Once dominated by the Great Black Swamp, this eco-region is poorly drained and contains clayey lake deposits, glacial till and fertile soils. Prior to draining, elm-ash swamp forests and beech forests were extensive while marshes and bogs occurred along the coast. These land covers have been replaced by productive, drained farmland. Sluggish, low gradient rivers meander through the region. They contain high suspended sediment loads of clayey silts that endanger the local ecology.

Oak Openings (57b) – The Oak Openings eco-region is a belt of low, often wooded, sand dunes and paleobeach ridges that are situated among the broad, nearly flat, agricultural plains of the Maumee Lake Plains eco-region. Originally the Oak Openings region supported mixed oak forests and oak savannas intermixed with poorly-drained depressions with wet prairies. Today, well-drained sandy soils are common, supporting farms, residential development, oak woodland and sand quarries.

Paulding Plains (57c) – This eco-region is a part of the lake plain and is characterized by clayey lake sediment and very poorly-drained soils. The nearly level topography once supported mostly elm-ash swamp forest but has been cleared and drained for soybean, small grain, corn and hay farming. The region's very sluggish, low-gradient streams and many ditches are typically muddy and have very high loads of suspended clay that endanger flora and fauna.

Marblehead Drift/Limestone Plain (57d) – This eco-region has areas of thin glacial drift and limestone-dolomite ridges and islands. Streams often flow on carbonate bedrock. Originally, beech forests and elm-ash swamp forests were common. Scattered carbonate ridges supported distinctive mixed oak forests and prairies, marl plains had prairies, and Lake Erie and Sandusky Bay shores supported fens. Many geographically isolated plant species occurred in this eco-region. Today, corn, small grains, soybeans and hay are grown on artificially drained land. Vegetable and fruit farming

is well adapted to the relatively mild climate near the coast.

Erie Lake Plain (61a) – This eco-region is a nearly level coastal strip of lacustrine deposits punctuated by beach ridges and swales. Its distinctive lake-modified climate extends this eco-region's annual growing season several weeks longer than inland areas. Urban-industrial sites, ports, fruit and vegetable farms and nurseries have developed on the plain.

Mosquito Creek/ Pymatuning Lowlands (61b) – This eco-region is characterized by poor drainage, wetlands, low-gradient streams and moisture tolerant woodlands. It is nearly flat and is underlain by clayey till and fine lacustrine deposits. Originally, beech forests were common. Today dairy farms and wooded lots occur.

Low Lime Drift Plain (61c) – This eco-region has a rolling landscape composed of low rounded hills with scattered end moraines and kettles. Its distinct terrain differs from the unglaciated, wooded and hilly country to the south and its soils are usually naturally less fertile than the high lime till plains to the west. Urban-industrial activity as well as dairy, livestock, corn and soybean farming are common. The growing season is shorter than that of the Erie Lake Plain eco-region.

Erie Gorges (61d) – This eco-region is a uniquely steep, dissected area along the Chagrin, Cuyahoga and Grand rivers. Local relief can exceed 500 feet. Rock exposures occur and fluvial erosion rates are high. Originally, mixed mesophytic forests were common on well-drained sites. Today, woodland, recreational areas, scattered farms and housing are dominant land uses.

Summit Interlobate Area (61e) – This region is set apart from adjacent eco-regions by its numerous lakes, wetlands, sphagnum bogs, sluggish streams, kames and kettles. The substrate is often sandy outwash and till. Mixed oak forests originally dominated well drained areas. Today, woodland, peat, agriculture, gravel quarries and urban-suburban development occurs.

For more information/ Source:

U.S. Environmental Protection Agency
www.epa.gov/wed/pages/ecoregions/ecoregions.htm

Wetland and Forested Habitat



Old Woman Creek State Nature Preserve, Erie County



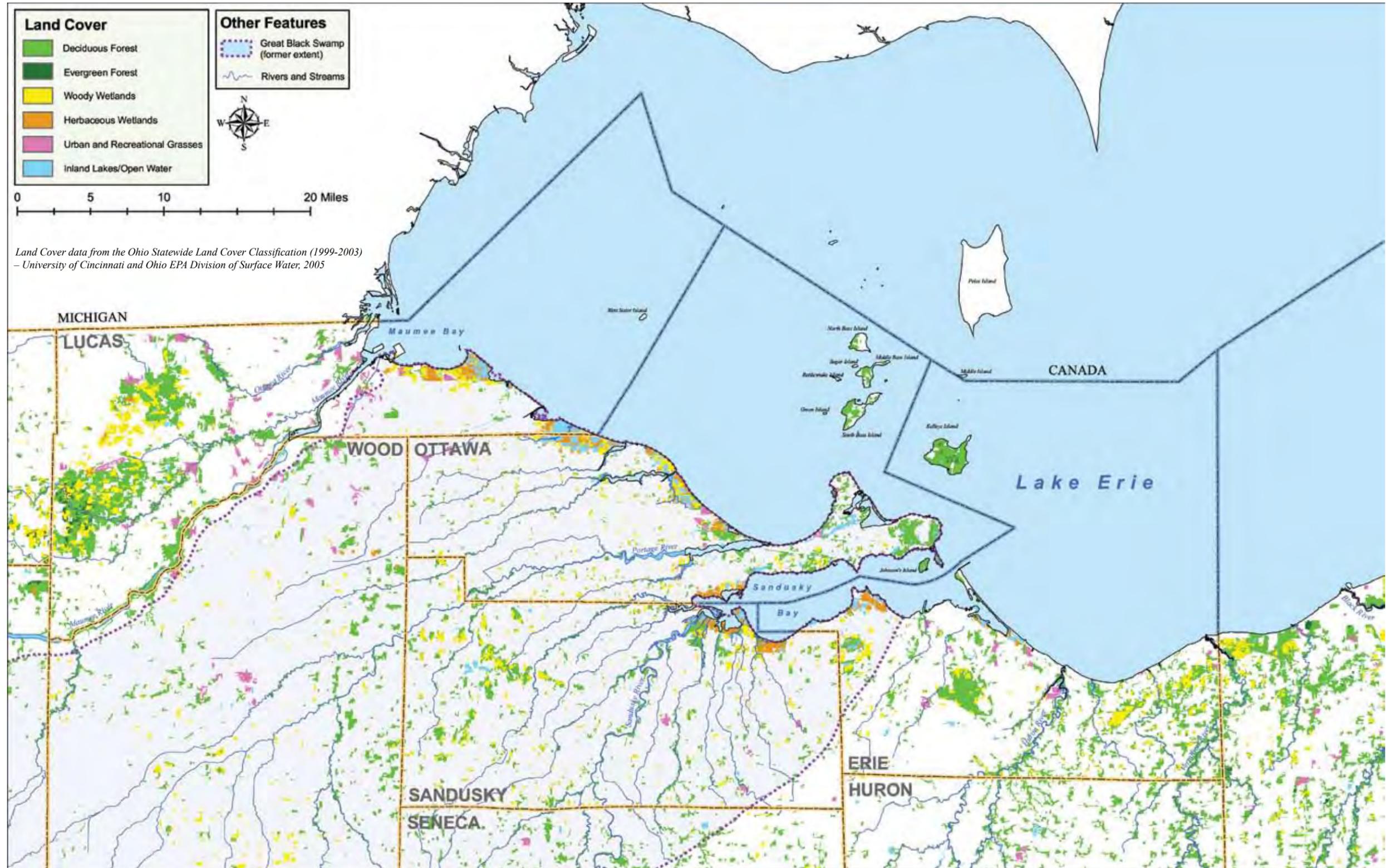
Goll Woods State Nature Preserve, Fulton County



Pymatuning Wetlands, Ashtabula County

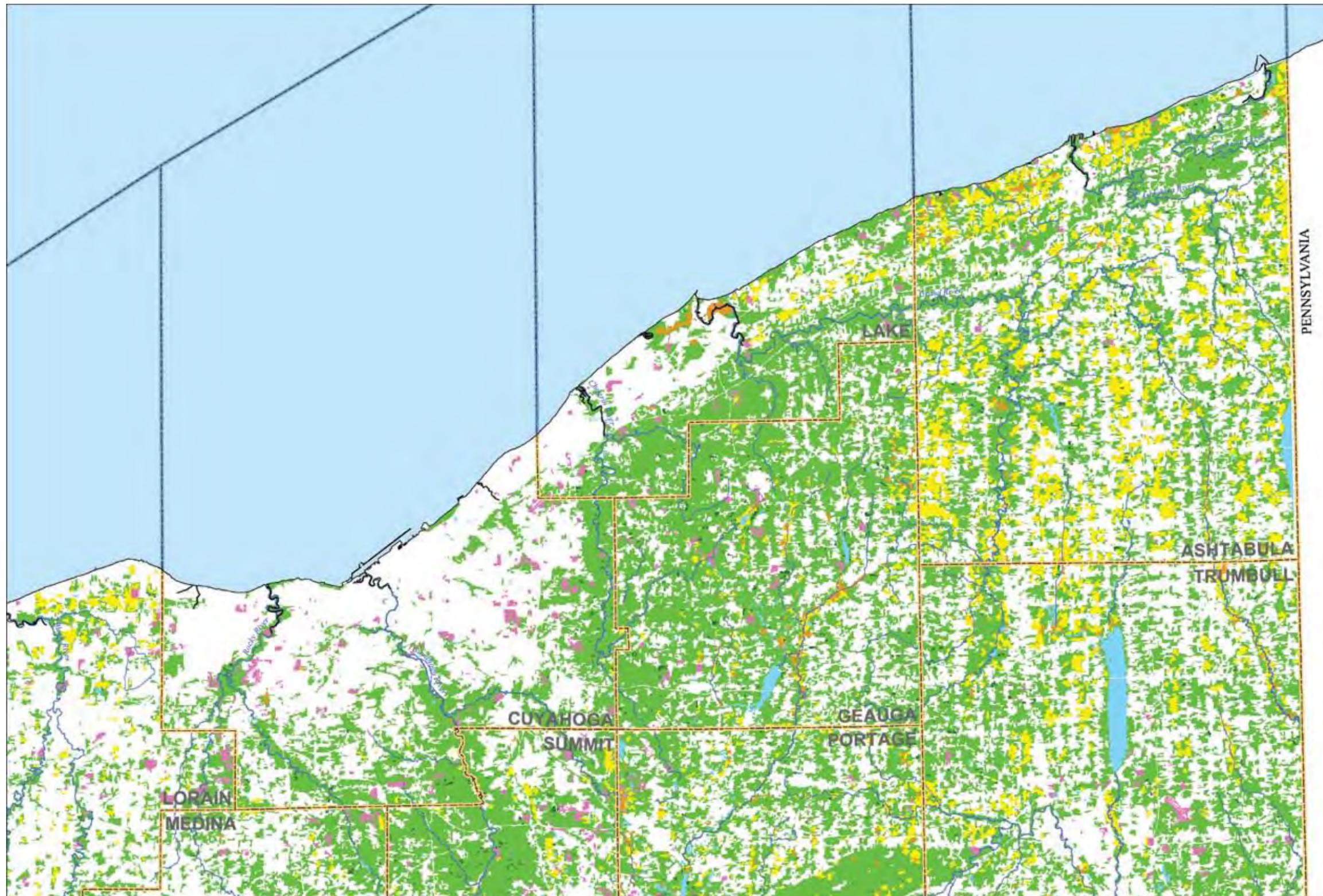


Kitty Todd State Nature Preserve, Lucas County



Map 21 GIS data citation in Appendices

Wetland and Forested Habitat



Arcola Creek Estuary

The Arcola Creek Estuary, located in the extreme north-east corner of Lake County, is one of Lake Erie's last undisturbed natural estuaries. An estuary is a partially enclosed body of water near a river or stream mouth where water flowing from the tributary meets and mixes with the water of a lake or ocean. In the case of the Arcola Creek Estuary, the encroaching water from Lake Erie spills into the estuary and mixes with the flowing waters of Arcola Creek.

The pristine marshy estuarine habitat at the Arcola Creek Estuary is reminiscent of the former marshlands that once dominated other Lake Erie river mouths preceding European settlement. Prior to the Cuyahoga River mouth's dredging and harbor construction in Cleveland, early accounts note that the river never flowed directly into Lake Erie, but rather into large estuarine swamps and marshes. Marshes were also dredged and eliminated in Fairport Harbor, Ashtabula and Conneaut. Remnant marshlands of the Grand River, which today comprise Mentor Marsh State Nature Preserve were spared, but much of the estuarine marsh was eradicated for the construction of Fairport Harbor.

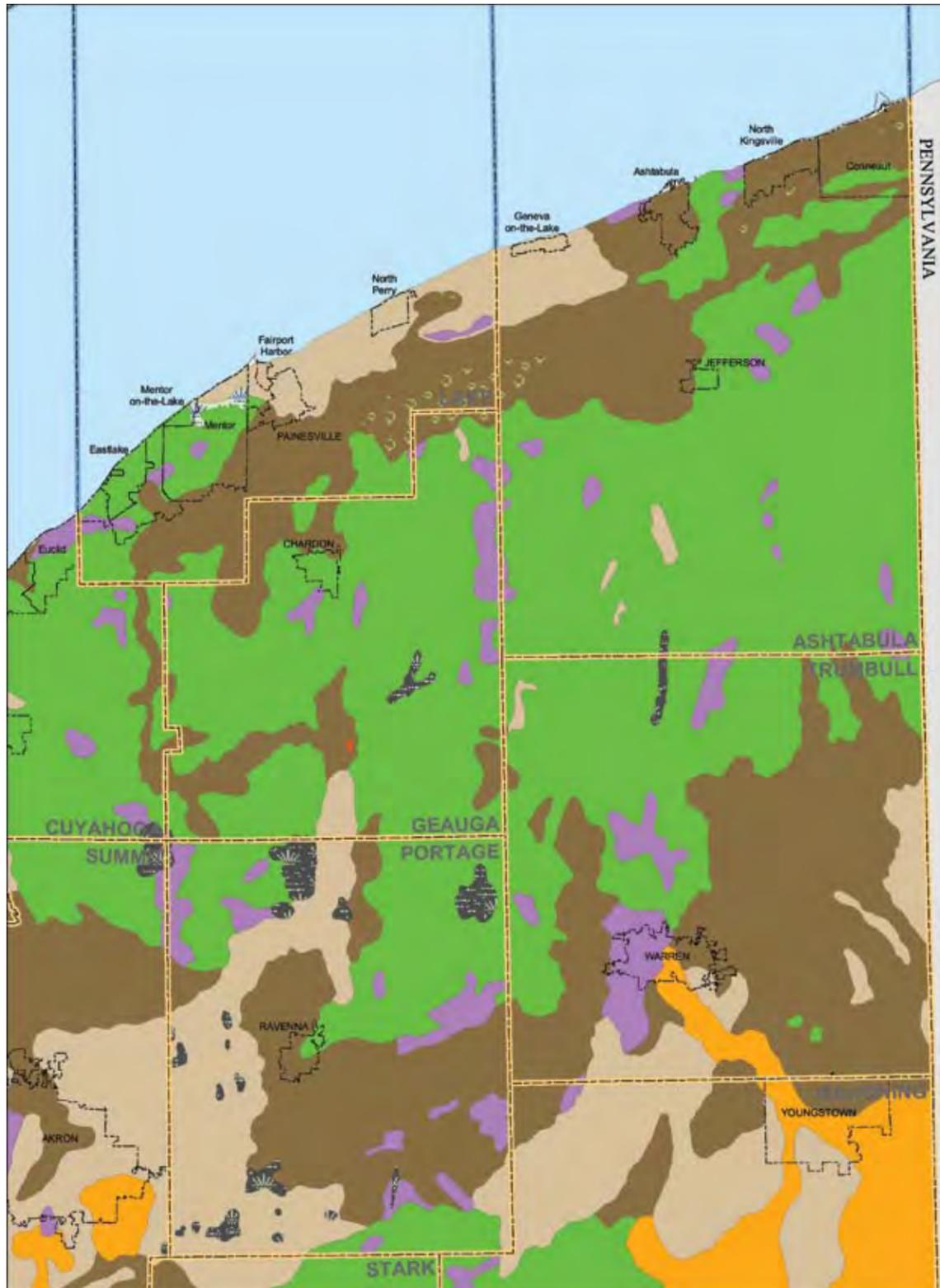
The Arcola Creek Estuary supports a wealth of habitat for a diverse number of aquatic and terrestrial plant and animal species including: water milfoil, white water lily, yellow pond lily, wood duck, mallard, blue heron and green heron. It is also an important breeding area for many species of fish and a frequent stopover area for migrating birds.

Arcola Creek Estuary is managed by the Lake Metroparks. Protection of the area is a collaborative effort between The Nature Conservancy, the Cleveland Museum of Natural History, Lake Metroparks and the Friends of Arcola Creek. For more information regarding estuaries, refer also to Chapter 6: Lake Science.

For more information:

The Nature Conservancy www.nature.org
 The Cleveland Museum of Natural History
www.cmnh.org
 Lake Metroparks www.lakemetroparks.com
 Friends of Arcola Creek
friendsofarcola.freeservers.com

Pre-European Vegetation



Map 22 GIS data citation in Appendices

The vegetation of Ohio at the time of settlement was the result of complex physical properties and processes. Local climate, topography, geology and disturbance regimes heavily influenced vegetation. Today, the natural vegetation of the coastal region has largely been replaced by man-made surfaces and cultural vegetation that is planted and maintained by humans.

This map is an Ohio Department of Natural Resources adaptation of Robert Gordon's 1966 work entitled "The Natural Vegetation of Ohio," published by the Ohio Biological Survey. Data used to compile the map was collected by Ohio's first land surveyors who noted witness trees near the corners of the newly laid out townships and sections. Surveyors also gave short descriptions of the timber for prospective buyers. Treeless areas were particularly well documented because of the belief that they were ill suited for agriculture.

As indicated on the map, historically the most prominent vegetation type covering the western coastal region was the elm-ash forest of the Great Black Swamp. Situated on the poorly-drained lake plain, dominant canopy species included American elm, black ash, white ash, silver maple and red maple. Today, Pearson Metropark in Lucas County (#1 on map) contains a small example of this forest community.

Where the elm-ash swamp forests met the coast of Lake Erie, the forest gradually graded to coastal marsh. This community supported tall emergent aquatic plants, including bulrushes, giant reed grass, cattail, bur reed, wapato and pickerel weed. Sheldon Marsh State Nature Preserve in Erie County (#2 on map) is an example of this community type.

Thin groves of white and black oak dominated savanna vegetation which in Ohio is known as the Oak Openings. Although the removal of firs has resulted in a closed canopy of oaks, prescribed burns

allow this vegetation type to persist at Kitty Todd State Nature Preserve (#3 on map).

Tall grasses such as big bluestem, switchgrass and Indian grass characterized the vegetation in areas mapped as prairie. Ohio's original grasslands were concentrated in flat, poorly-drained lands. Although this vegetation type has largely been destroyed, the community is represented today by Castalia Prairie at Resthaven Wildlife Area in Erie County (#4 on map).

Upland forest was common throughout the eastern coastal region. Mixed mesophytic and beech forests contained canopy species such as beech, sugar maple, tulip tree, oak, chestnut and hickory. Dominated by oak species, mixed oak forests were established on slightly drier areas throughout the region.

For more information:

Ohio Natural Heritage Program
ODNR Division of Natural Areas and Preserves
2045 Morse Road, Building F-1
Columbus, OH 43229-6693
Tel: 614-265-6453
www.ohiodnr.com/dnap

ODNR Division of Wildlife
2045 Morse Road, Building G
Columbus, OH 43229-6693
Tel: 614-265-6300
E-mail: wildinfo@dnr.state.oh.us
www.ohiodnr.com/wildlife

Ohio Biological Survey
P.O. Box 21370
Columbus, OH 43221-0370
Tel: 614-457-8787
Fax: 614-457-6005
E-mail: ohiobiologicalsurvey@rohoio.com
www.ohiobiologicalsurvey.org

Mentor Marsh State Nature Preserve

Located in the city of Mentor is a five-mile stretch of natural wetlands paralleling Lake Erie. Mentor Marsh State Nature Preserve is one of Ohio's largest remaining coastal marshes, and one of the last along the eastern portion of the state's Lake Erie coast. The marsh is a refuge for hundreds of bird species and has been identified as an Audubon Important Bird Area. The marsh is also a vital breeding site for many native Lake Erie fish species.

The crescent-shaped marsh was once the course of the Grand River, which in earlier times emptied into Lake Erie near the present day Mentor Lagoons. Mentor Marsh was cut off from the primary flow of the river, and the former riverbed naturally and gradually transformed into the diverse wetland ecosystem it is today. Although permanently disconnected from the river due to human development, trickles of water still manage to enter the marsh from the Grand River.

Mentor Marsh was not always viewed as a valuable natural resource. Those who opposed the marsh regarded it as a health hazard and overall unattractive blemish in the landscape. In 1960, there were plans to dredge the entire wetland so that a park, inland waterway and docks could be developed. However, conservation groups began perseverant efforts to acquire tracts of the marsh, acre by acre—some land was purchased and some was donated. In 1973, the ODNR Division of Natural Areas and Preserves and the Cleveland Museum of Natural History, with the Mentor Marsh Board of Management's support, signed the agreement to designate Mentor Marsh as a State Nature Preserve.

Today, the 691-acre Mentor Marsh State Nature Preserve is jointly managed by the ODNR Division of Natural Areas and Preserves and the Cleveland Museum of Natural History, and is also listed a National Natural Landmark. The nature preserve is open to the public and offers a visitor center, boardwalk trail system, observation deck and plenty of wildlife viewing opportunities.

For more information/sources:

Cleveland Museum of Natural History, www.cmnh.org
ODNR Division of Natural Areas and Preserves,
www.ohiodnr.com/dnap

Great Black Swamp



Lush habitat at Crane Creek State Park, Lucas County



Riverine marsh in Ottawa County

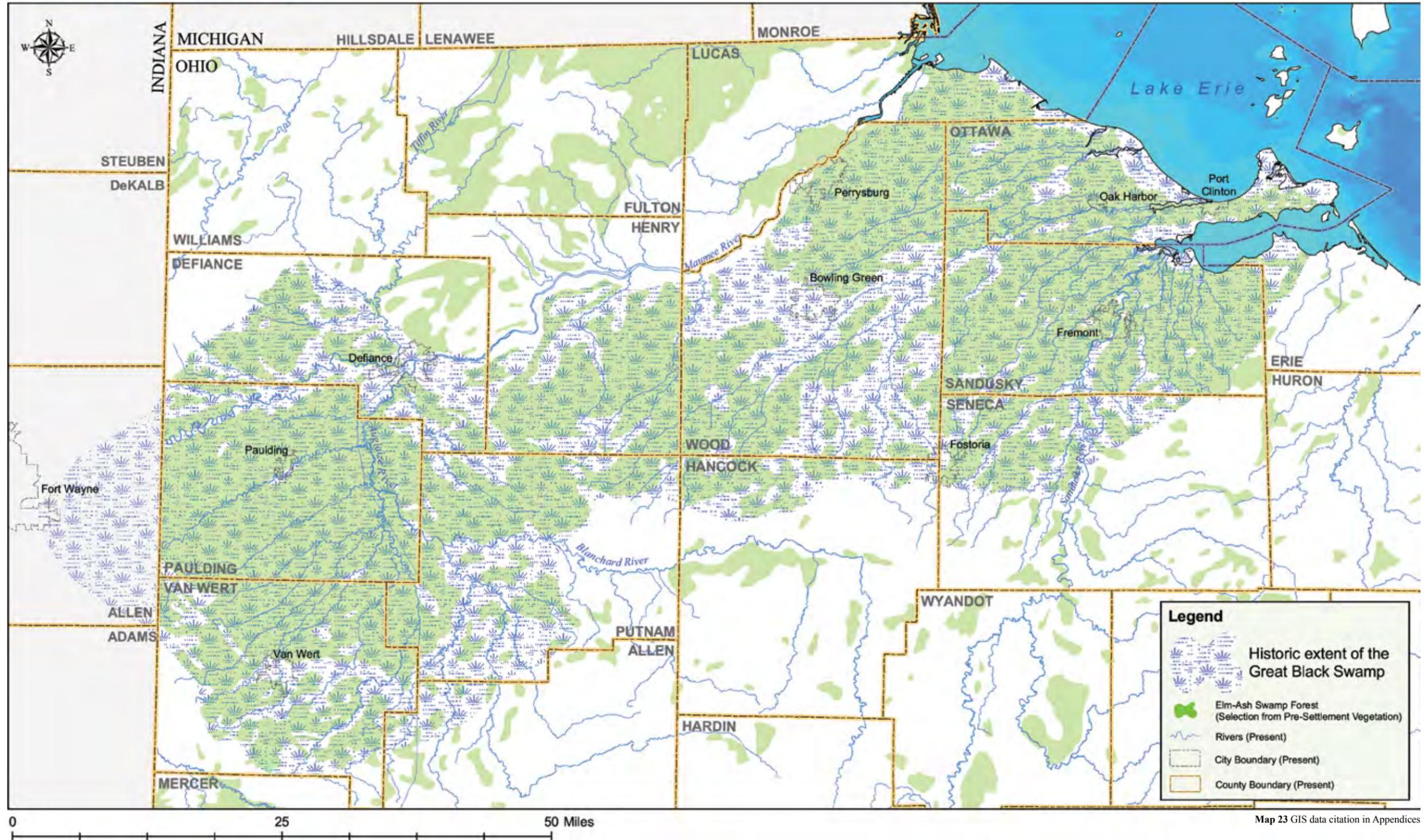


The Great Black Swamp was drained using a systematic network of manmade ditches



Goll Woods State Nature Preserve in Fulton County exhibits forest cover similar to that of the former Great Black Swamp

FOCUS AREA



Great Black Swamp

The Great Black Swamp

When Ohio entered statehood in 1803, its northwestern landscape looked considerably different. Settlement and development in this region was severely delayed due to the Great Black Swamp, a wetland ecosystem composed of 60-foot-tall ash, elm, maple and oak forest cover, coastal marshes, poorly-drained soils, pristine spawning areas, lush habitat and an overabundance of flies and mosquitoes.

Dominating nearly 900,000 acres, the Great Black Swamp spanned an area that completely or partially covered 13 Ohio counties—Allen, Defiance, Erie, Hancock, Henry, Sandusky, Seneca, Lucas, Ottawa, Paulding, Putnam, Van Wert and Wood— and Allen County in Indiana. The majority of the swamp's coverage ranged from the Lake Erie and Sandusky Bay shores between the Maumee and Sandusky rivers and extended as far west as Fort Wayne, Indiana. Present-day communities of Bowling Green, Defiance, Fostoria, Fremont, Oak Harbor, Oregon, Paulding, Perrysburg, Port Clinton and Van Wert currently sit within the former Great Black Swamp's expanse.

The Great Black Swamp was formed by glacial processes that molded the land and formed the Great Lakes. Lake Maumee, an ancient ancestral body of water preceding Lake Erie, stood at the foot of a melting glacier 13,700 years

ago. The water of this lake flowed southwesterly toward the Mississippi River. As the glacier's boundary moved farther north, the waters of the newly adapted Lake Whittlesey (successor of Lake Maumee) drained northward into what is now Lake Michigan. By 9,500 years ago, the glaciers had receded far enough north to allow the water to flow northeast to the Atlantic Ocean along its present course via the St. Lawrence River. At this time Lake Erie was beginning to take shape; the water consuming the Maumee River watershed started to drain into the newly forming lake. However, the flat terrain and poor soil permeability prevented the region from completely draining into Lake Erie's Western Basin. It was at this time that the Great Black Swamp became a prevalent feature of the land.

The Swamp provided diverse habitat for countless aquatic and terrestrial species including bald eagle, bear, beaver, bobcat, deer, mink, muskrat, raccoon and skunk. Native Americans rarely visited the swamp except to hunt. During the War of 1812, the U.S. forces navigated the swamp en route to Canada to battle the British. The Great Black Swamp was documented as the most "forsaken, desolate and inhospitable wilderness" in America.

Uninviting insects and undesirable treachery deterred most pioneers from settling in the region in the 1820s;

however, continuing westward meant traversing the Great Black Swamp. In 1825, a primitive "corduroy" planked road linking Fremont and Perrysburg was completed. The Maumee and Western Reserve Road was the first road constructed through the Great Black Swamp. The newly laid 31-mile corridor frequently submerged into the muddy ground. Once dubbed America's worst road, it took weeks to travel and at times challenged travelers with wagon-sized potholes. In 1838, the road was paved with gravel is today's U.S. Highway 20.

In an effort to facilitate agricultural progress and easier transportation, in 1850 the Ohio General Assembly passed the first of many laws authorizing drainage of the Great Black Swamp. As a result, a massive undertaking to dig a complex system of ditches, canals and feeders into Lake Erie tributaries commenced. The logging industry prospered as colossal trees were removed and sold until the Great Black Swamp was drained and the foliage cleared. The exposed land offered farmers tremendously rich, fertile and productive soils — some of Ohio's best.

Only small portions of the Great Black Swamp — approximately 15,000 acres — exist today. An extremely significant amount of plant and animal habitat has been altered and many native species are now extinct or extirpated. Fortunately, several remnant wetlands of the Great Black Swamp are protected by the U.S. Fish & Wildlife Service, the Ohio Department of Natural Resources and private conservation groups. The Lake Erie Western Basin marsh complex, comprised of the Cedar Point and Ottawa National Wildlife reserves, Metzger Marsh and Magee Marsh state wildlife areas and Crane Creek State Park (among other areas), are prime examples of protected lands within the bounds of the former swamp's reach.

Reference:

U.S. Fish & Wildlife Service
www.fws.gov

Toledo Metroparks
www.metroparkstoledo.com

For more information:

Black Swamp Conservancy
P.O. Box 332
Perrysburg, OH 43552
Tel: 419-872-LAND (5263)
Fax: 419-872-8197
E-mail: bse@blackswamp.org
Web: www.blackswamp.org



Magee Marsh State Wildlife Area, Ottawa County



Aerial view of western Lake Erie marsh area

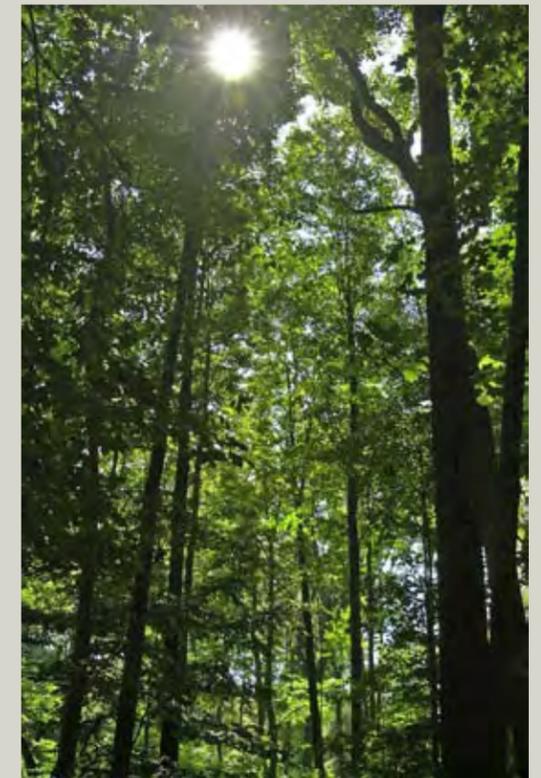
Goll Woods State Nature Preserve

Tucked away in Fulton County near the village of Archbold sits one of northwest Ohio's least disturbed woodland areas, Goll Woods State Nature Preserve. This preserve, although north of the post-glacial lake plain region once dominated by the Great Black Swamp, exemplifies similar forest cover types once found within the treacherous swampland's extents.

Characteristics of the Great Black Swamp at the 321-acre Goll Woods include untouched old-growth forest with 200- to 400-year-old oak trees. This protected natural area features a magnificent collection of bur oak, white oak, chinquapin oak and cottonwood trees. Many of these majestic trees measure four feet in diameter and represent some of Ohio's oldest and largest. The preserve also hosts many native shrubs and wildflowers.

Source:

ODNR Division of Natural Areas and Preserves
www.ohiodnr.com/dnap/location/goll_woods.html



Lush forest cover at Goll Woods State Nature Preserve, Fulton County

Rare Species Concentrations



Lake Erie water snake



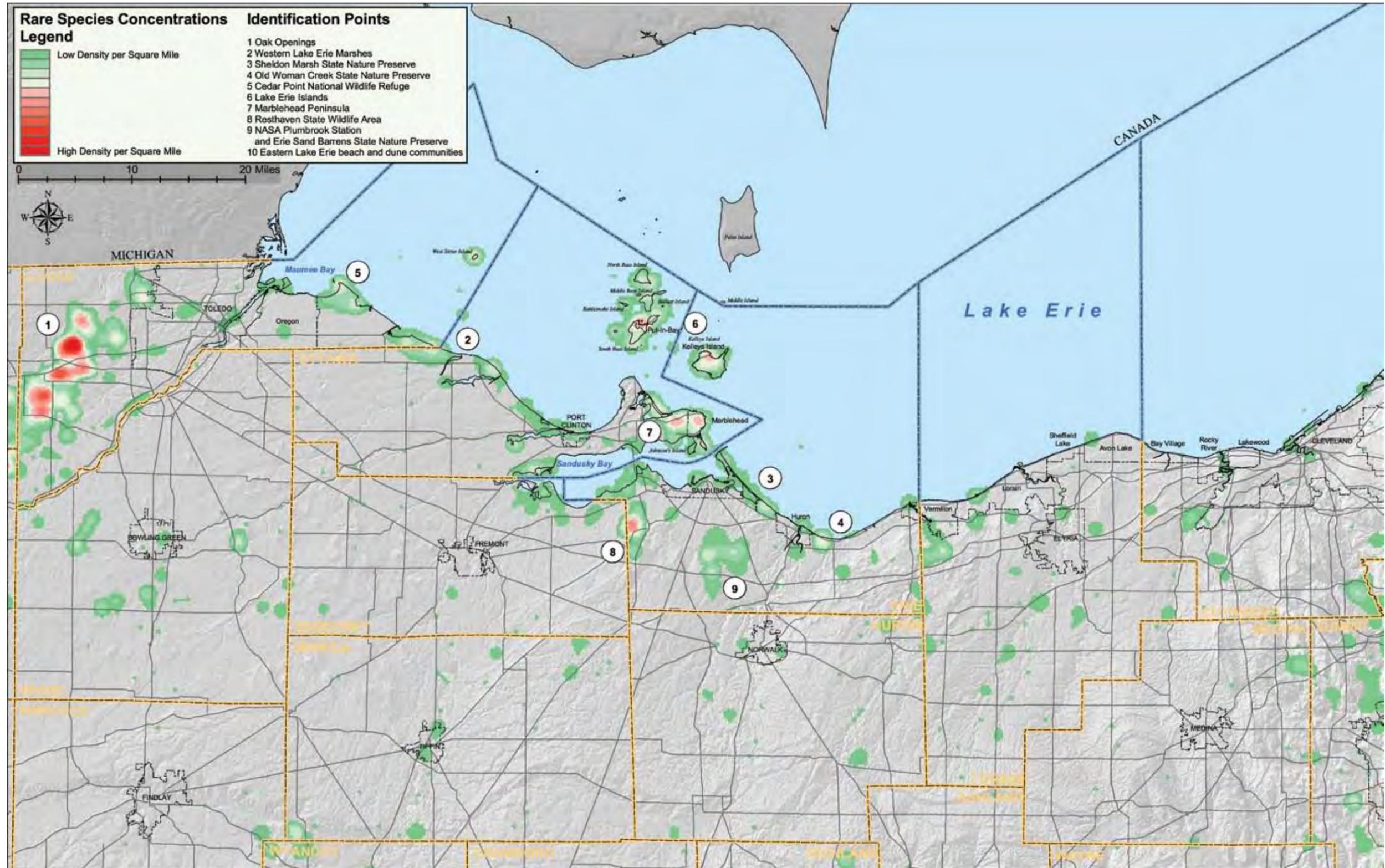
Lakeside Daisy at Lakeside Daisy State Nature Preserve, Marblehead



Resthaven State Wildlife Area, Erie County

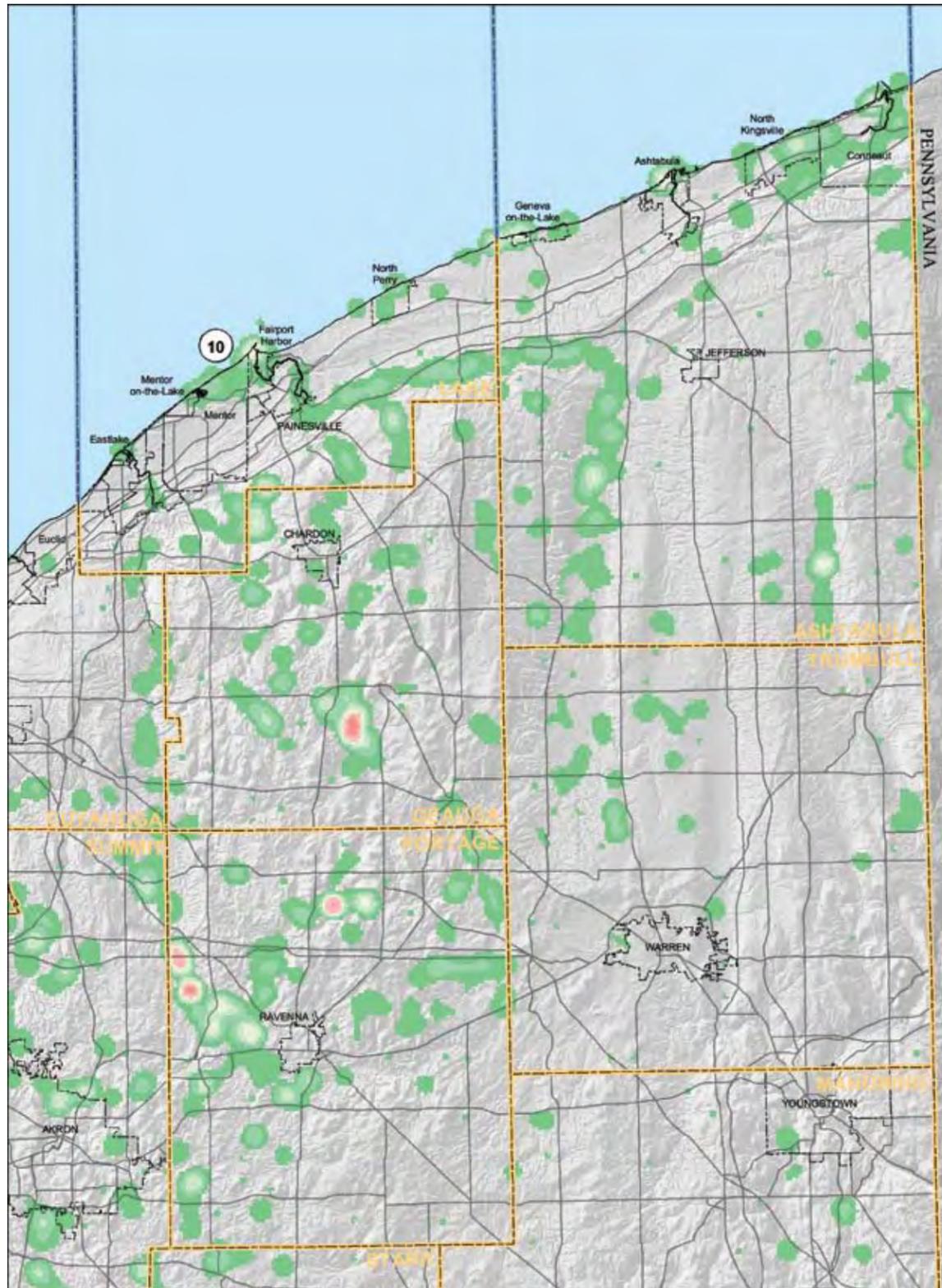


Common tern



Map 24 GIS data citation in Appendices

Rare Species Concentrations



Map 24 GIS data citation in Appendices

This map represents the compilation of thousands of observations of rare species from 1950 to 2004 and provides a general awareness of the known distribution of rare species across Ohio's coastal region. Data used to compile this map are stored within the Ohio Natural Heritage Database, managed by the Natural Heritage Program of the ODNR Division of Natural Areas and Preserves.

The Natural Heritage Program tracks known locations of state listed plant and animal species, rare geologic features, high quality plant communities, and breeding animal concentrations. Many of the rare and endangered species presented here were much more common at the time of European settlement, but have been heavily impacted by non-native invasive species, habitat loss and habitat fragmentation. Rare species are concentrated in the following ecosystems below and numbered on the map.

The Oak Openings region (#1 on map), located southwest of Toledo in Lucas and Fulton counties, contains the highest density and diversity of rare species occurrences found anywhere in the state. This globally rare ecosystem supports species such as the Karner blue butterfly (federally endangered), wild lupine (potentially threatened), spotted turtle (state threatened) and many additional rare species dependent on the sandy uplands and wet prairies of the area.

The coastal marshes of western Lake Erie (#2 on map) support many rare plants and animals including the bald eagle (federally threatened), prairie fringed orchid (federally threatened), and wapato arrowhead (state threatened). Important habitats for rare species include Sheldon Marsh State Nature Preserve (#3 on map), Old Woman Creek State Nature Preserve (#4 on map), and the Cedar Point National Wildlife Refuge (#5 on map).

Ohio's Lake Erie islands region (#6 on map) supports several rare plant and animal

species. North Shore Alvar State Nature Preserve supports a suite of limestone-loving plants including Garber's sedge (state endangered) along the northeast shore of Kelleys Island. The Lake Erie water snake (federally threatened) is also at home in this community and rocky shorelines throughout the islands region. The Lakeside Daisy (federally endangered) grows only in the abandoned quarries of the Marblehead Peninsula (#7 on map) and Kelleys Island.

Located in Erie County, Resthaven Wildlife Area (#8 on map) contains rare species in remnants of Ohio's prairies, while the NASA Plumbrook Station (#9 on map) and Erie Sand Barrens State Nature Preserve (#9 on map) support species dependent on the sandy beach ridges and swales left behind by ancient glacial Lake Warren, such as least St. John's wort (state endangered).

The beach-dune communities of the eastern Ohio lakeshore (#10 on map) support plants that in Ohio are found only on these beaches, including American beach grass and inland beach pea (both state threatened). Slightly inland from the beach dune communities, lying in poorly drained areas of the coastal plain, are remnants of hemlock-hardwood swamps that support the bluebead-lily (state endangered).

For more information:

Ohio Natural Heritage Program
ODNR Division of Natural Areas and Preserves
2045 Morse Road, Building F-1
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Tel: (614) 265-6453
Web: www.ohiodnr.com/dnap

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Lake Erie Water Snake (*Nerodia sipedon insularum*)

The Lake Erie water snake is a non-venomous snake species unique to the Lake Erie Islands region. Its geographic extent includes portions of Ohio's mainland between Catawba and Marblehead, and on the near-shore and offshore islands and waters of the western Lake Erie basin of Ohio and Canada. These snakes are most likely to be seen basking on rocky shores during the summer season.

Adult Lake Erie water snakes are uniform gray, greenish or brownish in color and their undersides are white or pale yellow, occasionally with hints of pink or orange down the center. They lack cross-bands (body markings), or these markings are extremely pale. This fact separates the Lake Erie water snake as a subspecies of the more common northern water snake. Adult Lake Erie water snakes grow to 1 to 3 feet in length. The snakes feed on fish and amphibians and have taken to consuming the invasive round goby.

Human persecution and the loss of the Lake Erie water snake's favored rocky shore habitat led to its listing as a threatened species under the federal Endangered Species Act on August 30, 1999. This listing authorizes protection of the sub-populations found on the western Lake Erie islands and adjacent waters of the United States. Water snakes on the Ohio mainland, Mouse Island and Johnson's Island are not protected. The Province of Ontario, Canada, also protects the Lake Erie water snake as an endangered species based on similar threats.

Since its listing, considerable and successful efforts have been made to increase the populations of the Lake Erie water snake. These efforts include the 2003 development of the Lake Erie Water Snake Recovery Plan by the U.S. Fish and Wildlife Service. The goal of the recovery plan is to ensure multiple viable subpopulations of the Lake Erie water snake on the U.S. islands so the snake can be removed from the Federal list of Endangered and Threatened Wildlife.

For more information/ Sources:

Lake Erie Water Snake Recovery Plan
www.fws.gov/midwest/Endangered/reptiles/lews-fnl-rpla-sm.pdf
"Save Our Snakes," ODNR Division of Wildlife and U.S. Fish & Wildlife Service; Publication 297 (597), 1999. www.ohiodnr.com/wildlife/Resources/reptiles/eriewatersnake.htm

Significant Bird Habitat



Mallards on the Huron River



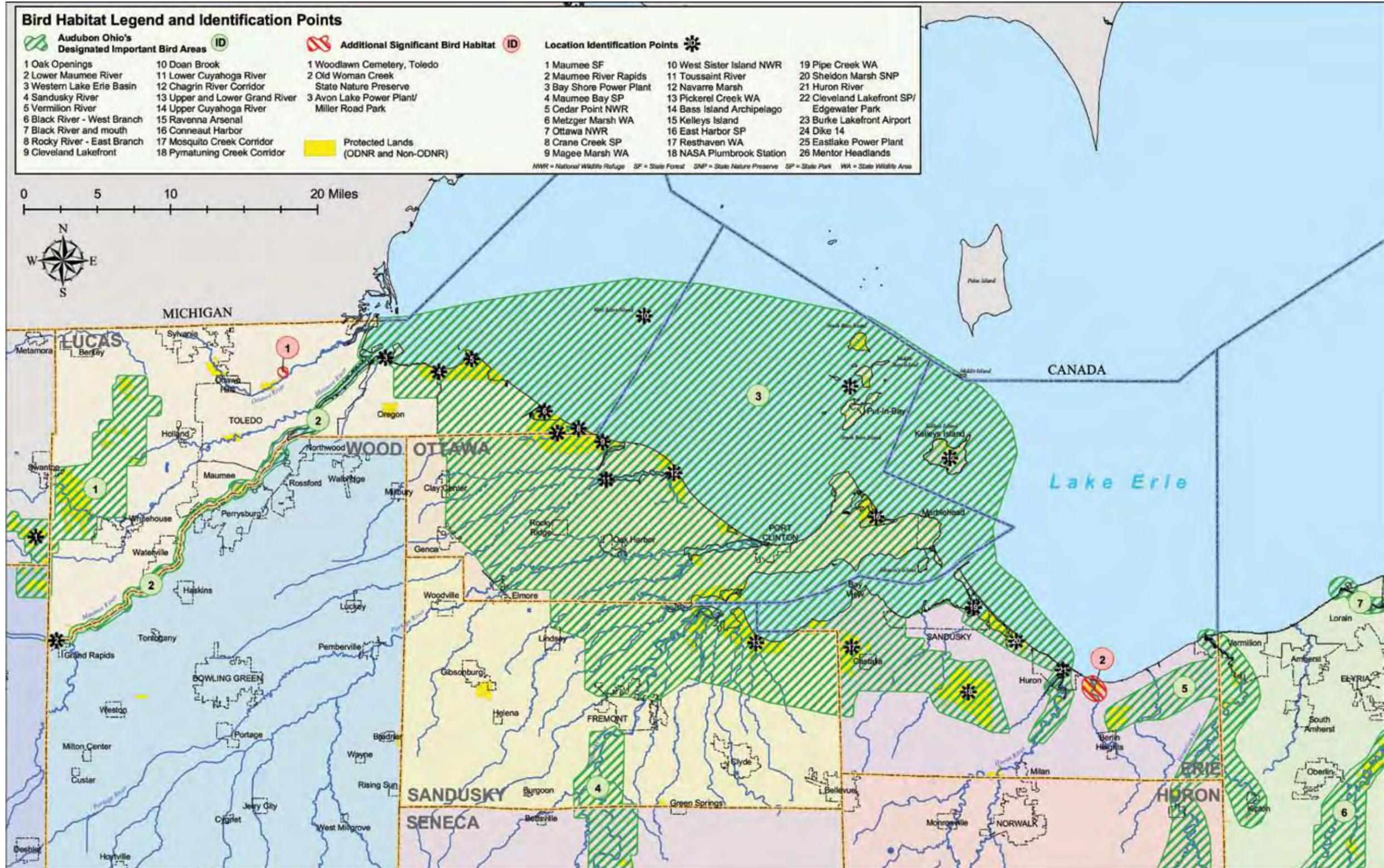
Great Egret preening



Bird watching at Magee Marsh State Wildlife Area, Ottawa County

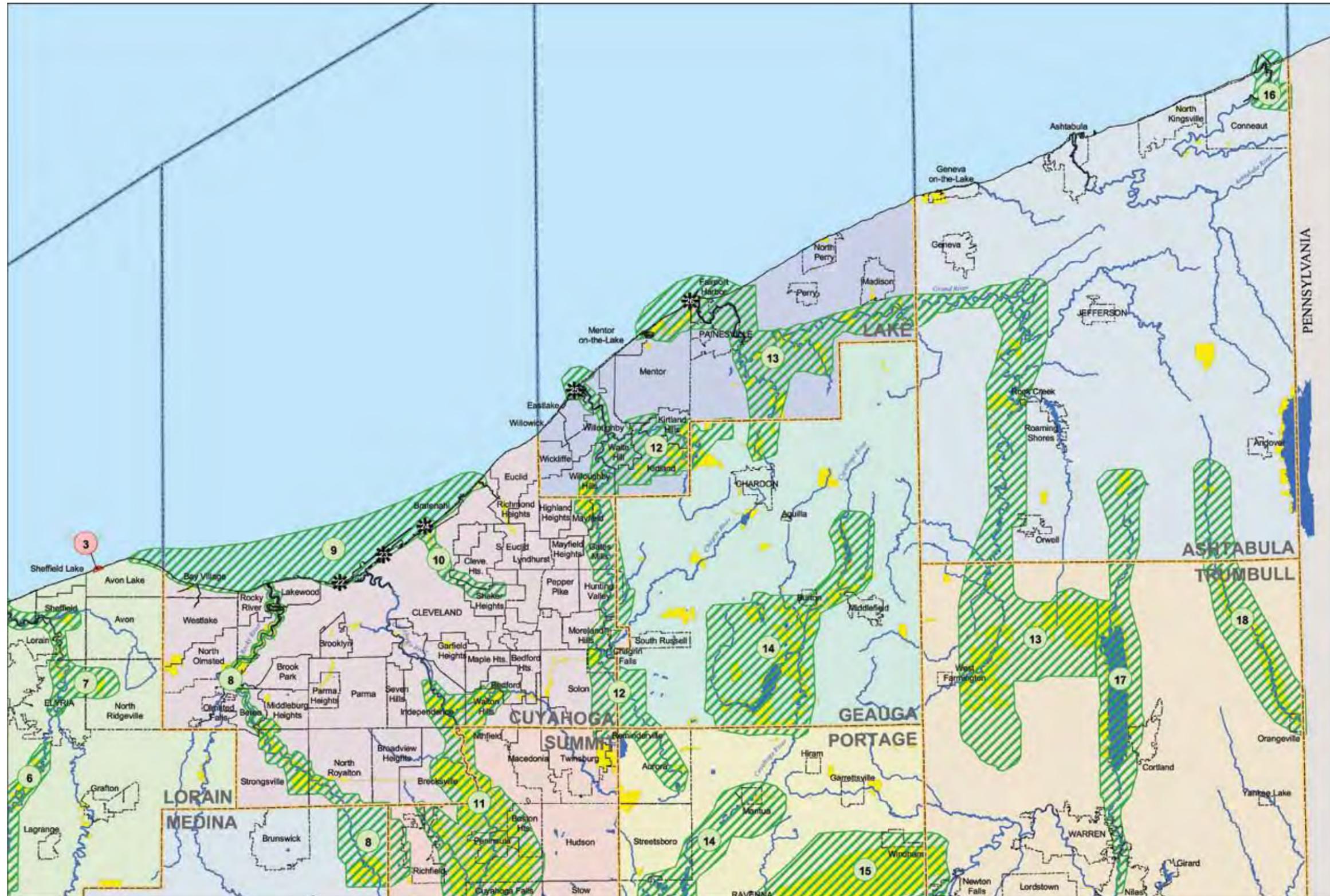


High wire act. Swallows at Pickerel Creek Wildlife Area, Sandusky County



Map 25 GIS data citation in Appendices

Significant Bird Habitat



Map 25 GIS data citation in Appendices

Significant Bird Habitat

Lake Erie and coastal areas of the Great Lakes Region are a vital resource to birds. Wetlands, shoreline areas, marshes, grasslands and forests provide perfect habitat for a variety of species that utilize these areas during the breeding season and migration.

Located at the intersection of the Mississippi and Atlantic flyways, Lake Erie represents one of the most diverse and important flyways in the country. During the spring and fall migrations, birdwatchers from across the country and around the world flock to its shores to observe more than 300 bird species. The wetlands along the Lake Erie shore provide extraordinary habitat for nesting waterfowl and support one of the largest populations of nesting bald eagles found in the Great Lakes region.

Some significant coastal habitat areas are:

- Conneaut Harbor, located in Ashtabula County near the Pennsylvania state line. This site has extensive mudflats that attract more than 33 species of shore birds. Conneaut is generally a migratory stopping location, as most birds continue their travels along the Lake Erie coast. In the winter snowy owls may often be found on breakwaters.
- Fairport Harbor and the neighboring Headlands Dunes State Nature Preserve and State Park together are one of the most productive birding locales with an excess of more than 300 species including king eiders and harlequin ducks.
- Lorain Harbor is host to a variety of waterfowl. Its sheltered harbor has wetland vegetation and scruffy thickets that attract marsh birds and migrant passerines. Passerines are perching birds that comprise nearly 50 percent of the total bird population.
- Sheldon Marsh State Nature Preserve, located east of Sandusky and west of Huron, has diverse habitat that includes a barrier beach, mature woodlands, mudflats and open fields with large marshes. Some species seen here include bald eagles and northern saw-whet

continued on pg 122

Significant Bird Habitat

owls. Sheldon Marsh was designated an Important Bird Area at its 50th anniversary celebration during September 2004.

- Kelleys Island is host to a large spring and fall passerine migration of more than 250 species. This passerine migration includes purple sandpiper, golden eagles and Kirtland's warbler. In November and December, one of the densest concentrations of migrating buffleheads (ducks) along the Great Lakes can be viewed.
- The vast marsh and wetland habitat along the shores of Lake Erie's Western Basin, comprised of Magee Marsh and Metzger Marsh State Wildlife Areas, the Ottawa National

Wildlife Refuge Complex, Crane Creek State Park and the eastern portion of the Toussaint River, encompasses more than 8,000 acres and provides a major feeding, nesting and resting area for migrating birds. These refuges preserve portions of historic Lake Erie marshes and Great Black Swamp habitats. This area is Ohio's top birding destination for many species such as bald eagles, yellow-headed black birds, dunlins, great blue herons, great egrets, green herons, night herons, American coots, herring gulls and pied-billed grebes. During spring and fall migrations, March to May and September to November respectively, raptors and tundra swans also move through these areas.

- The Ottawa National Wildlife Refuge Complex is comprised of three refuges – Cedar Point NWR, Ottawa NWR and West Sister Island NWR. West Sister Island NWR, is Ohio's only wilderness area and is located about 9 miles offshore in Lake Erie. The Bass Islands, Kelleys Island and West Sister Island attract birds because they are good places for passing birds to stop, refuel and rest.
- Power plants tend to attract birds and waterfowl due to the warmth of the water surrounding them. Three significant power plants include the Eastlake and Avon Lake power plants and the Bay Shore Power Plant in Oregon. Burke Lakefront

Airport in downtown Cleveland also provides an unlikely migratory stopping point.

Many other locations throughout Ohio provide excellent opportunities to view birds that rely on Lake Erie's coastal wetlands and marshes for their survival. Locations within the Lake Erie watershed are featured on the Significant Bird Habitat Map.

The Important Bird Areas of Ohio

Sixty-three Important Bird Areas (IBAs) have been identified throughout the Buckeye State by Audubon Ohio.

An Important Bird Area is a site that provides essential habitat to one or more bird species during some portion of the year — breeding season, spring migration, fall migration or winter. An IBA may be on private or public land, may be currently protected or not, and may range in size from a few acres to hundreds of thousands of acres. These sites and ecological complexes total approximately 2.6-million acres, or about 10 percent of Ohio's land and water area.

Important Bird Areas are part of a global network of sites identified by BirdLife International and its partners around the world. Ohio's IBA program, launched in 1999, is part of this global initiative to identify and protect critical, high-priority sites for conservation. Audubon is BirdLife's partner in the United States.

In order to identify IBAs, a statewide IBA Technical Committee of researchers, respected local bird experts, and authorities on bird distribution in Ohio collect science-based bird occurrence thresholds of priority bird species. Solid data is the key to designating an IBA, the collection of which is only possible with the effort of dedicated citizen scien-

tists and professionals working together. Subsequent bird inventories at IBAs provide a scientifically defensible method for prioritizing conservation activities, guiding conservation and land management plans, and allocating limited conservation dollars to ensure the maximum benefit.

Of Ohio's IBAs, many are intimately associated with the water resources within Ohio's Lake Erie watershed. For example, Audubon Ohio has identified numerous riparian corridors representing hundreds of miles of rivers that function as migratory stopover habitat as well as breeding corridors for priority bird species. These Important Bird Areas in the Lake Erie Watershed and along the coast are identified on the Significant Bird Habitat map.

As quality bird habitat decreases, it is increasingly important to recognize the conservation values of real places on the landscape. IBAs make otherwise abstract issues concrete and compelling, thereby catalyzing efforts to protect or restore the sites that contain the most significant bird habitats. Bird habitats require human advocates — a well-informed and passionate constituency must be built around each IBA in order to establish and maintain healthy populations of birds in Ohio.

For more information:

Audubon Ohio
www.audubon.org/chapter/oh/oh/
 BirdLife International
www.birdlife.org/

Yellow-Rumped Warbler



The yellow-rumped warbler is Ohio's most common migrant warbler; thousands are likely to be seen during spring and autumn migrations throughout the Lake Erie watershed. This warbler is quite hardy and is one of the only warblers to regularly over-winter in Ohio. During winter months they switch from eating insects to a diet largely comprised of berries. These conspicuously marked birds are likely to be seen across the Lake Erie area and throughout the state, especially in migration.

Great Egret



Great egrets were nearly exterminated by hunting due to plume demand in the early 1900s. But today, largely due to the efforts by the National Audubon Society, protection of these birds has resulted in their steadily increasing numbers. In Ohio, they reach peak abundance in the marshes of western Lake Erie in late summer as they disperse following the nesting season. These birds are not nearly as hardy as great blue herons, so are rarely sighted in winter.

Belted Kingfisher



The belted kingfisher makes shallow dives for small fish from a favored perch over the water. Unusual for the bird world, female kingfishers are more colorful than males. Good places to observe the birds are along the fringes of marshes or small stream habitats. They may be found anywhere in the Lake Erie watershed with suitable hunting waters and will regularly over-winter if open water is available. The nesting pairs dig earth burrows up to six feet long in which to lay their eggs.

Double-Crested Cormorant



No other Ohio water bird has undergone the tremendous population explosion of the double-crested cormorant. Since recovering from unregulated use of pesticides such as DDT, which decimated its numbers from the 1950s to the 1970s, the cormorant's comeback is amazing—and now in some cases a problem.

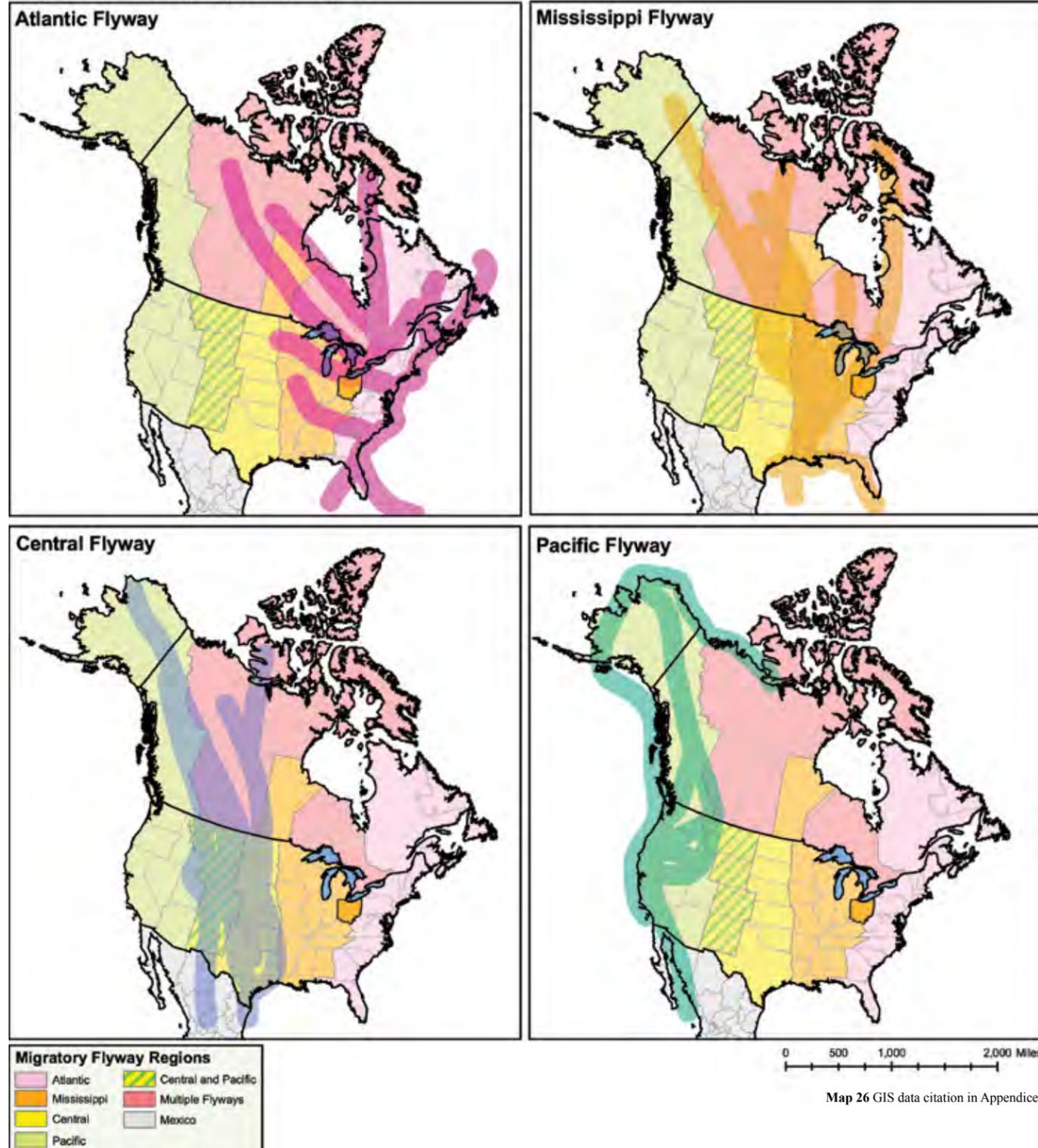
Today thousands of these birds gather in western Lake Erie in such concentrations that their breeding colonies are having harmful effects on other bird species, particularly great egrets and black-crowned night herons.

The double-crested cormorant has a wide range—breeding from the coast of Alaska and Nova Scotia south to Mexico and the Bahamas and living in brackish and freshwater habitats on lakes, rivers, swamps, bays and coasts.

Cormorants feed by diving to depths of 30 feet or more to capture small fish. They bring their prey to the surface to swallow.

Significant Bird Habitat

Migratory Bird Flyways and Regions



The Mystery of Migration

Migrating birds traverse almost every part of North America. However, the flow (particularly of waterfowl) is heaviest along four main corridors: the Atlantic, Mississippi, Central and Pacific Flyways. At their northern end, these flyways overlap considerably.

Navigation

Migratory birds have natural navigation skills, some of which are still not well understood. Most birds probably navigate by sight, using the sun to guide them during the day and the stars to lead them at night. Birds also seem to have innate time sense that tells them when it is time to depart. Migrants learn from experience, becoming familiar with territories and flyways. They also learn to follow certain air and sea currents, to use changes in temperature as guides, and to watch the passage flights of other birds.

Strategies

Most songbirds break their journey into short hops of a few hundred miles or so and they may delay their journey in the event of severe or overcast weather. Consequently, songbirds often migrate in a swarming wave, and the arrival of such a wave is an incredible sight.

Other birds, like some of the warblers, swallows or shore birds, undertake epic nonstop journeys of thousands of miles from North America to Central or South America.

Irruptions

Not all movements of birds involve migration. Non-seasonal movements, mainly brought about by changes in food supplies, can result in a species appearing in areas well outside its normal range. Such movements are known as irruptions; as sometimes observed when the Snowy Owl visits Ohio's Lake Erie shores from the American Arctic, following a drastic decline in its prey species.

References:

Birding/Joseph Forshaw, [et al]: consultant editor, Terrance Lindsey- A Nature Company Guide. pp.42-43.
 Birds of Ohio, McCormac, J.S. and Kennedy, G., Long Pine Publishing, Auburn, WA, 2004.

Baltimore Oriole



The Baltimore oriole is found throughout the Lake Erie region in woodlands, parks, nature preserves and suburbs. Oriole nests, which dangle from the outer twigs of large shade trees (often cottonwoods, sycamores and elms), are exquisitely woven pouches of plant fibers and animal hair. Male orioles have a black head, back, wings, and tail and an orange breast, rump and shoulder patch. Female orioles are olive-brown, with dull yellow-orange underparts and two dull white wing bars. Adults feed on insects, fruit and flowers. Their song is a series of sweet, whistled notes which some describe as clear and flute-like whistled in single or double notes in short, distinct phrases with much individual variation. (Golden Field Guide to Eastern Birds).

Eastern Screech-owl



Eastern screech owls are probably the most numerous owls in Ohio. The small, nocturnal, 8-inch tall predatory bird with a 22-inch wingspan occurs almost everywhere in the state – even in very urban areas. There are two distinct color morphs – red and gray. This diminutive bird will utilize almost any natural cavity for nesting, even wood duck boxes. Screech owls have a varied diet, capturing a broad array of small animals, insects and small fish. They are likely to be heard or seen anywhere in the Lake Erie watershed, especially where small wood lots adjoin small streams or neighborhoods.

Significant Bird Habitat – Bald Eagle



The Bald Eagle (*Haliaeetus leucocephalus*)

The Bald Eagle, our nation's symbol, was once an endangered species, but its population is now soaring. In 1979, only four nesting bald eagle pairs lived in Ohio. In 2005 there were 125 nests in the Buckeye State – 52 of which were in freshwater coastal wetlands along Lake Erie.

At the turn of the century, eagles thrived in Ohio. By 1979, only four nesting pairs remained. The cause for the bird's decline included loss of habitat, but was primarily caused by the increased use of agricultural pesticides such as DDT. Harmful chemicals contained within the pesticides were

released and carried into streams, rivers, estuaries and lakes during periods of rainfall. These chemicals were then transmitted into the fish and subsequently ingested by bald eagles who favor a fish diet. Once ingested, the chemicals disrupted the eagle's reproduction cycle. As a result, the bald eagle population crashed in the 1950s and 1960s.

DDT and other harmful pesticides were made illegal in the early 1970s. Since then the bald eagle population has gradually increased. In Ohio, the ODNR Division of Wildlife has a significant role in assisting in recovery. Several years ago, biologists took young eaglets from various Ohio zoos and placed them in wild eagle nests to be adopted by wild foster parents. This program

was extremely successful and during the 2006 mid-winter survey of bald eagles across the state, more than 500 adult or immature bald eagles were observed in Ohio.

Bald eagles are not really bald. They have white head feathers that make them look bald at times. Adult bald eagles also have white tail feathers. The rest of their body is dark brown. Males and females look alike, but the female is slightly larger. Eagles' wingspan is six to seven-and-a-half feet wide. Bald eagle nests are stunningly huge—usually three-to-five feet across and three-to-six feet deep. The largest eagle nest ever recorded was located near Vermilion. Dubbed the "Great Nest," it measured eight-and-a-half feet across and 12-feet deep. Different



pairs of eagles used the nest for more than 35 years. In 1925, the Great Nest toppled to the ground in a wind storm. It weighed approximately 2,000 pounds.

The best place to see a bald eagle in the wild in Ohio is along the western Lake Erie shore and/or marshes near the lake. They nest in the highest reaches of tall trees. The

likelihood of sighting eagles along the coast or soaring overhead is very good at these locations: Magee Marsh State Wildlife Area, Ottawa National Wildlife Refuge, Sheldon Marsh State Nature Preserve and Old Woman Creek National Estuarine Research Reserve and State Nature Preserve.

For more information/ Sources:
Birds of Ohio, McCormac, J.S. and Kennedy, G., Lone Pine Publishing, Auburn WA, 2004

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Columbus, OH 43229-6693
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www.ohiodnr.com/wildlife

Northern Cardinal



Of the more than 400 species of birds recorded in Ohio, the northern cardinal may be the best known. The male's showy red plumage is instantly recognized; the female's more subdued overall coloration and red beak are also very distinctive. The range of Ohio's state bird extends over most of the eastern United States,

parts of extreme southeastern Canada, and south through Mexico to Belize. It has also been introduced to Hawaii. Suitable habitat ranges from shrubby tangles and woodland edges to backyards and urban parks. The "redbirds" variable call, a loud "cheer cheer cheer" or "purty purty purty," is sung by both sexes and can be heard year round. Cardinals are nonmigratory, but some movement occurs in the later summer and fall.

American Black Duck



The American black duck is a duck in which both sexes have almost identical plumage: sooty brown on the body and crown and a lighter brown on the neck and rest of the head, with a dark stripe through the eye. In flight, the flashing white wing linings contrast sharply with the rest of its dark wings and body. The

speculum (wing patch) is an iridescent purplish-blue. During the breeding season, the adult male has a yellow bill and often bright red feet, while the adult female has an olive green bill and olive-colored feet. The American black duck frequents a variety of wetland habitats, including small lakes, ponds, peatlands, swamps, rivers and streams; however it is restricted to eastern North America. In summer, it is found primarily in eastern Canada and the Great Lakes. In winter, this species migrates as far south as the east-central United States. Many year-round populations exist, primarily throughout the southern Great Lakes region.

Snowy Owl



Most owls are nocturnal and rely on cryptic plumage to avoid detection, blending with its habitat – but not the snowy owl. This daytime hunter is bold, conspicuous and fearless, and likely to be found perching on posts or other obvious places. A small number of these unusual arctic visitors are seen each winter along Lake

Erie. Cyclical irruptions every 4 to 6 years, associated with the periodic decline of the bird's major food source, the northern lemming, brings larger numbers of these owls to Ohio. This large, white owl has a rounded head and yellow eyes. Both sexes have dark bars and spots although they are heavier on the larger female; old males may be pure white. This usually silent bird will sometimes utter a shrill whistle and hoarse croak on breeding grounds. The most likely places to view the snowy owl are along Lake Erie beach areas, near airports and at Mentor Headlands State Park and Headlands Dunes Nature Preserve near Painesville.

Piping Plover



Photo by U.S. Fish and Wildlife Service

Piping plovers formerly occupied beaches on all of the Great Lakes. Their numbers have now been greatly reduced in this region. Today these birds are rare migrants, averaging only a few sightings each year, with most records from sandy beaches along Lake Erie or inland lakes. Although unlikely, the best possibility for viewing this species

is Sheldon Marsh State Nature Preserve in Huron and the few other remaining natural beaches in the western basin of Lake Erie.

Sheldon Marsh was designated as critical habitat for the piping plover, a federally listed endangered species, in 2001. This site supports the primary elements of piping plover breeding habitat, which include: open sparsely vegetated sandy habitats that are associated with wide, unforested dunes and inter-dune wetlands, low levels of human disturbances, and dynamic ecological beach processes.

Significant Bird Habitat – Peregrine Falcon

Peregrine Falcon

Falco peregrinus

Peregrines are called the world’s swiftest birds. Slim, with a small head and long, thin, pointed wings, the falcons are similar in size to crows with adults measuring approximately 18 to 20 inches long with a wingspan up to 40 inches and weighing 1.6 to 2.4 pounds, the females are larger than the males. Although rare, these birds can live up to 12 to 18 years in the wild.

Adults have a short, dark, hooked beak, black cap and moustache, pale throat and breast, barred belly and gray upperparts. The bird’s underwings are barred black and white and the tail is gray with white bands. Peregrines are monogamous, mating in pairs for life. Their peak breeding season is late March through May, after which their average clutch of four eggs will be incubated for 32 to 34 days from April through early June. Young peregrines are helpless and dependent on the parents until they fledge 35 to 42 days after hatching. Peregrines have only one brood per year; however, if a nest is destroyed early in incubation, the female may re-nest.

Peregrines may be best known for their amazing flight speeds when pursuing prey. The falcon attacks by swooping—the wings folded nearly parallel and the bird diving headfirst toward its prey at speeds exceeding 200 miles per hour. The falcon strikes the prey with its talons, usually killing it upon impact. The prey may be caught in midair or on the ground. Pigeons, doves, shorebirds and waterfowl are typical food species.

Peregrine falcons are found on all continents of the world, with the exception of Antarctica; however they have always been somewhat rare in North America. It is believed that in the 1940s there were approximately 5,000 peregrines on the North American continent and of those only 350 breeding pairs in the eastern United States. The decline in peregrine numbers began in the 1950s, and continued through the 1960s into the early 1970s. The species was essentially exterminated by the 1960s in the eastern United States and only a third of the nests in the Rocky Mountains were still occupied.

Research showed that DDE, a by-product of DDT, accumulated in the fatty tissue of female

peregrines and disrupted their production of normal calcium layers in egg shell formation. DDT was the first of the modern insecticides developed in World War II and was a once-popular chemical used to control insect pests on crop and forest lands, around homes and gardens, and for industrial and commercial purposes.

Military and civilian populations, DDT was banned in the United States in the early 1970s. But for decades, peregrines’ abnormally thin-shelled eggs were broken in the nest during incubation and other eggs failed to hatch. Still there today, peregrine falcons were placed on the endangered species list in 1970. Regional teams prepared recovery plans to assist government agencies in the protection and recovery of the species with Ohio included in the Eastern Recovery Plan. A captive breeding program began in 1974 to introduce the peregrine falcon back into its previous breeding range. Since then, more than 600 young have been released in the Midwest and Eastern United States.

Respect for the peregrine falcon has grown as the bird makes headlines through its rather unusual course of population recovery – nesting and breeding on the sides of skyscrapers and office towers in major Midwestern and Eastern cities, making the artificial cliffs of tall downtown buildings home since 1988. The first such nest recorded in the state occurred in Toledo, followed by nests in Cleveland, Cincinnati, Columbus and Dayton. Peregrines have also been sighted along western Lake Erie during the spring migration season and from late September to late October, along Lake Erie from the Central Basin to the west. However, populations of peregrin falcons in Ohio are not readily classified as migratory or non-migratory because movement patterns are as yet unknown

Sources:

ODNR Division of Wildlife 2003, 2004, 2005
ohiodnr.com/wildlife/Resources/wildnotes/pub080.htm

U.S. EPA
www.epa.gov/history/topics/ddt/01.htm

USGS
www.mbr-pwrc.usgs.gov/id/framlst/i3560id.html



Peregrine Falcon in Ohio

Year	Nest Sites	Nesting Pairs	Eggs Statewide	Chicks Statewide
2005	22	19	74	59
2004	15	16	60	54
2003	20	16	46	31

Peregrine Falcon

Coastal Nest Sites - 2005

Site	City	Nest location	Eggs	Young
1	Cleveland	Bohn Building	3	3
2	Cleveland	Cleveland Clinic	4	2
3	Cleveland	Interstate 90 Bridge	5	4
4	Cleveland	LTV Steel	5 (-4)	1 (+2*)
5	Cleveland	Terminal Tower	4	4
6	Eastlake	Eastlake Power Plant	4	4
7	Huron	Peavey Grain	?	?
8	Lakewood	Hilliard Road Bridge	4	3
9	Lorain	Edgewater Power Plant	?	?
10	Oregon	BP Refinery	3 (-3)	0
11	Toledo	Commodore Perry	4	4

Coastal Nest Sites - 2004

Site	City	Nest Location	Eggs	Young
1	Cleveland	Bohn Building	3	3
2	Cleveland	Cleveland Clinic	4	4
3	Cleveland	Interstate 90 Bridge	5	2
4	Cleveland	LTV Steel	4	4
5	Cleveland	Terminal Tower	4	3
6	Lakewood	Hilliard Road Bridge	4	4
7	Toledo	Commodore Perry	4	4

Coastal Nest Sites - 2003

Site	City	Nest Location	Eggs	Young
1	Cleveland	Bohn Building	3	2
2	Cleveland	Cleveland Clinic	4	3
3	Cleveland	Interstate 90 Bridge	3	3
4	Cleveland	LTV Steel	3	3
5	Cleveland	Terminal Tower	4	3
6	Lakewood	Hilliard Road Bridge	3	2
7	Toledo	Commodore Perry	4	3

* Two young fostered at this nest location

Source: ODNR Division of Wildlife 2003, 2004, 2005

www.ohiodnr.com/wildlife/Resources/wildnotes/pub080.htm

Dike 14

FOCUS AREA



Watching for wildlife at Dike 14, Cuyahoga County Photo by Dave Brown



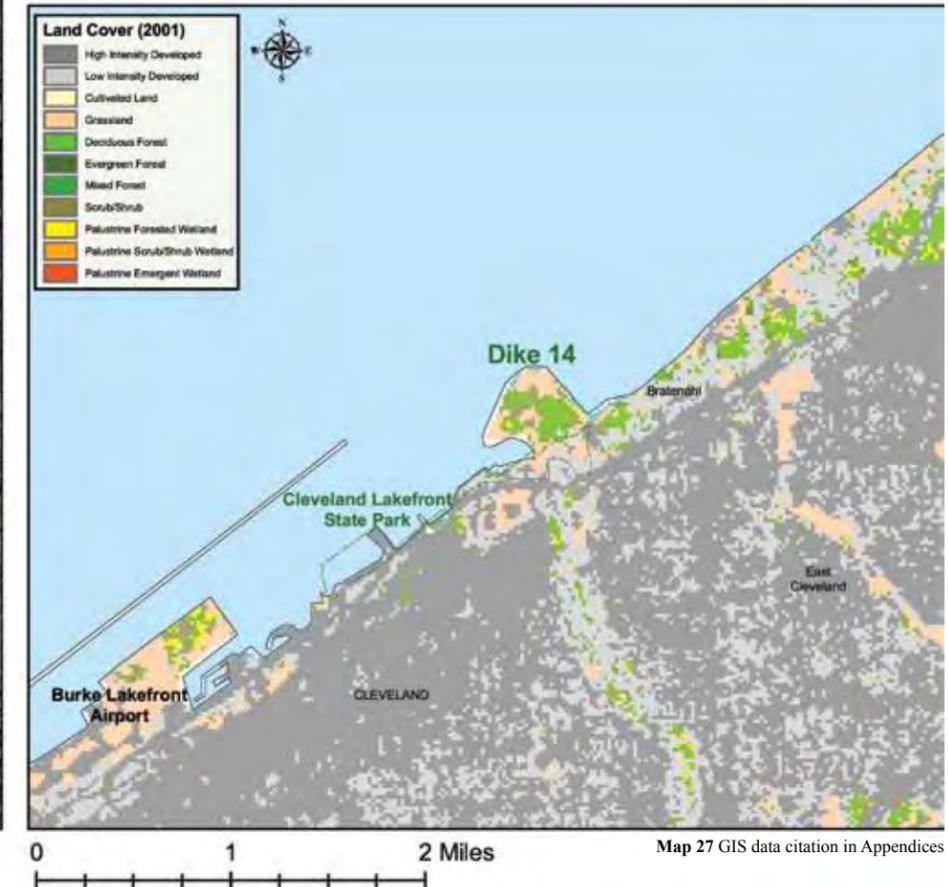
Bird watching on Dike 14 Photo by Earth Day Coalition



Dike 14 Photo by Earth Day Coalition



Dike 14 Photo by Earth Day Coalition



Map 27 GIS data citation in Appendices

Dike 14

Dike 14

Dike 14 is one of Cleveland's hidden treasures, a wild place on the shore of Lake Erie, just a few miles east of the heart of downtown. The 88-acre site is located just north of I-90 off Dr. Martin Luther King, Jr. Boulevard and North Marginal Road next to Gordon State Park in the Cleveland Lakefront State Park system. In 2005, the dike, accessible from the Gordon Park boat-launching area, is controlled by the Cleveland-Cuyahoga County Port Authority, which is turning it over to the city.

While Dike 14 may appear to be a natural peninsula jutting into Lake Erie, it is actually a man-made structure comprised of steel and stone. This near shore, in-water facility was a former confined disposal facility, where excess sediments dredged from the bottom of the Cuyahoga River and Cleveland's Harbor were deposited from 1979 through 1999.

Prior to 1960, the common practice was to dump dredged material in open water or use the material as artificial fill or beach sand. Because dredged materials often contained contaminants that affected the biological, chemical and physical health of Lake Erie, rising concern resulted in a shift of policy for dredged material disposal. With the passage of the River and Harbor Act of 1970, engineered structures called confined disposal facilities or CDFs were constructed in the Great Lakes by the U.S. Army Corps of Engineers. The CDFs are filled with dredged materials unsuitable for open water disposal because of possible contamination. Dike 14 is one of 45 CDF sites around the Great Lakes.

Dike 14's walls were constructed in layers; outside walls utilize heavy stones and steel sheets while the inside wall

is layered with smaller stones. At the bottom of the CDF are two sunken ore carriers that act as bedrock. As dredged sediments were piped into the facility, the sediments settled to the bottom and the associated water either evaporated or flowed out of the dike through a series of weirs. As the land mass in the dike accumulated, it became vegetated with trees, shrubs and plants, thus attracting diverse species of migratory birds and other wildlife. In 1999, the Army Corps of Engineers closed Dike 14 to dredge disposal and the future of the 88-acre landmass was uncertain.

Public planning meetings to discuss the future of the site were held by the state of Ohio and the city of Cleveland. Overwhelmingly, the public favored protection of the dike and public access to the open space. In 2004, the city of Cleveland included Dike 14 in the official Cleveland Lakefront Plan. Recently, Cleveland took that planning to the next level by completing a Feasibility Study for Public Access, funded by the ODNR Office of Coastal Management. This culminated in a Master Plan with a cost estimate of \$6.4 million. The proposal includes a woodland to shore restoration, wetland restoration, a central gathering area with a custom designed raptor ramp/tower, overlook mound, adaptive reuse of the dredging pier, and a hierarchy of trails. The City will now seek funding to conduct soil sampling and a risk assessment to determine the environmental risks and what will be required to proceed with the Master Plan.

Still, over the years, Dike 14 has become a significant wildlife attraction and has been identified as a "high performance" migratory site due to the number and diversity of bird species that use the dike due to its size, strategic coastal location and diverse habitats including

grasslands, forest land, meadows, shrub land, mudflats and wetlands. These habitats provide shelter, space, food and water for more than 200 species of birds, 29 species of butterflies, 26 native plant species, 16 mammal species, nine native tree and shrub species and two reptile species. In October 2004, Audubon Ohio dedicated the Dike 14-Doan Brook area as an Important Birding Area.

Dike 14 Environmental Education Collaborative

Local environmental education organizations in the Cleveland area recognized the unique opportunity for a Dike 14-centered educational resource for children, families and schools because no other urban area is available that provides lakefront access and comparable wildlife diversity. Seeing this opportunity, numerous organizations joined to form the Dike 14 Environmental Education Collaborative. The Collaborative's goal is to provide exemplary multi-interdisciplinary environmental education and to promote environmental stewardship of Dike 14.

Education Opportunities

Dike 14-centered environmental education resources can focus on watersheds, water quality, land use, dike development, native and invasive species, insects, birds and animals, and can emphasize how these and other resources can enhance the academic content standards for school children. The Dike 14 Environmental Education Collaborative has also produced an easy to use "field guide" that features historical background and highlights the area's habitat and natural history. The field guide and more information about Dike 14 and educational opportuni-

ties can be obtained by contacting any member of the Dike 14 Environmental Education Collaborative. Information on the Master Plan and next steps toward implementation can be found on the city of Cleveland's website at <http://planning.city.cleveland.land.oh.us/lakefront>

Dike 14 Environmental Education Collaborative members:

Audubon Ohio

www.audubon.org/chapter/oh/oh

Cleveland Metroparks, Outdoor Education, www.clemetparks.com

Cleveland Museum of Natural History www.cmnh.org

Cuyahoga Soil and Water Conservation District www.cuyahogawcd.org

Cuyahoga Valley National Park Association www.cveec.org

Earth Day Coalition www.earthdaycoalition.org

Lake Erie Nature and Science Center www.lensc.org

The Nature Center at Shaker Lakes www.shakerlakes.com

Sources:

Earth Day Coalition, Dike 14 Field Guide "in press".



Birdwatcher
Photo by Earth Day Coalition



Artificial shoreline of Dike 14 – Photo by Dave Brown

Oak Openings



Kitty Todd Nature Preserve, Lucas County



Maumee State Forest, Fulton, Henry and Lucas counties

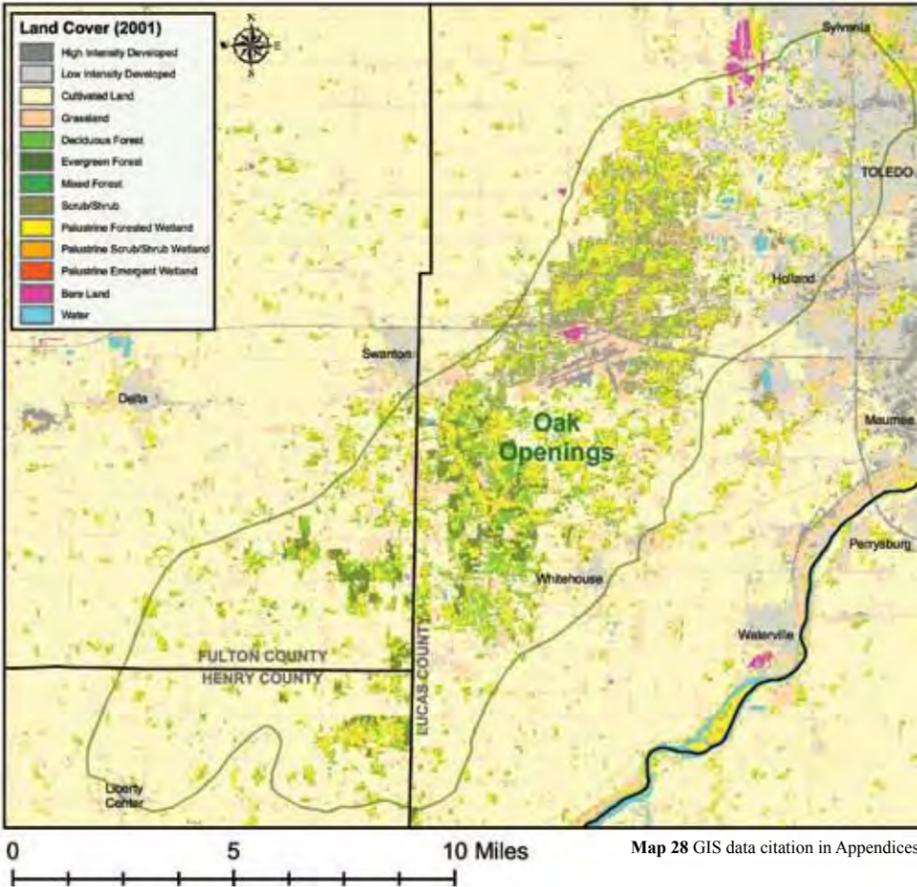
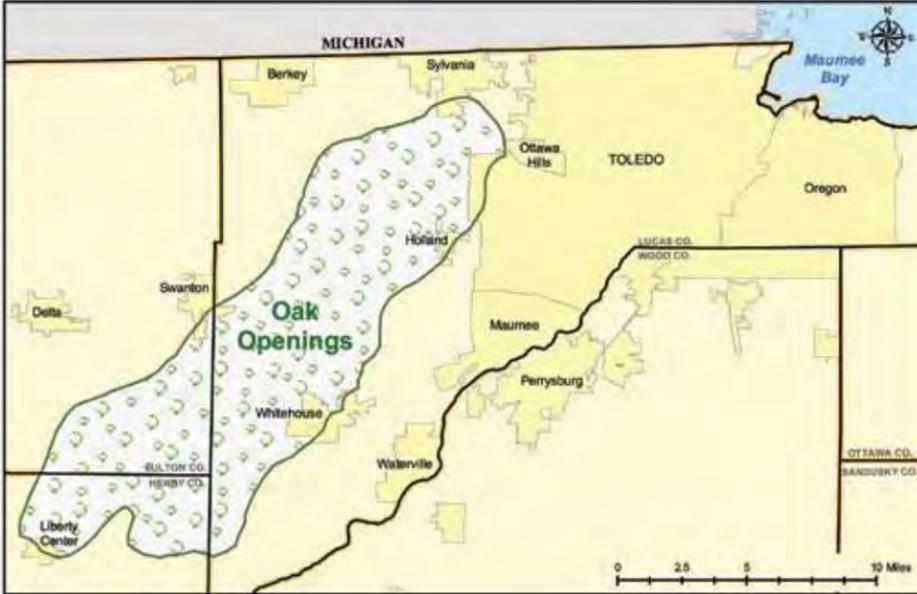
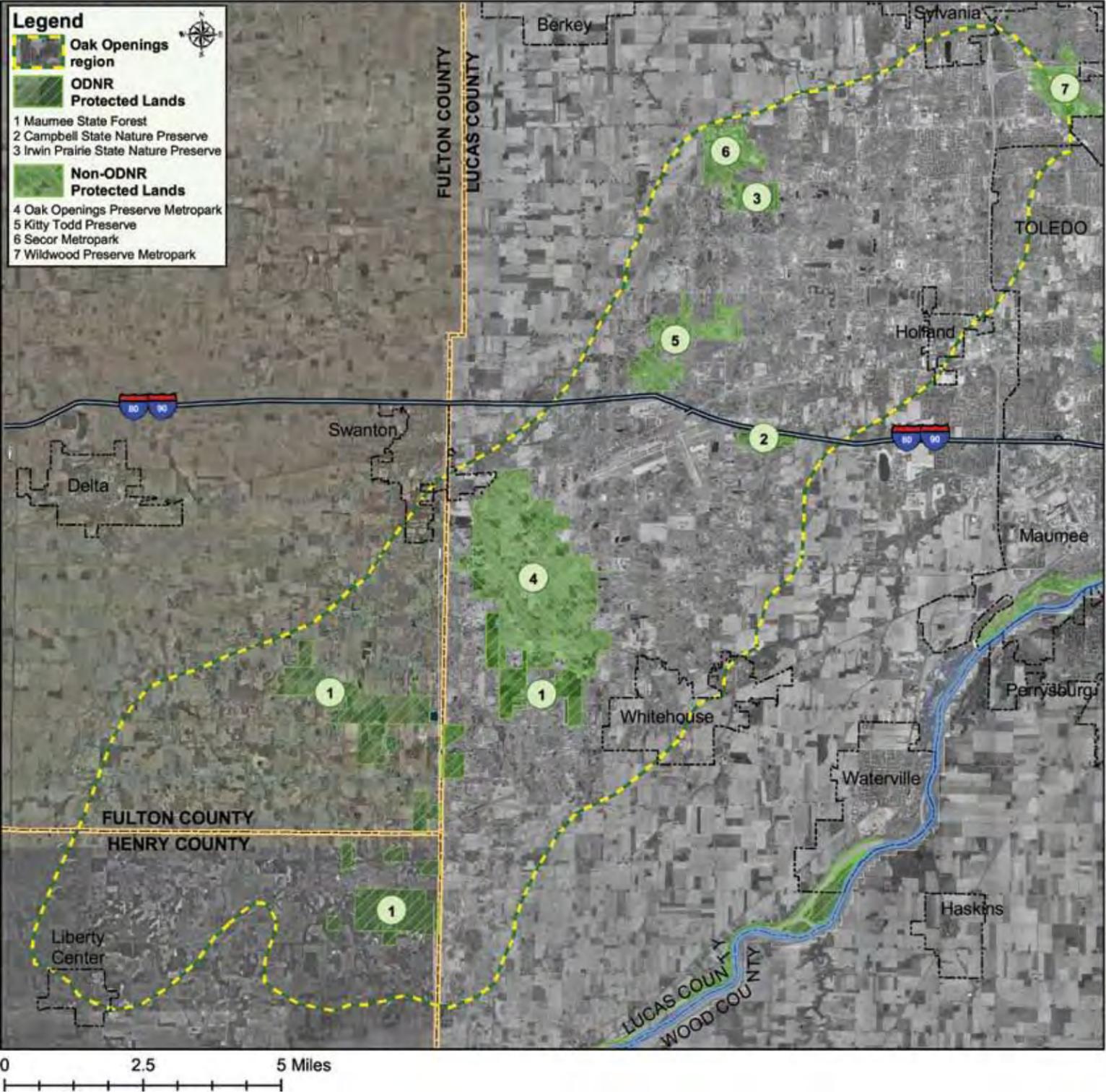


Irwin Prairie State Nature Preserve, Lucas County



Kitty Todd Nature Preserve

FOCUS AREA



Map 28 GIS data citation in Appendices

Oak Openings

The Oak Openings region is an ancient beach ridge where the western prairie meets the eastern forest. Prickly-pear cactus, wild lupine and sand cherry bloom atop dry, hot sand dunes just yards away from orchids growing in low, wet swales. At least 180 rare plant and animal species' survival depends upon the region's unique combination of wet and dry, sand and clay, forest and prairie. The region is also a critical breeding ground and migration stopover for many kinds of birds, meaning it impacts animal populations far beyond our immediate area.

The 130-square-mile Oak Openings Region is located west of the Maumee River, in parts of Lucas, Henry and Fulton counties. The region is 23 times the size of the well known Oak Openings Preserve Metropark and encompasses residential, commercial, agricultural and undeveloped areas – both protected and unprotected. This globally distinct ecosystem was designated in December 1999 by The Nature Conservancy, a renowned conservation organization, as “One of the 200 Last Great Places on Earth.”

The region sustains a mosaic of black oak savanna, oak woodland and wet prairie communities that persist on a series of post glacial beach ridges and swales. This area has long been recognized by naturalists as one of Ohio's preeminent natural regions because of its rich diversity of vegetation. The region harbors more rare species than any other of a similar size in the state and sustains two globally rare communities, oak savanna and wet prairie. However, this habitat is disappearing at an alarming rate as natural areas within the region are destroyed by urban sprawl.

History of the Oak Openings Region

Historically the Oak Openings Region may have covered more than 300 square miles, extending as far as neighboring Wood County and Monroe and Wayne counties in Michigan. Although remnants of habitat still exist in these outlying areas, conservationists focus primarily on the “Moseley” region. This is a portion of the original area identified by Edwin L. Moseley in his 1928 publication, “Flora of the Oak Openings.” At that time, and today, this area represented the best preserved remnant of Oak Openings habitat in northwest Ohio and southeast Michigan.

Prior to European settlement, the Oak Openings was a pocket of prairie and oak savanna surrounded by the forests of the Great Black Swamp. Early settlers, many of whom had just traveled through the dense forests of this swamp, called the area “Oak Openings” for its most obvious characteristics. Black and white oaks were the dominant trees and the landscape was very open and free of underbrush. Naturalist Lou Campbell describes what many settlers must have seen: “A short distance to the west (of Toledo) were hills of sand upon which only oak trees grew, and so sparse were the trees (that) a wagon could be driven in any direction through the patches of forest without the need of hewing a path.”

The Oak Openings is entirely confined to the physiographic region known as the lakeplain, a generally flat plain formed under the influence of post glacial lakes. The region is part of a sand belt that extends for approximately 120 miles from northeast of Napoleon, Ohio to west of Detroit, Michigan. The sand was deposited as a series of beach ridges formed by post glacial Lakes Warren I,

II and III (see Chapter 10: Geology).

These ridges, 50 feet deep in some areas, were deposited over a surface of clay-rich glacial till. In the swales, or depressions between the beach ridges, the sand is thinnest and the till is close to the surface. The rapid permeability and instability of the sandy soils discouraged the development of natural surface drainage. This combined with the impermeability of the underlying glacial till maintained a high water table throughout the year. During late winter and spring, groundwater levels in the swales would often be above the surface, with depths of several feet not uncommon. In late summer and fall, levels would drop and the swales would dry. This extreme oscillation favored herbaceous vegetation, kept the growth of trees and shrubs in the swales to a minimum, and encouraged the establishment of the wet prairies.

Fire and the dry sandy soils of the ridges were the two primary factors involved in maintaining the oak savannas. Savannas and woodlands experienced periodic fires that promoted a balance between the growth of trees and shrubs and herbaceous prairie/savanna vegetation.

Settlement of the region by Europeans in the early 1800s brought dramatic changes to the natural system. Logging removed the old growth trees, and grazing impacted much of the herbaceous layer. Farming converted large areas of the land to agriculture. Ditches were installed to improve drainage lowered the groundwater in the wet prairies and increased the growth of woody vegetation. Fire suppression resulted in a rapid increase in woody growth within the savanna and very likely within the wet prairies as well.

Much of the oak savanna and oak woodland that has survived has become heavily shaded oak woods or maple/oak woods. These areas possess little of the herbaceous prairie understory they once had. Leaf litter and duff accumulation has increased significantly, providing conditions suitable for more mesic, fire-intolerant, species. What has survived of the wet prairie persists in relatively small pockets surrounded and fragmented by thickets of trees and shrubs.

Conservation

Attempts to conserve habitat in the region have been ongoing since the 1930s. The results of these efforts can be seen in a series of “core” conservation areas that occur sporadically throughout the region. Ecologists have identified 6,000 acres (of 8,400 acres in the region) as high-quality greenspace running like a ribbon through the area. A group of conservationists who formed what is called the Green Ribbon Initiative in 2000, hopes to protect this habitat by creating a biological and recreational corridor of preserved land—a “green ribbon” of natural beauty, rare plant and animal species, and quality recreation opportunities stretching across Northwest Ohio and Southeastern Michigan.

Partners in the Green Ribbon Initiative include the Toledo Metroparks, which maintains several areas with the largest and most significant being the 4,000-acre Oak Openings Preserve Metropark. The Ohio Department of Natural Resources owns and manages three sites: Irwin Prairie (215 acres) and Lou Campbell (170 acres) State Nature Preserves and the 3,100-acre Maumee State Forest. The Nature Conservancy owns and manages the 735-acre Kitty

Todd Preserve. The stewardship of these and other protected lands is a critical component in the effort to preserve the biological significance of the area for the long term. Other partners in this effort include the Black Swamp Conservancy, Toledo Naturalists Association, Oak Openings Region Conservancy and the Olander Park System. Supporting organizations include the Toledo Zoological Society, U.S. Fish and Wildlife Service and the Lucas County Soil and Water Conservation District.

Conservation efforts also include the identification of primary stresses on the Oak Openings Region. In order of significance these are (1) loss of habitat, (2) fragmentation of habitat, (3) woody plant succession, (4) groundwater lowering, (5) exotic plant species and (6) elimination of species. Conservation efforts to address the stresses include land acquisition; increased community awareness concerning the significance and value of the area; compatible land use practices; promoting the planting of native species available through local retailers; implementing private and public land registry designed to encourage landowners to protect habitat on their own lands; encouraging the formation of an Oak Openings grassroots organization that will promote conservation within the region.

In your backyard

Property owners in the Oak Openings Region can individually promote the preservation of native vegetation by participating in the Oak Openings Native Plant Project which was organized by The Nature Conservancy. This project resulted in the creation of a line of genetically native prairie wildflowers and grasses, known as “Oak Openings

Natives,” which are grown and marketed locally by the Toledo Botanic Garden Native Plants.

Native plants can improve the Oak Openings ecosystem by helping restore habitat in one of the Midwest's rarest environments and increasing the biodiversity of the area by supporting the native insects, birds, butterflies and animals that depend upon these native plants. In addition, a native landscape is basically a self-sustaining ecosystem requiring minimal attention.

For more information/ Sources:

Oak Openings Green Ribbon Initiative
10420 Old State Line Road
Swanton, Ohio 43558
Tel: 419-867-1765
Web: www.oakopen.org/

ODNR Division of Forestry
2045 Morse Road, Building H-1
Columbus, Ohio 43229-6693
Tel: 877-247-8733
www.ohiodnr.com/forestry

ODNR Division of Natural Areas and Preserves
2045 Morse Road, Building F-1
Columbus, Ohio 43229
Tel: 614-265-6453
www.ohiodnr.com/dnap

Metroparks of the Toledo Area
www.metroparkstoledo.com/metroparks/oakopenings/



Karner Blue Butterfly

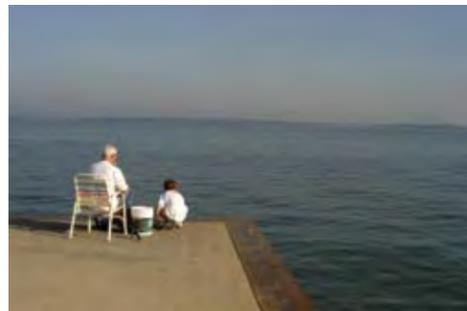
Walleye Spawning Habitat



RV Explorer, Division of Wildlife's Western Basin Research Vessel, Sandusky



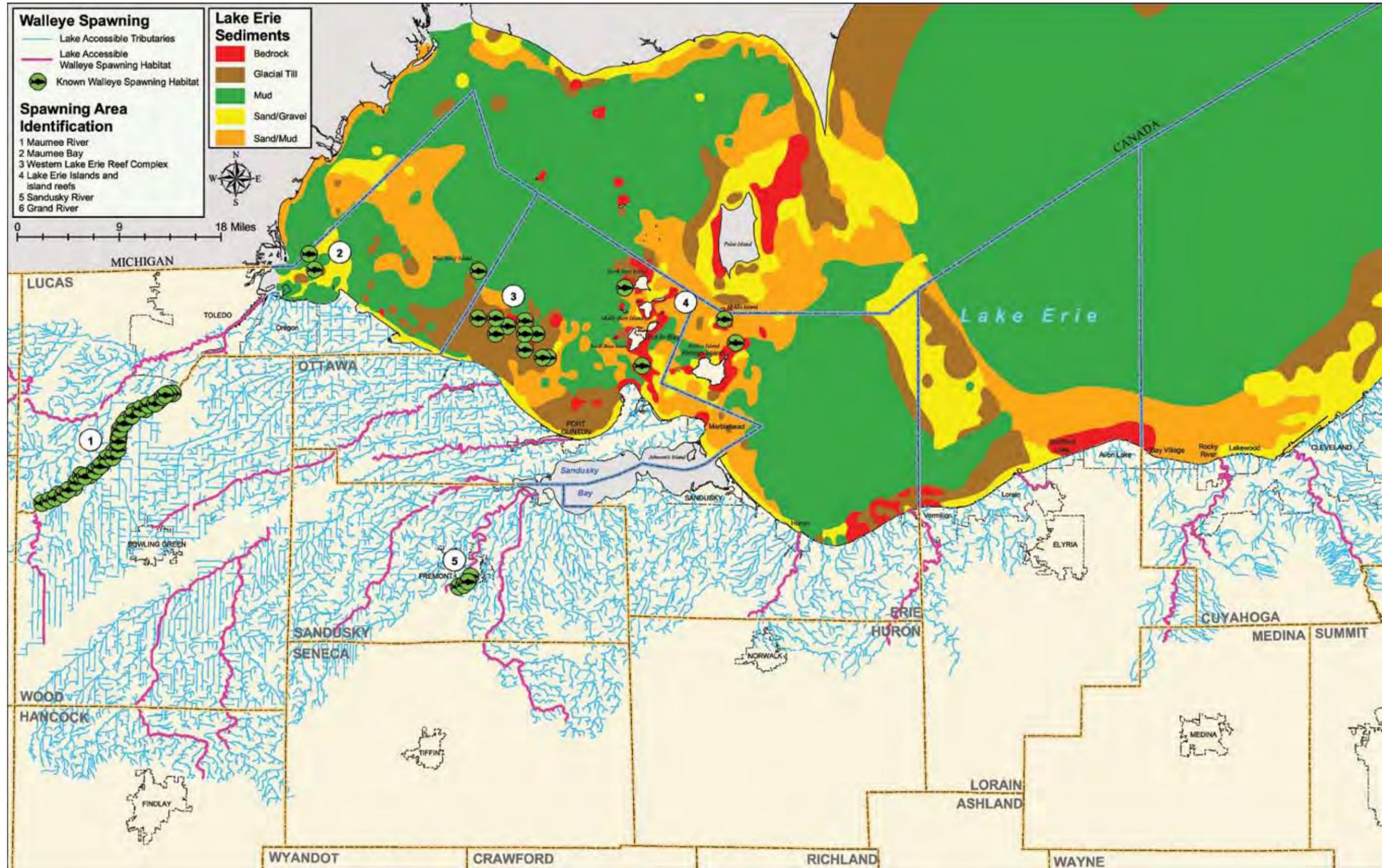
Fishing in Conneaut, Ashtabula County



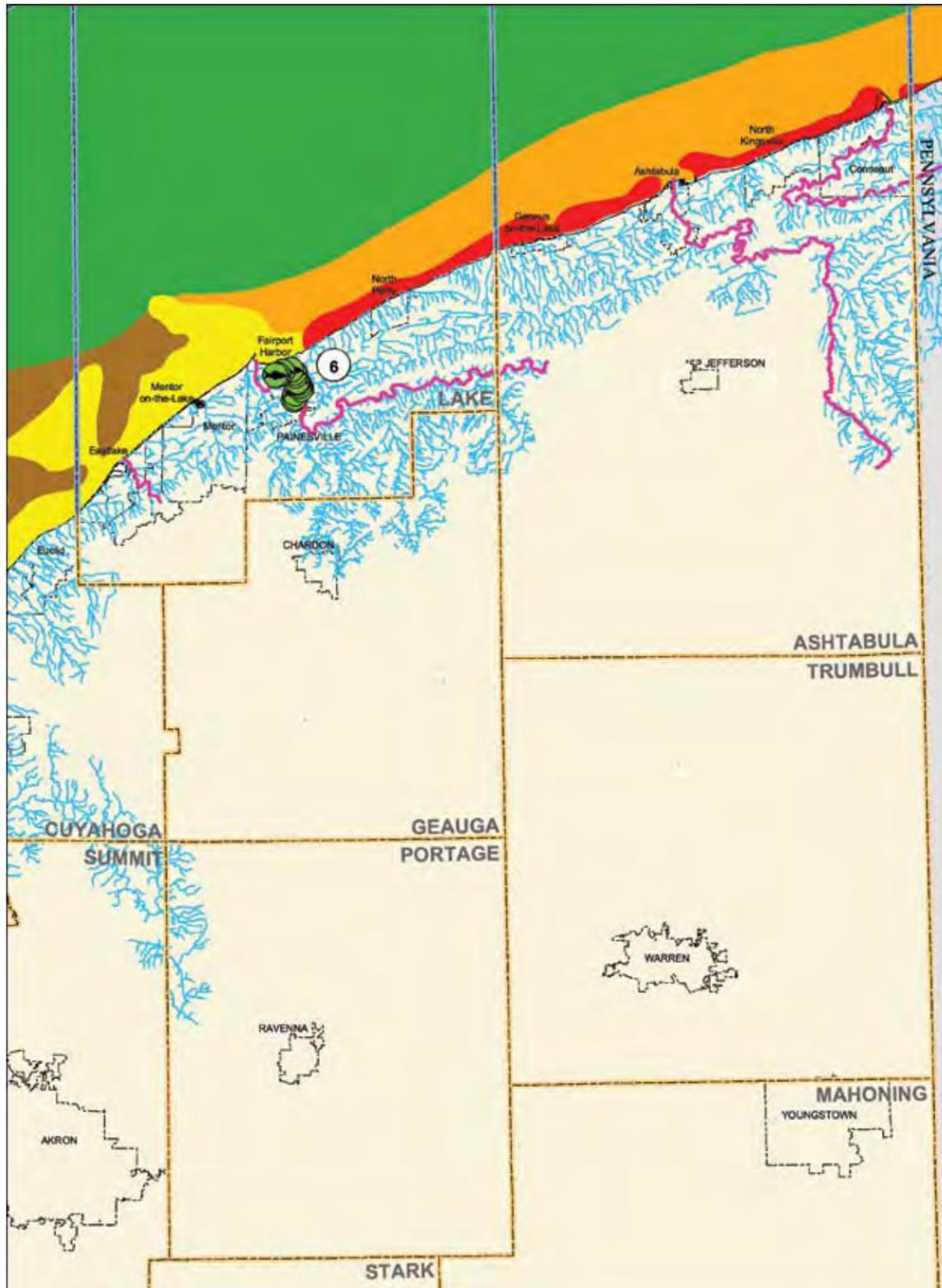
Fishing in Sandusky, Erie County



Boat with Cedar Point Amusement Park in background



Walleye Spawning Habitat and the Western Lake Erie Reef Complex



Map 29 GIS data citation in Appendices

Walleye Spawning Habitat

Major spawning areas for Lake Erie walleye include the midlake reef complex (#3 on map), reefs associated with the island archipelago (#4 on map), and spawning areas in the Maumee (#1 on map), Sandusky (#5 on map) and Grand (#6 on map) rivers. Walleye begin spawning shortly after ice-out (when ice breaks up in the lake and rivers) with peak spawning typically occurring by mid to late April. Eggs are broadcast over hard substrates (gravel/rock) in shallow areas of tributaries and on the tops of reefs. Eggs require oxygen levels above 35 percent saturation for survival. Incubation is temperature dependent, lasting up to two weeks.

The rate of water warming during the incubation period is considered an important factor in determining walleye-egg survival. When waters warm quickly and consistently, egg survival is typically high. When waters warm slowly or temperature reversals occur, the egg incubation period is prolonged and eggs remain vulnerable to several sources of mortality including predation, removal by currents and wave action, or suffocation due to siltation or low oxygen levels.

In rivers, high flows during the spawning and incubation period can remove eggs from favorable locations resulting in high egg mortality. Conversely, low flow during the spawning period can prohibit spawning adults from reaching spawning grounds. If water levels drop after spawning occurs, spawning substrates can be uncovered and eggs can die from dehydration and predation by birds. Dams on tributaries limit the upstream migrations of spawning walleye, although no evidence exists to

suggest that these impediments affect spawning success or numbers of walleye hatched in rivers.

Eggs incubating on reefs can be removed by wave and current action resulting from severe storms. In April of 1998, researchers observed that about 80 percent of incubating walleye eggs were removed from reefs after a single severe storm event. Other factors that can limit egg survival on reefs include predation by fish and invertebrates and reduced oxygen levels due to siltation.

Other factors that can impact walleye egg incubation and survival include dredging, agricultural pesticide runoff, silt and sediment deposition resulting from erosion, predation by fishes, birds and invertebrates and abrupt changes in water temperature.

Spawning site identification was based on research results described in the following publications:

Baker, C.T., and J.V. Manz. 1971. Walleye spawning area study in western Lake Erie. Ohio Dept. Nat. Res., Div. Wldlf. Final Rep. Res. Proj. F-35-R-10. 23 p. (Mimeo.)

Roseman, E.F., W.W. Taylor, D.B. Hayes, R.C. Haas, R.L. Knight, and K.O. Paxton. 1996. Walleye egg deposition and survival on reefs in western Lake Erie. *Annales Zoologici Fennici* 33:341-351.

Roseman, E.F., W. W. Taylor, D.B. Hayes, J. Fofrich, Sr., and R.L. Knight. 2002. Evidence of walleye spawning in Maumee Bay, Lake Erie. *Ohio Journal of Science* 102 (3):51-55.

Wolfert, D.R., W.-D.N. Busch, and C.T. Baker. 1975. Predation by fish on walleye eggs on a spawning reef in western Lake Erie, 1969-71. *Ohio J. Sci.* 75:118-125.

Importance of the Western Basin Reef Habitat of Lake Erie

The Western Basin Reef Complex lies generally within and west of the Lake Erie island archipelago. Most of the reefs are conical in shape and elongated in a northeast-southwest direction due to the influence of the retreating glaciers on the reef substrate structure. Consisting of bedrock exposures and associated rock cobble and gravel, the reef complex provides important habitat to many Lake Erie fish species.

Reefs are key reproductive sites for walleye, white bass, small-mouth bass, lake whitefish and other species. The cobble-pebble-gravel makeup of reef substrates creates ideal interstitial spacing for egg deposition by both nesting fish and broadcast spawners, allowing attachment surfaces with access to oxygen-laden water. Water above the reefs warms earlier than in surrounding areas, due to both the shallow water column and the heat-absorptive nature of the substrate. This provides spring temperatures that promote spawning activity, especially for early walleye spawning. Reefs are also subject to wave action and lake currents, which aid in the aeration of eggs, and delivers minerals necessary for larval development.

Some of the same attributes that make reefs quality spawning habitat can also be detrimental, especially in extremes. Interstitial spacing provides hiding cover for small, egg-predacious species such as the round goby. Excessive currents and wave action caused by storms can remove incubating eggs from the substrate; insufficient water movement may cause egg suffocation due to siltation or anoxia. Delays or reversals in warming prolong egg development and hatching, increasing their exposure to the sources of mortality listed above.

The reefs also provide important feeding areas for Lake Erie fish. Piscivorous fish, such as smallmouth bass, feed on smaller fish, such as the exotic round goby that are attracted to reefs for food and hiding cover. Mussels, including the exotic zebra mussel, reside on the hard reef substrates, feeding on attached and suspended organic matter. This in turn attracts mollusk-eating predators like the freshwater drum. As a result, reefs can be seasonally important places for anglers to encounter concentrations of target fish species.

Sources:

Bolsenga, S. J., and C. E. Herdendorf, editors. 1993. Lake Erie and Lake St. Clair Handbook. Wayne State University Press, Detroit, MI.
Munawar, M., T. Edsall, and I. F. Munawar. 1999. The State of Lake Erie (SOLE) – Past, Present and Future. Backhuys Publishers, Leiden, the Netherlands.

Walleye Nursery Habitat



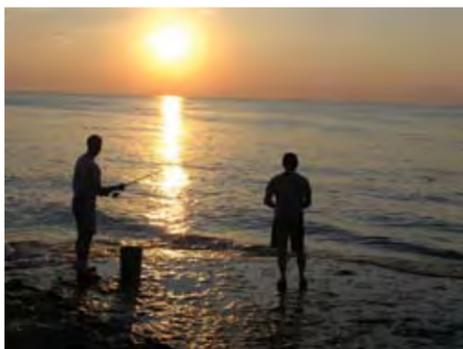
Adult walleye



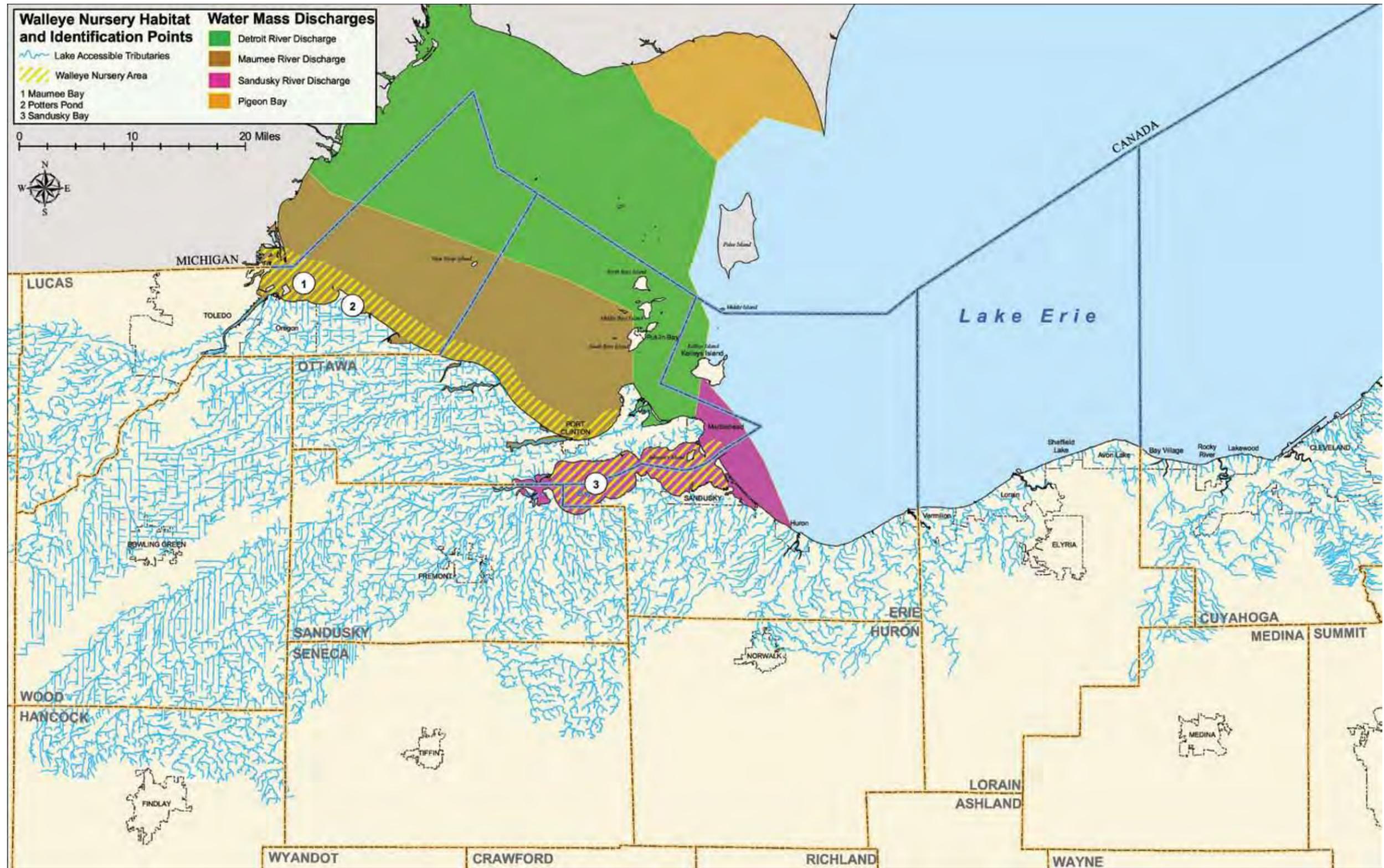
Walleye fishing Photo by Fred Snyder



Lake Erie fishing charter, Cleveland

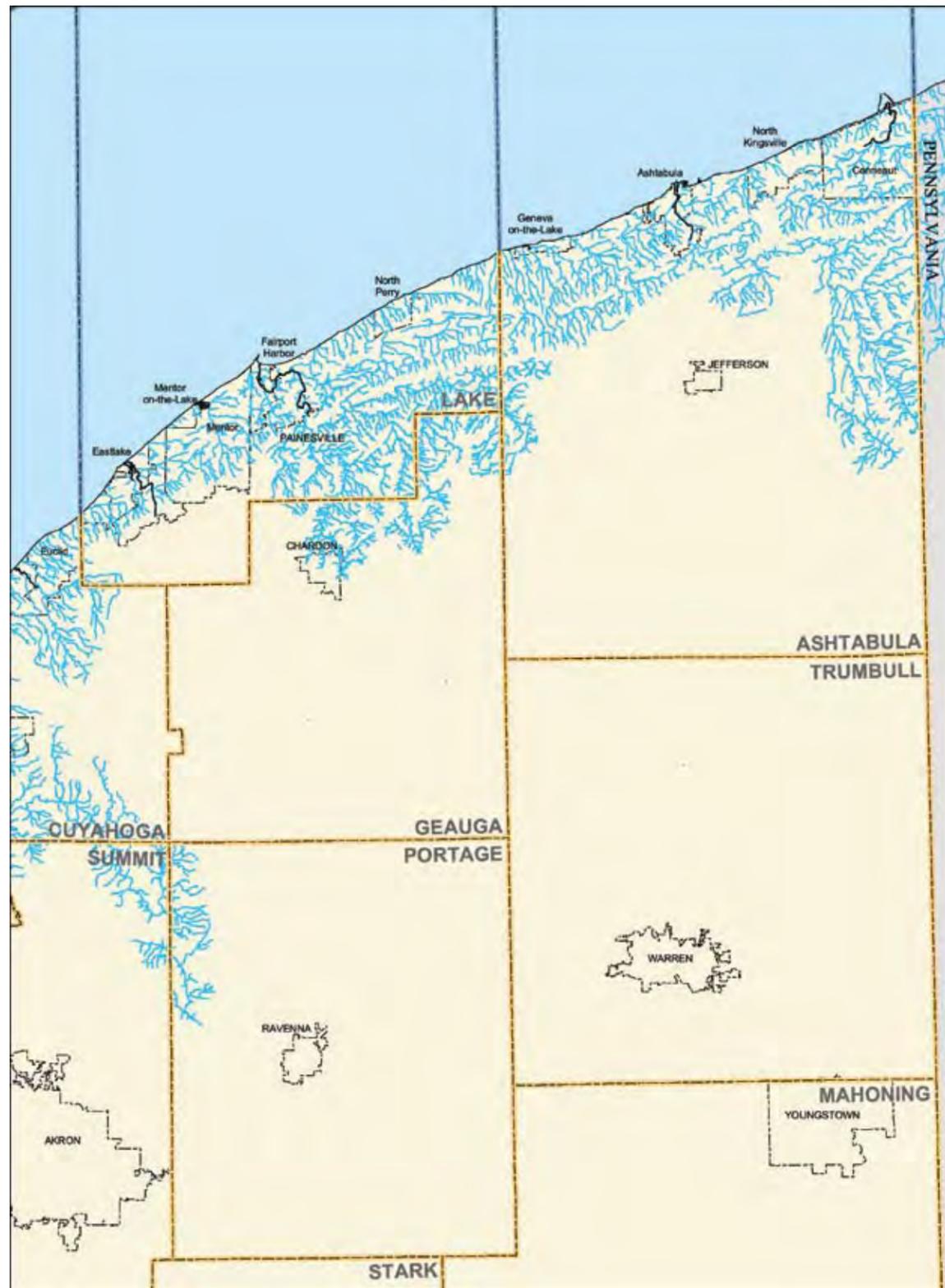


Lake Erie fishing at sunset



Map 30 GIS data citation in Appendices

Walleye Nursery Habitat and Yellow Perch



Map 30 GIS data citation in Appendices

Walleye Nursery Habitat

Walleye nursery habitat in Lake Erie is typically found at the mouths of spawning rivers, embayments and nearshore areas of the Western Basin. Areas such as Maumee Bay (#1 on map), Potters Pond (#2 on map), Sandusky Bay (#3 on map) and the shallow coastal areas along the Western Basin shore are known walleye nursery areas. These nursery areas are connected to spawning areas by flow regimes in the tributaries and water current patterns in the lake. Flow and currents are the physical forces that transport larval walleye from spawning to nursery areas and maintain larval habitat. Many of the large tributaries (Maumee, Sandusky, Detroit and Grand rivers) have significant impacts on water quality in the lake, and south shore tributary water-masses tend to support larval and juvenile walleye.

Walleye nursery habitat is typically shallow (less than 10-foot deep) and has low water clarity. These attributes allow these nearshore waters to warm at a faster rate than deeper, clearer offshore areas. Recent fisheries research studies have shown that nearshore areas typically have abundant prey resources (zooplankton and other larval fish) providing young walleye with an opportunity for fast growth.

Factors that can adversely affect the quality of walleye nursery habitats include dredging, silt and sediment resulting from erosion, changes in spawning tributary flow regimes and water level changes that reduce the quantity of nursery habitat or disrupt linkages

between spawning and nursery habitats.

Sources:

Nursery area identification was based on research results described in the following publications:
Ludsin, S. A. 2000. Exploration of spatiotemporal patterns in recruitment and community organization of Lake Erie fishes: A multiscale, mechanistic approach. Doctoral Dissertation, The Ohio State University, Columbus, OH.
Mion, J.B. 1996. River discharge drives differential survival of larval walleye. M.S. Thesis. The Ohio State University, Columbus, OH.

Roseman, E.F. 2000. Physical and biological processes influencing the year-class strength of walleye in western Lake Erie. Doctoral Dissertation, Michigan State University, East Lansing, MI.



Yellow Perch



Ecology of Lake Erie Yellow Perch

Yellow Perch (Perca flavescens) is a biologically, commercially and recreationally important native species in Lake Erie. Distributed throughout the lake, yellow perch occupy a role in the Lake Erie ecosystem as both predator and prey for larger piscivores (fish that feed on fish), such as walleye. Adult yellow perch are generally benthic feeders, consuming small fish such as shiners and invertebrates such as mayflies they locate at or near the lake bottom. Yellow perch fry feed on zooplankton, switching to small invertebrates as they grow.

Yellow perch spawning occurs in spring, usually during April and May, when water temperatures reach 44 to 54 degrees Fahrenheit. Spawning generally occurs upon coarse substrates such as rocks and boulders, although sand and gravel substrates are also used successfully. Females attach an egg mass, a long, cylindrical, gelatinous tube containing 2,000 to 90,000 eggs to the substrate and it is fertilized by one or more males. No parental care is provided for the eggs or fry. As they grow, yellow perch form schools that roam in search of food.

Yellow perch provide an economically important resource. Commercial trap-netters and sport anglers alike ply the depths of Lake Erie in search of this highly palatable fish. Commercial fishermen reported harvesting more than 5.2 million yellow perch in 2004, most destined for restaurants all over the region. Sport anglers harvested an estimated 6.8 million yellow perch the same year. Most successful anglers use small emerald shiners fished within a foot or two from the bottom in 25 to 45 feet of water.

Source:

ODNR Division of Wildlife. 2005. Ohio's Lake Erie Fisheries 2004. Annual status report. Federal Aid in Fish Restoration Project F-69-P. Ohio Department of Natural Resources, Division of Wildlife, Lake Erie Fisheries Units, Fairport and Sandusky. 102 pp.

Scott, W. B., and E. J. Crossman. 1973. Freshwater fishes of Canada. Fish Res. Board Can. Bull. 184. 966 pp.

Troutman, M. B. 1981. The fishes of Ohio, revised edition. The Ohio State University Press, Columbus, Ohio.

Adult Walleye Habitat



Lake Erie Walleye



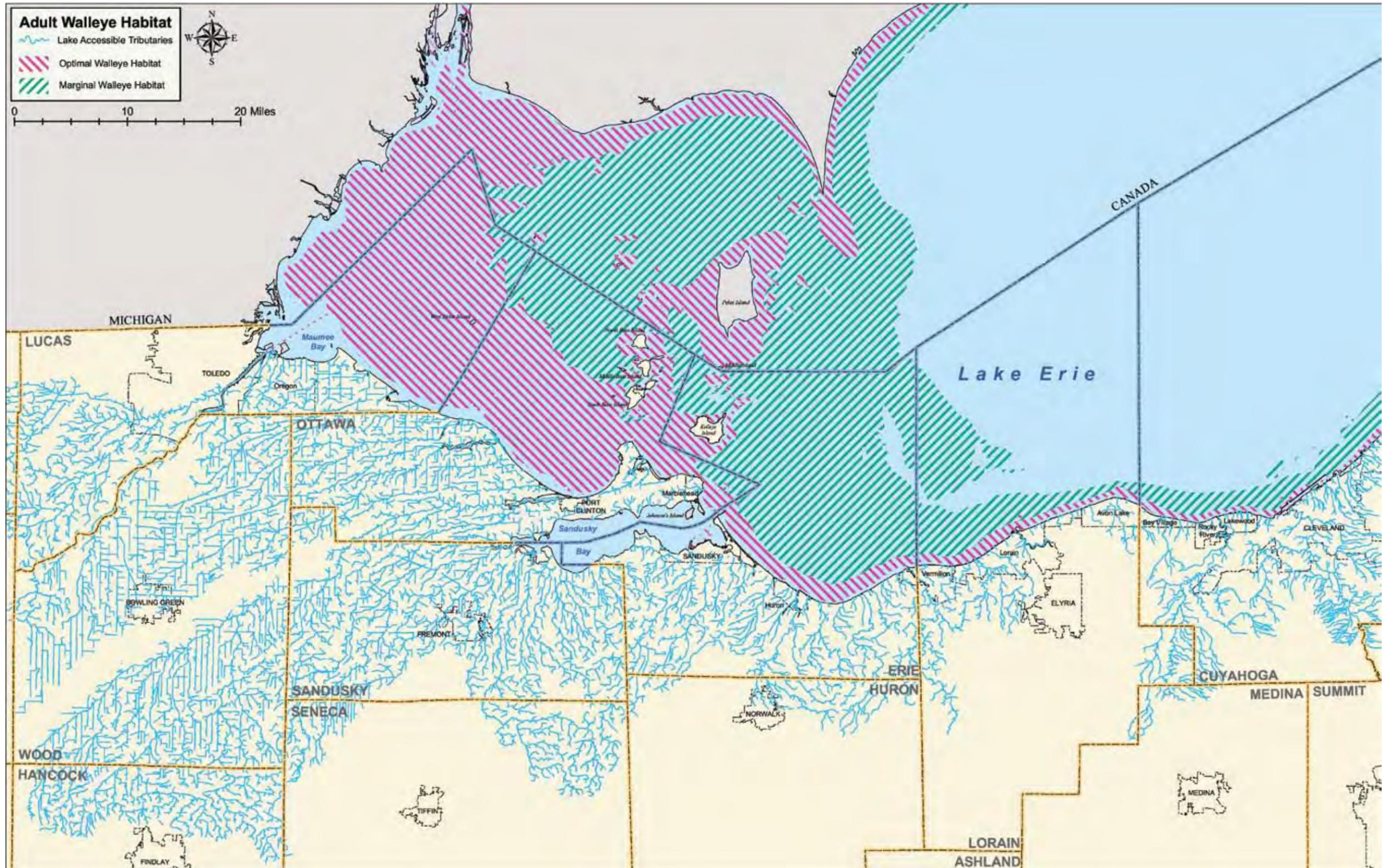
Walleye catch on the Maumee River



Catch of the day at Walleye Run on the Maumee River



Lake Erie Smallmouth Bass



Map 31 GIS data citation in Appendices

Adult Walleye Habitat and Smallmouth Bass



Map 31 GIS data citation in Appendices

Walleye Adult Habitat

Walleye tagging studies have shown that habitat for adult walleye exists throughout all three Lake Erie basins and is generally related to depth and water clarity. Generally though, most adult walleye are caught in water less than 60-feet deep which encompasses the entire Western basin and margins up to several miles wide along the periphery of the Central and Eastern basins. Tagging study results also indicate that walleye may pursue schools of forage fish such as smelt, shiners, alewife and gizzard shad out into deeper water. This pursuit leads large numbers of walleye from spawning areas in the Western Basin into the Central and Eastern basins by mid to late summer. In fall, walleye begin the return migration toward their spawning sites.

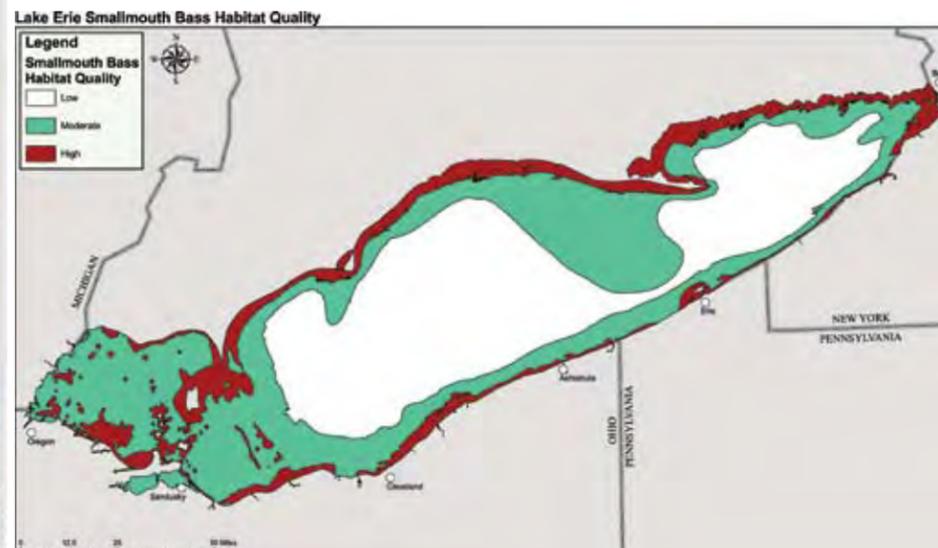
Walleye are known to be crepuscular, meaning they are most active in twilight hours when light levels are low and in waters that have limited clarity. Reductions in

nutrient loading and the introduction of Dreissenid mussels (zebra and quagga mussels) have contributed to increased water clarity in off-shore waters of Lake Erie. Fisheries researchers are currently investigating the effects these changes have on adult walleye behavior.

Adult walleye habitat and the tagging study are described in greater detail in the following publication:
ODNR Division of Wildlife. 2004. Ohio's Lake Erie Fisheries 2003. Annual status report. Federal Aid in Fish Restoration Project F-69-P. Ohio Department of Natural Resources, Division of Wildlife, Lake Erie Fisheries Units, Fairport and Sandusky, 96 pp.

For more information:

ODNR Division of Wildlife
Sandusky Fisheries Research Unit
Jeff Tyson
305 E. Shoreline Drive
Sandusky, Ohio 44870
Tel: 419-625-8062
E-mail: jeff.tyson@dnr.state.oh.us



Map 32 GIS data citation in Appendices



Ecology of Smallmouth Bass

As a native species and the dominant centrarchid in the lake, smallmouth bass (*Micropterus dolomieu*) occupy a valuable niche in the Lake Erie ecosystem.

Smallmouth bass excel in large lakes with clear water having average depths greater than 30 feet. Lake Erie smallmouth bass habitat varies in quality along a gradient of substrate types and maximum water depth (See Figure). In general, high quality smallmouth habitat in Lake Erie combines boulder- to gravel-sized substrate in areas with maximum water depths between 13 and 33 feet. Low quality habitat consists of silt and sand substrates in depths greater than 32 feet. Moderate quality habitat has characteristics of both high and low quality habitat, such as optimal substrate in sub-optimal depths (less than 13 feet or greater than 32 feet). Habitat use varies seasonally, such as during the spawning period.

Spawning occurs from May to July, when water temperatures reach approximately 59 degrees Fahrenheit. Smallmouth bass males build nests on clean rock or gravel substrates in depths from 5 to 22 feet prior to spawning, and remain on the nest 10 to 14 days to fan and defend the eggs and fry. Nest success is typically low, and in Lake Erie can be heavily influenced by storm-induced changes in water level, wave action and dramatic swings in temperature.

Not surprisingly, smallmouth bass diet is a reflection of habitat selection. Adult smallmouth diets historically were composed of crayfish and small fish (i.e., emerald shiners). Current diets are dominated by the round goby, a recent invader to the Great Lakes. Most of these prey are found in abundance in substrates with large amounts of interstitial spacing, such as boulder and cobble. Smallmouth bass fry feed on zooplankton.

Their tenacity and aggressiveness make smallmouth a valuable species to sport anglers. Common angling methods include goby-imitating plastic tubes jigs, dropshotting small plastics, trolling crankbaits and stickbaits, and live bait such as soft craws, emerald shiners and night crawlers. Smallmouth bass are highly active during fall as they prepare for cold winter water temperatures; they are particularly vulnerable to angling during the spawn, when males are defending nests.

Sources:

Edwards, E. A., G. Gebhart, and O. E. Maughan. 1983. Habitat suitability information: Smallmouth bass. U.S. Dept. Int., Fish Wildl. Serv. FWS/OBS-82/10.36. 47pp.
Scott, W. B., and E. J. Crossman. 1973. Freshwater fishes of Canada. Fish Res. Board Can. Bull. 184. 966 pp.
Troutman, M. B. 1981. The fishes of Ohio, revised edition. The Ohio State University Press, Columbus, Ohio.

Ottawa National Wildlife Refuge



Great Egret



Headquarters at Ottawa National Wildlife Refuge

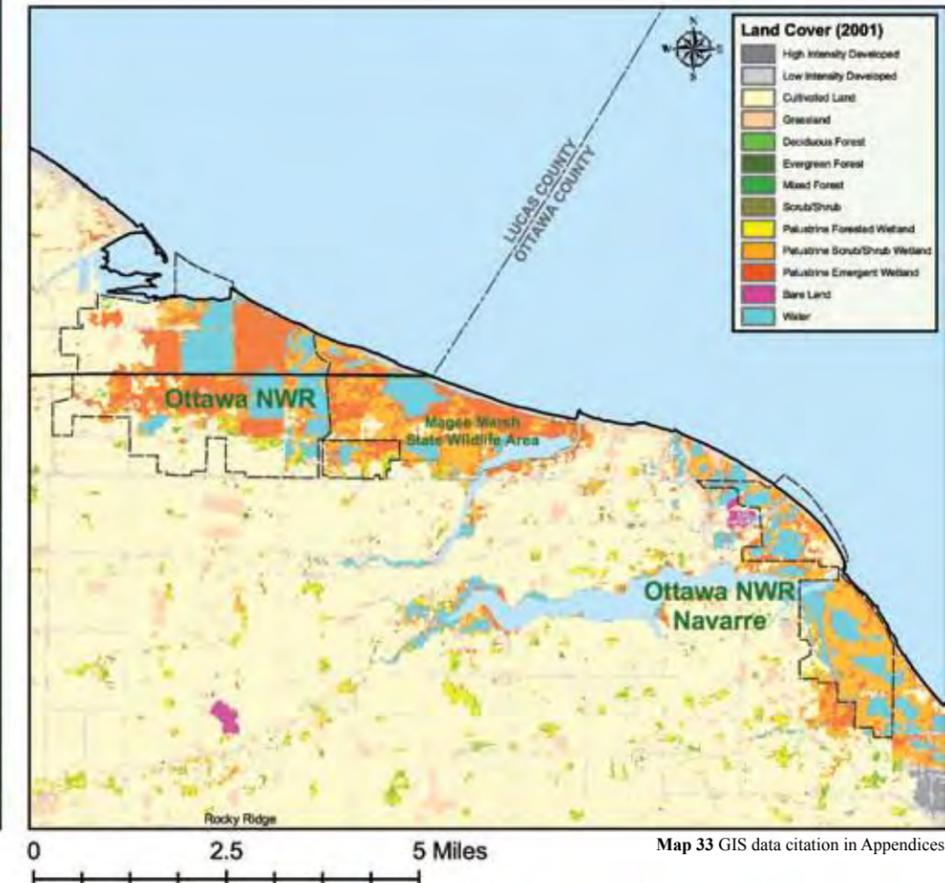
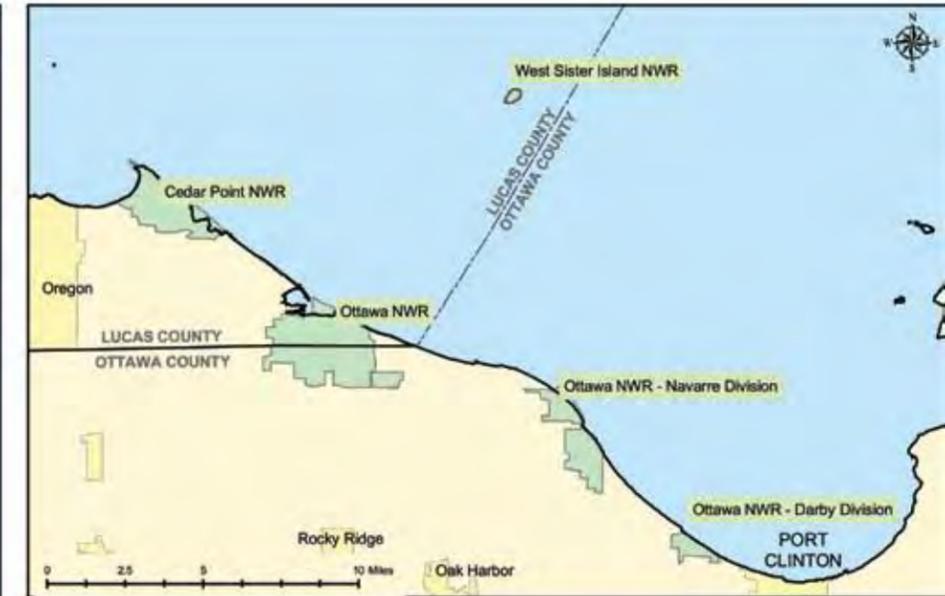


Ottawa National Wildlife Refuge, Lucas and Ottawa counties



Information kiosk at Ottawa National Wildlife Refuge

FOCUS AREA



Map 33 GIS data citation in Appendices

Ottawa National Wildlife Refuge

Ottawa National Wildlife Refuge Complex

The 4,683-acre Ottawa National Wildlife Refuge (Ottawa NWR) is the publicly-accessible part of the Ottawa National Wildlife Complex that also contains Cedar Point National Wildlife Refuge and West Sister Island National Wildlife Refuge. The Complex was established in 1961 under the authority of the Migratory Bird Conservation Act to preserve a portion of the remaining Lake Erie marshes. Collectively, the three refuges total 8,318 acres and are managed by the U.S. Fish and Wildlife Service.

Interspersed with marshes, open water, wooded wetlands, coastal wetlands, shrublands, grasslands, croplands and an estuary, the Complex is managed to provide diverse habitat for waterfowl, shorebirds, Neotropical migratory songbirds, fish, waterfowl and other animal and plant species. Up to 70 percent of the Mississippi Flyway

population of black ducks can be found in the Lake Erie marshes during the fall migration.

Ottawa Refuge marshes are the remaining remnants of the formidable Great Black Swamp that was drained by the area's early settlers. The refuge also includes some of the only coastal marsh systems open to Lake Erie. The Crane Creek Estuary is open to the widely fluctuating Lake Erie water levels. Connection with the lake provides access for spawning fish and supports native mollusk species.

The refuge trails are part of the National Recreational Trail System and enable visitors to hike more than 7 miles through marshlands, woods, shrublands and grasslands. A bird list, available at the refuge office, boasts more than 300 species including warblers, waterfowl, shorebirds, wading birds, owls and raptors. Bald eagles also nest in the refuge. In 2001, the Lake Erie marshes of the Complex,

were included in the designation as a Regional Shorebird Reserve in the Western Hemisphere Shorebird Reserve Network.

West Sister Island National Wildlife Refuge is an 82-acre island located off the north shore of the Ottawa NWR. It is jointly owned by the U.S. Coast Guard (USCG) and the U.S. Fish and Wildlife Service (USFWS). A lighthouse and five acres are owned by the USCG, and the remaining 77 acres are owned by USFWS. Since 1975 West Sister has been part of the National Wilderness Area System. Tall hackberry trees with an understory of abundant poison ivy, some of it 12 feet tall, dominate most of the island. Great Solomon's Seal reaches 7 to 9 feet in height, and a great variety of ferns, wildflowers, mushrooms and other plant life abound. It was near West Sister that in September 1813 Commodore Perry defeated the British

navy in the Battle of Lake Erie. The island was established as a National Wildlife Refuge in 1937 as breeding ground for migratory birds and other wildlife. The island was specifically designated to protect the largest nesting colony of wading birds on the U.S. Great Lakes. No public access is permitted to protect this vital nesting area.

Cedar Point National Wildlife Refuge, located on the Lake Erie shore north-east of Oregon, is named for the cedar trees growing at its northern tip. The 2,500-acre refuge is entirely marsh except for the dikes and a few acres of remnant beach covered with hardwoods. An open bay outside the dike system is known as Potter's Pond. The dike system separates the marsh from Lake Erie and divides the Cedar Point Refuge into three pools. All pools have cattail, bulrush and other emergent vegetation. Many waterfowl and wildlife species use the area for migra-

tion, feeding and nesting. The marsh is the largest contiguous marsh on Lake Erie. Historically, the property was owned by the Cedar Point Shooting Club which hosted local and nationally known hunters. In 1965, the property was donated to the U.S. Fish and Wildlife Service. A 15-acre pond near Yondota Road gate is open for fishing from dawn to dusk during the summer months. Other access is by permit only.

For more information:

Ottawa National Wildlife Refuge
14000 W State Route 2
Oak Harbor, Ohio 43449
Tel: 419-898-0014
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Great Blue Heron



Wood duck box at Ottawa National Wildlife Refuge



West Sister Island National Wildlife Refuge

Terrestrial Habitat



Coyote



Eastern fox snake



ODNR Division of Natural Areas and Preserves help release baby Blanding's Turtles at Sheldon Marsh State Nature Preserve



A closer look of the Blandings turtle, Sheldon Marsh State Nature Preserve, Erie County

Blanding's Turtle

Blanding's turtles are limited primarily to the northern counties along Lake Erie where they inhabit the marshy shores, inland streams and wet meadows. Although essentially aquatic, the Blanding's turtle often wanders about on land, but seldom far from water.

The most distinctive field mark is the bright yellow throat and chin, which can easily be seen from some distance away. Like the box turtle, the Blanding's has a hinged plastron. The plastron is not as functional as the box turtle's because its front lobe cannot be closed tightly. Unlike other species of pond turtles, this large but very timid turtle has no difficulty swallowing food out of water.

Blanding's turtles are listed as a species of concern in Ohio, which means the animal is not endangered, but may soon become so if conservation measures are not taken. Once native to most of the Lake Erie coast, these turtles are found in only four Ohio counties.

Sheldon Marsh State Nature Preserve in Erie County is one of a few sites chosen in 2005 for a multi-year research project. The project involved releasing Blanding's turtles fitted with radio transmitters. These transmitters will enable researchers to track the turtle's progress and location. The goal of this project is to learn more about the turtle's environment and predators. Along with loss of habitat, predation of their nests is also a major challenge for the Blanding's turtle. This turtle species gets its name from the early naturalist William Blanding, who first described it.

Coyotes

Originally native to the prairies and desert canyons of the west, coyotes are now thriving in Ohio as the landscape has been altered by human activities and the elimination of other predators. Native American folklore is filled with tales of the coyote. This animal is either revered for its intelligence and ability to resolve a life-threatening conflict or is frowned upon for being cunning and a deceiving manipulator. As its presence in Ohio shows, this versatile animal can make a home almost anywhere.

The coyote is a nocturnal animal meaning it is active during the night. The coyote is an omnivore and adapts its diet to the available food source. The coyote hunts small mammals including mice, voles and rabbits. It will also eat fruits, grasses, vegetables and carrion (dead, decaying animals). Although coyotes have a reputation for livestock predation, scientific studies show that livestock makes up less than 15 percent of their diet.

Coyotes are also known for their vocal repertoire. Their yips, barks and howls are now being heard in suburbia as their range extends to residential backyards, urban and suburban parks. Its collection of sounds has led to yet another nickname—song dog.

The coyote is no different than any other species of wildlife in that it needs shelter, food and water to establish itself. The coyote's strength is that it can adapt and exploit almost any habitat to its advantage. While most wildlife species have avoided developed areas, the coyote seems to have thrived.

Sources:

ODNR Division of Wildlife;
Pennsylvania Game Commission;
Desert USA.

Eastern Fox Snake

Eastern fox snakes are found along the southwestern shores of Lake Erie, mostly west of Vermilion. This handsomely-marked species also inhabits many Lake Erie islands as well as the extensive marshes of Lucas, Ottawa, Sandusky and Erie counties. Unfortunately, eastern fox snakes are killed because their copper colored heads mislead people into thinking they are venomous northern copperhead snakes. However, habitat for the northern copperhead snake does not extend into the coastal regions of Ohio and only extends to the unglaciated portions of southern Ohio.

The fox snake is harmless and not aggressive toward humans. If startled, it may vibrate its tail rapidly, resulting in a rattlesnake-type sound if surrounded by dry leaves or other ground litter. It feeds primarily on small mammals, frogs and birds. When annoyed, adults sometimes emit a musky-smelling, anal secretion which is said to smell like a fox.



Scarlet Tanager

One of Ohio's most colorful neo-tropical migrant birds, the scarlet tanager spends winter in Central and South America and moves north in summer to nest in eastern North America, including the Lake Erie Region. The unmistakable breeding



Two adult swans (tagged) at Magee Marsh State Wildlife Area, Ottawa County.

males are bright red overall with pure black wings and tail, while the females are olive and yellowish overall with brownish wings. Despite their bright colors, scarlet tanagers are hard to spot, as they perch high in the tree canopy. Their songs are described as sounding like a robin with a sore throat. The best places to see these birds along Lake Erie are at the Magee Marsh State Wildlife Area, Sheldon Marsh State Nature Preserve and other sites with good-sized woodlots.

Trumpeter Swans

Before European settlers made their way into the Ohio country, the resonant call of trumpeter swans echoed across area wetlands. These majestic birds, North America's largest waterfowl, will again soon be a natural part of wild Ohio through conservation efforts of the Ohio Department of Natural Resources.

The Division of Wildlife began efforts to return the trumpeter swan to the state with the help of its partners, the Cleveland Metroparks Zoo and The Wilds located in Muskingum County. Trumpeter swan eggs were initially collected from Alaska and hatched at the Cleveland Metroparks Zoo. When the cygnets were six weeks old, they were transferred to The Wilds where they stayed until old enough to be released into Lake Erie marshes and other wetlands. This fostering program ran from 1996 to 1998. Because of the success of the program, all trumpeter swan reproduction in Ohio now occurs in the wild.

Trumpeter swans weigh 21 to 30 pounds. The male is called a cob; the female is called a pen. With a wingspan of more than seven feet, these snow-white birds are truly spectacular. Standing on the ground, an adult trumpeter stands about four feet high.

Terrestrial Habitat

Monarch Butterflies

With distinctive orange and black wings, the monarch butterfly is one of the most widely known butterflies native to Ohio. The entire state is considered butterfly habitat, with a higher concentration of habitat along Lake Erie. Specific habitats include meadows, fields, marshes and cleared roadsides; however, the monarch's distribution is based on its dependent need for milkweed plants.

Breeding grounds of monarch butterflies are found in New England, the Great Lakes Region and the Rocky Mountains. Breeding areas exist throughout Ohio, with a greater concentration near the coast due to increased presence of the milkweed plant.

Adult female monarchs lay about 400 eggs singly on the underside of milkweed leaves. Depending on the temperature, the eggs hatch in 3 to 12 days. When the egg hatches, the two millimeter long caterpillars are conveniently sitting on their first meal—milkweed leaves.

When caterpillars begin the transformation into a butterfly (pupate) they use a special gland in their mouth to weave a small silk button on the underside of a twig or leaf to which they can attach their tails. Caterpillars then hang upside down in the shape of a "J" from the silk button. The pupa resembles a waxy, jade vase and becomes increasingly transparent as the two-week transformation process progresses. As time passes it sheds



Monarch butterfly migration patterns

its skin five times. When the old skin is gone, the remaining chrysalis looks like a giant green water droplet.

When the monarch emerges from the chrysalis, its wings are wrinkled and wet, and the butterfly's abdomen is very large. The newly emerged butterfly clings to the casing of the chrysalis while fluids from its abdomen are pumped into the veins of the wings, expanding them. After a few hours when the wings are dry, the abdomen reduces to a normal size, and the butterfly flies away.

Fall migration starts in Canada and the Great Lakes Region in late August and ends in November/December in the Transvolcanic Plateau of Mexico in the Oyamel Fir Forests—a 3,100 mile

trip. During the migration from North to Central America, heavy concentrations of monarchs fly over Lake Erie. Monarchs can travel 50 miles per day at roughly 12 miles per hour encountering dangers such as storms, predators, cars and fatigue. The migration south takes just one generation to complete. Winter butterflies are sluggish and do not reproduce. In spring they return to summer homes, breeding three to four generations of monarchs along the way.

The biggest problem facing monarch butterflies is the loss of habitat. The milkweed plant in Canada is considered a noxious weed, meaning the plant is not allowed to be grown on private or public lands. In the United States, farm-

ers see milkweed as a nuisance and often use pesticides to eliminate it. In Mexico many trees that have been home to these butterflies for years are being cut down. Changing weather patterns are also playing a role in the monarch's declining numbers.

Both the United States and Canada are instituting programs to assist in monarch restoration. The Canadian province of Ontario has designated three sites along the lower Great Lakes as "butterfly reserves" since hundreds of thousands of monarchs spend their summers along the shores of Lakes Erie and Ontario. The Ohio Department of Natural Resources also has a monarch research project underway at Maumee Bay State Park. The goal of this research project is to increase monarchs' survival. Maumee Bay State Park naturalists manage a captive breeding program and more than 2,000 monarchs have been raised and released there.

For more information:

Maumee Bay State Park
Nature Center
1400 State Park Road
Oregon, Ohio 43618-9532
Tel: 419-836-9117

Sources:

Bollin, Dana. Maumee Bay State Park Naturalist 2004
Urquhart, F. 1987. *The Monarch Butterfly: International Traveler*.
Nelson Hall. Pp. 92-163)
www.monarchwatch.org
www.ohiohistorycentral.org

Snowshoe Hare

Snowshoe hares are very common in the northern forests of North America. During the winter, snowshoe hares have a thick white coat that helps them blend in with the snow. In the spring, they shed their winter coats and grow thin brown summer coats. This acts as camouflage among the green and brown shadows on the forest floor. Even though the snowshoe hare has a snowy-white coat for part of the year, it actually gets its name from its feet. The hind feet on a snowshoe hare can be up to 7-inches long and have webbing between the toes like snowshoes. This allows the hare to stay on top of the snow while running and jumping. This is very important when the snowshoe hare is trying to escape predators like foxes, lynx and raptors. Snowshoe hares can reach speeds up to 30 miles per hour.

Although once native to the extreme

northeast corner of Ohio, snowshoe hares were probably never abundant or widely distributed. It is believed that they were extirpated from the state in the early 1900s due to large-scale clearing of forest lands. The ODNR Division of Wildlife released 604 snowshoe hares in the northeastern part of Ohio in several reintroduction attempts in the 1950s. But for unknown reasons, no stable populations were established. In 2000, the Division of Wildlife once again researched ways to stock the hares in their native territory. In 2001, 96 snowshoe hares were trapped in Michigan and released in Ashtabula County. This time the population has remained stable, and there has been evidence of reproduction. In February 2002, 28 more snowshoe hares were released. Today, the Division of Wildlife is still carefully monitoring Ohio's new population of snowshoe hares.



Rabbits Vs. Hares

Rabbits and hares can be very common and most of us have seen them running around in our lawns. But do you know whether it is a rabbit or a hare in your front yard? In most cases hares are larger than rabbits and have longer legs and ears. One easy way to tell the difference between the two is by comparing the young. Newborn hares are born with a full coat of fur and open eyes. They are able to hop around just a few hours after birth. Newborn rabbits are born blind, naked and helpless. Their eyes don't open for a full week, and it is not until two weeks after they are born that they grow fur and hop around.