

Chapter 2

Description of Planning Area

I. Regional Population

A direct result of population is the volume of wastewater generated through private, commercial, or industrial activities. Areawide Water Quality Management Plans (AWQMPs) were developed in the mid-1970s to focus on long-term wastewater treatment planning. The TMACOG region includes Lucas, Ottawa, Sandusky, and Wood Counties in Ohio and Bedford, Erie, and Whiteford Townships in Monroe County Michigan. Since 1970, there has been a major decline in the population of Lucas County while Wood County has grown, and Ottawa and Sandusky Counties have remained similar. Compared to the other counties, Lucas has the greatest population at more than 430,000, which includes the region's largest city, Toledo with a population of greater than 270,000 (Table 2-1). Aside from the decreasing population in the City of Toledo since 2010, and increasing population in Perrysburg, most of the cities in the region have remained the same. Among the three townships in Michigan, Bedford Township has the greatest population with more than 31,000.

Table 2-1 Population in TMACOG region

Jurisdiction	1970 Population	2010 Population	2020 Population	Cities	2010 Population	2020 Population
Lucas County	484,370	441,815	431,279	Maumee	14,286	13,896
				Oregon	20,291	19,950
				Sylvania	18,965	19,011
				Toledo	287,208	270,871
				Waterville	5,523	6,003
Ottawa County	37,099	41,428	40,364	Port Clinton	6,056	6,025
Sandusky County	60,983	60,944	58,896	Bellevue	8,202	8,249
				Clyde	6,325	6,294
				Fremont	16,734	15,930
Wood County	89,722	125,488	132,248	Bowling Green	30,028	30,808
				Fostoria	13,441	13,046
				Northwood	5,265	5,160
				Perrysburg	20,623	25,041
				Rossford	6,293	6,299
Bedford Township		31,085	31,813			
Erie Township		4,517	4,299			
Whiteford Township		4,602	4,590			
Total		709,879	703,489			

Sources: [Decennial](#) Census 1970, 2010, 2020

II. Physical Setting

Geology

The TMACOG planning area is located within the Huron-Erie Lake Plains physiographic region that once was the bottom of a much larger ancient lake known as Lake Maumee (Ohio DNR, 2018). The region is an extremely flat plain with sandy beach ridges and dunes in the western portion (known as the Oak Openings) and the remaining areas marked by rich black soils and poor drainage (formerly the Great Black Swamp). The underlying bedrock that consists of limestone, shales, and sandstone wither in outcrops or near the surface. The geological features for the area are illustrated in Figure (2-1).

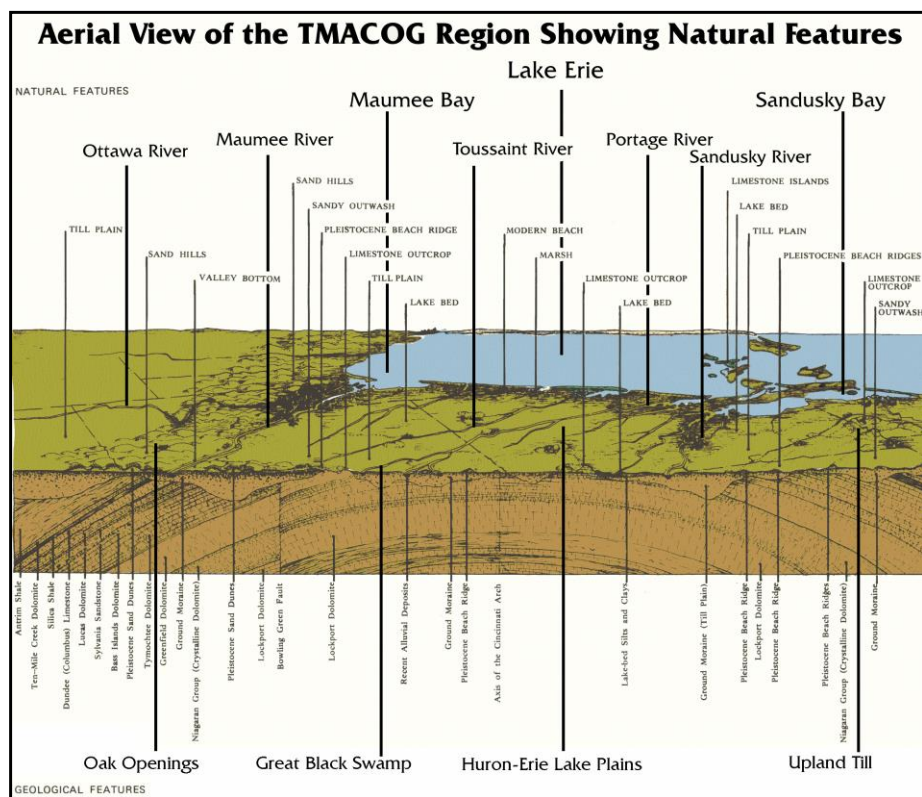


Figure 2-1: Geological Features in the TMACOG Region

Ecology

The last ice age to impact northwest Ohio and southeastern Michigan was the Wisconsin glaciation. As the glacier retreated, it left a flattened surface covered with impermeable clay. Lakes formed where

water was trapped between the retreating ice and higher land to the west. As the water levels dropped, sand dunes formed along the beach ridges and dense forests developed in lower swampy areas. The swamp became known as the Great Black Swamp, which covered approximately 1,500 square miles in northwest Ohio (Figure 2-2). In 1859, Ohio legislature passed the Ditching Law, allowing county commissioners to construct drainage ditches. As a result, the swamp was rapidly drained and by 1900, most of the region was converted to agricultural land with few remaining swampy areas.

The region's single most important natural habitat area is the Oak Openings Region (OOR), bordering the former Great Black Swamp (Figure 2-2). Considered as "One of America's Last Great Places" by The Nature Conservancy, the OOR is a sandy five-mile-wide swath that stretches southwestward over 80 miles through Wayne and Monroe counties in Michigan and Lucas, Henry, Fulton and Wood counties in Ohio (Green Ribbon Initiative, 2016). The unique geology of the region supports globally rare plant communities, including oak savanna, tallgrass prairie, and wet prairie. Since the first rare plant list was created in 1980, Lucas County has led the state with more rare plant species than any other county in Ohio.

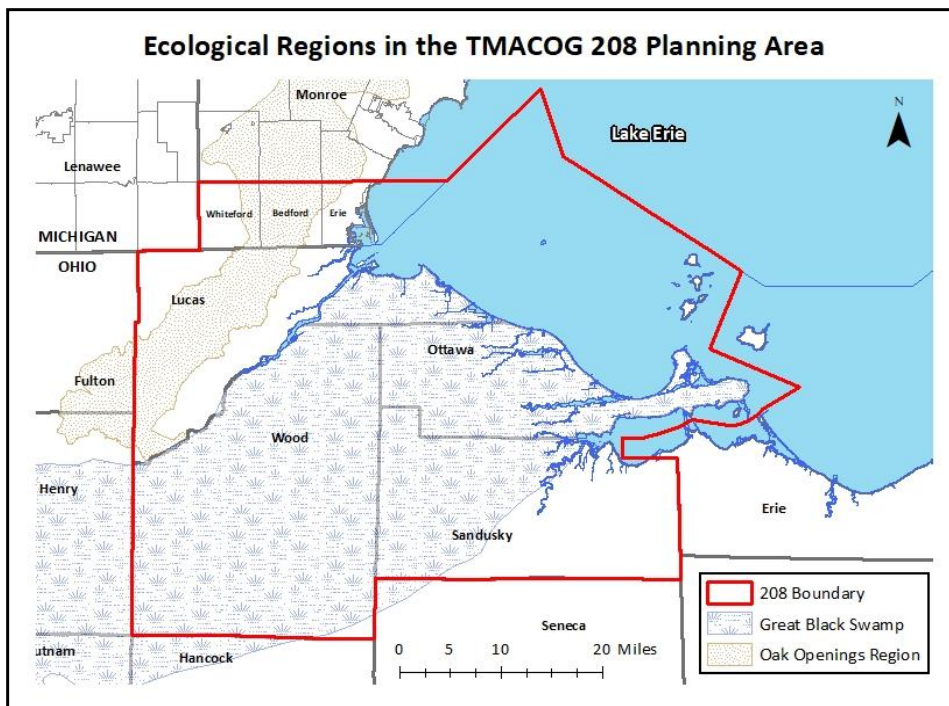


Figure 2-2: Ecological Regions in the TMACOG Region

Lake Erie

Lake Erie is one of Ohio's most valuable natural resources and is essential for economic development. The lake provides water for drinking and industry, shipping of commodities, commercial fishing, waterborne transportation, and recreation. It was estimated that total tourism annual spending exceeds \$14 billion which helps support more than 120,000 jobs (Lake Erie Foundation 2018). Ultimately the purpose of this entire AWQMP is to protect Lake Erie and sustain the regional quality of life.

Lake Erie is the shallowest, smallest by volume, and most productive of the Great Lakes. Because it is the shallowest, it is also the warmest and is also the first lake to freeze in the winter. Because it is the smallest, it has the shortest retention time of 2.6 years. Despite being the smallest lake, its fish population accounts for an estimated 50% of all fish inhabiting the Great Lakes. Lake Erie is divided into eastern, central, and western basins. The Eastern Basin has an average depth of 80 feet and holds lake water 322 days. The Central Basin is the largest, with an average depth of 60 feet and a retention time of 635 days. The TMACOG region is on the Western Basin, which has an average depth of 24 feet and a retention time of 51 days (Bolsenga and Herdendorf, 1993).

Rivers and Watersheds

All drainage in the TMACOG region flows to western Lake Erie. The three primary rivers draining the region include the Maumee, Portage, and Sandusky.

Maumee River

The Maumee River is the largest Great Lakes tributary, draining all or part of 17 Ohio counties, two Michigan counties, and five Indiana counties. The total river basin covers 8,316 square miles. The Maumee mainstem begins in Fort Wayne, Indiana at the confluence of the St. Joseph and St. Mary's rivers then flows northeasterly through Defiance and Toledo, Ohio. Along the way the Maumee is joined by several major tributaries: Tiffin, Auglaize, and Blanchard Rivers. In Wood and Lucas Counties, several smaller streams flow into the Maumee: Beaver Creek and Tontogany Creek from the south, and Swan Creek in downtown Toledo. Most drainage flows through the tributaries, and then into the Maumee. The Maumee's gradient is 2.0 feet per mile from Grand Rapids in Wood County to Point Place near its mouth, with the steepest section between Waterville and Maumee, at 5.0 feet per mile (Forsyth, 1968).

Portage River

The Portage is a Black Swamp river, draining a large part of Wood County, smaller parts of Hancock, Ottawa, and Sandusky Counties, and a small area in Seneca County. The total river basin covers 581 square miles. The headwater streams are the only part of the basin with substantial fall, especially in Hancock County, in the Defiance Moraine. Most of the remaining areas of the basin are very flat and historically were covered with wet prairies and forests, and shallow lakes with little natural drainage. Settlement and farming were made possible only through draining the swamp and preventing floods. The headwater streams of Brush Creek, Yellow Creek, and West Creek originally flowed into the Portage North Branch but were cut off through the Jackson Cutoff Ditch in 1878-1879. Today the Jackson Cutoff Ditch flows into the Maumee River through Beaver Creek. In Oak Harbor, the Portage broadens into

“Portage Pond,” the lacustrine area. This lower reach is strongly influenced by Lake Erie and wind-driven seiche events. The highest headwater tributary is the East Branch, starting at 855 feet above sea level in Hancock County. The lowest headwater stream is the North Branch, starting at 700 feet above sea level where it was cut off from Brush Creek in Wood County. The mainstem of the river is over 60 miles with gradient ranges from 2.1 to 4.7 feet per mile down to Lake Erie at 573 feet above sea level (Ohio DNR, 1965).

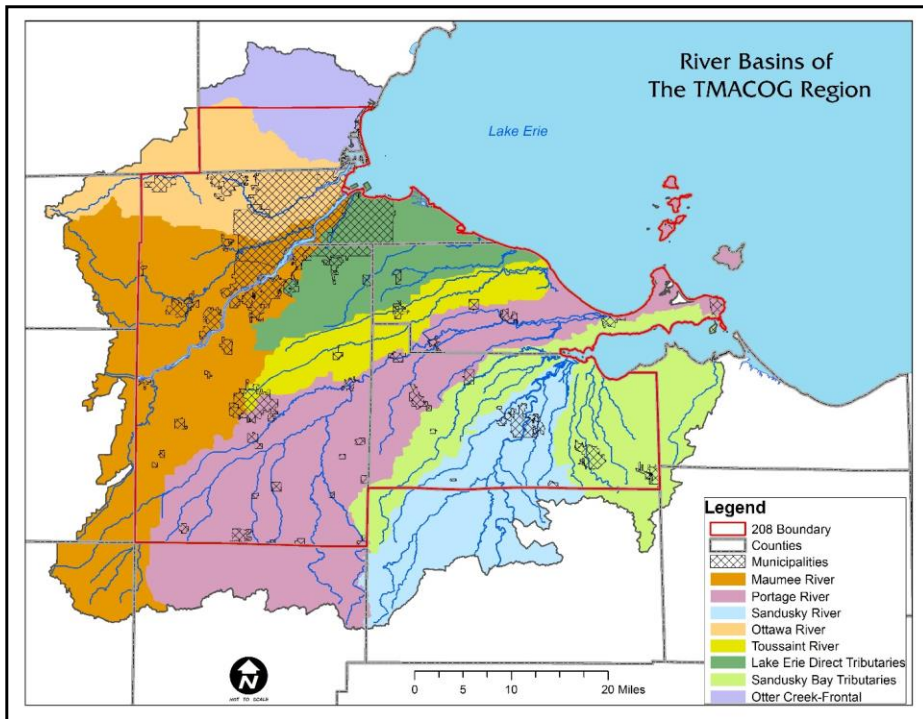


Figure 2-3: Major Watersheds of the TMACOG Region

Sandusky River

The Sandusky River is the second largest Ohio Lake Erie tributary with a drainage area of 1,421 square miles. The Sandusky drains parts of 10 counties, with the central part of the basin covering Sandusky, Seneca, Wyandot, and Crawford Counties. The Sandusky River basin is different geologically from the Maumee and Portage, in that only the lower portion of the river is in the Huron-Erie Lake Plains Eco-Region; the upper watershed has more relief from moraine deposits. Overall, the Sandusky has a gradient of 3.9 feet per mile from its headwaters to mouth at Sandusky Bay (Sandusky River Watershed Coalition, 2002). In the TMACOG region, the principle tributaries are Muskellunge Creek, which drains

central Sandusky County; Wolf Creek, which flows northeast from Fostoria and joins the Sandusky in Beallville Township; and Bark Creek, which flows north through eastern Fremont and into the Sandusky near Wightman's Grove in Riley Township.

III. Designated Uses for Water in the Planning Area

Water Quality Standards

USEPA signed a final rule updating the federal water quality standards regulation which helps implement the Clean Water Act (CWA). The final rule was published in the Federal Register on August 21, 2015 (80 FR 51019) to replace the previous regulation that had been in place since 1983; it is available in the Code of Federal Regulations (CFR) Title 40: Protection of Environment, Part 131 – Water Quality Standards. States are responsible for reviewing, establishing, and revising water quality standards. As recognized by Section 510 of the CWA, States may develop water quality standards more stringent than required by the federal regulation. Ohio EPA's water quality standards were reorganized in February 2017 and are available in the Ohio Administrative Code 3745-1. Michigan's water quality standards were filed in January 2006 and are available in the State of Michigan's Part 4 Rules.

Water quality standards consist of two distinct elements: designated uses (USEPA, 2012) and numerical or narrative criteria (USEPA, 2017) designed to protect and measure attainment of the uses (Figure 2-4). The designated uses in the figure below represent examples; states may identify their own designated uses for monitoring the quality of water. For example, Ohio EPA addresses human health, recreation, aquatic life, and public drinking water supply; Michigan Department of Environment, Great Lakes, and Energy (EGLE) addresses navigation, industrial water supply, agriculture, aquatic life and wildlife, fish consumption, and body contact.

Designated Use	Description
Protection and propagation of fish, shellfish and wildlife	Coldwater fish, warmwater fish, shellfish, aquatic flora, waterfowl, shore birds, and other water-oriented wildlife
Recreation	Primary contact – swimming, water-skiing, skin-diving, surfing, other activities likely to result in immersion. Secondary contact – boating, wading, and rowing
Public drinking water supply	Waters that are the source for drinking water supplies and often includes waters for food processing
Agricultural, industrial, navigational and other purposes	Agricultural – waters that are suitable for irrigation of crops, consumption by livestock, support of vegetation for range grazing. Industrial – industrial cooling and process water supplies. Navigation – waters used for commerce

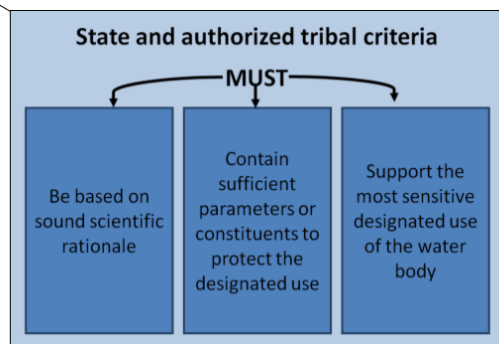


Figure 2-4: Water Designated Uses

Water quality criteria used to protect the specific designated uses include several parameters:

- Physical: temperature, acidity (pH), turbidity, and suspended solids.
- Chemical: dissolved oxygen, biochemical oxygen demand, electrical conductivity, nutrients (various forms of phosphorus and nitrogen), pesticides, metals (copper, lead, mercury, zinc, etc.), polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and toxins.
- Biological: pathogens (*Escherichia coli*, total and fecal coliforms, etc.), index of biotic integrity (IBI), invertebrate community index (ICI), and cyanobacteria.
- Additional: physical habitat information (qualitative habitat evaluation index (QHEI)).

Integrated Report

State environmental agencies are required by the CWA to provide the USEPA with an assessment of the quality of the State's waters [Section 305(b)], a list of waters that do not support their designated uses or attain Water Quality Standards and require the development of Total Maximum Daily Loads (TMDLs)

[Section 303(d)], and an assessment of status and trends of publicly owned lakes (Section 314). Ohio EPA and Michigan EGLE combine these reports as Integrated Reports, which are updated every two years. The main goal of the Integrated Report is to describe the attainment status of surface waters at the watershed scale relative to the uses specified by the State environmental agency.

The current reports for Ohio and Michigan are:

- The Ohio EPA 2020 Integrated Water Quality Monitoring and Assessment Report
- The Water Quality and Pollution Control in Michigan 2020 Sections 303(d), 305(b), and 314 Integrated Report *Lake Erie*

The Western Lake Erie Basin (WLEB) extends from the Ohio – Michigan shorelines to Marblehead and is bordered to the north by Canada (Figure 2-5). Ohio EPA divides the western's basin into shoreline and open water. The shoreline area is defined as the portion that extends out to and including a depth of three meters from the shore; the open water is the area in Ohio beyond three meters. Lake Erie islands shoreline includes South Bass Island, Middle Bass Island, North Bass Island, Kelleys Island, West Sister Island, and other small islands) (Ohio EPA, 2018).

In 2016, Michigan EGLE announced its designation of the Michigan waters of Lake Erie as impaired to due to excessive levels of phosphorus that promotes algal blooms which adversely impact aquatic life and other wildlife (Michigan EGLE, 2016). In 2018, Michigan EGLE similarly declared Lake Erie impaired for public drinking water used. In 2016, Ohio EPA assessed the shoreline area of the WLEB and identified all four beneficial uses (aquatic life, recreation, human health, and public drinking water) as impaired (Ohio EPA, 2016). Ohio EPA's position on the assessment and designation of Lake Erie's open waters had been that since they are multi-jurisdictional and multi-national, that USEPA should take the lead on setting targets and assessment methods. However, there had been no progress establishing federal targets for the lake, so Ohio EPA proceeded with considerable aid of several universities and NOAA, to develop a method for assessing the open waters. The 2020 Ohio Integrated report released long-awaited public drinking water and recreational use impairment designations for the open waters of the WLEB. The full list of impairment designations made by the Ohio EPA in 2018 for the Lake Erie assessment units are shown in Table 2-2 that correlates with Figure 2-5 (Ohio EPA, 2020). With the release of the 2020 Ohio Integrated Report, Ohio EPA announced that it will develop a Maumee nutrient TMDL within two to three years, a process it began in 2021. [In September 2023 US EPA approved the Maumee Watershed Nutrient TMDL.](#)

Table 2-2: Impairment designations for the western Lake Erie basin.

Assessment Unit Name	Recreational Use	Public Drinking Water	Human Health Use	Aquatic Life Use
Lake Erie Islands Shoreline OHLE041202000101	Impaired; TMDL needed	Impaired; TMDL needed	Impaired; TMDL needed	Impaired; TMDL needed
Western Basin Shoreline OHLE041202000201	Impaired; TMDL needed	Impaired; TMDL needed	Impaired; TMDL needed	Impaired; TMDL needed
Sandusky Basin Shoreline OHLE041202000202	Impaired; TMDL needed	Impaired; TMDL needed	Impaired; TMDL needed	Impaired; TMDL needed
Western Basin Onshore Areas	-	-	-	-
Sandusky Basin Onshore Areas	-	-	-	-
Western Basin Open Water OHLE041202000301	Impaired; TMDL needed	Impaired; TMDL needed	Impaired; TMDL needed	Use attainment unknown
Sandusky Basin Open Water OHLE041202000302	Use attaining	Impaired; TMDL needed	Impaired; TMDL needed	Use attainment unknown

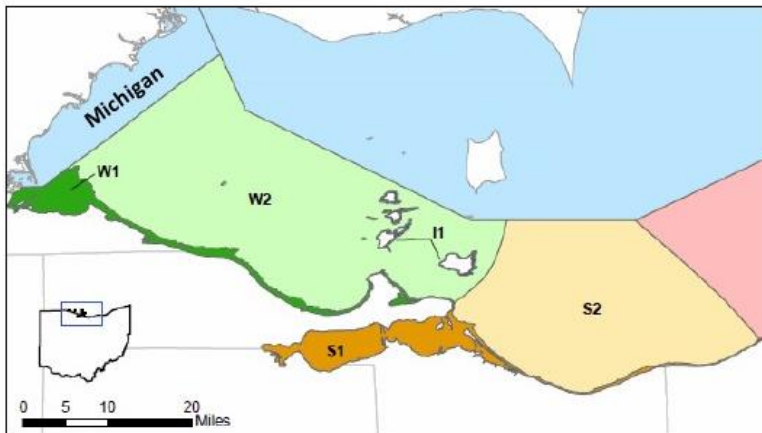


Figure 2-5: Lake Erie Assessment Units. W1 – Western Basin Shoreline ($\leq 3\text{m}$); W2 – Western Basin Open Water ($>3\text{m}$); I1 – Islands Shoreline ($\leq 3\text{m}$); S1 – Sandusky Basin Shoreline ($\leq 3\text{m}$); S2 – Sandusky Basin Open Water ($>3\text{m}$).

Details for all the HUC 12 watersheds and their use assessments in the TMACOG region are provided in Appendix A. The following figures summarize the watershed attainment status for Public Drinking Water Supply, Recreational Use, Human Health Use, and Aquatic Life Use. Appendix A and the figures below were developed using data from Ohio's [2018-2022 Integrated Water Quality Monitoring and Assessment Report](#) and [Michigan EGLE's 2016 the Water Quality and Pollution Control in Michigan 2022 Sections 303\(d\), 305\(b\), and 314 -Integrated Report](#). All data and maps ~~will have been~~ fully updated with ~~2022~~ data from the Ohio and Michigan integrated reports ~~in the 2021-208 Plan update~~.

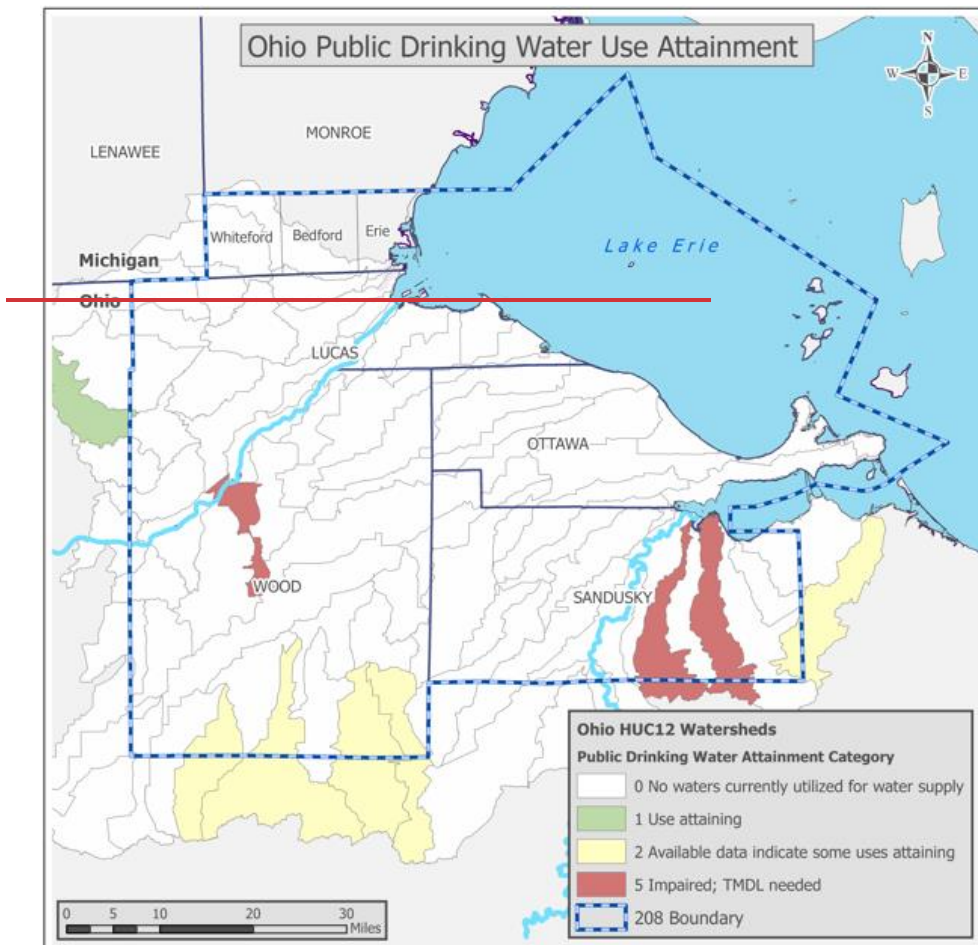
Public Drinking Water Supply

Figure 2-6 shows water quality attainment for the public drinking water supply use designation. Several municipalities in Sandusky County, central and southern Wood County and western Lucas County draw water from streams and use offline reservoirs. Most of the watersheds in the TMACOG region are not assessed for this designated use because there are no public water supplies in these watersheds. There are no waters assessed for public water supply by Michigan EGLE within the TMACOG region. - In Ohio, the bodies with one or more the following characteristics are designated public water supply:

- All publicly owned lakes and reservoirs, except for Piedmont reservoir;
- All privately owned lakes and reservoirs used as a source of public drinking water;
- All surface waters within 500 yards of an existing public water supply surface water intake;
- All surface waters used as emergency water supplies

Ohio's water quality standards for Public Drinking Water Supply are detailed in Section H of the

Integrated Report.



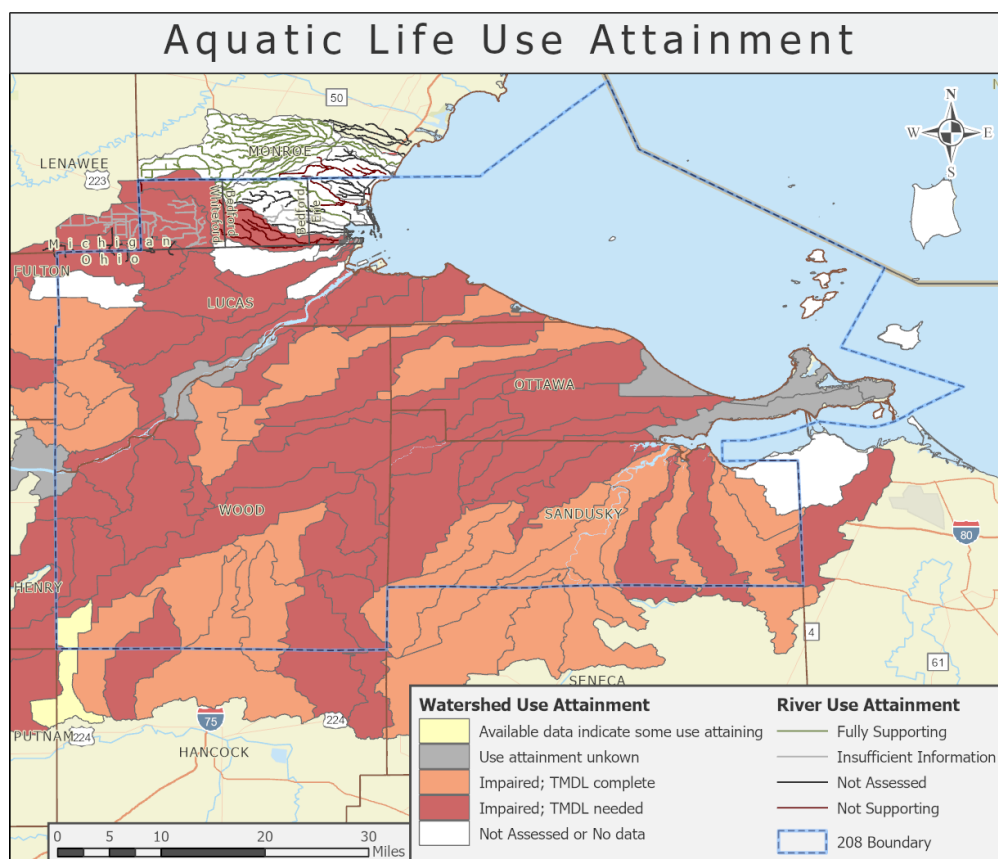
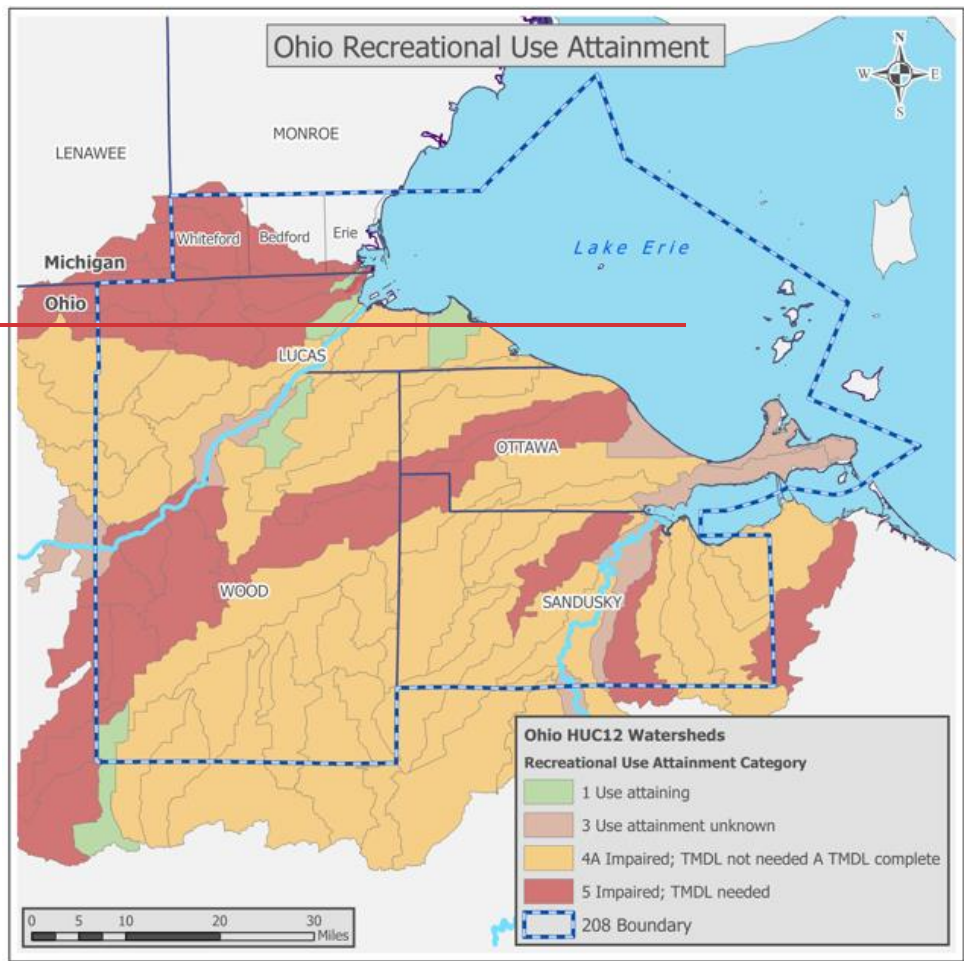


Figure 2-6: Watershed Use Attainment for Public Drinking Water Supply

Recreational Use

Figure 2-7 shows water quality attainment for the recreational use designation. Watershed use attainment for recreation is based principally on [the parameters of](#) bacterial contamination, [which is](#) measured by the levels of *Escherichia coli* [and pathogens](#) in the water. Most of the watersheds in the region are impaired for recreational use with only a few in attainment.

Ohio's water quality standards for Recreational Use are detailed in Section F of the Integrated Report. Michigan's water quality standards for Recreational Use are provided in Chapter [34](#) Section [34.7](#) [Partial Body Contact Recreation And Total Body Contact Recreation](#) of the Integrated Report.



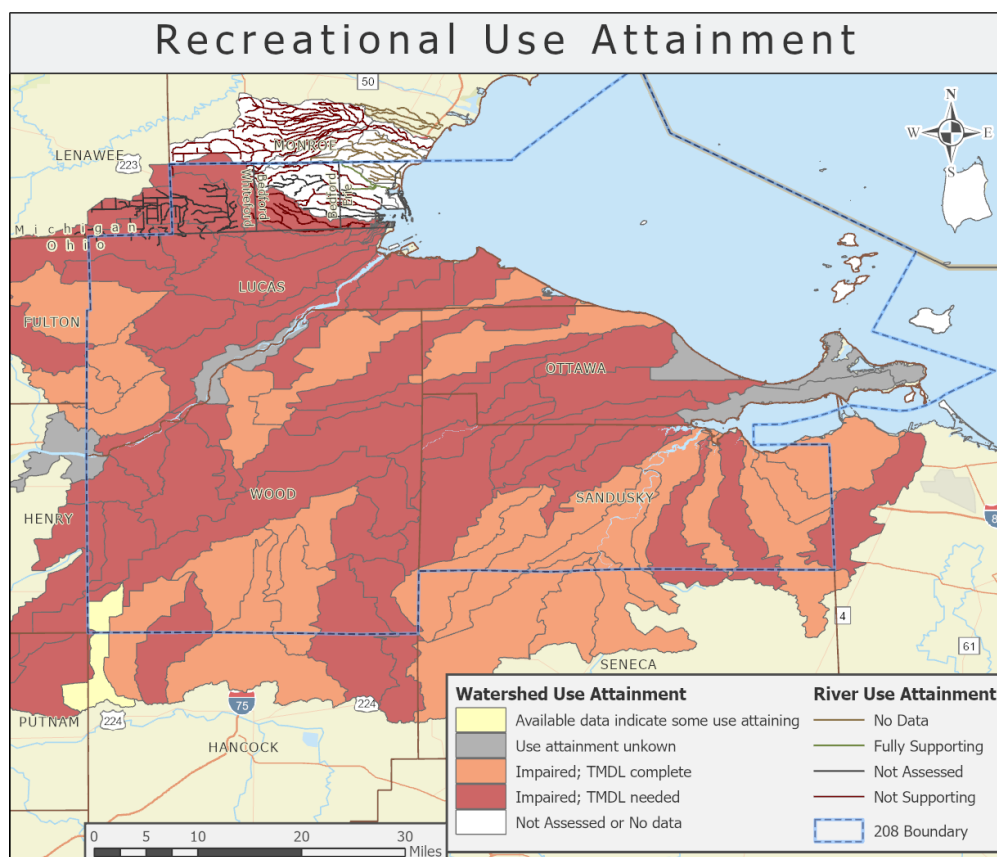


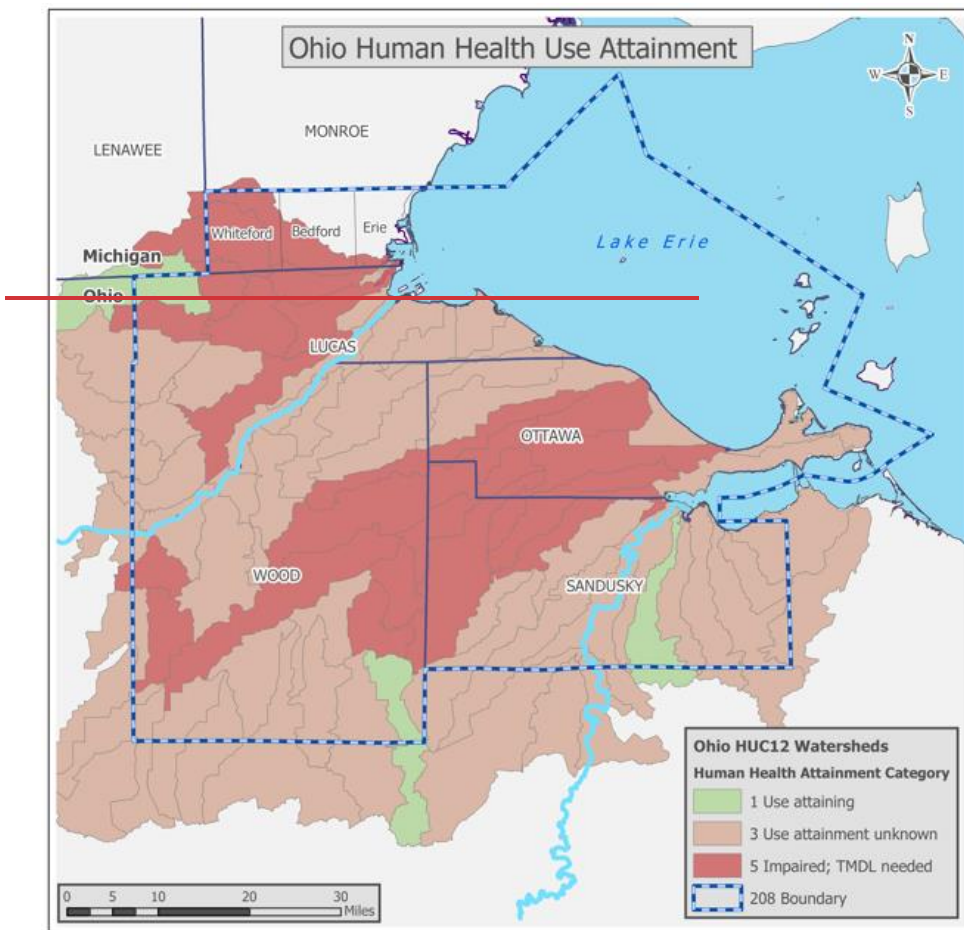
Figure 2-7: Watershed Use Attainment for Recreational Use

Human Health Use

Figure 2-8 shows water quality attainment for the human health use designation. Human health use attainment for a watershed is based on potential public exposure to carcinogenic and non-carcinogenic chemicals due to exposure via drinking water and exposure from contaminated flesh of sport fish. Chemicals of concern include PCBs, mercury, DDT, chlordane, hexachlorobenzene, and mirex among several others. A Fish Consumption Advisory (FCA) is determined based on the quantity of a chemical in fish, such as micrograms of chemical per kilogram of fish tissue ($\mu\text{g}/\text{kg}$). The Human Health Use designation is unknown for most of the watersheds in the region is unknown. Approximately one third of the watershed area of the region is impaired with respect to human health, and nearly all of these watersheds the chemical of concern is PCBs.

Section E of Ohio's 2018 Integrated Report lists which contaminants were found in each impaired watershed. Michigan's water quality standards are provided in Chapter 5—3 Section 3.8 Fish

Consumption5 (Great Lakes), 6 (Inland Lakes and Reservoirs), and 7 (Rivers) of the Integrated Report.



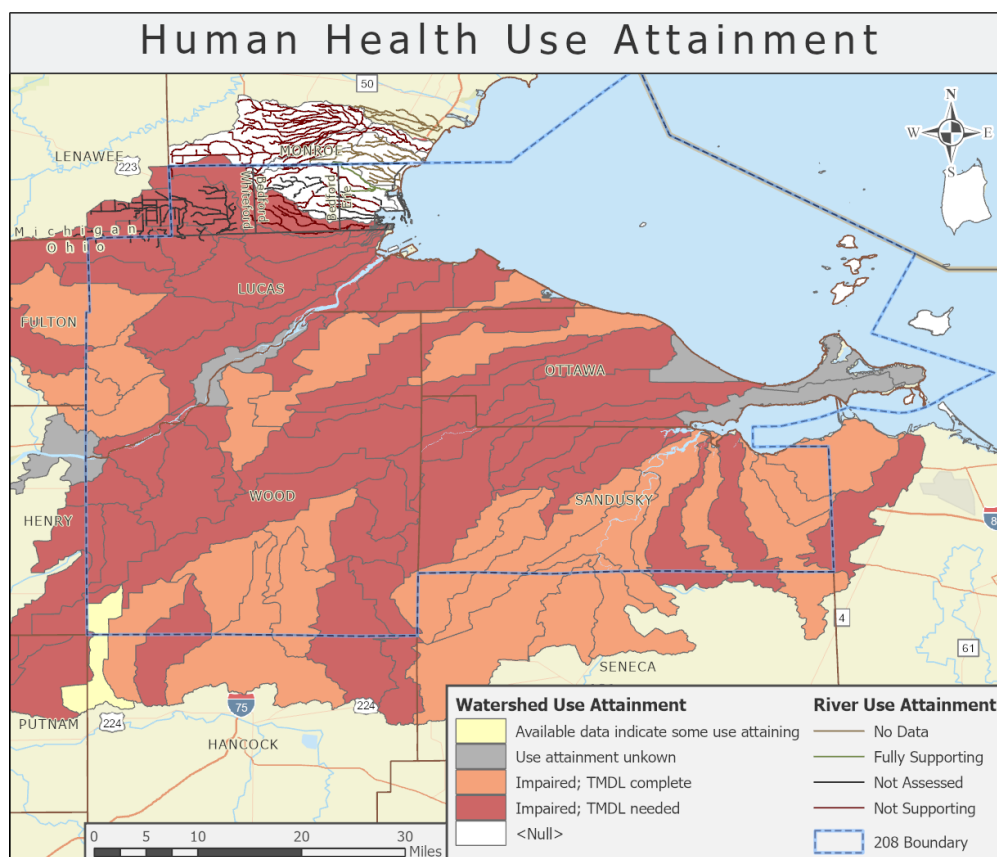


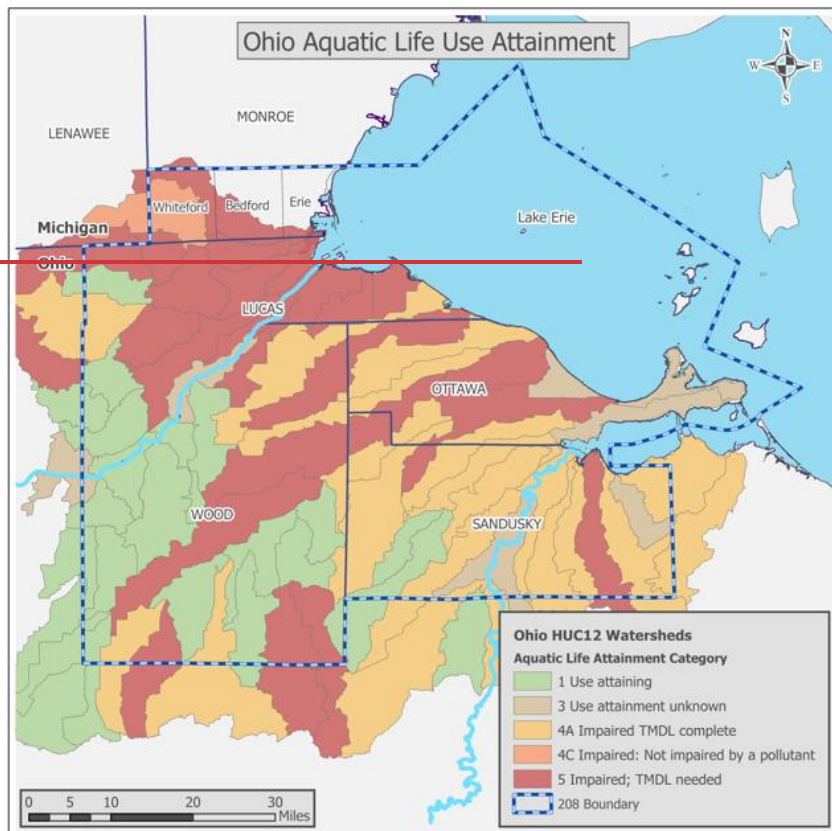
Figure 2-8: Watershed Use Attainment for Human Health Use

Aquatic Life Use

Figure 2-9 shows water quality attainment for the aquatic life use designation. Aquatic life rates a watershed's ability to provide habitat and support fish and macroinvertebrates (e.g., insect larvae, crustaceans, mollusks, worms, and other organisms at the base of the food chain). More than the other use attainment categories, aquatic life is dependent on the land draining into the stream. Use attainment is based on biological and chemical data from water samples and surveys conducted instream to determine the number of organisms, the number and diversity of species, and whether those species are pollution sensitive or pollution tolerant. More than half of the region's watershed area is impaired with respect to aquatic life, with the top five causes of impairment due to: siltation/sediment, nutrients, habitat modification, hydromodification, and organic enrichment / dissolved oxygen (DO).

Ohio's water quality standards for Aquatic Life Use are detailed in Section G of the Integrated Report.

Michigan’s water quality standards are provided in Chapter 34 Sections 4.5 and 4.6 Other Indigenous Aquatic Life And Wildlife of the Integrated Report.



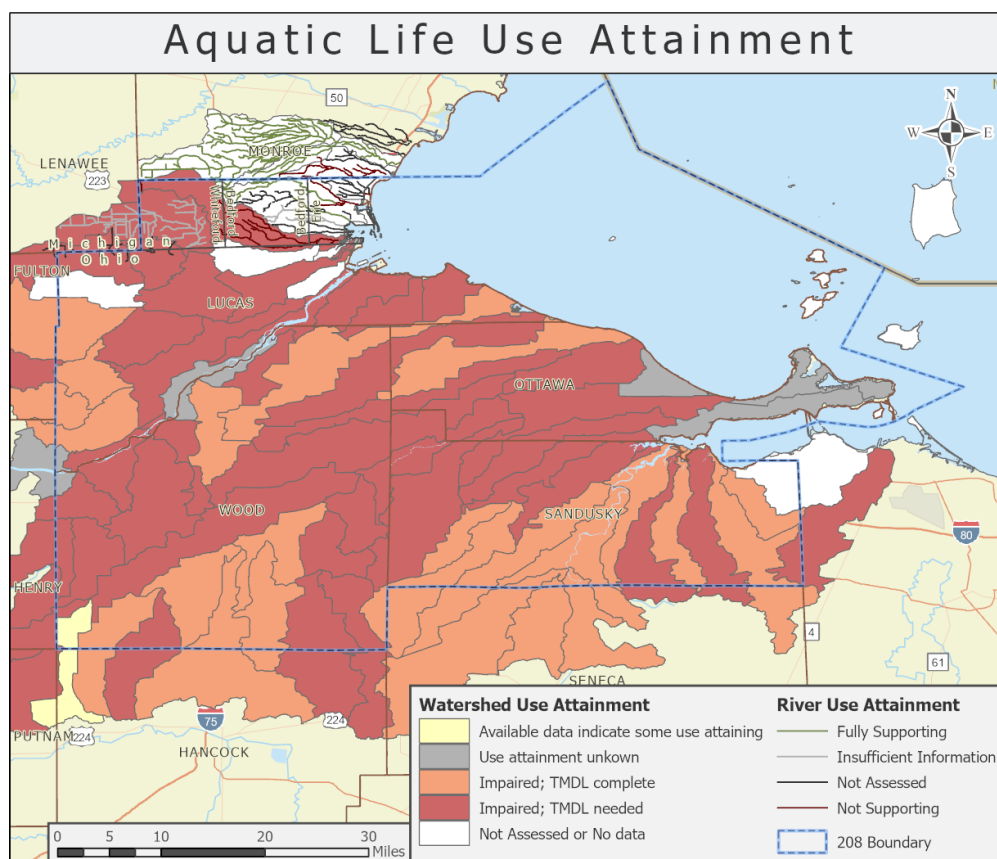


Figure 2-9: Watershed Use Attainment for Aquatic Life

Beneficial Uses in Michigan

Michigan EGLE assesses use attainment and reports the results of these assessments differently from Ohio EPA. Due to the inability to align the two assessment methods between Ohio and Michigan, the most recent available data for use attainments in Michigan watersheds are presented as table A-3 in appendix A, and the use attainment maps (Figures 2-6 through 2-9) only include watersheds assessed by Ohio EPA.

Total Maximum Daily Loads

Under Section 303(d) of the Clean Water Act, individual States or the USEPA, conduct the Total Maximum Daily Load (TMDL) program for waters that have identified as impaired. The program focuses on identifying and restoring polluted rivers, streams, lakes and other surface water bodies. The TMDL establishes the maximum amount of a pollutant allowed in a waterbody and serves as the starting point

or planning tool for restoring water quality and fully obtaining the designated uses. Both Ohio EPA and Michigan EGLE conduct TMDLs.

As of July 2020², the progress for TMDLs in the TMACOG region:

- Toussaint River – approved
(https://epa.ohio.gov/static/Portals/35/tmdl/ToussaintTMDL_final_jul06.pdfhttps://www.epa.ohio.gov/portals/35/tmdl/ToussaintTMDL_final_jul06.pdf)
- Portage River – approved
(https://epa.ohio.gov/static/Portals/35/tmdl/Portage_Report_Final.pdfhttps://www.epa.ohio.gov/portals/35/tmdl/Portage_Report_Final.pdf).
- Swan Creek – approved
(https://www.epa.ohio.gov/portals/35/tmdl/SwanCreekTMDL_final_oct09_wo_app.pdfhttps://www.epa.ohio.gov/portals/35/tmdl/SwanCreekTMDL_final_oct09_wo_app.pdf)
- Lower Maumee River Tributaries and Lake Erie Direct Tributaries – approved
(https://epa.ohio.gov/static/Portals/35/tmdl/MLEtribs_Final_Report.pdfhttps://www.epa.ohio.gov/Portals/35/tmdl/MLEtribs_Final_Report.pdf)
- Maumee River Main Stem – under development, data available
(<https://epa.ohio.gov/divisions-and-offices/surface-water/reports-data/maumee-river-watershed><https://www.epa.ohio.gov/dsw/tmdl/MaumeeRiver>)
- Sandusky River – approved
(https://epa.ohio.gov/static/Portals/35/tmdl/LSanduskyTMDL_final%20with%20cover_20140528.pdf<https://www.epa.ohio.gov/dsw/tmdl/SanduskyRiver>).
- Ottawa River – under development, data available
(<https://epa.ohio.gov/divisions-and-offices/surface-water/reports-data/ottawa-river-watershed-toledo-area-and-river-raisin-watershed><https://www.epa.ohio.gov/dsw/tmdl/OttawaRiverToledo>).
- Lake Erie Luna Pier Beach – approved (<https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Programs/WRD/SWAS/TMDL-Ecoli/luna-pier.pdf>)
- LaPointe Drain - approved
(<https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Programs/WRD/SWAS/TMDL-Other/lapointe.pdf>
https://www.michigan.gov/documents/deq/wrd-swas-tmdl-lapointe_577506_7.pdf)
- River Raisin - approved
(<https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Programs/WRD/SWAS/TMDL-Ecoli/raisin-ecoli.pdf>
https://www.michigan.gov/documents/deq/wrd-swas-tmdl-raisin-ecoli_451065_7.pdf)
- Wagner-Pink Drain – approved
(<https://www.michigan.gov/egle/-/media/Project/Websites/egle/Documents/Programs/WRD/SWAS/TMDL-Ecoli/wagner-pink.pdf>)

Commented [EK1]: Now part of the State Wide e.coli TMDL

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[/media/Project/Websites/egle/Documents/Programs/WRD/SWAS/TMDL-Ecoli/wagner-pink.pdf](#)https://www.michigan.gov/documents/deq/wrd-sw-as-tmdl-wagnerpink_451085_7.pdf)

- Maumee Watershed Nutrient TMDL – ~~under development~~[approved](#)
(<https://epa.ohio.gov/static/Portals/35/tmdl/MaumeeNutrient/Maumee-Watershed-Nutrient-TMDL-Final.pdf> <https://epa.ohio.gov/dsw/tmdl/MaumeeRiver#119945358-maumee-watershed-nutrient-tmdl>)

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