Chapter 8

SOILS AND INTERPRETIVE SOIL GROUPS

Soil scientists, or pedologists, recognize five factors that account for differences in soils: parent material (material that the soil formed in), climate, topography, living organisms and time. Soil scientists first attempted to map different soils near the Lake Erie coast in 1902, when field investigations were conducted in the Toledo area and reported in a U.S. Department of Agriculture publication. By 1987, soil maps at a scale of 1:15,840 (4"= 1 mile) were available in soil survey publications for all counties along the coast.

The published soil maps have been digitized since then, and the detailed digital soils data is available through the U.S. Natural Resources Conservation Service's Soil Data Mart website at soildatamart.nrcs.usda.gov/ and the ODNR Division of Soil and Water Conservation website: Ohiodnr.com/soilandwater/. The digital soils data have been used to generate maps in this chapter. Soil scientists employed by ODNR's Division of Soil and Water Conservation, the U.S. Natural Resources Conservation Service, and the Ohio Agricultural Research and Development Center continue to study the soils in the region to refine information first published in the 20th Century.

Soils by Parent Materials

The basic unit of soil classification is the soil series, which are generally named after a town near the location where they were first mapped. Soil scientists currently recognize about 150 soil series in the counties in Ohio's coastal region. These can be grouped into seven general kinds of parent materials in which the soils formed, in the upper 20 inches.

Since soil surveys were conducted at a more detailed scale and for a different purpose than geologic maps, apparent conflicts between these maps and geologic maps should not be considered as contradictory. It should be noted that some soil series are not defined as specifically as others with regard to parent materials. Thus, some areas oriented parallel to the coast have been identified by soil series associated with glacial stream sediments, even though they may be more likely to be associated with off-shore lake sediments.

The soils of Ohio's coastal region vary greatly from west to east. Soils formed in glacial till with relatively high lime content and in lakebed (lacustrine) sediments on a relatively flat landscape are common in the western area. Soils formed in glacial till with relatively low lime content and in loamy sediments along the steeper sloping Portage Escarpment are common in the eastern area. Soils that are very poorly drained are more common in the western part; they are very productive for agriculture when drained. Soils that are less fertile for agricultural production and prone to erosion are more common in the eastern reaches.

Organic Soils

Organic soils formed in depressions caused by blocked drainage or in kettle holes. These soils are very poorly drained and have significant limitations for all management practices. They are composed of various amounts of organic material such as decayed leaves. Carlisle and Willette are common organic soils along Ohio's coast. However, organic soils account for only about 0.1 percent of coastal counties' soils.

Alluvial Soils

Alluvial or floodplain soils are young soils that receive continuous additions of sediment during flooding. These soils have many limitations, mainly due to the occurrence of flooding. Natural drainage for these soils ranges from well drained to very poorly drained. Where these soils can be managed for flooding and wetness, they are typically productive for agriculture. Soils in this category include Wick, Orrville and Sloan. Alluvial soils make up 5.0 percent of coastal counties' soils.

Lakebed Sediment Soils

These soils formed in lakebed (lacustrine) deposits from old glacial lakes that extended beyond what is now Lake Erie, primarily to the southwest, parallel to the present Maumee River. These sediments have a high clay content and a low sand content, and therefore the soils have relatively slow permeability. Most soils in this group are poorly or very poorly drained and are productive for agriculture if drained and managed carefully. Soils in this category include Toledo, Latty and Lenawee. These soils comprise 10.9 percent of the coastal counties' soils.

Off-shore Lake Sediment Soils

These soils formed in sediments in deltas, bars or beaches. They range in texture from sandy to silty in the upper 20 inches or more. Some of the soils are highly stratified. Natural drainage for these soils ranges from well drained or even excessively drained, to very poorly drained. Permeability is less restrictive for these soils than in the Lakebed Sediment Soils, making management for agriculture somewhat easier. Soil series common to the western coastal area generally are more fertile than their counterparts to the east. Examples are Mermill, Haskins and Conneaut soils. These soils make up 20.3 percent of the coastal counties' soils.

Glacial Till Soils

These soils formed on large relatively flat till plains or ground moraines. Glacial till is composed of debris from the glacier that was mixed, ground and compressed by the ice. Soils formed in glacial till range in texture and natural drainage, but layers, or horizons, below the subsoil are generally relatively dense and slowly permeable. The soils are generally well suited to row crops if subsurface drainage and, in some cases, surface drainage are provided. The most extensive soils are Hoytville, Mahoning and Mill. This large class of soils accounts for 54.6 percent of the soil in coastal counties. Seven different categories of Glacial Till Soils listed below are displayed spatially on the Glacial Till Map in this chapter.

- ***High lime, fine or fine-loamy, lake-planed till*** soils are common in the western coastal counties. Commonly the very poorly drained Hoytville soil is on broad flats and the somewhat poorly drained Nappanee soil is on slight rises in the landscape.
- ***High lime, fine or fine-loamy till*** soils are of relatively minor extent in the coastal counties, but they are extensive in the southwestern part of the Lake Erie basin. The very poorly drained Pewamo soil is common in depressions below broader areas of the somewhat poorly drained Blount soil.
- ***Shallow or moderately deep till over limestone*** soils are of relatively minor extent in the Lake Erie basin, but many land uses are severely limited by the presence of hard bedrock within 40 inches of the surface. The very poorly drained Millsdale soil is common on flats and in depressions and drainageways, and the well drained Milton soil is on slight rises in the landscape.
- ***Medium or low lime, fine or fine-loamy till*** soils are generally less fertile than soils formed in high lime till, to the west. Soils formed in low lime till are more common in the coastal counties than soils formed in medium lime till. The somewhat poorly drained Mahoning soil is extensive on nearly level and gently sloping landscapes, and the moderately well drained Ellsworth soil is common on gently sloping and steeper areas.
- ***Moderately deep till over sandstone or shale*** soils are of relatively minor extent in the Lake Erie basin, but many land uses are severely limited by the presence of bedrock within 40 inches of the surface. Shale is more common in areas of these soils than sandstone. Commonly, the poorly drained Allis soil is on flats, and the somewhat poorly drained Hornell soil is on nearly level and sloping areas.
- ***Low lime, finer loamy till*** soils are common in the eastern coastal counties. These soils generally have less clay in the subsoil than soils formed in fine or fine-loamy till. The poorly drained Mill soil is extensive on flats, and the some-

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what poorly drained Darien and Platea soils are common on nearly level and sloping areas.

- ***Low lime, coarser loamy till*** soils are common in parts of northeastern Ohio near the southern limit of the Lake Erie basin. The moderately well drained Canfield soil is the most common of these soils in the basin. These soils commonly have a non-clayey but dense layer in the subsoil that restricts permeability.

Glacial Stream Sediment Soils

These soils are common in valleys associated with glacial streams. The maps also show areas of this group of soils, particularly in the eastern coastal region, where beach ridge sediments contain gravel. Soils formed in glacial stream sediments range widely in texture and natural drainage, but areas of well drained soils are more common in this group than in any other. Soils with relatively rapidly permeable layers, or horizons, below the subsoil are also common. The soils are usually well suited to row crops if properly drained. Fitchville, Oshtemo, and Jimtown are the most common soils of this group. These valley soils make up 7.2 percent of the soils in the coastal counties.

Residual Soils

Residual soils are formed directly from bedrock material that is naturally present, such as sandstone or shale. Soils formed in residuum are typically well drained but vary in texture. Generally, soils formed over sandstone are coarser-textured than soils formed over shale, but both contain rock fragments. These soils are poorly suited to agriculture because of their limited moisture holding capacity. Some are in steep, wooded areas. Dekalb and Brecksville are the most commonly occurring of these soils in the coastal counties where they make up about 0.8 percent of the soils.

Non-soil Areas and Other Soils

This group includes areas where the soils have been disturbed during construction of highways and buildings. Impermeable surfaces such as concrete, blacktop and rooftops are dominant in many of these areas. Also included are areas where gravel, sand or tufa has been extracted for industrial purposes and areas that are submerged most of the time.

NATIONAL INVENTORY GROUPINGS

Technical soil groupings have been developed as criteria for the application of national legislation concerned with the environment and with agricultural commodity production. These groupings pertain to agricultural productivity and diversity, erosion potential, surface and groundwater quality, and maintenance of wetlands. Three such groupings are displayed spatially on maps in this chapter.

Prime Farmland

This is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops. To be considered prime, it must also be available for these uses. It has the soil quality, growing season and moisture supply needed to produce economically sustained high yields of crops when treated and managed according to acceptable farming methods, including water management. In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding.

The Prime Farmland Map illustrates that most areas in the western coastal counties meet criteria for prime farmland as long as subsurface drainage or surface drainage has been provided. Areas that cannot meet prime farmland criteria are more common in the eastern coastal counties. Soils that do not meet prime farmland include soils that have been converted to urban uses, soils that cannot be drained effectively, soils with insufficient moisture holding capacity, and soils with more than six percent slope.

Hydric Soils

These are soils that exhibit evidence that they have been saturated, flooded or ponded long enough annually to develop anaerobic conditions in the upper part. They make up part of the criteria for the identification of wetlands. Since areas within all soil map units delineated in soil survey publications include soils that vary from the soil series used in the map unit name, hydric soils constitute 100 percent of only the wettest of map units. Conversely, map units identified with moderately well drained soils in the map unit name may include relatively small areas in depressions or seeps that meet hydric soil criteria.

The Hydric Soils Map illustrates that a very high percentage of areas in most soil map units in the western coastal counties meets hydric soil criteria. Areas with a very high percentage of hydric soils are also common within several miles of the coast and in Ashtabula County. Areas with a very low percentage of hydric soils predominate elsewhere. The percentage of hydric soils is in the range of 45 to 65 percent in some map units near cities where areas of poorly drained and very poorly drained soils have been paved or built on and therefore no longer meet hydric soil criteria.

Highly Erodible Lands

These lands have been defined in order to identify areas on which erosion control efforts should be concentrated. The Food Security Act of 1985, as amended in subsequent farm bills, includes provisions that remove incentives to produce annually tilled agricultural commodity crops on highly erodible land unless cropland on such land is protected from excessive soil erosion. The definition is based on erosion indices derived from certain variables of the Universal Soil Loss Equation and the Wind Erosion Equation. These indices are the quotient of tons of soil loss by erosion predicted for bare ground divided by the sustainable soil loss, or "T factor."

Some soil map units are clearly defined as having slopes steep enough and long enough to meet highly erodible land criteria. Other soil map units are clearly defined as having so little slope or such short slopes that highly erodible land criteria cannot be met. Soil map units identified as "Potentially highly erodible land" require additional information to determine whether specific areas meet highly erodible land criteria.

The Highly Erodible Land Map illustrates that highly erodible land is rare west of a line extending southwest from Sandusky. On the other hand, much of the land east of Lorain County is potentially highly erodible. Most areas that sare definitively highly erodible are narrow and associated with valley slopes that extend above 800 feet in elevation. One notable exception is an area west of the Huron River in Erie County, in the Mud Brook watershed, where silty soils with low resistance to erosion are common on relatively short slopes.

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Background photo – Autumn Harvest

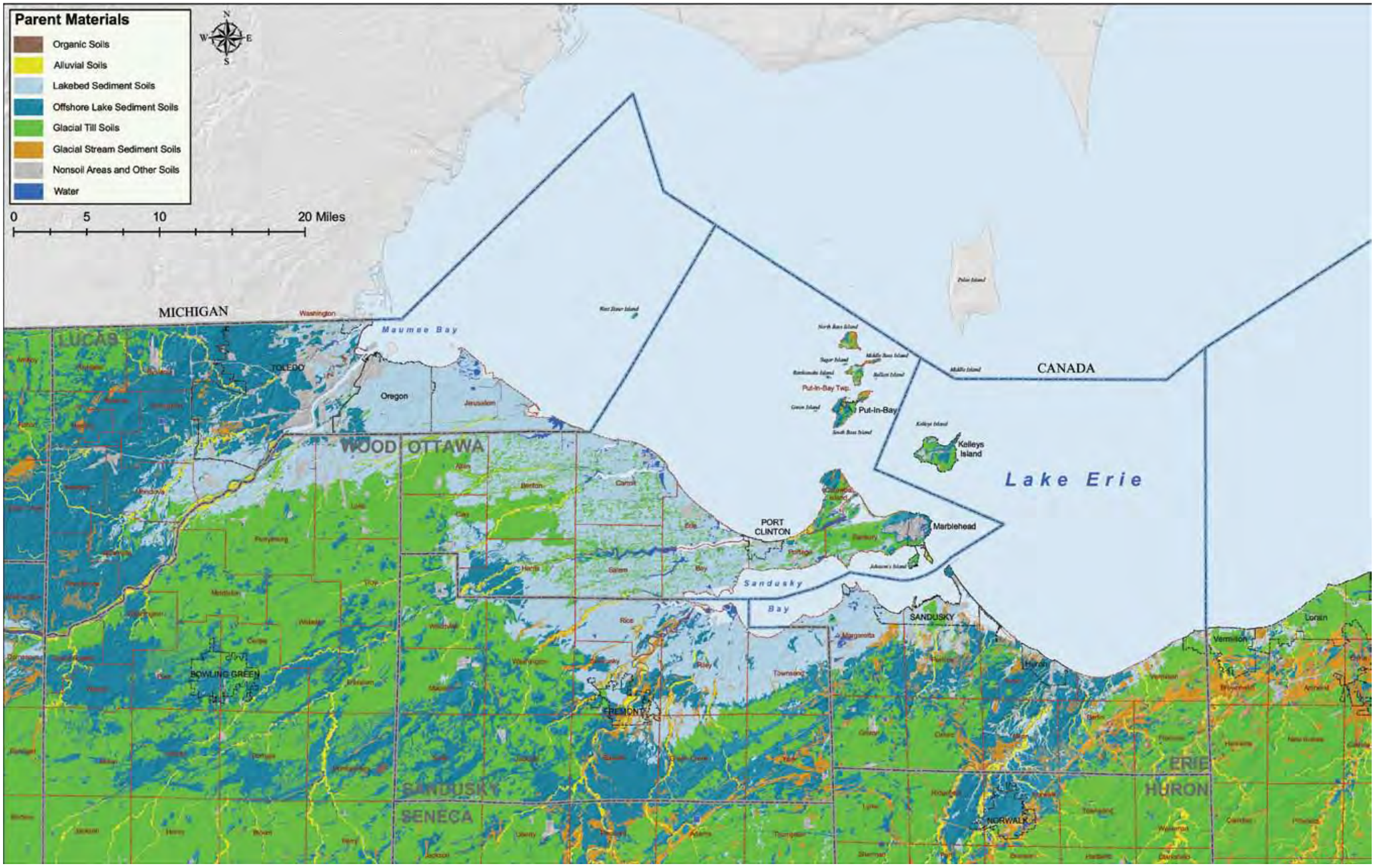
Soils by Parent Materials

Soil type: Hoytville

Sandpit in Fulton County

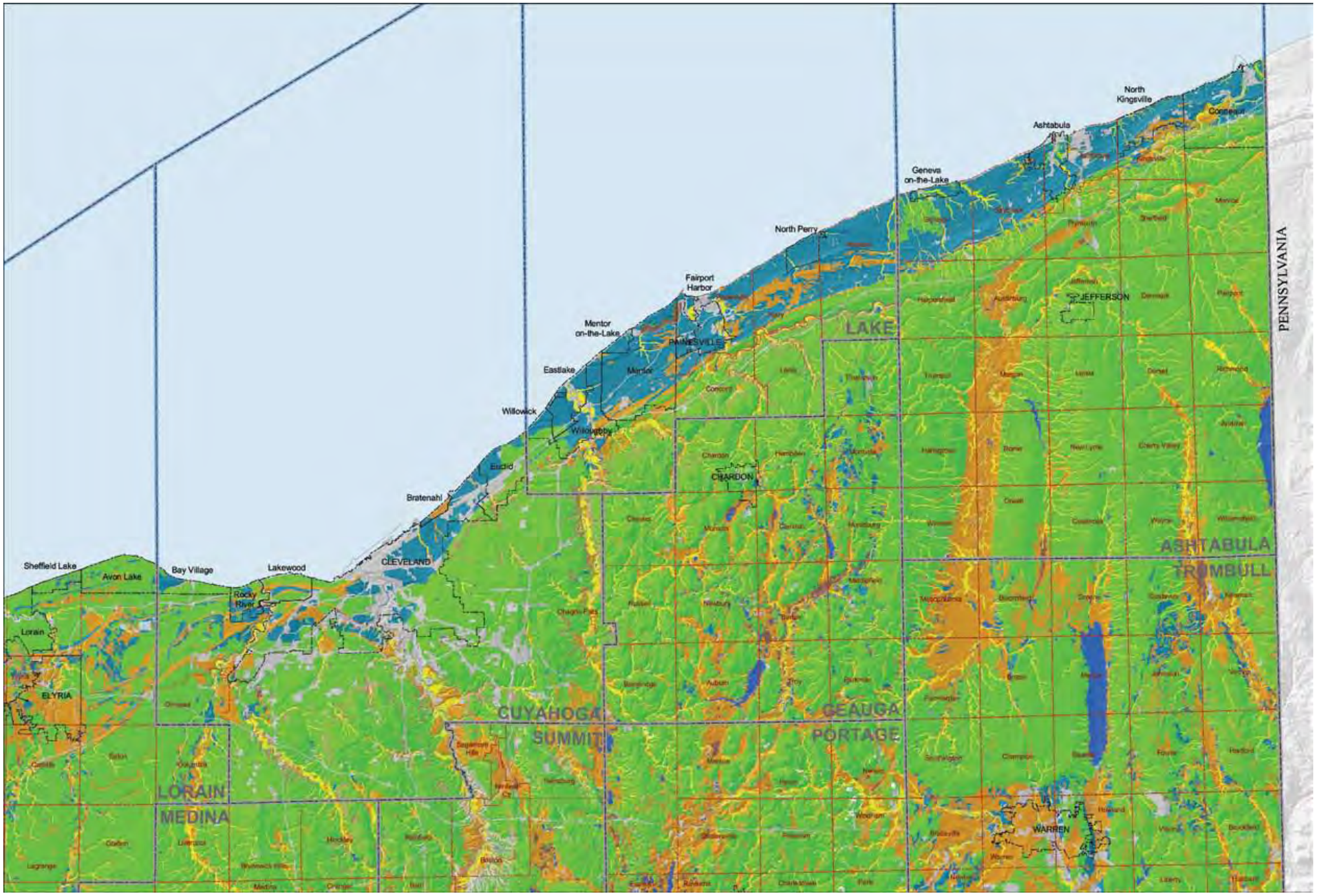
Soil type: Nappanee

Potholes in soil (see Glossary)



Map 34 GIS data citation in Appendices

Soils by Parent Materials



Map 34 GIS data citation in Appendices

Parent Materials

Soil scientists recognize five factors that account for differences in soils: parent material (material that the soil formed in), climate, topography, living organisms and time. Soil scientists currently recognize about 150 different soil series, the basic unit of soil classification, in the counties in Ohio's coastal region. Those 150 soil series can be grouped into seven general kinds of parent materials in which the soils formed, in the upper 20 inches or more.

The soils of Ohio's coastal region vary greatly from west to east. Glacial Till Soils with relatively high lime content and Lakebed Sediment Soils on a relatively flat landscape are common in the western part. Glacial Till Soils with relatively low lime content and loamy Off-shore Lake Sediment Soils along the steeper sloping Portage Escarpment are common in the eastern part. A separate map on the following pages shows the distribution of seven different categories of Glacial Till Soils, since these soils make up more than half of the coastal counties. Glacial Stream Sediment Soils and Alluvial Soils are less common in the coastal counties and located near streams. Residual Soils and Organic Soils are rare but significant. Soils that are very poorly drained are more common in the western part; they are very productive for agriculture when drained. Soils that are less fertile for agricultural production and prone to erosion are more common in the eastern reaches.

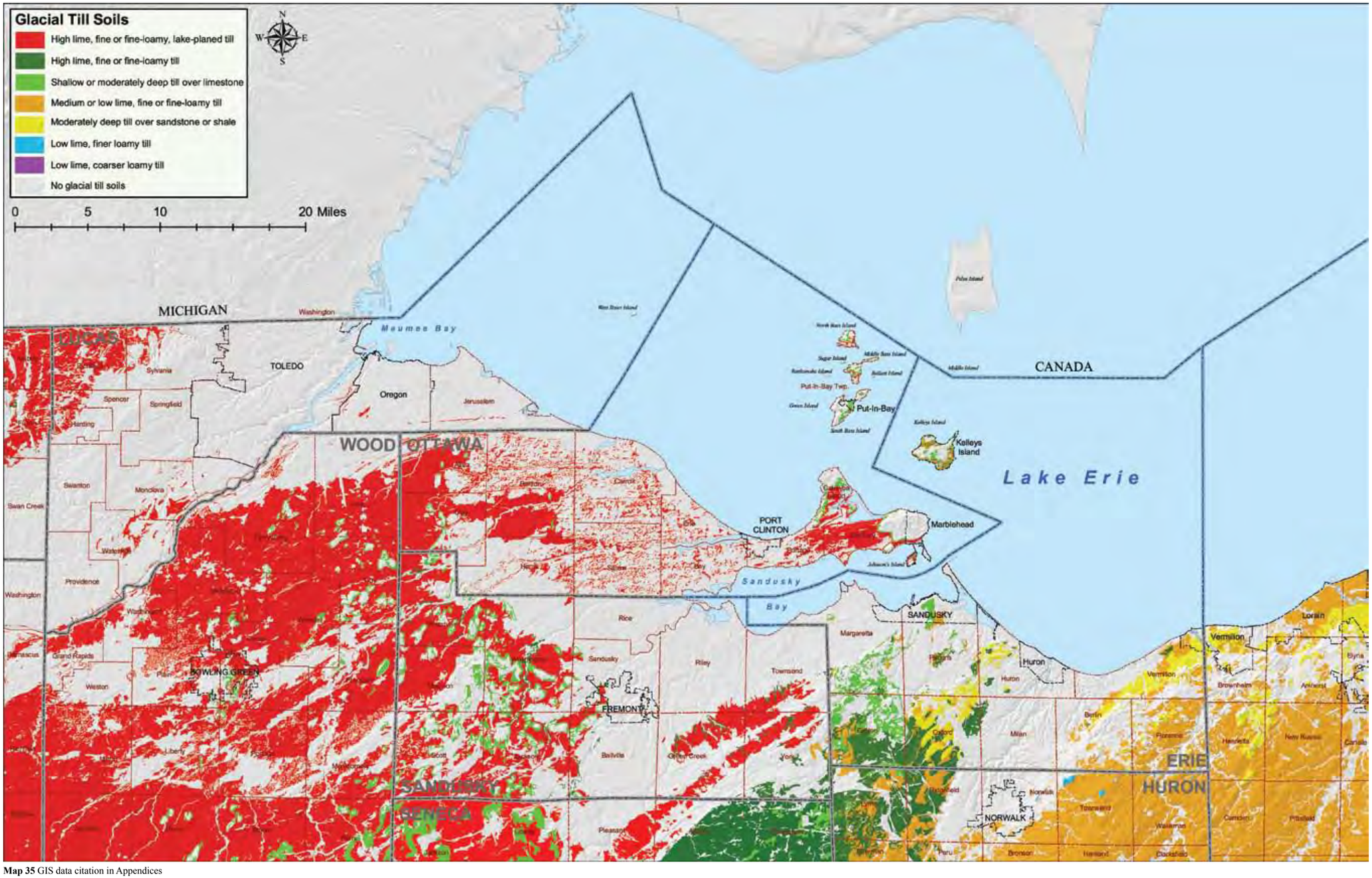
Glacial Till Soils

Corn harvest

Corn shocks in Geauga County

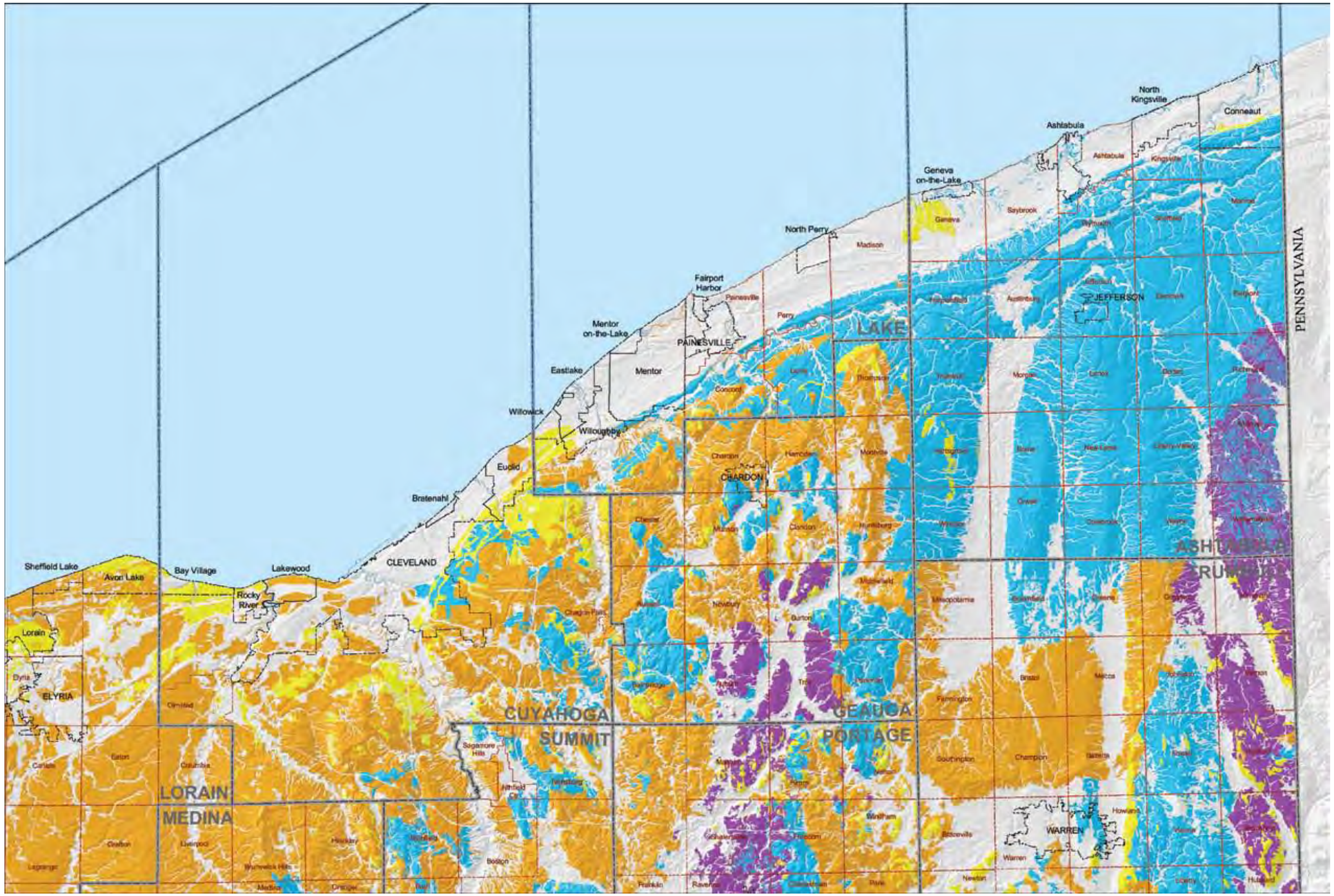
Farm application of manure into ground, Erie County

Soybean harvest west of Toledo



Map 35 GIS data citation in Appendices

Glacial Till Soils



Map 35 GIS data citation in Appendices

Glacial Till Soils

Glacial Till Soils occupy 54.6 percent of the land in coastal counties. Glacial till is composed of debris from the glacier that was mixed, ground and compressed by the ice. As a result, layers, or horizons, below the subsoil are generally relatively dense and slowly permeable.

Since glacial ice moved over limestone in the western part of the coastal area, the till has a relatively high concentration of limestone and dolomite. Glacial ice moved over sandstone and shale in the central and eastern parts of the coastal area, and so the till there has a relatively low concentration of limestone and dolomite. "High lime" soils are less acid in the topsoil and upper part of the subsoil and have better natural fertility than "low lime" soils. Glacial Till Soils on broad flats in the western part of the coastal area exhibit evidence that wave action "planed" glacial till deposits when they were submerged by a glacial lake.

Soils formed in "fine or fine-loamy" till typically have 35 to 55 percent clay in the subsoil, while soils formed in "loamy" till have as little as 15 percent clay in the upper part of the subsoil. Bedrock is deeper than 60 inches for most areas of Glacial Till Soils in the coastal counties, but areas where bedrock is "moderately deep" (i.e., within 20 to 40 inches) or even "shallow" (i.e., within 10 to 20 inches) are significant because of the impact of restricted soil depth on a variety of land uses.

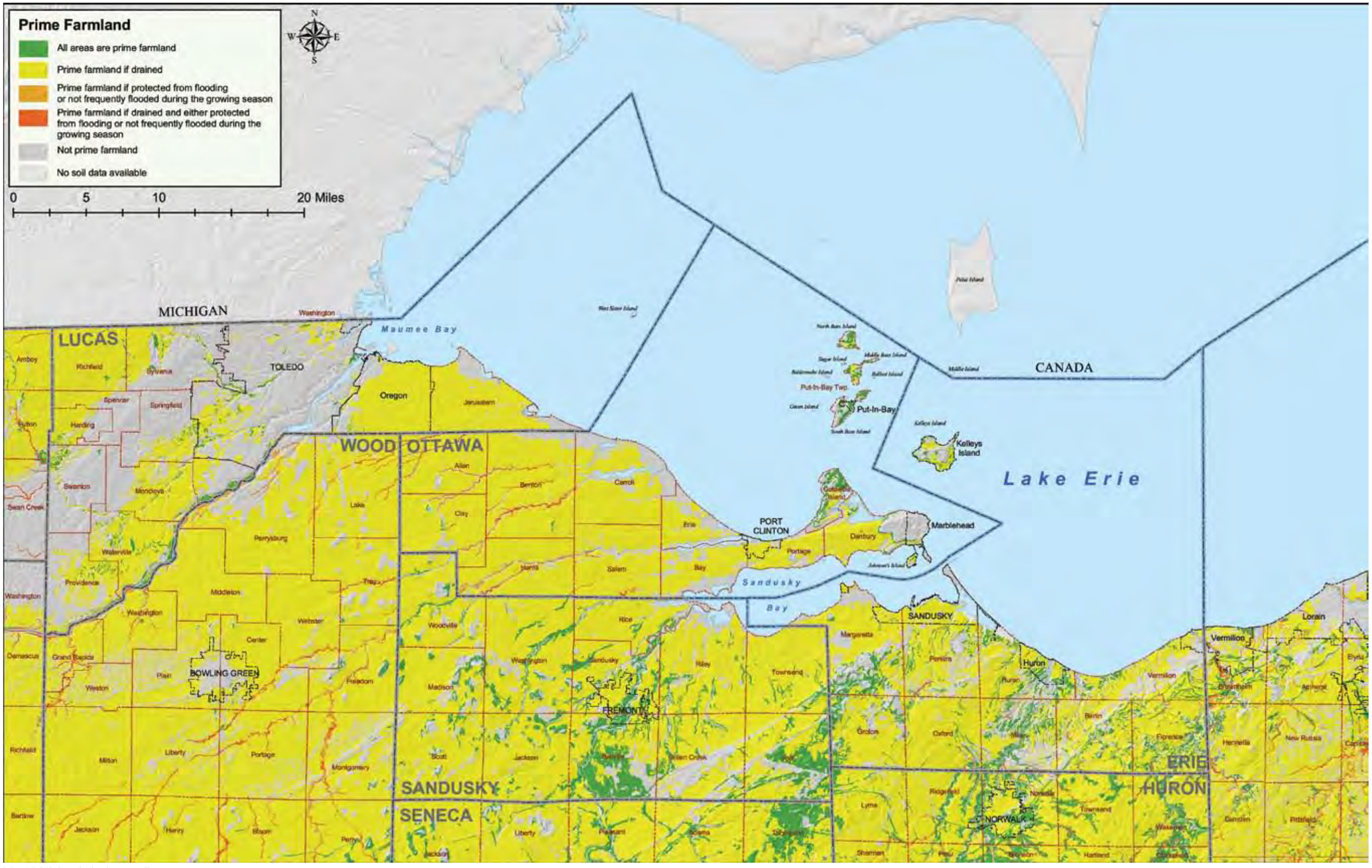
Prime Farmland

Agriculture industry

Cabbage patch, Sandusky County

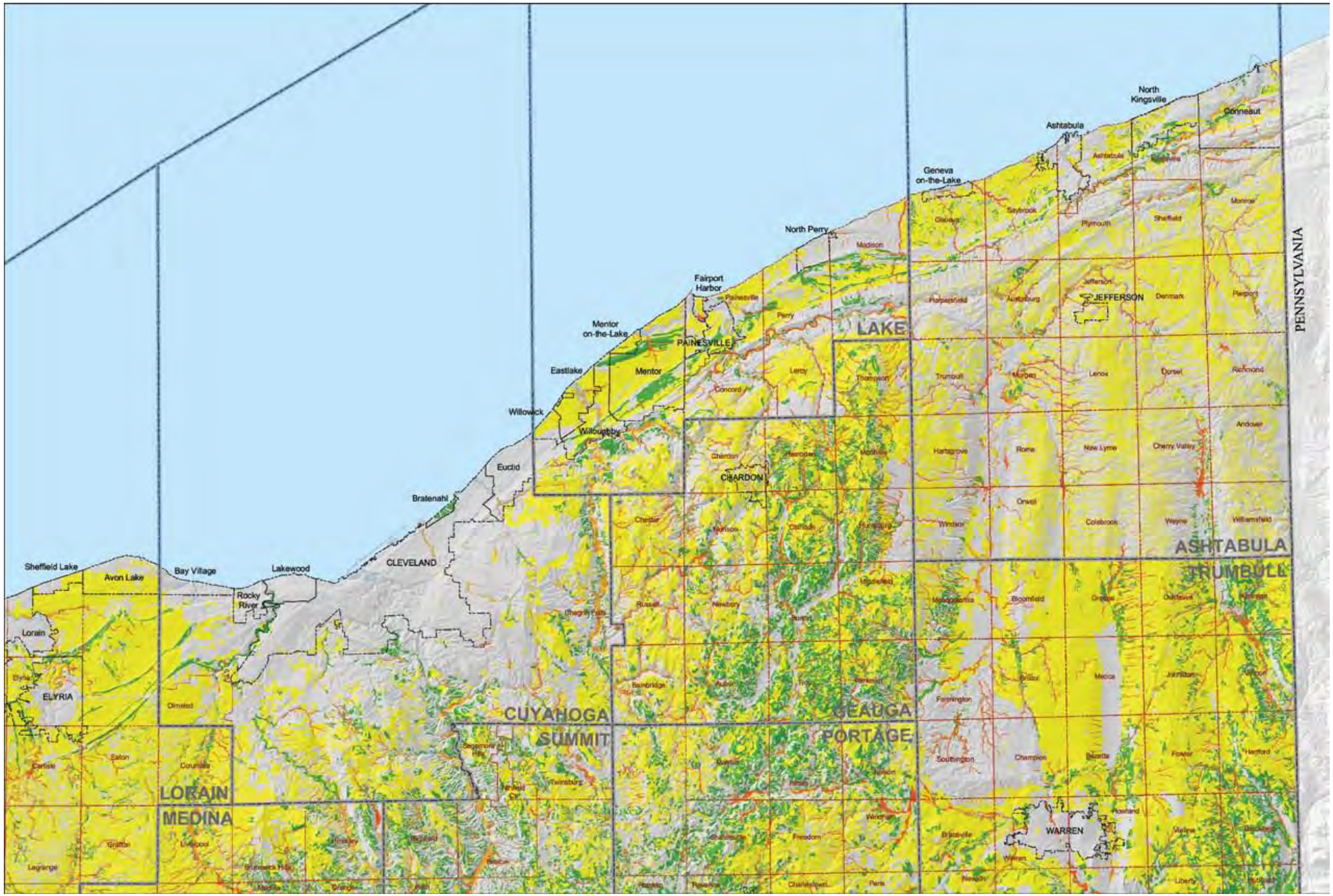
Grain elevator, Erie County

Harvest



Map 36 GIS data citation in Appendices

Prime Farmland



Map 36 GIS data citation in Appendices

Prime Farmland

Prime Farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops. It must also be available for these uses. It has the soil quality, growing season and moisture supply needed to produce economically sustained high yields of crops when treated and managed according to acceptable farming methods, including water management. In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding.

Most areas in the western coastal counties meet criteria for prime farmland as long as subsurface drainage or surface drainage has been provided. Areas that cannot meet prime farmland criteria are more common in the eastern coastal counties. Soils that do not meet prime farmland include soils that have been converted to urban uses, soils that cannot be drained effectively, soils with insufficient moisture holding capacity, and soils with more than six percent slope.

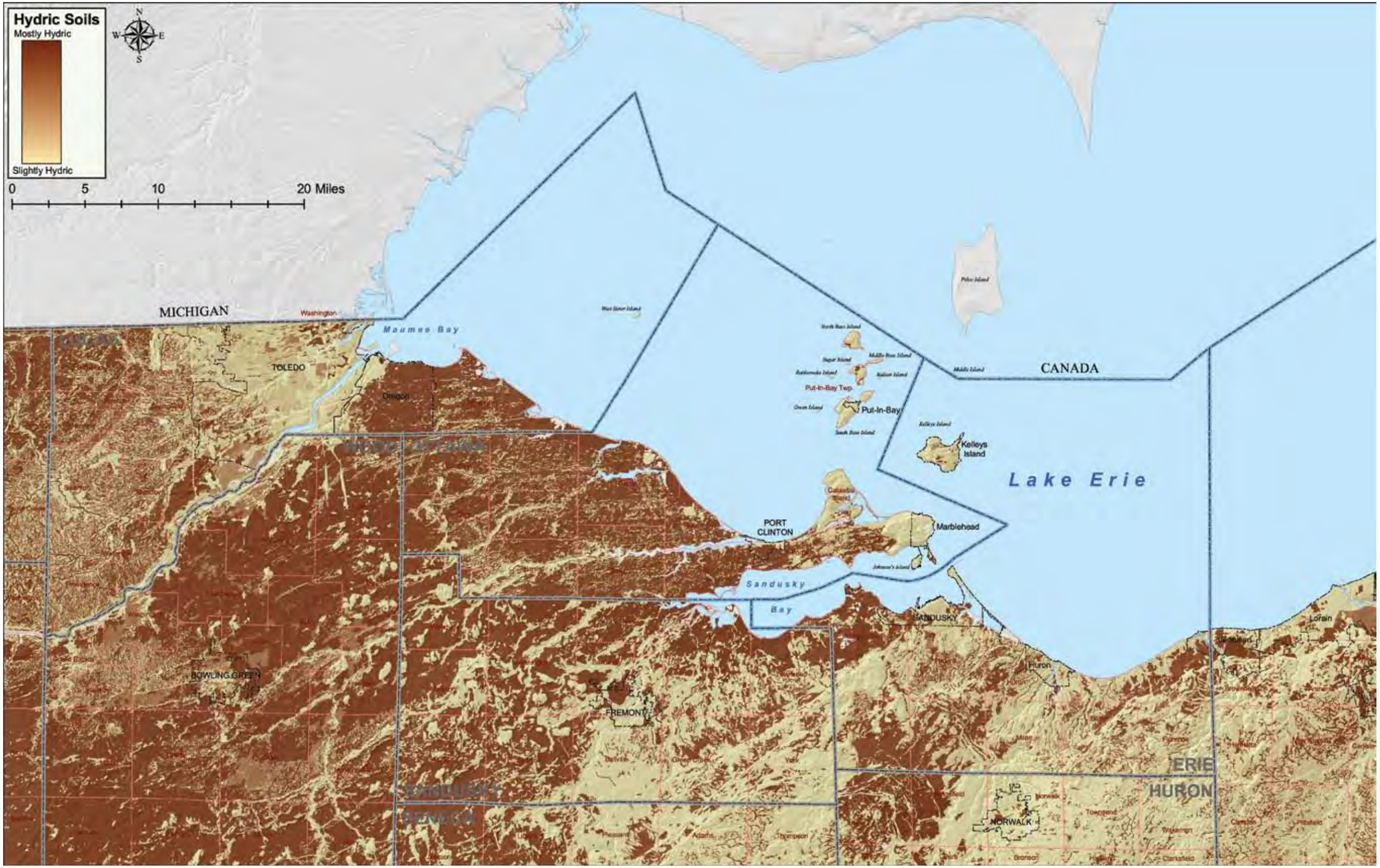
Hydric Soils

Tinker's Creek State Nature Preserve, Portage County

Magee Marsh State Wildlife Area, Ottawa County

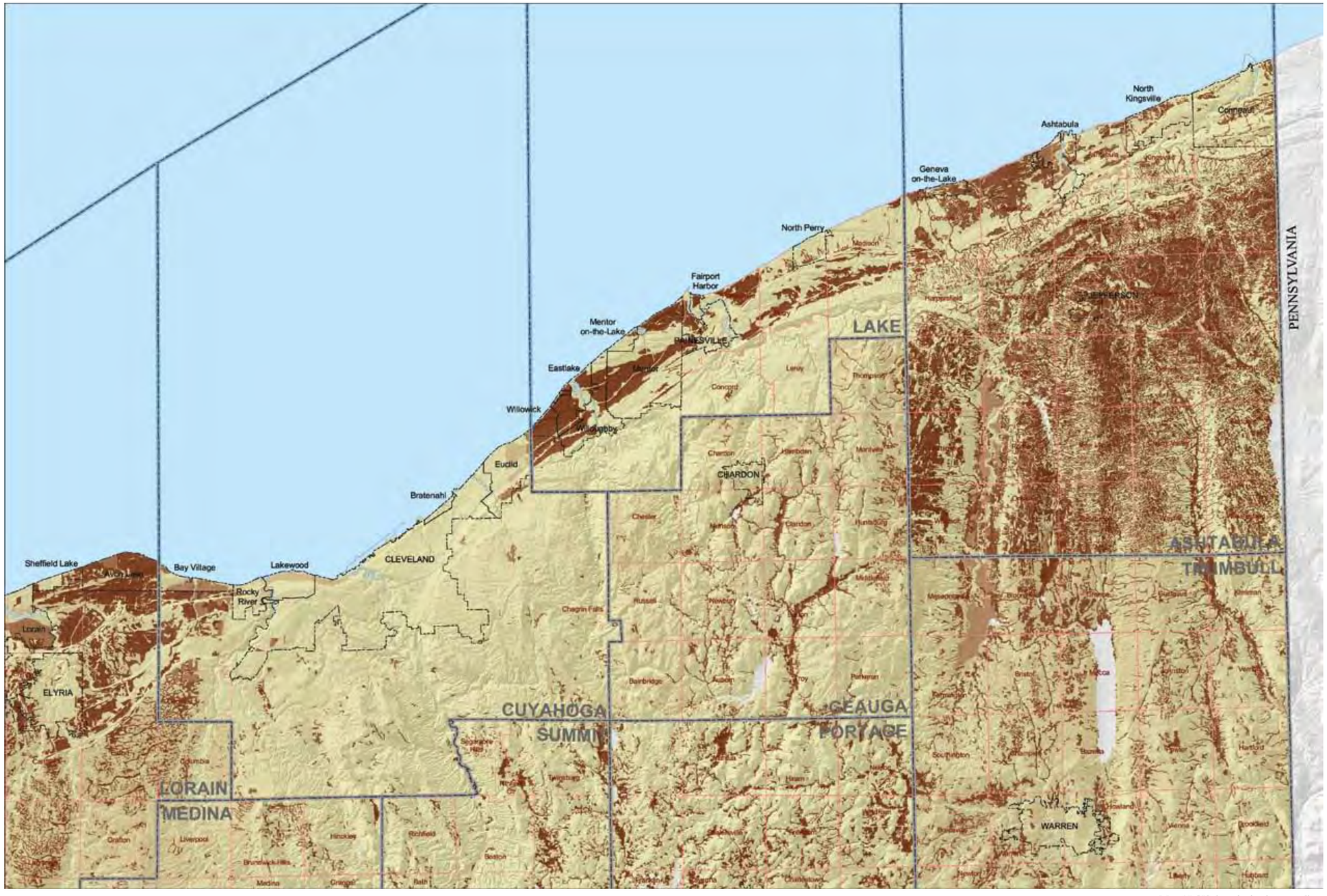
Great Egret

Pickerel Creek State Wildlife Area, Sandusky County



Map 37 GIS data citation in Appendices

Hydric Soils



Map 37 GIS data citation in Appendices

Hydric Soils

Hydric Soils exhibit evidence that they have been saturated, flooded or ponded long enough annually to develop anaerobic conditions in the upper part. Areas of hydric soils in the coastal counties were wetlands at the time of European settlement, before surface and subsurface drainage were provided. Since areas within all soil map units delineated in soil survey publications include soils that vary from the soil series used in the map unit name, hydric soils constitute 100 percent of only the wettest of soil map units. Conversely, map units identified with a moderately well drained soil series in the map unit name may include relatively small areas in depressions or seeps that meet hydric soil criteria.

These maps show the percentage of soils within delineated soil map units that meet hydric soil criteria. A very high percentage of areas in most soil map units in the western coastal counties meets hydric soil criteria. Areas with a very high percentage of hydric soils are also common within several miles from the coast and in Ashtabula County. Areas with a very low percentage of hydric soils predominate elsewhere. The percentage of hydric soils is in the range of 45 to 65 percent in some map units near cities where areas of poorly drained and very poorly drained soils have been paved or built on, and therefore no longer meet hydric soil criteria.

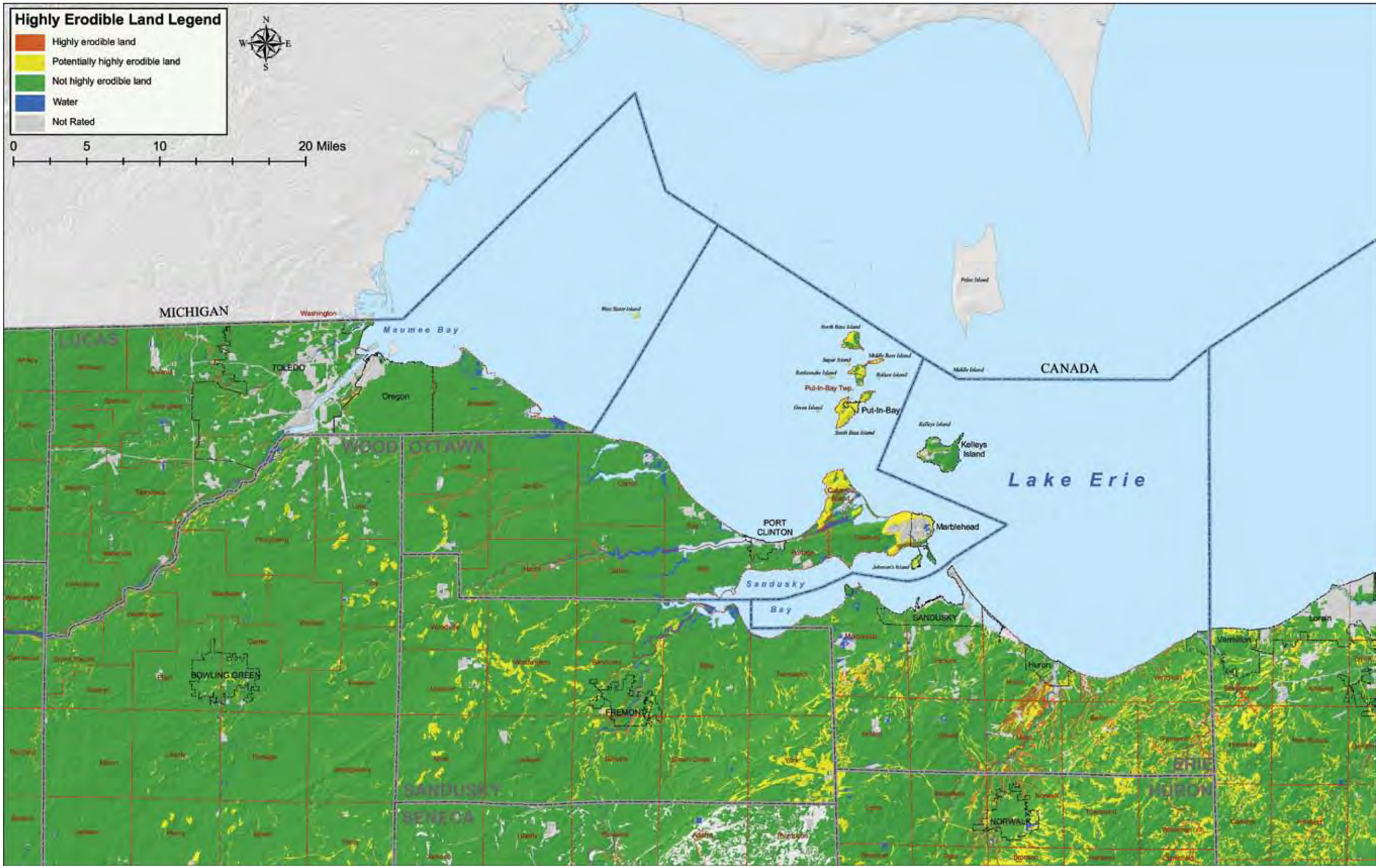
Highly Erodible Lands

Land slumping into Lake Erie, Ottawa County

Erosion in Ottawa County

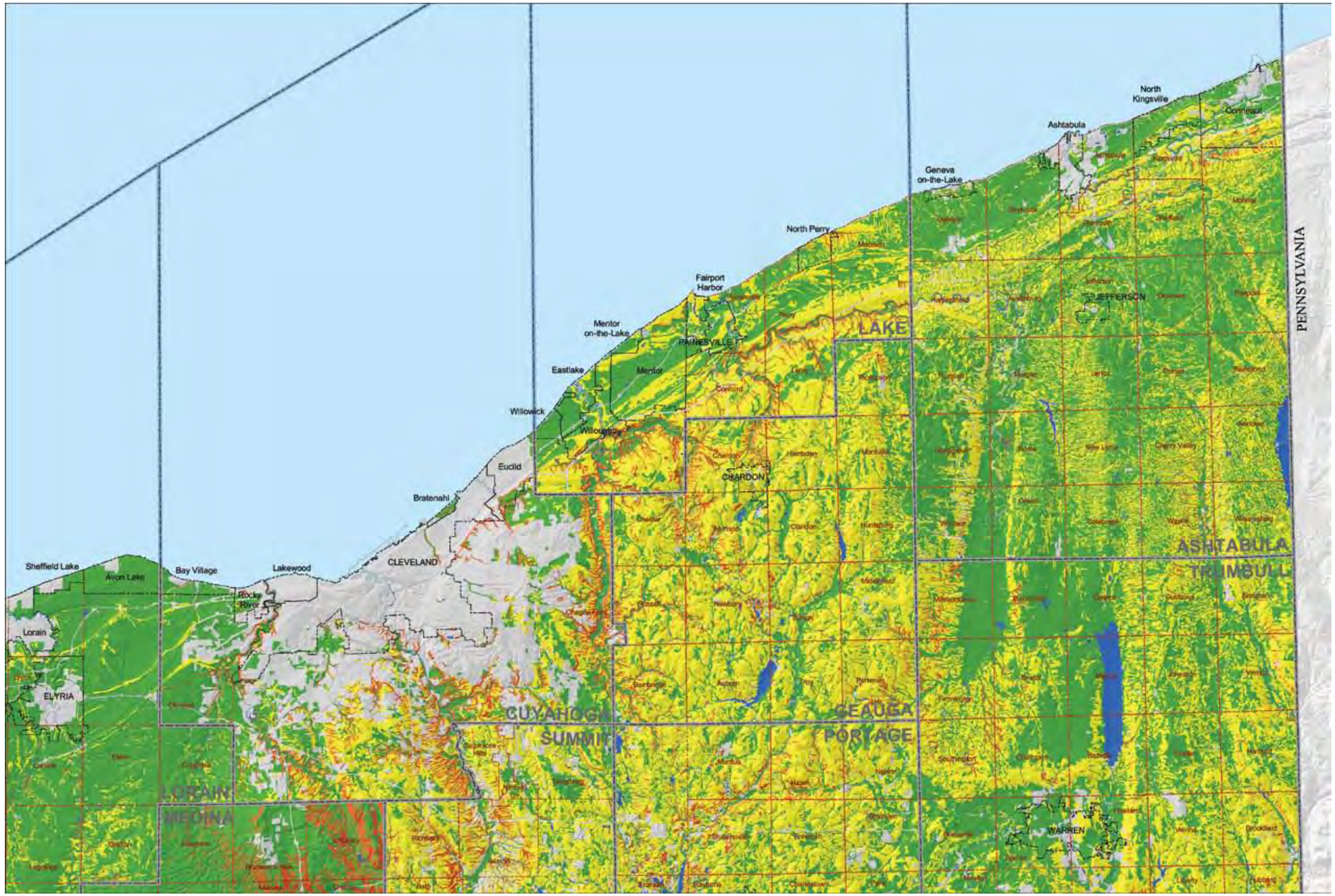
Wooded riparian corridor

Stream bank stability



Map 38 GIS data citation in Appendices

Highly Erodible Lands



Map 38 GIS data citation in Appendices

Highly Erodible Lands

Highly Erodible Lands have been defined in order to identify areas on which erosion control efforts should be concentrated. The Food Security Act of 1985, as amended in subsequent farm bills, includes provisions that remove incentives to produce annually tilled agricultural commodity crops on highly erodible land unless cropland on such land is protected from excessive soil erosion. The definition is based on erosion indices derived from certain variables of the Universal Soil Loss Equation and the Wind Erosion Equation. The indices are the quotient of tons of soil loss by erosion predicted for bare ground divided by the sustainable soil loss, or "T factor."

Some soil map units are clearly defined as having slopes steep enough and long enough to meet highly erodible land criteria. Other soil map units are clearly defined as having so little slope or such short slopes that highly erodible land criteria cannot be met. Thus, they are designated as "Not highly erodible." Soil map units identified as "Potentially highly erodible land" require additional information to determine whether specific areas within delineations meet highly erodible land criteria.

Highly erodible land is rare west of a line extending southwest from Sandusky. On the other hand, much of the land east of Lorain County is potentially highly erodible. Most areas that are definitively highly erodible are narrow and associated with valley slopes that extend above 800 feet in elevation. One notable exception is an area west of the Huron River in Erie County, in the Mud Brook Watershed, where silty soils with low resistance to erosion are common on relatively short slopes.