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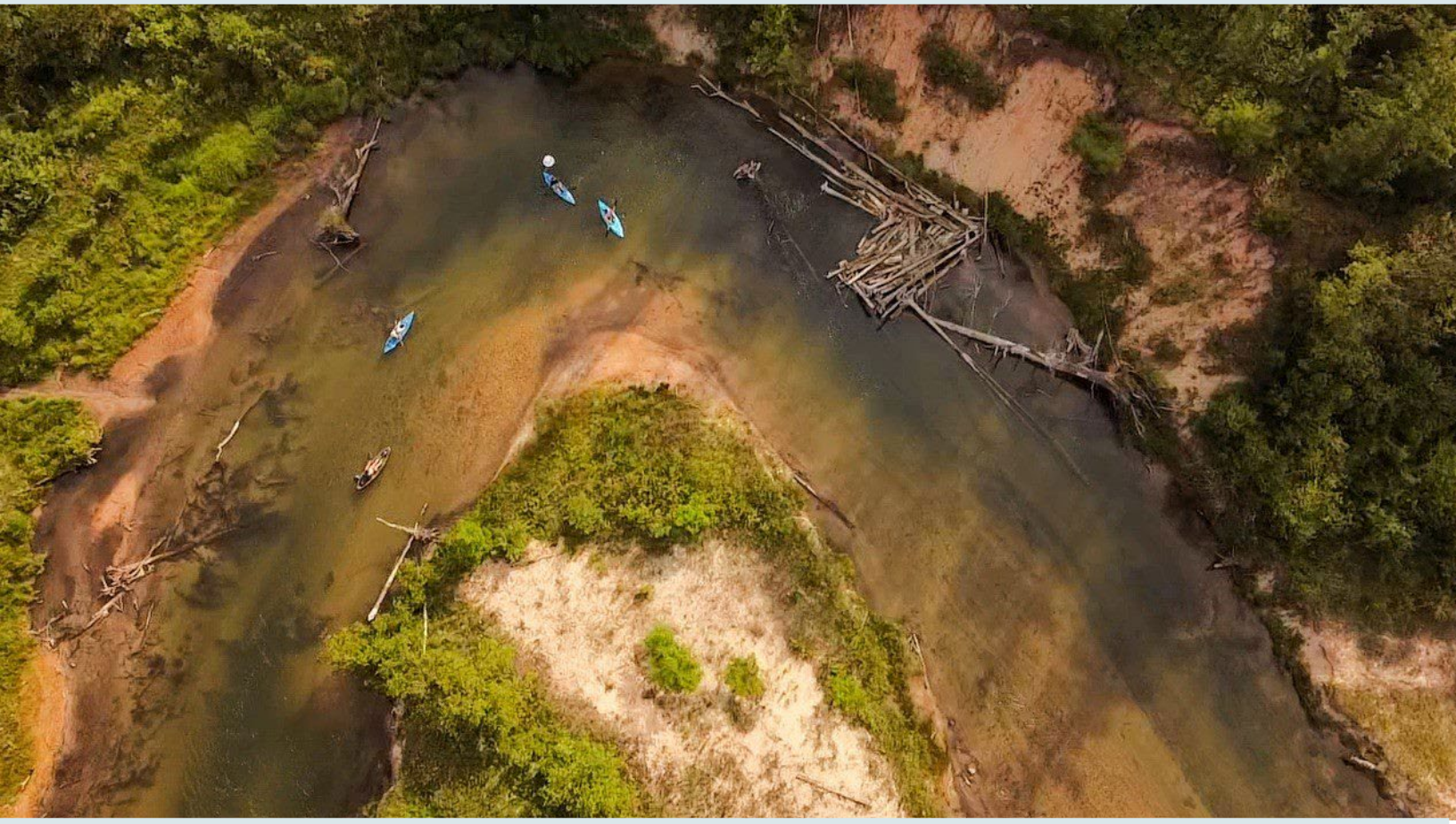
MICHIGAN DEPARTMENT OF
ENVIRONMENT, GREAT LAKES, AND ENERGY

Water Quality and Pollution Control in Michigan 2022

Sections 303(d), 305(b), and 314

Integrated Report



Michigan Department of Environment, Great Lakes, and Energy
Water Resources Division
May 2022

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Report Compiled by: Kevin Goodwin, Jason Smith
Surface Water Assessment Section
Water Resources Division

MICHIGAN DEPARTMENT OF
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Due to the extensive number of pages contained in these documents, all appendices are available upon request by contacting GoodwinK@Michigan.gov or calling 514-290-4198.

LIST OF ACRONYMS

AIS	Aquatic Invasive Species
ATTAINS	Assessment, Total Maximum Daily Load Tracking, and Implementation System
BCC	Bioaccumulative Chemicals of Concern
BPJ	Best Professional Judgment
CAZ	Critical Assessment Zone
CLMP	Cooperative Lakes Monitoring Program
CSO	Combined Sewer Overflow
CWA	Clean Water Act
DDT	Dichlorodiphenyltrichloroethane
EGLE	Michigan Department of Environment, Great Lakes, and Energy
HCV	Human Cancer Value
HNV	Human Noncancer Value
HUC	Hydrologic Unit Codes
IR	Integrated Report
LHD	Local Health Department
MCL	Maximum Contaminant Level
MDHHS	Michigan Department of Health and Human Services
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
NHD	National Hydrography Dataset
ng/L	Nanograms per liter
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
NREPA	Natural Resources and Environmental Protection Act
P51	Procedure 51
PBB	Polybrominated Biphenyl
PCB	Polychlorinated Biphenyl
PFAS	Per- and polyfluoroalkyl substances
PFOS	Perflourooctane Sulfonate
TMDL	Total Maximum Daily Load
TSI	Trophic Status Index
USEPA	United States Environmental Protection Agency
ug/L	Micrograms per liter
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WCMP	Water Chemistry Monitoring Program
WQS	Water Quality Standards
WRD	Water Resources Division

EXECUTIVE SUMMARY

The federal Water Pollution Control Act (PL 92-500), also known as the Clean Water Act (CWA), requires states to provide the United States Environmental Protection Agency (USEPA) with an assessment of the quality of their waters (Section 305[b]), a list of waters that do not support their designated uses or attain Water Quality Standards (WQS) 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). Similar to the 2020 reporting cycle, the Michigan Department of Environment, Great Lakes, and Energy (EGLE) (formerly the Michigan Department of Environmental Quality [MDEQ]) is fulfilling these CWA reporting requirements in 2022 through the submission of an Integrated Report (IR).

A primary objective of this IR is to describe attainment status of Michigan's surface waters relative to the designated uses specified in Michigan's WQS. Michigan's WQS are consistent with the Great Lakes Initiative, establish minimum water quality requirements by which the waters of the state are to be managed, and provide the primary framework that guides EGLE's water quality monitoring/assessment and water protection activities. To describe the attainment status of surface waters, each water body is placed in at least one of five reporting categories based upon the amount of information known about the water body's water quality status, the degree of designated use support, and the type of impairment preventing designated use support.

This IR includes a description of the scope of Michigan waters covered; an overview of water quality monitoring in Michigan; a description of Michigan's current assessment methodology; brief summaries of monitoring results and designated use support in the Great Lakes (including connecting channels and bays), inland lakes and reservoirs, rivers, and wetlands; information regarding water bodies not supporting designated uses, including water bodies requiring the development of a TMDL (i.e., Section 303[d] listings); and a summary of the public participation process used in the development of this IR.

With the biennial development of each IR, Michigan continues to refine its data management and assessment methodology. This is the third IR cycle in which EGLE has fully used the USEPA-developed and redesigned Assessment, Total Maximum Daily Load Tracking and Implementation System (ATTAINS) from start to finish in the IR development. ATTAINS was created as the singular location for assessment decision storage and output nationwide to be implemented for the 2018 IR cycle by all states and tribes. With each IR cycle and ATTAINS update, Michigan finds the process more efficient and looks forward to continuing to capitalize on increased familiarity and functionality as ATTAINS continues to develop with the USEPA's support.

The shift to using ATTAINS, when paired with the redesigned "How's My Waterway" Web site (June 2020; mywaterway.epa.gov/), gives broad access to the nation's water quality information at many scales and assessment decisions in a user-friendly platform geared toward the lay-person, but with details and data that technical experts will also find helpful. In addition, access to Geographic Information System data is available through Michigan's open data portal by searching "Assessment Units" (November 2021; gis-egle.hub.arcgis.com/search).

Detailed lists of designated use support are contained in this report (Appendix B). Broadly, many of Michigan's surface waters continue to be impacted by polychlorinated biphenyls (PCB) and mercury and consequently do not support the other indigenous aquatic life and wildlife designated use and/or the fish consumption designated use. Atmospheric deposition is considered to be the major source of these persistent bioaccumulative chemicals. Additionally, per- and polyfluoroalkyl substances (PFAS) comprise an emerging group of contaminants that may have broad impacts on water quality. Ongoing PFAS monitoring in Michigan provided data that, once received and quality checked, were considered in this IR. Excluding widespread PCBs and mercury-related impairments, physical/chemical and biological assessments of inland lakes and rivers indicate designated uses are supported in a majority of water bodies.

CHAPTER 1: INTRODUCTION

1.1 PURPOSE

The federal Water Pollution Control Act (PL 92-500), also known as the CWA, requires states to provide the USEPA with an assessment of the quality of their waters (Section 305[b]), a list of waters that do not support their designated uses or attain WQS and require the development of TMDLs (Section 303[d]), and an assessment of status and trends of publicly owned lakes (Section 314). Like the 2020 reporting cycle, EGLE is fulfilling these CWA reporting requirements in 2022 through the submission of an IR.

Where possible, Michigan's 2022 IR was developed consistent with the USEPA's "Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b), and 314 of the Clean Water Act" and supplemental guidance information for 2008-2022 IRs prepared by the USEPA.

A primary objective of this IR is to describe attainment status of Michigan's surface waters relative to the designated uses specified in Michigan's WQS (available at michigan.gov/egle/-/media/Project/Websites/egle/Documents/Programs/WRD/NPDES/part-4-water-quality-standards.pdf). Michigan's Part 4 Rules, WQS, are promulgated under Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). Michigan's WQS are consistent with the Great Lakes Initiative, establish minimum water quality requirements by which the waters of the state are to be managed, and provide the primary regulatory framework that guides EGLE's water quality monitoring/assessment and water protection activities.

To describe the attainment status of surface waters, each water body is placed in at least one of five reporting categories (see Section 4.11) based upon the amount of information known about the water body's water quality status, the degree of designated use support, and the type of impairment preventing designated use support. Additionally, the attainment status information described within this IR is used to help inform some of the outcomes associated with various goals identified within the Water Resources Division's (WRD) Measures of Success. The Measures of Success are used to define the expected outcomes of water resource programs geared toward having clean and safe water.

Similar to previous IRs, trends in designated use support are not discussed in this IR. Due to data management changes over time, and assessment methodology changes cycle-to-cycle, designated use support summaries are not directly comparable to previous IRs. Analysis of designated use support trends based on information presented in this and previous reports (e.g., change in number of river miles supporting designated uses) would be misleading.

The remainder of this chapter includes a description of the scope of Michigan waters covered in this IR. Chapter 3 details Michigan's current assessment methodology. Chapters 4, 5, 6, and 7 provide summaries of monitoring results and designated use support in the Great Lakes (including connecting channels and bays), inland lakes, rivers, and wetlands, respectively. Chapter 8 addresses all water body types not supporting designated uses, including water bodies requiring the development of a TMDL [i.e., Section 303(d) listings]. Chapter 9 includes information regarding the public participation process in the development of this IR.

Data Management and Access to Information

This 2022 IR cycle continues the significant changes started in the 2018 IR cycle related to recording, storing, and communicating information surrounding assessment decisions. This shift to the USEPA-developed ATTAINS as the singular location for assessment decision storage and output nationwide achieves more efficient data transfer between the state and the USEPA; establishes a more consistent system for states and authorized tribes to store, exchange, and retain assessment information; and ultimately provides greater public access to information as part of the redesigned How's My Waterway Web site released in June 2020, mywaterway.epa.gov.

While the appendices that comprise the Section 305(b) and 303(d) lists are available (Appendices B and C, respectively), as are explicit lists of impairment delistings and new listings (Appendices D1 and D2, respectively), the use of the How's My Waterway Web site presents the same information, and more, in a user-friendly platform.

In addition to EGLE's assessment decisions, How's My Waterway provides access to available data and information from other sources, all easily searched at national, state, or community levels. The community level search, probably most informative for those with specific waters of interest, can be conducted by address, place names, zip codes, or even device location (computer or smartphone). Once a user has navigated to the water body of interest, selecting that water body expands an informational box, the bottom of which contains a link to a viewable "Water Body Report." This report is the direct summary of information from EGLE's assessment process.

1.2 MICHIGAN'S WATERS

Michigan is blessed with a wealth of surface water resources, including Great Lakes and their connecting channels, inland lakes, rivers, and wetlands (Table 1.1). Most of Michigan also has an abundant supply of high-quality groundwater.

In general, the open waters of the Great Lakes have good to excellent water quality. The inland waters of Michigan's Upper Peninsula and the northern half of the Lower Peninsula support diverse aquatic communities and are commonly found to have good to excellent water quality. Many lakes and rivers in this mostly forested area of the state support coldwater fish populations. Lakes and rivers in the southern half of Michigan's Lower Peninsula generally have good water quality and support warmwater biological communities as well as some coldwater fish populations. The southern portion of the state contains Michigan's major urban areas with much of the rural land in agricultural production. Many of Michigan's rivers and lakes receive direct discharge of treated effluent from municipal and industrial sources as well as runoff from urbanized areas, construction sites, and agricultural areas. Sedimentation, nutrient enrichment, and toxic pollutant loading are problems associated with runoff that can impact surface water quality. Surface water quality is generally showing improvement where programs are in place to correct problems and restore water quality.

Table 1.1 Michigan Atlas (all values are approximations).

Topic	Number	Area	Length	Source
State population	9.9 Million			United States Census Bureau 2010 Estimate
State surface area		96,760 mi^2		Sommers, 1977
Great Lakes, Great Lakes bays, and Lake St. Clair		42,167 mi^2 (~45% of total Great Lakes area)	3,049 mi shoreline	USGS NHD (1:24,000 scale)
Inland lakes and reservoirs with surface area ≥ 0.1 acre	46,000	872,109 acres		USGS NHD (1:24,000 scale)
Rivers and streams (including connecting channels)			76,439 mi	USGS NHD (1:24,000 scale)
Wetlands		6,465,109 acres		USFWS National Wetland Inventory

1.2.1 Great Lakes, Bays, Connecting Channels, and Lake St. Clair

The Great Lakes contain 20 percent of the world's fresh surface water and are a unique natural resource. The protection of the Great Lakes is shared by the United States and Canadian federal governments; the states of Minnesota, Wisconsin, Michigan, Illinois, Indiana, Ohio, Pennsylvania, and New York; and the Canadian Provinces of Ontario and Quebec. Various Native American tribal organizations are also stakeholders and play a role in protecting Great Lakes water quality.

Michigan lies almost entirely within the watersheds of Lakes Superior, Michigan, Huron, and Erie (Table 1.2). The state maintains jurisdiction over approximately 45 percent (by surface area) of the 4 bordering Great Lakes (38,865 of a total area of 86,910 square miles) and 3,049 miles of Great Lakes shoreline. Significant Great Lakes bays include Grand Traverse Bay and Saginaw Bay. In this IR, the St. Marys, St. Clair, and Detroit Rivers (connecting channels) and Lake St. Clair are generally discussed in the Great Lakes Chapter (see Chapter 4). The term "connecting channels" used in this report is slightly different than the term "connecting waters" defined in Michigan's WQS. In this IR, the Keweenaw waterway (i.e., the Portage Lake ship canal, Portage Lake, Portage River, etc.) is reported as river miles and inland lakes. Michigan's WQS include the Keweenaw waterway in the "connecting waters" definition.

Generally, the open waters of the upper Great Lakes (Superior, Michigan, and Huron) have excellent water quality. Exceptions include a few impaired locations restricted to nearshore zones influenced by large, densely populated, and heavily industrialized areas. Great Lakes water quality has benefited from pollutant control and remedial efforts in tributaries. These activities have reduced the discharge of conventional and toxic pollutants, including nutrients, persistent organic compounds, metals, and oils.

Table 1.2: Jurisdictional control of the four Great Lakes bordered by Michigan.

Lake	Canadian* (miles^2)	United States* (miles^2)	Michigan† (miles^2)	Total* (miles^2)
Lake Superior	11,100	20,600	16,400	31,700
Lake Michigan	---	22,300	13,250	22,300
Lake Huron	13,900	9,100	9,100	23,000
Lake Erie	4,930	4,980	115	9,910
Total	**29,930**	**56,980**	**38,865**	**86,910**

*Strum, 2000; †United States Census Bureau 2002 estimate

Aquatic Invasive Species (AIS) continue to have dramatic indirect and direct effects on the Great Lakes. AIS are responsible for increases in water clarity, loss of organisms and biodiversity, disruption of food webs, and impacts on economically important fish species (International Association for Great Lakes Research, 2002). Emerging research also shows that AIS cause changes in nutrient cycling and availability and may contribute to increased plant and algae growth in many nearshore areas, such as Saginaw Bay and the western basin of Lake Erie.

The Great Lakes have problems with selected persistent bioaccumulative chemicals. Fish consumption advisories in the Great Lakes serve as reminders that certain pollutants, such as PCBs, chlordane, dioxins, and mercury remain elevated in the water column and fish tissue. The use of PCBs and dichlorodiphenyltrichloroethane (DDT) was banned in the 1970s and concentrations of these chemicals in Great Lakes fish have declined; however, concentrations in some species still require consumption advisories. Atmospheric deposition, tributary loadings, and the dynamic exchange and cycling between air, water, and sediment within the Great Lakes basins are the key factors influencing contaminant levels in Great Lakes fish.

1.2.2 Inland Lakes and Reservoirs

Michigan has approximately 46,000 inland lakes (including lakes, ponds, and river impoundments) with a surface area of at least one-tenth of an acre or greater. Lakes with the largest surface area include Houghton (Roscommon County), Torch (Antrim and Kalkaska Counties), Charlevoix (Charlevoix County), Burt (Cheboygan County), Mullett (Cheboygan County), Gogebic (Gogebic and Ontonagon Counties), Manistique (Luce and Mackinac Counties), Black (Cheboygan and Presque Isle Counties), Crystal (Benzie County), Portage (Houghton County), and Higgins (Crawford and Roscommon Counties).

Michigan has 730 inland lakes that are deemed "public access lakes" (Table 1.3). The list of public access lakes includes lakes with a public boat launch and a lake surface area of at least 50 acres as well as a few recreationally important small lakes (less than 50 acres) that have public boat launches. There are 345 public access lakes located in the southern Lower Peninsula, 219 in the northern Lower Peninsula, and 166 in the Upper Peninsula. The average public access lake size is 341 acres in the southern Lower Peninsula, 1,342 acres in the northern Lower Peninsula, and 731 acres in the Upper Peninsula.

Michigan has 156 inland lakes that are deemed "cisco lakes" (Table 1.3). The cisco (*Coregonus artedi*) is a member of a trout and salmon (Salmonidae) subfamily that usually occupies the cooler and deeper niches of high-quality freshwater inland lakes and many parts of the Great Lakes. In North America, cisco can be found from Alaska to New England. Ciscos are, or were, present in at least 156 lakes in 41 Michigan counties ranging from the Indiana border to Keweenaw County in the Upper Peninsula. The cisco is currently identified as a state threatened species pursuant to the NREPA. Ciscos require relatively deep inland lakes with cool, well-oxygenated waters. During summer stratification, cisco are rarely found in waters above 20^{o}C or at dissolved oxygen concentrations less than 3.0 parts per million. This species is very sensitive to habitat degradation and has been extirpated from lakes where these minimum thermal and dissolved oxygen conditions are not met. In 2003, the Michigan Department of Natural Resources (MDNR) initiated a study to assess the status of the cisco populations in Michigan. The intent of this ongoing study is to identify inland lakes in which populations are extant and increase awareness of this species so that protective best management practices are promoted.

Table 1.3. Michigan's public access and cisco lakes by county. *Indicates that the lake is a public access lake and a cisco lake. †Indicates that the lake is a cisco lake only.

ALCONA COUNTY				
Alcona Dam Pond	Brownlee Cedar	Crooked Hubbard*	Jewell North	Vaughn
ALGER COUNTY				
AuTrain Basin	Deer†	Grand Sable	Nawakwa	
AuTrain Lake	Fish	Kingston		
ALLEGAN COUNTY				
Allegan	Duck	Hutchins	Miner	Swan
Baseline	Eagle	Kalamazoo	Osterhout	Swan Creek
Big	Green*	Lower Scott	Selkirk	Pond
ALPENA COUNTY				
Beaver*	Fletcher Pond			
ANTRIM COUNTY				
Bellaire*	Clam	Intermediate*	St. Clair	
Benway	Elk*	Lake of the	Torch*	
Birch	Ellsworth	Woods	Wilson	
BARAGA COUNTY				
Beaufort	King	Prickett Dam	Vermilac	
Big Keewaydin	Parent	Ruth		
BARRY COUNTY				
Baker	Cloverdale	Jordan	Long	Payne
Barlow†	Crooked	Leach	(Johnstown	Pine
Big Cedar†	Deep	Lime†	Twp)*	Thornapple
Bristol	Duncan	Little Cedar†	Long (Yankee	
Carter	Fine	Long (Hope	Springs Twp)	
Chief Noonday	Fish*	Twp)	Lower Crooked	
Clear	Gun		Middle	
BENZIE COUNTY				
Ann*	Herendeene	Pearl	Turtle	
Betsie	Little Platte	Platte	Upper Herring	
Crystal*	Lower Herring	Stevens		
BERRIEN COUNTY				
Paw Paw				

*Public access lake and a cisco lake. †Cisco lake only

BRANCH COUNTY				
Archer*	East Long*	Marble*	Randall	Union
Bartholomew†	George	Matteson	Rose (Lake of	
Cary	Gilead	Morrison	the Woods)	
Coldwater*	Kenyon	North	Silver	
Craig	Lavine	Oliverda	South	

CALHOUN COUNTY				
Duck	Lane	Prairie	Warner's	
Goguac	Lee	Upper Brace	Winnipeg	
Homer	Nottawa	Wabascon		

CASS COUNTY				
Baldwin*	Curtis†	Fish	Lewis†	Round†
Belas	Day†	Harwood*	Lime†	Shavehead*
Birch*	Dewey	Hemlock	Magician	South Twin
Bunker†	Diamond	Indiana†	Mill	Stone
Chain†	Donnell*	Juno/Painter	North Twin	Tharp†
Christiana	Driskels	Kirk*	Paradise	

CHARLEVOIX COUNTY				
Charlevoix*	Hoffman	Susan	Walloon*	
Deer	Six Mile	Thumb		

CHEBOYGAN				
Black	Douglas†	Long	Silver	Twin North†
Burt*	Lancaster	Mullett*	Twin Central†	Twin South †

CHIPPEWA			
Caribou	Frenchmans	Monacle*	Shelldrake
Carp	Hulbert†		Impoundment

CLARE COUNTY				
Arnold	Cranberry	George	Mud	Silver
Big Long	Crooked	Lily	Perch	Windover
Budd	Five	Little Long	Shingle	

CLINTON COUNTY	
Ovid	Park

CRAWFORD COUNTY				
Jones	K.P.	Margrethe	Section One	Shupac

*Public access lake and a cisco lake. †Cisco lake only

DELTA COUNTY				
Boney Falls	Corner	Pole Creek Lake	Skeels	
Camp 7	Dana	Round		
DICKINSON COUNTY				
Antoine	Edey	Mary*	Rock	Six Mile
Bass	Hamilton	Norway	Sawyer	
Carney	Louise†	Pickeral	Silver	
EATON COUNTY				
Narrow	Saubee†			
EMMET COUNTY				
Crooked	Larks	Paradise	Pickeral	Round
GENESEE COUNTY				
C.S. Mott Impoundment	Fenton Holloway Reservoir	Kearsley Reservoir	Lobdell* Ponemah	Thread
GLADWIN COUNTY				
Lake Four	Secord	Wiggins	Wixom	
Pratt	Impoundment		Impoundment	
GOGEBIC COUNTY				
Allen	Clearwater	Henry	Marion	Sunday
Bass	Crooked†	Impoundment	McDonald	Taylor*
Beatons	Dinner	Lac Vieux Desert	Moon	Thousand
Bobcat	Duck	Loon†	Moosehead	Island*
Chaney	Eel	Langford	Moraine	
Cisco*	Gogebic*	Little Oxbow	Noorwood†	
Clark*		Lake Pomeroy	Ormes	
GRAND TRAVERSE COUNTY				
Arbutus	Bridge†	Cedar Hedge*	Green*	
Bass	Brown Bridge	Dubonnet	Long	
Bass	Pond	Duck*	Silver	
Boardman	Cedar	Fife	Spider	
HILLSDALE COUNTY				
Baw Beese	Carpenter†	Hemlock*	Long (Stubin Co., IN)	Sand Middle†
Bear*	Cub	Long (Reading	Round	Sand South†
Bird	Diane	Twp)*	Sand North†	Wilson†

*Public access lake and a cisco lake. †Cisco lake only

HOUGHTON COUNTY				
Bob	Emily	Pike	Rice	Sandy
Boston	Otter*	Portage*	Roland	Torch*

INGHAM COUNTY				
Lansing				

IONIA				
Long	Morrison	Sessions	Woodard	

IOSCO				
Floyd	Londo	Loud Dam Pond	Tawas	
Foote Dam Pond	Long	Round	VanEtten	
Indian	Loon*	Sand	West Londo	

IRON COUNTY				
Bass	Ellen	Hannah Webb	Mary	Stager
Brule	Emily	Indian	Michigamme	Stanley
Buck	Fire	Iron	Norway	Sunset
Cable	First Fortune	James	Ottawa	Swan
Camp	Gibson	Kidney	Perch	Tamarack
Chicagon	Golden	Little Smoky	Runkle	Tepee
Deer	Hagerman	Long	Smoky*	Winslow

ISABELLA COUNTY				
Coldwater*	Halls	Littlefield*	Stevenson	

JACKSON COUNTY				
Brown†	Crispell	Pleasant	South Lime	Vineyard
Center	Gilletts	Portage	Swain's*	Wampler's
Clark	Grass	Round	Vandercook*	

KALAMAZOO COUNTY				
Austin	Eagle	Howard†	Paw Paw*	Sherman
Barton	Gourdneck	Indian*	Portage (Blue)	Sugarloaf
Crooked†	Gull*	Long	Ruppert	West
Eagle	Hogsett	Morrow Pond	Sagmaw†	Whitford

KALKASKA COUNTY				
Bear	Cub	Manistee	Starvation	
Blue (Big)*	East	North Blue†	Skegmog*	
Big Guernsey	Indian	Pickeral	Twin (Big)*	

*Public access lake and a cisco lake. †Cisco lake only

KENT COUNTY				
Bass	Big Wabasis	Campbell	Murray*	Ziegenfuss†
Big Myers	Camp	Lime	Pratt	
Big Pine Island	Campau	Lincoln	Reeds	

KEWEENAW COUNTY				
Bailey	Fanny Hoe*	Lac LaBelle	Ritchie†	Siskiwit†
Desor†	Gratiot	Medora	Sargent†	Thayer's

LAKE COUNTY			
Big Bass	Harper	Little Bass†	Reed
Big Star	Idlewild	Paradise	Wolf

LAPEER COUNTY		
Big Fish	Long	Nepessing
Davidson	Minnewanna	Otter

LEELANAU COUNTY			
Cedar	Lime	North Lk	South Lk
Davis	Little Glen	Leelanau*	Leelanau*
Glen*	Little Traverse*	School	

LENAWEE COUNTY			
Allens	Devils	Round	Sand
Deep	Hudson	Round	

LIVINGSTON COUNTY				
Appleton*	Bishop	Hiland	Runyan†	Whitmore
Baseline*	Chemung*	Limekiln†	Sandy Bottom†	Woodland
Bass†	Fish†	Ore†	Thompson	Zukey†
Bennett†	East Crooked*	Portage†	West Crooked*	

LUCE				
Bass	Culhane	Muskallonge	Perch	Twin
Bodi	Kaks	North Manistique*	Pike	

MACKINAC COUNTY		
Brevoort*	Manistique*	Millicoquins
Little Brevoort	Milakokia	S. Manistique*

MACOMB COUNTY
Stony Creek Impoundment

*Public access lake and a cisco lake. †Cisco lake only

MANISTEE COUNTY

Arcadia	Canfield	Manistee	Portage	
Bear	Healy	Pine*		

MARQUETTE COUNTY

Anderson	Dead River	Independence*	McClure Storage	Silver†
Ann†	Storage Basin	Ives†	Reservoir	Sporley*
Arfelin	Engmans	Johnson	Mountain†	Squaw
Bass	Greenwood	Little	Pike	Witch
Bass	Reservoir	Little Shag	Pine†	Wolf
Big Shag	Horseshoe	Michigamme	Rush†	

MASON COUNTY

Bass	Gun	Hamlin	Pere Marquette	Round
Ford	Hackert (Crystal)	Lincoln	Pliness	

MECOSTA COUNTY

Bergess	Clear	Jehnsen	Merrill	Round
Blue	Hillsview	Martiny	Pretty	School Section
Chippewa	Horsehead	Mecosta	Rogers Pond	Townline

MENOMINEE COUNTY

Long

MIDLAND COUNTY

Sanford

MISSAUKEE COUNTY

Crooked	Goose	Long	Missaukee	Sapphire

MONTCALM COUNTY

Baldwin	Derby	Loon	Rainbow	Winfield
Bass	Dickerson	Montcalm	Rock	
Clifford	Halfmoon	Mud	Tamarack	
Cowden	Horseshoe	Muskellunge	Townline	
Crystal	Little Whitefish	Nevins	Whitefish	

MONTMORENCY COUNTY

Atlanta	Clear	Gaylanta	Long*	Rush
Avalon*	East Twin	Grass	McCormick	Sage
Avery	Ess	Lake Fifteen	Muskellunge	West Twin

*Public access lake and a cisco lake. †Cisco lake only

MUSKEGON COUNTY

Bear	East Twin	Mona	White
Big Blue	Fox	Muskegon	Wolf
Duck	Half-Moon	North	

NEWAYGO COUNTY

Baptist	Brooks	Diamond	Hess	Pickerel*
Benton	Croton Dam	Englewright	Kimball*	Robinson
Bills	Pond	Fremont	Nichols*	Sand
Blanch	Crystal	Hardy	Pettibone	Woodland

OAKLAND COUNTY

Angelus†	Green†	Lower Pettibone	Seven	Upper
Big	Hammond†	Maceday*	Silver†	Pettibone†
Cass*	Heron	Middle Straits	Squaw/Clear	Valley
Cedar Island*	Kent	Oakland	Tipsico	White
Crescent	Lakeville	Orchard*	Townsend†	Wildwood
Deer*	Long	Orion	Union*	Wolverine
Dickinson	Loon*	Oxbow†	Upper Proud	
Dunham†	Lotus*	Pontiac		

OCEANA COUNTY

Crystal	Pentwater	Silver
McLaren	Schoolsection	Stony

OGEMAW COUNTY

Au Sable	DeVoe*	Hardwood	Peach	Tee
Bush	George	Horseshoe	Rifle	
Clear	Grousehaven*	Lake George	Sage	

ONTONAGON COUNTY

Bond Falls	County Line

OSCEOLA COUNTY

Big	Hicks	Sunrise	Wells
Diamond	Rose	Todd	

OSCODA COUNTY

McCollum	Mio Dam	Pond	Tea

OTSEGO COUNTY

Big Bass	Dixon	Manuka	Pickerel
Big Bear	Emerald	Opal	Twenty Seven
Bradford	Heart	Otsego	

*Public access lake and a cisco lake. †Cisco lake only

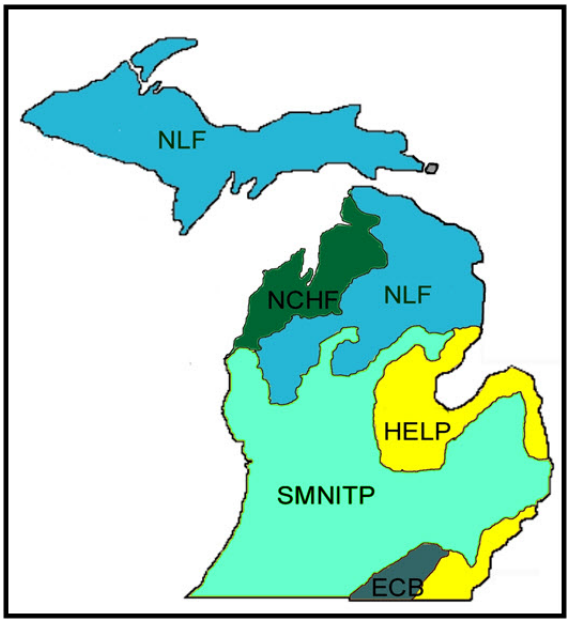
OTTAWA COUNTY				
Crockery	Macatawa	Pigeon	Spring	
PRESQUE ISLE COUNTY				
Big Tomahawk	Essau	Long	May	Shoepac
Emma	Grand	Lost	Nettie	Sunken
ROSCOMMON COUNTY				
Higgins*	Houghton	St. Helen		
SCHOOLCRAFT COUNTY				
Boot	Gemini	Island	Petes	
Colwell	Gulliver*	Kennedy	Ross	
Dodge	Indian*	McDonald	Snyder	
ST JOSEPH COUNTY				
Big Fish	Fisher's	Palmer	Sand	Three Rivers
Clear	Klinger*	Pleasant*	Sturgeon	Impoundment
Corey*	Long	Portage	Tamarack†	
Crotch	Long	Prairie River*	Thompson*	
TUSCOLA COUNTY				
Caro Reservoir	Murphy	North		
VAN BUREN COUNTY				
Ackley	Eagle	Huzzy's	Rush	Three Legged
Banksons	Eleven	Lake of the	Saddle	Three Mile
Brandywine	Fish	Woods	School	Upper Jeptha
Cedar	Fourteen	Maple	Section	Upper Reynolds
Clear	Gravel	North Scott	Shafer	VanAuken
Cora	Halls	Round	South Scott	Wolf†
WASHTENAW COUNTY				
Big Portage	Crooked	Half Moon*	North	Winnewanna
Blind†	Ford	Joslin	Pickerel†	
Bruin*	Four Mile	Mill	South*	
Cedar	Green	Mud	Sugar Loaf	
WAYNE COUNTY				
Belleville	Newburgh			
WEXFORD COUNTY				
Berry	Hodenpyl Dam	Long		
Cadillac	Pond	Mitchell		

*Public access lake and a cisco lake. †Cisco lake only

1.2.3 Rivers

Michigan's rivers can be grouped by the distinct ecoregions through which they flow. Each of the five ecoregions in Michigan consists of areas that exhibit relatively similar geological landform characteristics (Omernik and Gallant, 1988). Factors used to delineate ecoregions include climate, soils, vegetation, land slope, and land use. This framework provides information on the environmental characteristics that tend to occur within each ecoregion. In order by size (largest to smallest area), the five ecoregions in Michigan are Southern Michigan/Northern Indiana Till Plains, Northern Lakes and Forests, North Central Hardwood Forests, Huron-Erie Lake Plains, and Eastern Corn Belt Plains (Figure 1.1).

Rivers in the Northern Lakes and Forests and North Central Hardwood Forests ecoregions tend to support coldwater fish within at least a portion of their systems. These rivers commonly have relatively small watersheds, high relief topography, substantial groundwater inputs, and are naturally low in productivity. Most rivers in the Northern Lakes and Forests ecoregion are perennial, often originating from lakes or wetlands. Although relatively free of sediment, surface waters in this ecoregion often have a characteristic brownish color because of elevated concentrations of dissolved organic material, including tannins and lignins. In the North Central Hardwood Forests ecoregion, river flow is highly variable. Flow is entirely intermittent in some portions of the ecoregion and entirely perennial in other areas. These rivers typically drain soils with much poorer nutrient content than in bordering ecoregions to the south.



SMNITP - Southern Michigan/Northern Indiana Till Plains

NCHF - North Central Hardwood Forests

NLF - Northern Lakes and Forests

HELP - Huron-Erie Lake Plains

ECB - Eastern Corn Belt Plains

Figure 1.1. Ecoregions of Michigan (Level III) (adapted from Omernik and Gallant, 1988).

Rivers in the Southern Michigan/Northern Indiana Till Plains ecoregion are generally of good water quality in the headwaters. This ecoregion is drained predominantly by perennial rivers. Such rivers are typically sluggish and are bordered, often extensively, by wetland tracts. Drainage ditches and channelized rivers have been a common solution to assist drainage of areas that are too wet for settlement and agricultural needs.

Upland features related to poor soil drainage heavily influence the rivers in the Huron-Erie Lake Plains and Eastern Corn Belt Plains ecoregions. Broad and nearly level lake plain is crossed by beach ridges and low moraines, which has resulted in the formation of poorly drained soils. More than half of the rivers in the Huron-Erie Lake Plains ecoregion are intermittent, and river flows are commonly runoff-dependent. In addition to the construction of numerous drainage ditches, the headwaters of many rivers are extensively channelized for quicker drainage and to improve upland field conditions. About half of the rivers in the Eastern Corn Belt Plains ecoregion are perennial and many have been channelized to assist soil drainage. This ecoregion is almost entirely farmland, and river quality is influenced by increased soil and water runoff from agricultural land uses.

1.2.4 Wetlands

About 15 percent of Michigan's land area is wetland. Several inventories of wetlands in Michigan have been undertaken by different agencies. The two most utilized are the Part 303 State Wetland Inventory, and the United States Fish and Wildlife Service (USFWS) National Wetland Inventory. Sources of wetland loss include permitted activities; unpermitted activities (i.e., violations of Section 404 of the CWA and state law); activities that are exempt under state and federal law; the loss of small, isolated wetlands that are not under state or federal jurisdiction; natural processes (e.g., beaver activity); and indirect effects (e.g., alteration of drainage networks due to urbanization). Wetland acreage may increase for some of the same reasons (e.g., changes in drainage pathways). However, most wetland gains are attributed to voluntary wetland restoration projects, pond construction, and mitigation for permitted impacts.

Part 303, Wetlands Protection, of the NREPA requires EGLE to make a preliminary inventory of all wetlands in the state on a county-by-county basis. County wetland inventories are now completed for all 83 counties in the state and have been made available to the public at Michigan.gov/Wetlands. The county wetland inventories were produced by overlaying data from the following sources: the USFWS National Wetland Inventory maps (1978), Natural Resources Conservation Service soil survey maps, and Michigan Resource Information System land use/land cover maps. County wetland inventories are intended to be used as planning tools that provide potential and approximate locations of wetlands and some information regarding wetland condition but are not intended to be used to determine the jurisdictional boundaries of wetland areas subject to regulation.

Estimates of wetland losses since European settlement range from 35 percent, based on the Michigan Natural Features Inventory presettlement inventory to 50 percent based on the USFWS Status and Trends reporting. During 2006, EGLE's, Wetlands, Lakes, and Streams Unit, partnered with Ducks Unlimited Great Lakes/Atlantic Regional Office to perform an update to the original National Wetland Inventory dataset that was completed in the late 1970s and early 1980s. The project updated the National Wetland Inventory dataset to the two most recent, statewide, aerial photography flights conducted in the state, that being the 1998 United States Geological Survey (USGS) Digital Ortho Quarter Quads data and the 2005 National Agriculture Imagery Program data. This effort resulted in three distinct temporal wetland inventories for the State from which to draw conclusions and analyze trends. The 1998 inventory shows a total loss of vegetated wetlands of

32,839 acres. The 2005 inventory shows a total loss of vegetated wetlands of 8,096 acres. Subtracting these losses from the original National Wetland Inventory total wetland acreage yields a total of 6,465,109 acres of wetland remaining in Michigan.

The Michigan Natural Features Inventory published a preliminary assessment entitled, "Wetland Trends in Michigan Since 1800" (Comer, 1996), based on a comparison of original land surveys conducted by the General Land Office from 1816 to 1856 and Michigan Resource Information System land use/land cover maps. This publication includes a county-by-county estimate of historical wetland types and losses since pre-European settlement. In addition, the pre-European settlement maps have been digitized and are available for review in a Geographic Information System.

1.2.5 Water Protection Activities

EGLE has several programs designed to protect and restore water quality. These programs: establish WQS; provide regulatory oversight for public water supplies; issue permits to regulate the discharge of industrial and municipal wastewaters and to alter wetlands, lakes, streams, and Great Lakes bottomlands; provide technical and financial assistance to reduce pollutant runoff; ensure compliance with state laws; regulate and protect wetlands; and educate the public about water quality issues. More information on Michigan's water quality protection programs can be found at Michigan.gov/WaterQuality.

The activities encompassing Michigan's water quality protection programs are carried out by several EGLE divisions and offices. Full quantification of expenditures is not possible at this time. However, the WRD alone spent approximately $82.2 million in fiscal year 2020 and $83.4 million in fiscal year 2021 for the implementation of water quality protection, restoration, and monitoring programs. Sources include federal funds, state general funds (including Renew Michigan funds), and fees. These expenditures support EGLE staffing and operating expenses as well as grants and loans to local governments and organizations. A variety of water quality protection activities are implemented through these funds, including regulatory requirements, technical and financial assistance, and education/outreach efforts. These expenditures also leverage substantial local funds and services since many of the programs and grants have cost-share or match requirements.

The benefits associated with the implementation of these programs are numerous, although it is not possible to accurately quantify the benefits in strictly monetary terms. From a financial perspective, citizens and out-of-state tourists are estimated to have spent $26.3 billion in 2019 on Michigan tourism, much of that on outdoor sports and recreation that depend on clean water, air, and forests ("2019 Tourism Economic Impact - Statewide" Michigan.org/Industry/ResearchAndReports. Popular activities include boating, swimming at Great Lakes and inland beaches, fishing, and hunting. The revenue from these activities far exceeds the money spent on water quality protection and monitoring activities each year. Aside from strictly financial considerations, clean water is also essential to protect human health, drinking water quality, biological diversity, and quality of life issues, which attract many businesses and citizens to live and work in Michigan.

CHAPTER 2: WATER QUALITY MONITORING

Environmental monitoring is an essential component of the EGLE mission. Comprehensive water quality monitoring is necessary to improve natural resource management, maintain sustainable ecosystems, and protect public health. Although EGLE is the lead state agency responsible for monitoring, assessing, and managing the state's surface water and groundwater, effective water resource management is best achieved through the formation and implementation of meaningful coalition partnerships with outside entities including other state and federal agencies, Canadian organizations, local governments, tribes, universities, industry, environmental groups, and citizen volunteers.

Wherever possible, EGLE strives to organize and direct the resources and energies created by these partnerships through a "watershed approach" to protect the quality and quantity of the state's water resources.

Many EGLE water quality monitoring and water pollution control programs are integrated and implemented according to a five-year rotating watershed cycle to facilitate effective watershed management. Michigan has 57 major watersheds based on the USGS's eight-digit HUCs. Water quality assessment efforts focus on a subset (approximately 20 percent) of these major watersheds each year (Figure 2.1).

In January 1997, EGLE completed a monitoring report entitled, "A Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters" (Strategy) (MDEQ, 1997). It was developed specifically to identify the activities and resources needed to establish a comprehensive, state-of-the-art water quality monitoring program, and has guided Michigan's monitoring program implementation. The Strategy consists of nine interrelated elements: fish contaminants, water chemistry, sediment chemistry, biological integrity, wildlife contaminants, bathing beaches, inland lake quality and eutrophication, stream flow, and volunteer monitoring. The Strategy specifically identifies four monitoring goals:

- Assess the current status and condition of waters of the state and determine whether WQS are being met.
- Measure spatial and temporal water quality trends.

- Evaluate the effectiveness of water quality protection programs.
- Identify new and emerging water quality issues.

The evolving nature of management and program needs, technology, and technical monitoring guidance/science requires continuous evaluation of existing activities to ensure effective, comprehensive monitoring and to identify opportunities for improvement. Program assessment led to an update of the 1997 Strategy in May 2005 and again in January 2017 (MDEQ, 2017) (available at Michigan.gov/WaterQuality).

Regarding wetland monitoring, the 4 goals of Michigan's Water Quality Monitoring Strategy are addressed in a separate document entitled, "State of Michigan Wetland Monitoring and Assessment Strategy," updated in 2013. This strategy follows the 3-Tiered Technical Approach – Level 1: Landscape Assessment, Level 2: Rapid Wetland Assessment, and Level 3: Intensive Site Assessment - outlined in the USEPA publication, "Application of Elements of a State Wetland Monitoring and Assessment Program" (USEPA, 2006). The objectives of the wetland monitoring and assessment strategy are:

Objective 1: Complete an inventory of Michigan's wetland resources that provides both fundamental resource information and a baseline for evaluating gains and losses over time.

Objective 2: In order to support state and national no net loss/net gain goals for wetlands, cooperate in updating of National Wetland Inventory maps for use in status and trends reporting.

Objective 3: Assess the effectiveness of Michigan's state-administered Section 404 permit program by tracking authorized impacts and mitigation for those impacts, as well as documented unauthorized impacts and restoration measures.

Objective 4: Apply Landscape Level Functional Wetland Assessment methods to support the protection, management, and restoration of wetlands on a watershed scale.

Objective 5: Evaluate individual wetland sites using the Michigan Rapid Assessment Method to quickly assess the wetland functions and values on an equal scale regardless of ecological type.

Objective 6: Use full scale biological assessment of wetlands for resource management purposes. Develop and document wetland Indices of Biological Integrity and related methods.

Objective 7: In cooperation with other public and private agencies and organizations, provide for the evaluation of Michigan's most outstanding wetland resources, especially Great Lakes coastal wetlands, by supporting the long-term monitoring of wetlands through the Great Lakes Coastal Wetland Consortium and similar cooperative efforts.

Objective 8: Assess statewide wetland quality by establishing a routine wetland monitoring program that parallels other basin-wide water quality monitoring, including the National Wetland Condition Assessment.

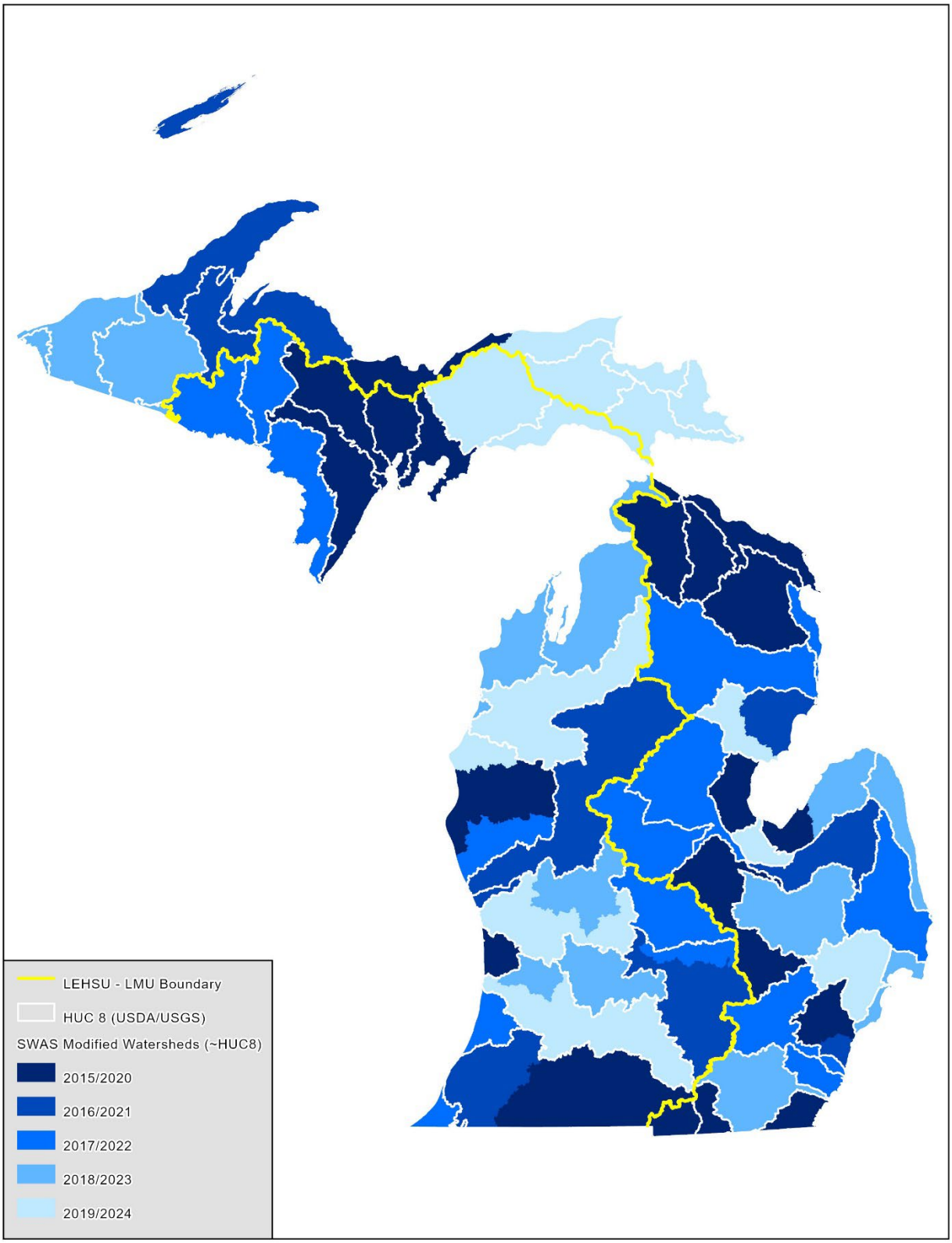


Figure 2.1. Five-Year Rotating Watershed Cycle.

CHAPTER 3: ASSESSMENT METHODOLOGY

3.1 INTRODUCTION

Michigan's assessment methodology describes how data and information are used to determine designated use support for surface waters of the state and describes how surface water resources are reported using 5 categories (fully supporting, partially supporting, not supporting, insufficient information, or not assessed, described in more detail in Section 3.11).

Ultimately, this methodology describes the process used to arrive at the decisions reflected in the appendices and summary tables included in this IR to satisfy the requirements of Sections 305(b) and 303(d) of the federal CWA.

The internal coordination and review process used to generate Sections 305(b) and 303(d) lists is carried out by a team of EGLE technical staff and managers with considerable knowledge of local watershed conditions/issues and expertise in aquatic biology, limnology, ecology, environmental engineering, chemistry, microbiology, and mammalian/aquatic toxicology.

3.2 DATA AND INFORMATION USED TO DETERMINE DESIGNATED USE SUPPORT

EGLE considers readily available, adequately georeferenced, and quality checked data and information collected and submitted by EGLE, its grantees and contractors, other agencies, and the public (including volunteer monitoring groups). Sources of data and information, in part, include:

- EGLE's water quality monitoring program that includes eight interrelated elements: fish contaminants, water chemistry, sediment chemistry, biological integrity and physical habitat, wildlife contaminants, bathing beach monitoring, inland lakes monitoring, and stream flow (see Chapter 2).

As part of EGLE's water quality monitoring program, sites for biological integrity and water chemistry monitoring are selected using both targeted and probabilistic study designs. The probabilistic monitoring approach is used to address statewide and regional questions about current water quality conditions and temporal trends. Targeted monitoring is used to fulfill specific monitoring requests, assess known or potential problem areas or areas where more information is needed, and provide information to support and evaluate the effectiveness of EGLE water protection programs (e.g., National Pollutant Discharge Elimination System (NPDES), Nonpoint Source (NPS), and Site Remediation). All site-specific data are considered when determining designated use support.

- Michigan's 2020 IR (EGLE, 2020), which serves as a baseline for the 2022 IR and is modified using new data and information.
- Fish Consumption Advisories established by the Michigan Department of Health and Human Services (MDHHS).
- Dilution calculations, trend analyses, or predictive models for determining the physical, chemical, or biological integrity of surface water bodies.
- Reports of fish kills and chemical spills.
- Surface water quality monitoring data submitted by the general public or outside agencies. This information was solicited by EGLE in a notice on the EGLE Web-based Calendar in the following publications: January 29, February 5, 12, 19, and 26, and March 5 and 12, 2021. Information was also solicited directly from an EGLE list-serve specific to Integrated Reporting and TMDLs which has a membership including various governmental (local to federal) agencies, State of Michigan agencies, tribal contacts, Michigan colleges and universities, watershed organizations, private consulting firms, and general citizens via e-mail on February 12, 2021, and was posted on the EGLE Integrated Report Web site. Data received from outside sources, and if and how they were used, is summarized in Section 9.2.
- Public Water Supply taste and odor complaints as well as surface water, drinking water, and source water quality assessments conducted under Section 1453 of the federal Safe Drinking Water Act, enacted by Public Law 93-523, December 16, 1974, as amended, through August 6, 1996, being Title 42 of the United States Code (U.S.C.), Section 300j-13.
- Remedial investigation/feasibility studies to support Records of Decision under the Comprehensive Environmental Response, Compensation, and Liability Act, 1980 PL 96-510 or Part 201, Environmental Remediation, of the NREPA.

To ensure adequate time for proper data analysis, EGLE applies a cutoff date for newly collected data considered for the IR (i.e., data that were not used for development of the 2020 IR). For the 2022 IR, unless otherwise noted below or in the methodology under each use, EGLE considered all new readily available and quality-checked water quality data and information collected by EGLE and its grantees/contractors within the two-year period immediately following the cutoff date considered for the 2020 IR. In other words, data collected during the period from January 1, 2019, to December

31, 2020, were considered for the 2022 IR. Data collected prior to January 1, 2019, that were unable to be used for the 2020 IR or that were helpful to understand conditions over a longer period of time given limited datasets were considered for the 2022 IR using the current assessment methodology.

A seven-year span of available data were used with Water Chemistry Monitoring Program (WCMP) data to capture multiple sampling events and provide better supporting information on conditions over time. WCMP data collected through 2019 were used for this IR. WCMP data collected in 2020 were not quality-checked in sufficient time to be broadly used for this IR. However, data collected in 2020 and after the December 31, 2020, cutoff date are occasionally considered for inclusion in the 2022 IR on a case-by-case basis as determined appropriate by EGLE.

TMDL documents completed and approved by the USEPA through 2021 were used to prepare this IR. Water quality data collected since January 1, 2019, and submitted to EGLE by March 19, 2021, by other parties (e.g., in response to the data solicitation described above, from the Michigan Clean Water Corps volunteer monitoring database, etc.) were evaluated according to this assessment methodology and potentially used to help prepare the 2022 IR.

The quality assurance/quality control requirements for water, sediment, and fish tissue chemistry and biological data collected by EGLE are described in EGLE's Quality Management Plan (MDEQ, 2005). To ensure acceptable data quality, EGLE also requires all grantees or vendors receiving state or federal money for the purpose of conducting water quality monitoring to prepare and follow Quality Assurance Project Plans prior to sample collection (MDEQ, 2007). Other data, such as those submitted by outside agencies or the public, must satisfy EGLE's quality assurance/quality control requirements to be used to make designated use support determinations of supporting or not supporting, to change the designated use support, or to reassign water bodies to different categories. Data that do not fully satisfy EGLE's quality assurance/quality control requirements or data that are collected and analyzed using techniques that are less rigorous than those used by EGLE to make designated use support determinations may be used to list a water body for further evaluation (i.e., as insufficient information).

Each dataset for a water body is evaluated to determine if the data are representative of existing conditions and of adequate quality to make designated use support decisions. Data may not be representative of existing conditions if land use, point sources, or hydrologic conditions were substantially changed since the point of last data collection. Data may not be of adequate quality if field or laboratory methods changed to address quality concerns subsequent to data collection. In addition, the quantity of data; duration, frequency, magnitude, and timing of WQS exceedances; analytical method sensitivity; and contextual information (e.g., naturally occurring, weather, and flow conditions, etc.) are considered to ensure the data are representative of critical conditions. Target sample sizes may be given in this assessment methodology to determine designated use support; however, these sample sizes are not applied as absolute rules.

Generally, data that are collected to determine compliance with permitted activities, such as NPDES discharge data, are not used to determine designated use support; however, ambient data collected during these studies will be considered. Similarly, although some foams associated with surface waters have been shown to contain PFAS, it is the associated water quality and fish tissue concentration data related to PFAS that will continue to be used for assessment and impairment listings. The presence of foam, absent additional data, does not supply the information needed to adequately assess use attainment; however, reports of PFAS foams continue to be an important component of the process used to guide future fish tissue and water chemistry sampling of lakes and streams to help find sources of PFAS.

Water body, assessment, or data types not specifically discussed in this assessment methodology (including uncommon data or unusual circumstances) are considered on a case-by-case basis and are evaluated consistent with WQS; any related decisions will be supported by Assessment Unit-specific comments retained in ATTAINS.

3.3 Determination of Designated Use Support

At a minimum, all surface waters of the state are designated and protected for all of the following designated uses: agriculture, navigation, industrial water supply, warmwater fishery, other indigenous aquatic life and wildlife, partial body contact recreation, and fish consumption (R 323.1100[1][a]-[g] of the Part 4 Rules). In addition, all surface waters of the state are designated and protected for total body contact recreation from May 1 to October 1 (R 323.1100[2]). Specific rivers and inland lakes as well as all Great Lakes and specific Great Lakes connecting waters are designated and protected for coldwater fisheries (R 323.1100[4]-[7]). Several specific segments or areas of inland waters, Great Lakes, Great Lakes bays, and connecting channels are designated and protected as public water supply sources (R 323.1100[8]). The Part 4 Rules form the basis for this assessment methodology.

Most designated uses have one or more types of assessment that may be used to determine support. For example, to determine support for the other indigenous aquatic life or wildlife designated use, biological or physical/chemical assessment (e.g., rapid bioassessment of the macroinvertebrate community or chemical analysis of water samples) may be used. The assessment types include biological, habitat, physical/chemical, toxicological, pathogen indicators, other public health indicators, and other aquatic life indicators (default types from the USEPA ATTAINS). In addition, a variety of parameters may be considered for the same assessment type. For example, physical/chemical assessments to determine fish consumption designated use support may include analysis of mercury or PCB concentrations in the water column.

Michigan uses the principle of independent applicability when making most support determinations for each designated use for each water body. If data for more than one parameter with clear assessment thresholds (e.g., numeric criteria or water quality values) are available that are used to determine support for the same designated use, each data type is evaluated independently to determine support for the designated use. If any one type of data indicates the designated use is not supported, then generally, the water body is listed as not supporting that designated use. In

some instances, data require reevaluation to resolve discrepancies. When making assessment decisions based on narrative criteria without clear indicator thresholds or in situations using less standardized data sets a 'weight-of-evidence approach' is used to provide a context that evaluation of multiple data types brings. If no data are available for any assessment methods, then a water body is considered not assessed.

A single parameter may be used to make support determinations for more than one designated use. For example, appropriate data for a water body may reveal that water column mercury concentrations exceed the wildlife value and human noncancer value (HNV) (nondrinking water) (R 323.1057); therefore, both the other indigenous aquatic life and wildlife, and fish consumption designated uses are not supported. The inclusion of a parameter under a specific designated use in this assessment methodology does not preclude the use of that parameter to make support determinations for a different designated use.

Though infrequent, when best professional judgment (BPJ) is used to make a designated use support determination, justification is documented in the designated use comment field in the ATTAINS record.

Water bodies listed as having insufficient information will generally be revisited in the watershed-specific basin year as resources allow (Figure 2.1).

3.4 Designated Uses: Agriculture, Navigation, and Industrial Water Supply

3.4.1 Assessment Type: No Specific Indicator or Assessment Method

EGLE does not conduct specific assessments to evaluate support of the agriculture, navigation, and industrial water supply designated uses. These uses are assumed to be supported unless there is site-specific information indicating otherwise. In a scenario where site-specific information is used, the information is evaluated on a case-by-case basis using BPJ.

3.5 Designated Use: Warmwater Fishery and Coldwater Fishery

All surface waters of the state are designated and protected for warmwater fishery. In addition, specific rivers and inland lakes as well as all Great Lakes and specific Great Lakes connecting waters are designated and protected for coldwater fishery per R 323.1100(4)-(7).

3.5.1 Assessment Type: Physical/Chemical

For the following parameters the ideal dataset for river/stream assessments will come from continuous data collection or similar frequent collection over a target time frame. Collecting data of a sufficient frequency over an appropriate duration is important to fully investigate fluctuations in parameter quality over time and during critical periods in flowing waters (e.g., predawn and midday dissolved oxygen monitoring to investigate diurnal swings). Inland lake data are important to collect during critical periods, particularly during stratified summer conditions as oxythermal habitat has the potential to be most limiting during those periods.

3.5.1.1 Dissolved Oxygen Concentration

River/Stream: Support determinations using dissolved oxygen data in Great Lakes, connecting waters and inland streams will typically be based on continuous data collected over a time period (e.g., two weeks) that is representative of conditions and captures environmental variability. Limited individual grab samples (e.g., 1 or 2 collected during other monitoring efforts) may generally be used only to assess a site as "insufficient information," thereby recognizing the need for more specific and detailed monitoring to make a use support determination. Data should be collected with properly maintained equipment following the manufacturer's guidelines. Current quality assurance/quality control procedures should be followed. Consideration of environmental conditions (e.g., weather, sample collection time of day, etc.) is especially important when making designated use determinations using dissolved oxygen concentrations.

In general, a decision of "not supporting" for dissolved oxygen will be based on a 10 percent exceedance threshold following USEPA guidance (USEPA, 2002). If more than 10 percent of representative measurements (with continuous monitoring being the preferred method) exceed the criteria set forth in R 323.1064, the site is listed as "not supporting." In addition to the guidelines outlined above (e.g., continuous monitoring preferred over a 2-week period), BPJ remains a factor in any case of support determinations using ambient dissolved oxygen for the warmwater and coldwater fishery designated uses. It is conceivable, although likely infrequent, that in using BPJ, a water body may be assessed with a less rigorous set of data (e.g., than the preferred continuous monitoring over a two-week period), based on other environmental data concerns and/or multiple grab samples, showing degradation of water quality, collected over consecutive years or particularly egregious exceedance of WQS indicating obviously degraded conditions.

Inland Lake: Support determinations using dissolved oxygen data in inland lakes will typically be based, at a minimum, on dissolved oxygen profile data collected at the lake's deepest point during summer stratification periods (ideally mid-July through August, taking into account annual weather pattern variability) from at least two of the most recent representative years. Profile data collected during unstratified conditions is also helpful in comparing conditions to the applicable WQS. For coldwater lakes, as defined in R 323.1100(4) and (6), comparisons of available data will be made to R 323.1065(1)(a)-(d), to determine which subpart WQS is applicable based on historic knowledge of the lake's most unaltered condition. Historic data, if available, will be helpful in determining the coldwater lake's stratification category as described in R 323.1065(1)(a)-(d), which in turn defines the WQS goals. The four types of coldwater inland lakes are summarized as follows:

1. 323.1065(1)(a): stratified coldwater lake with D.O. concentrations less than 7 mg/L in the upper half of the hypolimnion
2. 323.1065(1)(b): stratified coldwater lake with D.O. concentrations greater than 7 mg/L in the upper half of the hypolimnion
3. 323.1065(1)(c): stratified coldwater lake with D.O. concentrations greater than 7 mg/L throughout the hypolimnion
4. 323.1065(1)(d): unstratified coldwater lake

Data not in keeping with the WQS defined in R 323.1065 (1)(a)-(d), as relevant, will typically result in a "not supporting" listing.

3.5.1.2 Temperature

Support determinations using temperature data will typically be based on continuous data collected over a time period (e.g., two weeks) that is representative of conditions and captures environmental variability. Limited individual grab samples (e.g., one or two collected during other monitoring efforts) may generally be used only to assess a site as "insufficient information," thereby recognizing the need for more specific and detailed monitoring to make a use support determination. Data should be collected with properly maintained equipment using manufacturer's guidelines. Current quality assurance/quality control procedures should be followed. Consideration of environmental conditions (e.g., weather, sample collection time of day) is especially important when making designated use determinations using temperature.

In general, a decision of "not supporting" for temperature will be based on a 10 percent exceedance threshold following USEPA guidance (USEPA, 2002). If more than 10 percent of representative measurements (with continuous monitoring being the preferred method) exceed the criteria set forth in R 323.1069, R 323.1070, R 323.1072, R 323.1073, or R 323.1075, depending on water body type, the site is listed as "not supporting."

In addition to the guidelines outlined above (e.g., continuous monitoring preferred over a two-week period), BPJ remains a factor in any case of support determinations using ambient temperature for the warmwater and coldwater fishery designated uses. During periods of extreme ambient air temperatures, it is assumed that stream temperatures will also rise. In some cases, this alone may cause temperatures to exceed criteria. BPJ to list a water body will be used in these situations. Likewise, it is conceivable, although likely infrequent, that in using BPJ, a water body may be assessed with a less rigorous set of data (e.g., than the preferred continuous monitoring over a two-week period), based on other environmental data concerns and/or multiple grab samples, showing degradation of water quality, collected over consecutive years or particularly egregious exceedance of WQS indicating obviously degraded conditions.

3.5.1.3 Ammonia (un-ionized) Concentration

Support determinations of chronic conditions using un-ionized ammonia data will typically be based on grab sample data collected over a time period (e.g., one week) that is representative of conditions and captures environmental variability. Limited individual grab samples (e.g., one or two collected during other monitoring efforts) may generally be used only to assess a site as "insufficient information," thereby recognizing the need for more specific and detailed monitoring to make a use support determination. Consideration of other relevant parameters (e.g., temperature, pH, total ammonia) is especially important when calculating un-ionized ammonia concentration to make designated use determinations. In general, a decision of "not supporting" for un-ionized ammonia will be based on more than 1 exceedance of the monthly average (chronic) WQS per R 323.1057 over the period of review (typically two years, see 3.2) following USEPA guidance (USEPA, 1999).

Support determinations of daily maximum (acute) conditions using un-ionized ammonia data will be based on following USEPA guidance; when comparing ambient water column data to Aquatic Maximum Values, more than one exceedance of the acute un-ionized ammonia WQS over the period of review will typically result in assessing the site as not supporting (USEPA, 1999).

In addition to the guidelines outlined above, BPJ remains a factor in any case of support determinations using un-ionized ammonia for the warmwater and coldwater fishery designated uses. It is conceivable, although likely infrequent, that in using BPJ, a water body may be assessed with a less rigorous set of data (e.g., than the preferred continuous monitoring over a two-week period), based on other environmental data concerns and/or multiple grab samples, showing degradation of water quality, collected over consecutive years or particularly egregious exceedance of WQS indicating obviously degraded conditions.

3.5.1.4 pH

Support determinations using pH data will typically be based on continuous data collected over a time period (e.g., two weeks) that is representative of conditions and captures environmental variability. Limited individual grab samples (e.g., one or two collected during other monitoring efforts) may generally be used only to assess a site as "insufficient information," thereby recognizing the need for more specific and detailed monitoring to make a use support determination. Data should be collected with properly maintained equipment using the manufacturer's guidelines. Current quality assurance/quality control procedures should be followed. Consideration of environmental conditions (e.g., weather, sample collection time of day) is especially important when making designated use determinations using pH.

In general, a decision of "not supporting" for pH will be based on a 10 percent exceedance threshold following USEPA guidance (USEPA, 2002). If more than 10 percent of representative samples (with continuous monitoring being the preferred method) exceed the criteria set forth in R 323.1053, the site is listed as "not supporting."

In addition to the guidelines outlined above (e.g., continuous monitoring preferred over a two-week period), BPJ remains a factor in any case of support determinations using pH for the warmwater and coldwater fishery designated uses. It is conceivable, although likely infrequent that in using BPJ, a water body may be listed with a less rigorous set of data (e.g., the preferred continuous monitoring over a 2-week period), based on other environmental data concerns and/or multiple grab samples, showing degradation of water quality, collected over consecutive years or particularly egregious exceedance of WQS indicating obviously degraded conditions.

3.5.1.5 Water Column Toxic Substance Concentrations

To determine warmwater and coldwater fishery designated use support using toxic substances that are non-Bioaccumulative Chemicals of Concern (BCC), ambient water column chemical concentrations are compared to Aquatic Maximum Values and Final Chronic Values per R 323.1057 using Figure 3.1a and following the process described in 3.6.1.1.

3.5.2 Assessment Type: Biological

3.5.2.1 Fish Community

In addition to chemical and physical assessment types, Michigan uses rapid bioassessment of fish communities in wadeable streams and rivers (generally Procedure 51 [P51] [MDEQ, 1990]) to determine support for the warmwater fishery and coldwater fishery designated uses. Fish community biosurvey sites are generally selected using targeted study designs.

Rivers and streams with no site-specific fish community biosurvey results are considered not assessed unless other data are available to assess this use as described elsewhere in this Section (3.5).

Using P51, warmwater fish communities are scored with metrics that rate water bodies from excellent (+5 to +10) to poor (-10 to -5). Fish ratings from -4 to +4 are considered acceptable (Creal et al., 1996). Water bodies with warmwater fish communities rating acceptable or excellent using P51 are determined to support the warmwater fishery designated use. Fish communities collected from designated coldwater streams using P51 are determined to support the coldwater fishery designated use if the relative abundance of salmonids is equal to or greater than one percent. One bioassessment result is generally considered sufficient to make this determination.

Using P51, a determination of not supporting or, infrequently, insufficient information is made for water bodies that have metrics that rate the warmwater fish community poor, have coldwater fish communities with salmonid relative abundance of less than one percent, if fewer than 50 fish are collected, or if the relative abundance of fish with anomalies exceeds two percent (applies to both warmwater and coldwater fisheries). Generally, targeted biosurvey results should have sufficient supporting information available to determine survey representativeness and to list the water body as not supporting using one survey result. However, instances where other supporting information raise concerns over data quality and representativeness (e.g., a poor fish community result during high-water conditions or when equipment function was in question) may require the collection of additional information to determine data representativeness. In this case, a determination of insufficient information is made.

For fish communities that rate poor, current and past weather conditions, assessments of biological communities in adjacent stream or river segments, historic data, and the source and frequency of pollutant exposure are considered to determine if conditions are ongoing or temporary. If conditions are determined to be temporary, a water body may be listed as having insufficient information. For example, a water body with a temporarily poor biological community due to a short-term chemical spill may be listed as having insufficient information if remediation occurred and the community is expected to recover.

Fish community data for streams, rivers, and lakes collected using methods other than P51 are evaluated on a case-by-case basis. For example, fish community data collected as part of the MDNR Fisheries Division's Status and Trend monitoring can be evaluated based on community structure and compared to the definitions for coldwater and warmwater fishery use as stated in R 323.1043 and R 323.1044. Additional factors considered in determining support of the fishery designated

uses are the presence of indicator species such as cisco in coldwater lakes or walleye in warmwater lakes at densities sufficient to indicate water body support of a healthy food web that could maintain taxa of such trophic levels. Similarly, the absence of indicator species where they historically existed, particularly in coldwater lakes (e.g., cisco), will be considered in combination with other information such as oxythermal profile data, to identify potential impairments to the fish community. Data on indicator species absence, while difficult to quantify with ultimate certainty, will be considered in a weight-of-evidence approach from a number of proven sources such as creel data, fish community sampling (netting, electrofishing, etc.), as well as potentially useful emerging tools (e.g., eDNA) as efficacy is demonstrated.

When evaluating this information, two biologists with fisheries experience independently assess fish community data relative to the definitions in the rules and their assessments are subsequently compared. Assessments with agreement (e.g., both biologists rating the data as 'fully supporting' the fishery designated use) are used to assess the appropriate assessment unit as such. Assessments with disagreement (e.g., one biologist rating the data as 'fully supporting' while the other rates it as 'not supporting') result in discussions of the data and agreement reached or a rating as 'insufficient information' to generate additional data collection to fully assess the assessment unit in question.

3.6 Designated Use: Other Indigenous Aquatic Life and Wildlife

3.6.1 Assessment Type: Physical/Chemical

3.6.1.1 Water Column Toxic Substance Concentrations

To determine other indigenous aquatic life and wildlife designated use support using toxic substances, ambient water column chemical concentrations are compared to Wildlife, Aquatic Maximum, and Final Chronic Values per R 323.1057 using Figures 3.1a and b, as described below. Water chemistry monitoring sites are selected using both targeted and probabilistic study designs. All site-specific water column chemistry data that are determined to be representative of current conditions are used to determine other indigenous aquatic life and wildlife designated use support. Additionally, site-specific water column chemistry data for non-BCCs are also used to determine warmwater and coldwater fishery designated use support, as described in Section 3.5.1.5. and illustrated in Figure 3.1a, below.

A minimum of 4 data points in a year are generally used to assess toxic substances per USEPA guidance (USEPA, 2002). In rare instances, and particularly in the case of acute WQS, limited data (less than 4 data points) demonstrating exceedance of WQS may be used to assess a water body as not supporting; if so, the basis for these decisions will be reflected in ATTAINS. A seven-year window of the most recent quality assured data is used for WCMP information to capture two probabilistic monitoring events spaced five years apart.

Following USEPA guidance, when comparing ambient water column data to Final Chronic Values for non-BCCs, more than one exceedance of the WQS over the period of review (typically seven years in Michigan's review process) will typically result in assessing the site as not supporting, as illustrated in Figures 3.1a and 3.1b (USEPA, 2002). Similarly, to be reflective of the need to protect aquatic life against acute impacts, when comparing ambient water column data to Aquatic Maximum Values for BCCs and non-BCCs, one or more exceedance of the WQS over the period of review will typically result in assessing the site as not supporting, as illustrated in Figures 3.1a and b. For BCCs, comparisons of ambient water column data to Wildlife Values (the most sensitive chronic value) will be made using geometric means of available data as illustrated in Figure 3.1b. Geometric mean is chosen to help interpret the data when Wildlife Values are most sensitive because these criteria are based on long-term exposure of wildlife to surface water for drinking and consuming fish tissue. This is an analogous approach to that used when assessing human health protection as recommended per USEPA guidance (USEPA, 2002).

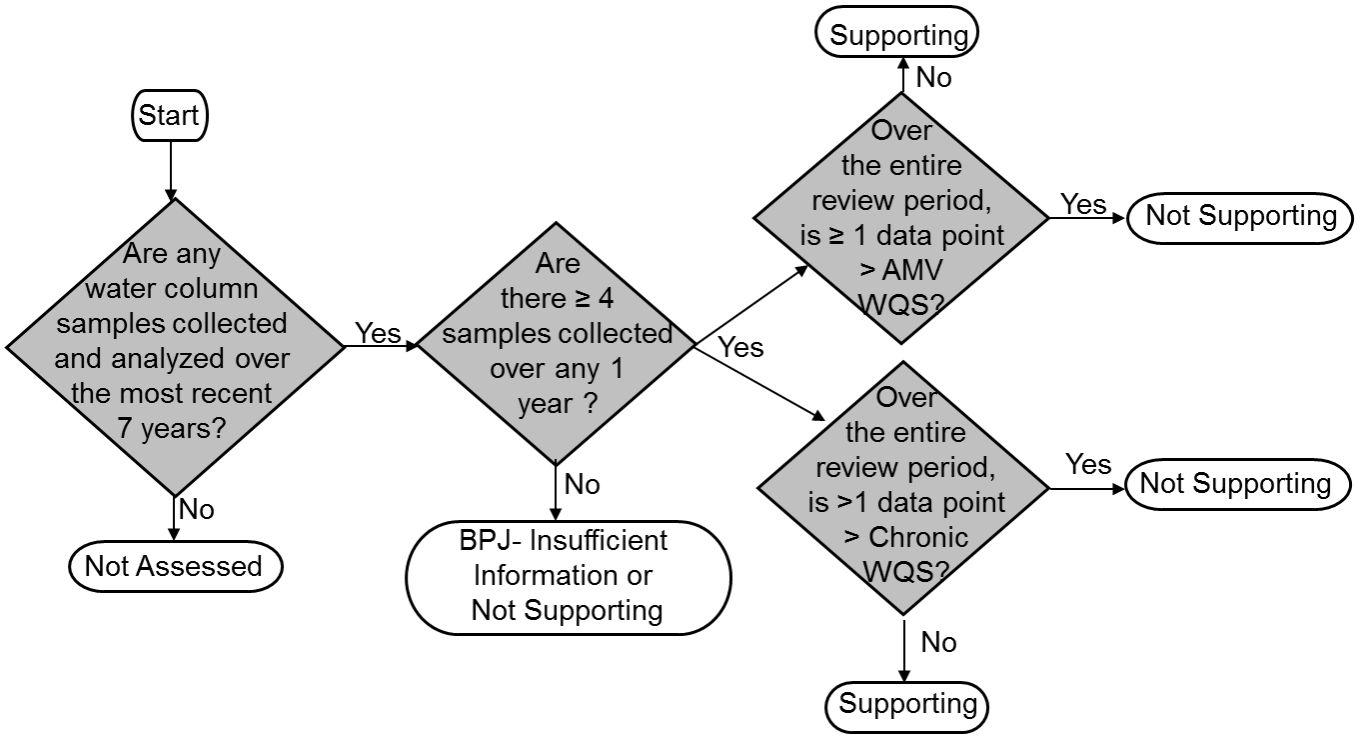


Figure 3.1a. Determination of other indigenous aquatic life and wildlife and warmwater/coldwater fishery designated uses support using water column toxic substance concentration for non-BCCs.

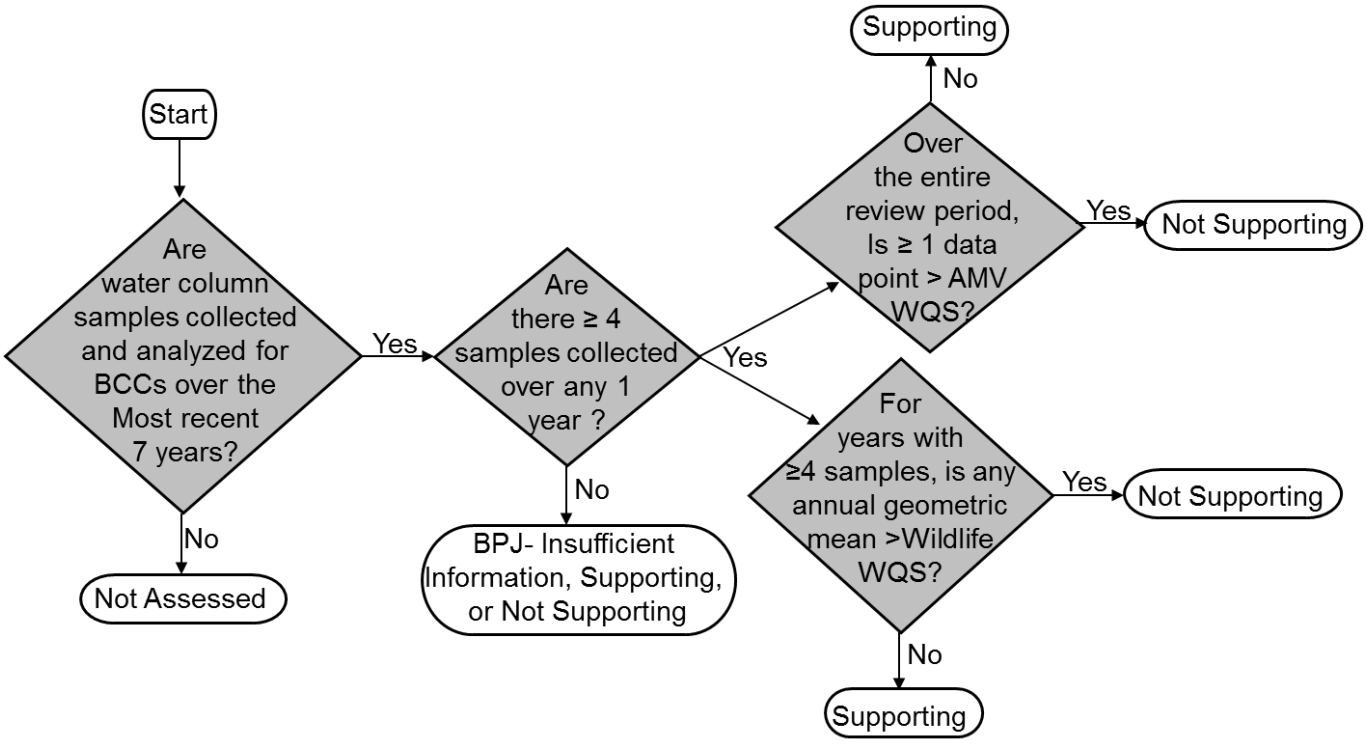


Figure 3.1b. Determination of other indigenous aquatic life and wildlife designated use support using water column toxic substance concentration for BCCs.

Site-Specific Aquatic Life Criteria may be developed following R 323.1057(2)(r)(ii). If Site-Specific Aquatic Life Criteria are developed, determination of designated use support status will be assessed following the processes in Figures 3.1a and b, as appropriate with water column data assessed against the corresponding Site-Specific Aquatic Life Criteria.

3.6.1.2 Water Column Nutrient Concentrations

For all waters, ambient water column nutrient concentrations are used in conjunction with biological indicators to determine support of the other indigenous aquatic life and wildlife designated use in all surface waters per R 323.1060 using BPJ to interpret conditions related to this narrative standard. Samples collected during July through September, when the impacts due to nutrient expression are most likely to occur, are particularly important for making designated use support determinations.

Nutrient concerns may generate the need to conduct additional studies on possible ecological effects, including indirect effects to dissolved oxygen concentrations that may impact the fish community. If so, the results of those studies may be used to assess the warmwater and coldwater fishery designated uses following Section 3.5.1.1 thereby linking nutrient impacts to those uses as well depending on the monitoring outcome.

For inland lakes, various data are useful in a 'weight-of-evidence' approach to determine designated use support. Supporting information may include a combination of Carlson's trophic status index (TSI) and water chemistry results for various nutrients or cyanotoxins, as discussed below, as well as reports of nutrient expression/blooms, aerial imagery showing visible blooms and extent, aquatic nuisance control documentation, and aquatic macrophyte surveys (as described in Section 3.6.2.2). All are potentially useful in demonstrating frequent impact to designated use support, although TSI and evidence of frequent, persistent blooms are most useful in demonstrating a nutrient-enriched system. Data within a 10-year time frame are most relevant to the assessment process. However, data older than 10 years may be useful support information coupled with more recent data.

Inland lakes classified as oligotrophic, mesotrophic, or eutrophic are generally determined to support the other indigenous aquatic life and wildlife designated use, unless other information exists regarding designated use impacts resulting from excess nutrients (e.g., persistent and significant algal blooms). Trophic classifications of lakes as hypereutrophic, or occasionally eutrophic, coupled with additional information discussed above are all potentially supportive lines of evidence for a designated use assessment. Inland lakes that are classified as hypereutrophic, but without additional supporting information regarding nutrient expression, are generally listed as insufficient information with the goal of conducting additional site-specific monitoring to confirm the trophic designation and provide additional supportive information.

Data considerations for inland lake designated use assessment include the following indicators, and those found in Section 3.6.2.2:

- *TSI calculation* – Trophic state determinations for inland lakes in Michigan have typically used data collected during comparable late summer time frames with consistent sample collection methods (e.g., primarily EGLE monitoring data, USGS Lake Water Quality Assessment data [Fuller and Taricska, 2012], or Cooperative Lakes Monitoring Program (CLMP) volunteer data [MIcorps.net/reports/lake-reports]).
  Individual TSI values are calculated using summer data for each trophic state indicator: summer secchi depth (transparency), total phosphorus concentration (epilimnetic), and chlorophyll *a* concentration (photic zone) (Table 3.1).
  An overall TSI is determined from the mean of the individual indicator TSI values to provide a way of reducing the effects of individual sampling and measurement errors, thus developing a more robust estimate of the index. Based on these index values the trophic status classification is determined as listed in Table 3.2 (Fuller and Taricska, 2012). Carlson's index may underestimate the trophic state of lakes dominated by macrophytes. Therefore, the relative abundance of submergent macrophytes, if available, is used to indicate more productive conditions than indicated by the TSI values. It is assumed that moderate and dense growths of macrophytes are indicative of mesotrophic and eutrophic conditions, respectively. Therefore, if Carlson's TSI indicate mesotrophic conditions, but dense macrophytes are present, the lakes will be classified eutrophic (MDEQ, 2013a).

Priority is given to monitoring events with all three parameters (secchi depth, total phosphorus concentration, chlorophyll-a concentration) collected during the summer in the deep point of the lake by a program with an existing quality assurance or work plan (typically, but not exclusively, state, federal, or university collections). However, data collected by other sources, with fewer parameters, or gathered using somewhat different methods may be useful in calculating TSI values for lakes where TSI information is lacking or to investigate support for additional lines of evidence. For example, the use of data collected during the USEPA-sponsored National Lakes Assessments, and by Michigan tribes, the National Park Service, and potentially other sources (e.g., CLMP, MDNR, Fisheries Division, or through satellite imagery interpretation of secchi depths) is considered on a case-by-case basis.

The total phosphorus and chlorophyll-*a* samples collected during these efforts may deviate from the standard sampling methods used by EGLE but remain useful for assessments. Similarly, data collected from shoreline areas may be useful in providing ancillary support for other available information.

- *Water chemistry results: nutrients and cyanotoxins* – In addition to visible signs of expression, associated water chemistry information may also be indicative of nutrient-enriched lakes and may be useful as a component of the assessment process. Total phosphorus less than 30 ug/L in the water column has been shown to generally not cause nuisance plant and algal conditions (Watson et al., 1992; Soranno et al., 2008; and Carvalho et al., 2013).

  Although intense cyanobacteria blooms may not produce toxins, when concentrations of cyanotoxins are detected they are often tied to extensive visible cyanobacteria blooms and are an additional support for nuisance nutrient expression.

Table 3.1: Carlson's TSI Equations.

TSI_{SD} = 60 - 14.40 lnSD	SD = Secchi depth transparency (m)
TSI_{TP} = 4.15 + 14.42 lnTP	TP = total phosphorus concentration (ug/l)
TSI_{CHL} = 30.6 + 9.81 lnCHL	CHL = chlorophyll *a* concentration (ug/l)

Table 3.2: Michigan Inland Lakes Trophic Status Classification Criteria.

Trophic State	*Carlson's TSI*	*TP (ug/l)*	*SD (m)*	*CHL (ug/l)*
Oligotrophic	<38	<10	>4.6	<2.2
Mesotrophic	38-48	10-20	2.3-4.6	2.2-6
Eutrophic	49-61	21-50	0.9-2.2	6.1-22
Hypereutrophic	>61	>50	<0.9	>22

3.6.1.3 Ammonia (un-ionized) Concentration

Support determinations of chronic and acute conditions using un-ionized ammonia data to assess the other indigenous aquatic life and wildlife designated use follow the processes found in Section 3.5.1.3.

3.6.1.4 pH

Support determinations using pH data to assess the other indigenous aquatic life and wildlife designated use will follow the process found in Section 3.5.1.4.

3.6.1.5 Physical Characteristics

R 323.1050 addresses the following physical characteristics of a water body: turbidity, color, oil films, floating solids, foams, settleable solids, suspended solids, and deposits. Michigan does not have specific assessment methods or numeric standards for these physical characteristics; therefore, BPJ (including visual observation) in conjunction with other assessment types (e.g., biological, water column toxics) is used to determine the other indigenous aquatic life and wildlife designated use support based on this narrative standard. Additionally, where related assessment methods have been developed, including numeric thresholds, those established processes will be used to assess relevant uses (e.g., the use of water column concentrations or fish tissue concentrations leading to consumption advisories where possible PFAS-containing foams have been identified).

3.6.2 Assessment Type: Biological

3.6.2.1 Macroinvertebrate Community

In addition to chemical and physical assessment types, Michigan uses rapid bioassessment of macroinvertebrate communities in wadeable streams and rivers (generally P51; MDEQ, 1990) to determine support for the other indigenous aquatic life and wildlife designated use. Using P51, macroinvertebrate communities are scored with metrics that rate water bodies from excellent (+5 to +9) to poor (-5 to -9). Macroinvertebrate ratings from -4 to +4 are considered acceptable (Creal et al., 1996). Biosurvey sites are selected using both targeted and probabilistic study designs. All biosurvey data are considered to determine other indigenous aquatic life and wildlife designated use support.

Rivers and streams with no site-specific macroinvertebrate community biosurvey results are considered not assessed unless other data are available to assess the use as described elsewhere in this Section (3.6).

Water bodies with macroinvertebrate communities rating acceptable or excellent (i.e., total P51 macroinvertebrate community score -4 to +9) are determined to support the other indigenous aquatic life and wildlife designated use. One bioassessment result is generally considered sufficient to make this determination.

A determination of not supporting or, infrequently, insufficient information is made for water bodies with macroinvertebrate communities rated poor (total P51 macroinvertebrate community score -5 to -9). Generally, targeted biosurvey results should have sufficient supporting information available to determine survey representativeness and to list the water body as not supporting using one survey result. For biological communities that rate poor, current and past weather conditions, relevant available historic data, assessments of biological communities in adjacent stream or river segments, and the source and frequency of pollutant exposure are considered to determine if conditions are ongoing or temporary. In all cases, ATTAINS reflects the information used to support the assessment decisions.

EGLE is recalibrating the macroinvertebrate community metrics and scoring within P51 using the reference condition concept as the basis for determining attainment. The process includes defining reference criteria (i.e., least impacted available), establishing site classes that account for natural variability in communities, testing and evaluation of multiple macroinvertebrate metrics, and combining the most responsive metrics into an index. Each metric is selected to be included in the index if it shows a consistent response along a known disturbance gradient and is not duplicative of another selected metric. The combined index gives an indication of biological condition relative to the disturbance gradient, and attainment is determined relative to reference condition. Following final development of metrics, scoring, and thresholds for impairment decisions, this methodology will be updated to reflect the new information. It is anticipated that these changes will be implemented for the 2024 IR cycle.

Macroinvertebrate data for wadeable streams and rivers collected using methods other than P51 are evaluated on a case-by-case basis. Similarly, biological integrity data regarding water bodies where P51 is not appropriate (e.g., wetlands, lakes, ephemeral streams, etc.) will be evaluated on a case-by-case basis using BPJ to assess community characteristics like taxa balance, diversity, and other indicators of system health and function.

Nonwadeable rivers are assessed using Michigan's Qualitative Biological and Habitat Survey Protocols for Nonwadeable Rivers (MDEQ, 2013b). Using this nonwadeable procedure, macroinvertebrate communities are scored with metrics that rate water bodies from excellent to poor. Macroinvertebrate ratings from 76-100 are considered excellent, 50-75 good, 25-49 fair, and 0-24 are considered poor.

Nonwadeable rivers with macroinvertebrate communities rating excellent, acceptable, or fair (i.e., total macroinvertebrate community score ≥25) are determined to support the other indigenous aquatic life and wildlife designated use. One bioassessment result is generally considered sufficient to make this determination.

Similar to determinations made for wadeable streams and rivers, a determination of not supporting or insufficient information is made for nonwadeable rivers with macroinvertebrate communities rated poor (total macroinvertebrate community score 0-24) depending on the quality and amount of supporting contextual information available.

3.6.2.2 Bacteria, Algae, Macrophytes, and Fungi

Site-specific visual observations of bacteria, algae, macrophytes, and fungi may be used to make a support determination for the other indigenous aquatic life and wildlife designated use. In addition, water column nutrient concentrations may also be used to support this determination (see Section 3.6.1.2).

A determination of not supporting will be made if excessive/nuisance growths of algae (particularly, *Cladophora*, *Rhizoclonium*, and cyanobacteria) or aquatic macrophytes are present. Although the determination of excessive, nuisance conditions is generally made using BPJ in accordance with narrative WQS, P51 offers the following guidance to make these determinations for streams:

- *Cladophora* and/or *Rhizoclonium* greater than 10-inches long covering greater than 25 percent of a riffle.
- Rooted macrophytes present at densities that impair the designated uses of the water body.
- Presence of bacterial slimes.

For inland lakes and impoundments, chlorophyll *a* (used as a surrogate for algal biomass) is a component of the TSI calculation and is used quantitatively to determine the trophic state (see Section 3.6.1.2). Additionally, the following data are considered for inland lake designated use assessment in combination with indicators in 3.6.1.2:

- *Bloom reports/complaints* – These should be documented through existing EGLE avenues of either the Environmental Assistance Center, Pollution Emergency Alerting System, or the AlgaeBloom@michigan.gov email. Ideally, reports are most useful if they include photos with descriptions of the extent and duration the bloom has been visible. Repeated annual or intra-annual complaints or documentation of blooms provide useful information on frequent blooms over time (e.g., more than one bloom report in the past 5 years), and the persistence of those blooms when they occur (e.g., more than one bloom report in a season, separated by at least one week).
- *Aerial Imagery* – Visible indication of any bloom (green or blue-green) extent from high-resolution satellite imagery, typically available through online applications, may be useful in corroborating whether blooms have occurred historically. The specific time frame of the images used should be available for perspective when relating to other available information. Other, more frequently obtained images, such as those used in various forecasting efforts by the National Oceanic and Atmospheric Administration (NOAA), are useful in their ability to aid in the evaluation of both extent and duration of blooms.
- *Aquatic Nuisance Control Permits* – Information on target plants and the extent and frequency of treatment are useful information in identifying potentially persistent nutrient expression. For purposes of assessment, the extent of treatment beyond 30 percent of the littoral zone is considered moderately extensive and an indication of broad nutrient expression, particularly when those treatments occur over more than one year in the past five. Additionally, multiple treatments within a season are summarized by the ratio of total cumulative area treated over the season to the unique area treated within the lake; ratios

equal or higher than three are considered to indicate persistence in nutrient availability and vegetation presence throughout the growing season.

The presence of an extensive nuisance control program on a lake that successfully alleviates nutrient expression through treatment may be a supportive line of evidence in an impairment determination; the masking of problems through herbicide application represents a short-term fix that does not address root causes that would otherwise be impacting the lake.

3.6.2.3 Sediment Toxicity

The results of sediment toxicity studies on freshwater invertebrates may be used in conjunction with supporting data from sediment chemistry analyses and/or additional site-specific information, to make support determinations for the other indigenous aquatic life and wildlife designated use. Sediment toxicity tests must be conducted following USEPA Methods 100.1 or 100.2, or a similar test, and must incorporate test acceptability requirements and other quality control steps (USEPA, 2000). It is important from an assessment standpoint that the control-corrected sediment toxicity be further supported by additional information, which lends confidence to the results and reduces the potential of making a listing decision based on possible laboratory error during the testing process. As such, sediment analyses, in-situ biological assessments, or other information in support of toxicity analyses results are necessary to make a full assessment determination following the process in Figure 3.2.

The determination of spatial area represented by toxicity tests will rely on associated information regarding sediment deposit mapping and other site-specific information that supports the likely extent of impacted areas.

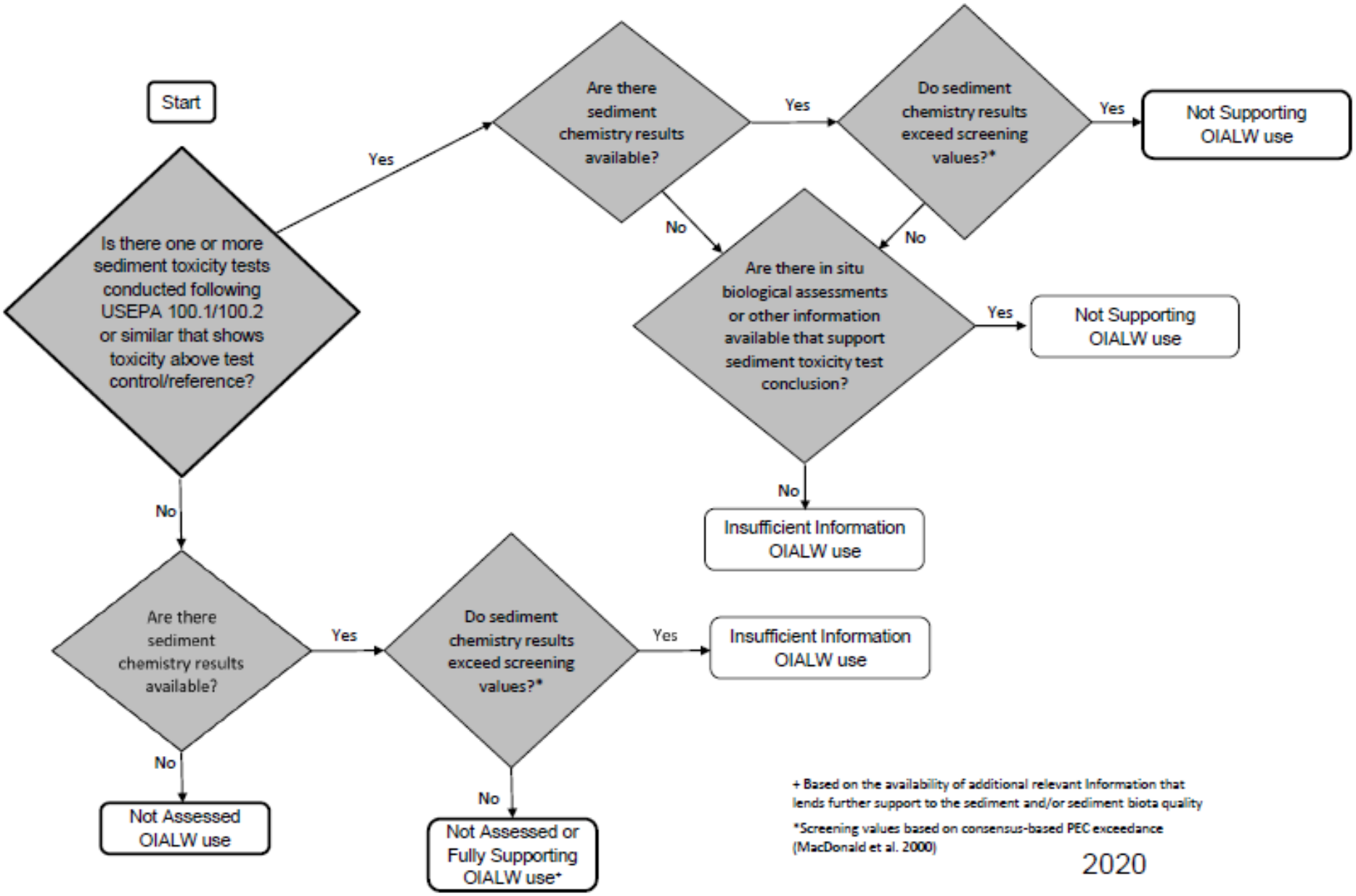


Figure 3.2: Determination of other indigenous aquatic life and wildlife designated use support using sediment toxicity.

3.7 Designated Use: Partial Body Contact Recreation and Total Body Contact Recreation

The partial body contact recreation designated use applies to all water bodies throughout the entire year, while the total body contact recreation designated use applies to all water bodies during May 1 to October 31.

3.7.1 Assessment Type: Pathogen Indicators

3.7.1.1 E. coli

Michigan uses ambient *E. coli* concentration, and the presence of raw sewage discharges, to determine partial body contact and total body contact recreation designated use support using Rule 323.1062 and following Figures 3.3a and 3.3b, respectively. A minimum of five sampling events are needed to assess the partial and total body contact recreation designated uses using *E. coli* data. For the 30-day geometric mean total body contact WQS to be evaluated, the sampling events must be "representatively spread over a 30-day period" (Rule 323.1062). A sampling event is defined by Rule 323.1062 as "three or more samples taken during the same sampling event at representative locations within a defined sampling area." Available quality-checked riverine *E. coli* data, including those from the year immediately preceding the IR cycle, may be used in assessments (e.g., data from 2019 through 2021 may be used during the 2022 IR cycle). Larger datasets (e.g., weekly over the total body contact season or over multiple years) should be used to their fullest extent when available to assure that changing conditions during the year or over multiple years are adequately represented. For example, assessments of bathing beaches for which the most recent two years of data indicate a shift in status (fully supporting to not supporting or vice versa), were expanded to use an additional year of data to increase confidence in changing conditions. A 10 percent exceedance threshold is targeted for making designated use determinations following USEPA guidance (USEPA, 2002). However, discretion may be used when considering a single violation and the magnitude of the exceedance under certain circumstances using small datasets (USEPA, 2002).

The representativeness of *E. coli* data is critical in assessing use attainment. It is important that the *E. coli* data used be spaced over time to represent a range of conditions rather than be clustered around a single event (e.g., single rain event or a single dry weather event). It is acceptable to sample during a critical 30-day period that may be driving *E. coli* concentrations (e.g., summer low flow, wet weather conditions) as long as they are distributed representatively over that time frame. Data used for reassessing an assessment unit previously listed as not supporting should, at a minimum, capture conditions that were reflected in the data used to make the initial assessment. For example, if wet weather events were captured as part of an initial dataset used to list an assessment unit as not supporting, it would be inappropriate to use only dry weather data to assess for delisting purposes. Additionally, when using more extensive datasets, the breadth of the data used is contingent on confidence that it represents conditions and variability typical of the water body being assessed.

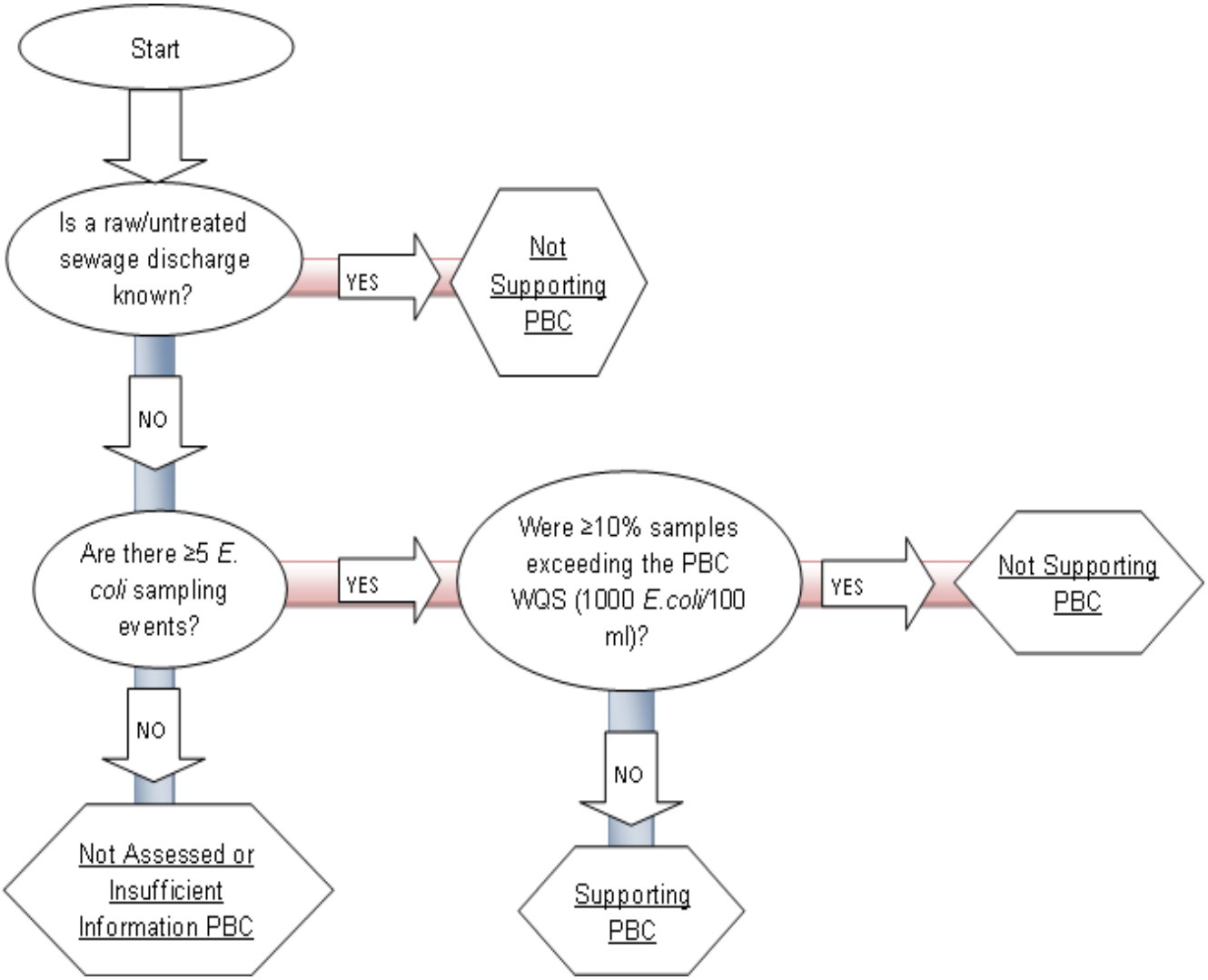


Figure 3.3a: Determination of partial body contact designated use support using ambient *E. coli* water column concentration. See Section 3.7.1.1 for additional details.

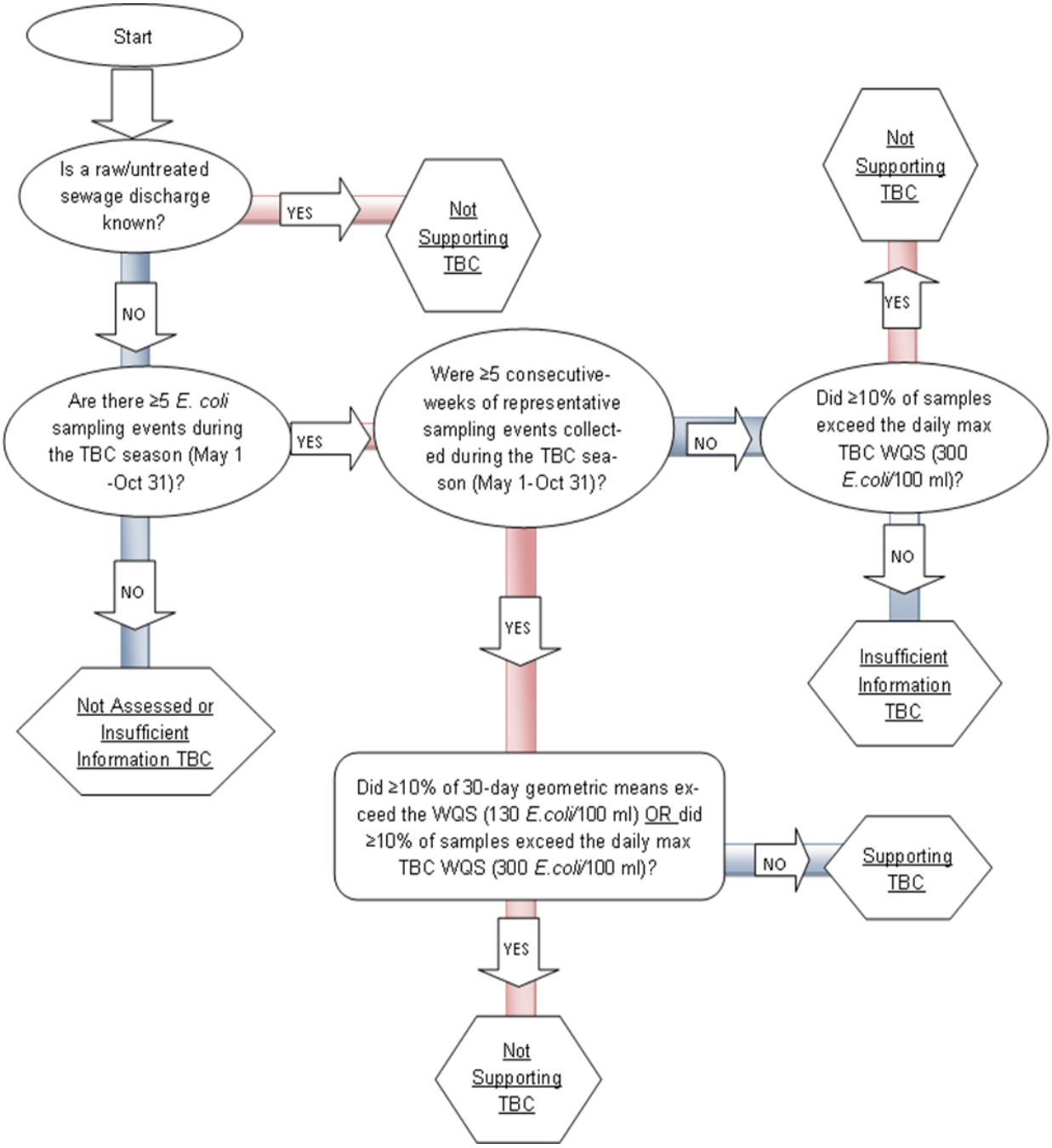


Figure 3.3b: Determination of total body contact designated use support using ambient *E. coli* water column concentration. See Section 3.7.1.1 for additional details.

3.7.2 Assessment Type: Physical/Chemical

3.7.2.1 pH

A determination of not supporting may be made in situations where the pH of surface water is such that direct human contact presents an opportunity for physical danger (e.g., contaminated groundwater venting from cement kiln dust disposal sites). Although infrequent, in such situations decision processes will be captured in relevant comment fields under affected Assessment Units within ATTAINS.

3.8 Designated Use: Fish Consumption

Michigan uses the concentration of BCCs (as listed in Table 5 of the Part 4 Rules) and other bioaccumulative substances (selenium and perfluorooctane sulfonate) in the water column, and fish consumption advisories issued by the MDHHS to determine fish consumption designated use support. A water body is considered to not support the fish consumption designated use if either the MDHHS has issued a site-specific fish consumption advisory for that water body or ambient water column concentrations exceed WQS, as described below.

3.8.1 Assessment Type: Physical/Chemical

3.8.1.1 Water Column and Fish Tissue Mercury Concentrations

A fish consumption designated use decision based on ambient water column mercury concentrations is made by comparing mercury concentrations in the water with the HNV (nondrinking water) WQS (1.8 nanograms per liter [ng/L]) following the flow chart in Figure 3.4. In keeping with the assessment process spelled out in Section 3.6.1.1, geometric mean is chosen to help interpret the data when comparing to HNV because these criteria are based on long-term exposure to surface water for consuming fish tissue.

Michigan's fish tissue mercury value development method is similar to the USEPA's development method for the national fish tissue criterion (USEPA, 2001). Michigan's fish tissue mercury value (0.35 milligrams per kilogram [mg/kg]) was derived using the same exposure scenario used to derive Michigan's HNV (nondrinking water) WQS of 1.8 ng/L. Michigan's fish tissue value for mercury is the concentration that is not expected to pose a health concern to people consuming 15 grams or less of fish per day. This fish tissue value of 0.35 mg/kg for mercury is used as the decision point for making nonattainment listing decisions using the previous two years (2018-2019) of available tissue data for this 2022 IR. The two meal per month MDHHS advisory level based on mercury equates to tissue mercury concentrations in edible portions over a range (0.27-0.53 mg/kg wet weight), encompassing Michigan's fish tissue value for mercury (0.35 mg/kg wet weight).

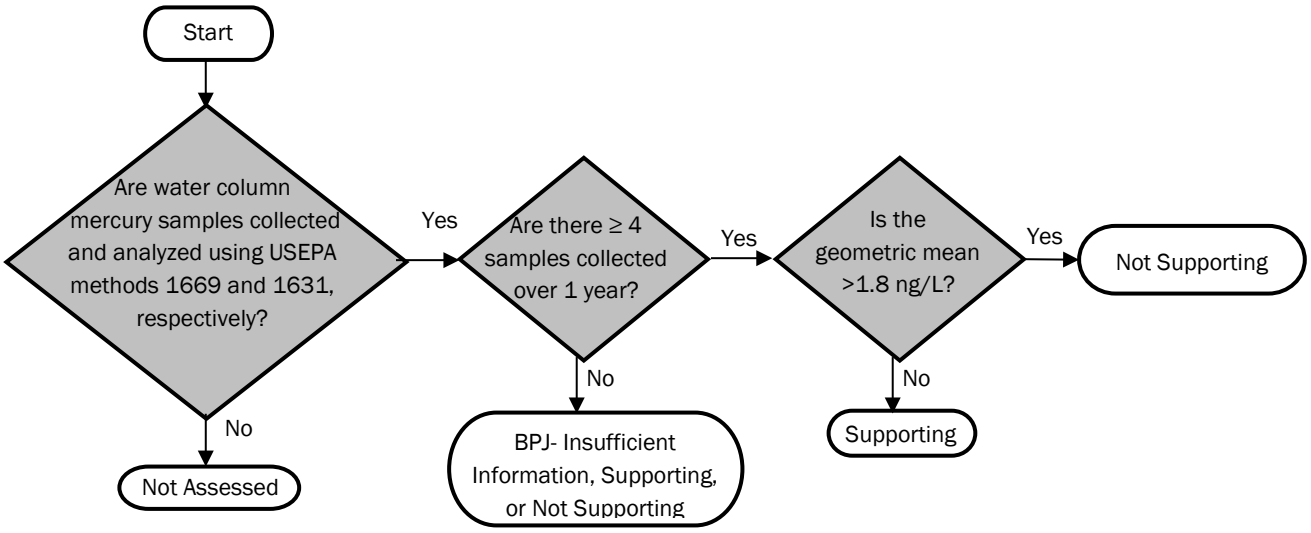


Figure 3.4a: Determination of fish consumption designated use support using water column mercury concentration.

3.8.1.2 Water Column PCB Concentration

To determine fish consumption designated use support for PCBs, the ambient water column PCB concentration is compared to the non-drinking water Human Cancer Value (HCV) (0.026 ng/L) (R 323.1057). PCB samples should be collected and analyzed according to protocols published by the USEPA (1997a and 1997b), with the exception that dissolved and particulate fractions are combined. For PCBs, a sample size of 1 is considered sufficient information to determine WQS nonattainment. This approach is justified by the existence of a large PCB dataset for the state as a whole, which shows virtually 100 percent exceedance of the HCV for total PCBs. If there are no appropriate PCB data, then a water body is considered not assessed. Water bodies with or more ambient water column PCB sample results greater than the non-drinking water HCV are determined to not support the fish consumption designated use.

3.8.1.3 Water Column BCCs Concentration other than Mercury and PCBs

To determine fish consumption designated use support for BCCs other than mercury and PCBs in the water column, ambient water column chemical concentrations are compared to the HNV and HCV for nondrinking water per R 323.1057 using Figure 3.4b and following the process described in Section 3.6.1.1.

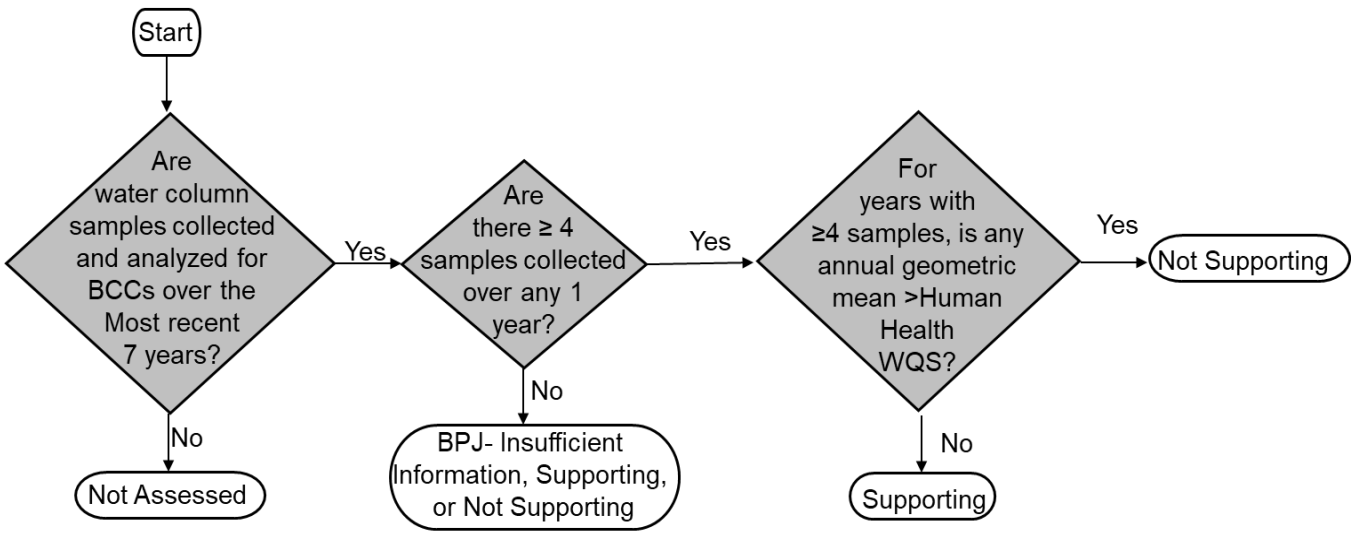


Figure 3.4b. Determination of fish consumption designated use support using water column concentration for BCCs other than Mercury and PCBs.

3.8.2 Assessment Type: Other Public Health Indicators

The MDHHS bases their "Eat Safe Fish" Guidance (advisory) on fish tissue contaminant data collected as part of the Michigan Fish Contaminant Monitoring Program. The fish tissue value is not an ambient WQS; however, EGLE considers the use of the MDHHS advisory based on fish tissue data as appropriate for determining fish consumption designated use support. For example, a fish consumption advisory due to PCBs on a water body specific basis occurs when the upper 95 percent confidence limit on the mean total PCB concentration in fillet samples of any species exceeds 0.01 mg/Kg (wet weight). The MDHHS has developed advisory screening values for mercury, total PCBs, total DDT, dioxins, toxaphene, selenium, and perfluorooctane sulfonate. Information specific to the MDHHS fish consumption advisory issuance process can be found on the MDHHS Web site (www.michigan.gov/mdhhs/safety-injury-prev/environmental-health/Topics/eatsafefish/reports-and-science).

3.8.2.1 Fish Consumption Advisories for Mercury

As described in Section 3.8.1.1, a fish tissue value of 0.35 mg/kg for mercury is used as the decision point for making nonattainment listing decisions using the previous two years of available tissue data.

3.8.2.2 Fish Consumption Advisories for BCCs and other bioaccumulative substances other than Mercury

For contaminants other than mercury, a water body is considered to not support the fish consumption designated use if the MDHHS has issued a site-specific fish consumption advisory for that water body recommending a consumption rate of 12 meals or less per month. The MDHHS bases their advisories on fish tissue contaminant data collected as part of the Michigan Fish Contaminant Monitoring Program. The fish tissue value is not an ambient WQS; however, EGLE considers the use of the MDHHS advisory listing based on fish tissue data as appropriate for determining fish consumption designated use support. For example, a fish consumption advisory due to PCBs on a water body-specific basis occurs when the upper 95 percent confidence limit on the mean total PCB concentration in fillet samples of any species exceeds 0.01 mg/kg (wet weight). Information specific to the MDHHS fish consumption advisory issuance process can be found on the MDHHS web site

3.9 Designated Use: Public Water Supply

Several specific segments or areas of inland waters, Great Lakes, Great Lakes bays, and connecting channels are designated and protected as public water supply sources [R 323.1100(8)].

3.9.1 Assessment Type: Physical/Chemical

3.9.1.1 Toxic Substances in Water Column

Assessment of public water supply designated use support determination is problematic because the HNV and HCV for drinking water (surface WQS) calculations assumes exposure via the consumption of 2 liters of untreated water per day, but it also assumes exposure via the consumption of 15 grams

of fish per day. The majority of human exposure to compounds that are shown to have a potential to bioaccumulate using this exposure scenario would be from the consumption of fish. In other words, based on the process used to develop the HNV and HCV WQS the relative human exposure to a BCC and many non-BCC toxics in surface waters via strictly water consumption is minimal. Currently, Michigan's Part 4 rules do not contain a methodology to derive human health values that protect humans solely for the consumption of 2 liters of untreated surface water per day. However, for compounds that do not have the potential to bioaccumulate (generally, a bioaccumulation factor of 1) the drinking water HNV and HCV WQS can be used directly to assess the public water supply designated use.

Conversely, for compounds where bioaccumulation has been demonstrated to be an important component in human exposure (generally, a bioaccumulation factor >1), a surrogate screening value will be used to assess the public water supply designated use. In these cases, the Maximum Contaminant Levels (MCL) will be used to compare to water column data from an assessment standpoint. The MCLs are used by EGLE's, Drinking Water Program, as the maximum permissible level of a contaminant in water that is delivered to any user of a public water system. The MCLs are solely based on the consumption of two liters of water and do not include a fish consumption component in the calculation; because of this, it was decided that MCLs were reasonable to use as a screening value for water column comparison for toxics where bioaccumulation makes direct comparison to WQS inappropriate. Because the MCL is a standard applicable after treatment, an exceedance of an MCL will not be used as the basis for a nonattainment determination. Instead, the water body will be assessed as "Insufficient Information" indicating the need for further investigation and additional coordination with EGLE's, Drinking Water Program, to complete a full assessment.

Data used for public water supply assessments should be reflective of conditions within the Critical Assessment Zone (CAZ) for Great Lakes and inland intakes as described in Section 3.10, for a particular intake. Similar to the assessment methods used in Section 3.6.1.1, and USEPA guidance, a minimum of four annual data points is generally used to assess toxic substances following Figure 3.5 (USEPA, 2002). The geometric mean of ambient water sample results from a CAZ will be compared to either the WQS or the MCL, as appropriate following the process in Figure 3.5. Geometric mean is chosen to help interpret the surface water data for WQS or MCL comparison because these levels are based on long-term exposure of humans to surface water for drinking. In rare instances, limited data (less than 4 data points) demonstrating extreme exceedance of WQS may be used to assess a water body as not supporting the public water supply designated use; if so, the basis for these decisions will be reflected in ATTAINS.

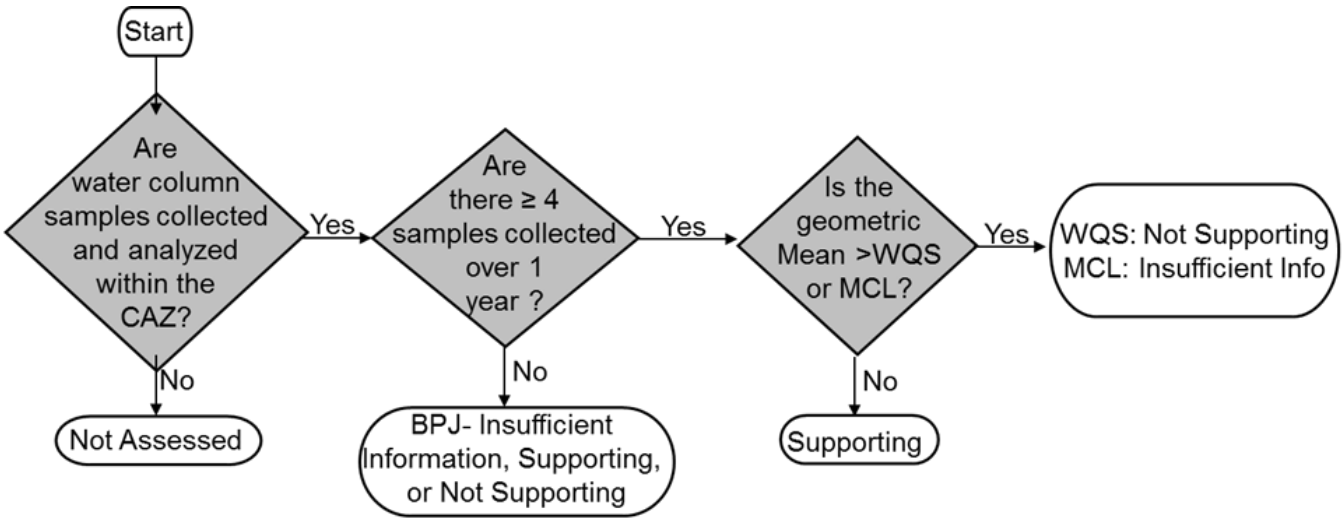


Figure 3.5: Determination of the public water supply designated use support using WQS or MCLs.

3.9.1.2 Chlorides

Designated use support determination using chlorides data is made on a case-by-case basis where one or more representative monthly average calculations can be made and compared to R 323.1051(2). With consistent ambient monitoring data (e.g., ambient drinking water intake data) the WQS will be considered not supporting the public water supply designated use if more than 10 percent of samples during the period of review exceed the applicable WQS.

3.9.1.3 Taste and Odor

To determine public water supply designated use support, site-specific complaints of taste and odor causing substances in community source waters are considered on a case-by-case basis.

3.9.1.4 Nitrates

Elevated nitrates in drinking water source water can lead to acute health concerns, particularly in infants. The nitrate WQS and MCL are both 10 mg/L to be protective of methemoglobinemia in infants. Nitrate data used for public water supply assessments should be reflective of conditions within the Critical Assessment Zone (CAZ) as described in Section 3.10, for a particular intake. Similar to the assessment methods used in Section 3.6.1.1, a minimum of four annual data points is generally used to assess nitrate conditions in surface waters as supporting the public water supply designated use. However, due to the acute nature of the health impacts, one or more exceedances of the 10 mg/L WQS will lead a not supporting assessment.

In rare instances, limited data (less than four data points) demonstrating extreme exceedance of WQS may be used to assess a water body as not supporting the public water supply designated use; if so, the basis for these decisions will be reflected in ATTAINS.

3.9.1.5 Total Microcystins

The relationship between microcystins and their environmental drivers is complicated and not well understood. From a public water supply assessment standpoint in Michigan, the understanding of expectations for natural background concentrations, the susceptibility of surface water drinking water intakes to microcystins, and expectations for conventional treatment efficacy need to be more fully explored. Although the presence of microcystins in source water may necessitate additional treatment from a SDWA program standpoint, the link between that need and the presence of total microcystins in source water that indicates something unnatural and caused by a pollutant may not be clear in many cases.

The USEPA developed health advisory (HA) levels for total microcystins in finished drinking water in 2015. While non-regulatory, these HA levels serve as guidance and provide concentrations at or below which adverse health effects are not anticipated over a 10-day duration. Two HA levels were developed, one (1.6 ug/L) for school-age children through adults and one (0.3 ug/L) for pre-school age children under six years old. Practically speaking, the more conservative HA level of 0.3 ug/L offers a level at which the entire population is protected. These HA levels are important in providing meaningful targets for SDWA programs from a treatment perspective.

The presence of microcystins in drinking source water, while treatable, often presents the need for water treatment facilities to upgrade from conventional treatment to address a source water quality problem. The detection of microcystins in raw intake water above the HA level indicates that, without additional treatment, the source water body may not provide suitable potable water. However, the ability to differentiate between possibly naturally occurring occasional total microcystins from those caused or exacerbated by pollutants, differentiates between possible assessments for the PWS use from a surface water standpoint. It should be noted that the designated use assessment has no bearing on the decisions made in the SDWMA Program regarding the need to provide additional treatment to protect human consumption.

There are no cyanotoxin water quality criteria for the protection of the public water supply designated use. However, the public water supply designated use may be assessed with a combination of total microcystins monitoring data in raw source water and information on the condition of that water body in the vicinity of the intake related to nutrient inputs and other indications of source water quality issues (e.g., documented blooms of algae or cyanobacteria, observed scums, elevated chlorophyll-a). To assess the public water supply designated use total microcystins data should be gathered monthly, at a minimum, during the growth season (June through September).

In cases where two or more total microcystins results in surface water exceed the more conservative HA level of 0.3 ug/L in a three-year period and are supported by documented eutrophication and nuisance nutrient conditions in the same three-year period (see Section 3.6.2.2) that are likely causative, an assessment of Not Supporting the use may be made. Exceedance of the HA level must be at least 30 days apart to reflect cyanotoxin events that are either repeating frequently, or substantial in duration.

In rare circumstances, BPJ may be used to assess a water for the public water supply designated use based on different 'weight-of-evidence' scenarios. Equally rare, the presence of total microcystins alone, particularly with limited monitoring data and no context relative to other nutrient expression, may result in an assessment of Insufficient Information until additional support linking those concentrations to conditions related to human impacts on the water body.

3.10 Assessment Units and Determination of Geographic Extent

Michigan uses the NHD coding scheme (1:24,000 resolution) to georeference water bodies when generating the Sections 305(b) and 303(d) lists. As a base assessment unit, Michigan uses 12-digit HUCs (Appendix A). The geographic extent of a designated use support determination for each water body is made on a case-by-case basis. The 12-digit HUC base assessment unit is used as a default when listing streams and rivers to facilitate record keeping and mapping. Each 12-digit HUC base assessment unit may be split into multiple assessment units if site-specific information supports a smaller assessment unit (e.g., contextual information such as land use, known areas of contamination, point source pollution location, specific fish consumption advisory geographic information, barriers such as dams that restrict fish migration, etc.). An assessment unit may consist of all water bodies in a 12-digit HUC (as a maximum) or specific stream segments or lakes in a 12-digit HUC.

Beyond using the 12-digit HUC as a base assessment unit, contextual information is considered when making a determination of the geographic extent that data collection points represent. For example, if a macroinvertebrate community survey conducted in the lower reach of a branch of a river indicates support of the other indigenous aquatic life and wildlife designated use and a second survey conducted farther upstream (several 12-digit HUCs upstream) in the same river branch also indicates designated use support, then contextual information may be considered to make a determination that the spanned river miles also support the designated use. In this example, contextual information may include similar physical habitat, similar land use, absence of point sources, absence of contaminated sites, etc. Similarly, if an intensive riverine *E. coli* monitoring is conducted, the results from that study may be applied to adjacent assessment units if supported by additional information like land use and more reduced *E. coli* grab sampling data. In other words, if contextual information indicates that it is appropriate, data collected from an assessment unit may be used to make designated use determinations for surrounding water body segments in different assessment units that lack data.

For public water supply intakes that are located in the Great Lakes or connecting channels, a concept of a CAZ around each intake was developed based on a Sensitivity Factor calculated for each intake. The two attributes used to develop the Sensitivity Factor are the water depth above the intake structure and the perpendicular distance from shore or length of the intake pipeline. Other factors such as localized flow patterns, thermal effects, wind effects, lake bottom characteristics, benthic nepheloid layers, etc., may be used to complete the sensitivity analysis. A radius for the CAZ, ranging from 3,000 feet for the most sensitive intakes to 1,000 feet for the least sensitive intakes, is assigned based on the Sensitivity Factor. A shape with this radius is then drawn around the intake to

illustrate the CAZ. If the CAZ intersects the shoreline, then the geographic extent of the assessment unit is determined on a case-by-case basis as the most influential 12-digit HUCs that are along the shoreline within the CAZ. For intakes that are located in open waters of the Great Lakes where the CAZ does not intersect the shoreline, the geographic extent of the assessment unit is 1.5 square miles.

For the public water supply designated use in inland intakes, the geographic extent of the assessment unit is the CAZ; calculated as a 3,000-foot radius for all inland intakes.

Ultra low-level PCB monitoring conducted by the EGLE indicates that PCB concentrations exceed the HCV WQS (0.026 ng/L) in all waters sampled. Based on these results, all river miles in the individual watersheds sampled for PCBs are listed as not supporting the fish consumption designated use for PCBs in the water column.

The geographic extent of some beaches is not currently available. In these instances, a geographic extent of 0.2 shoreline miles was used as a default value.

Streams and rivers are listed in terms of miles. Wetlands are listed in terms of acres. Generally, inland lakes are listed in their entirety as acres, and Great Lakes and bays are listed in terms of square miles, except for Great Lake and inland lake beaches, which are listed in terms of shoreline miles for pathogen concerns.

3.11 Assessment Unit Assignment to Categories

After support determinations for all designated uses and geographic extent decisions are made for an assessment unit, categories are assigned using a multiple category system. The following categories and subcategories are used:

Category 1: All designated uses are supported; no use is threatened.

Category 2: Available data and/or information indicate that some, but not all of the designated uses are supported; the remainder are either not assessed or have insufficient data to make a support determination.

Category 3: There is insufficient available data and/or information to make a designated use support determination.

Category 4: Available data and/or information indicate that at least one designated use is not being supported or is threatened, but a TMDL is not needed.

- Category 4a: A TMDL to address the impairment-causing pollutant has been approved or established by the USEPA.
- Category 4b: Other approved pollution control mechanisms are in place and are reasonably expected to result in attainment of the designated use within a practical time frame.

Category 4c: Impairment is not caused by a pollutant (e.g., impairment is due to lack of flow or stream channelization).

Category 5: Available data and/or information indicate that at least one designated use is not being supported or is threatened, and a TMDL is needed.

Category 5alt: An alternative restoration approach is being taken, with a schedule and milestones, that is anticipated to be more practical and immediately beneficial to the goals of achieving designated use support than the development of a TMDL. Following the USEPA's 2013 Long-Term Vision for Assessment, Restoration, and Protection under the CWA Section 303(d) Program guidance, an alternative approach should incorporate adaptive management and be tailored to specific circumstances where such approaches are better suited to achieve water quality goals in the near-term. Importantly, the impaired use remains on the Section 303(d) list, recognizing that development of a TMDL is required, unless the alternative approach is able to achieve the goal of designated use support and WQS attainment.

An assessment unit is considered threatened and is placed in Categories 4 or 5 when water quality data analysis demonstrates a declining trend that is expected to cause that water body to not attain WQS by the next listing cycle (2024). An assessment unit is not attaining WQS when any designated use is not supported (i.e., Category 4 or 5). Assessment units placed in Category 5 form the basis for the Section 303(d) list and the TMDL development schedule (see Chapter 8 for additional information regarding TMDLs).

Statewide TMDLs have been developed for PCBs and mercury and approved by the USEPA. It is anticipated that future assessments involving PCB or mercury data determined to be atmospheric in source (vs. an otherwise locally controllable source from legacy contamination or point-source conditions) will be assigned to Category 4a based on the existence of the approved statewide TMDLs. More information on this process is described in both the statewide PCB and mercury TMDLs.

A few instances exist where the EGLE has determined that assessment units do not support one or more designated uses, but other appropriate pollution control mechanisms are in place. These assessment units are placed in Category 4b. As described above, the pollution control mechanism for a Category 4b water body is expected to result in the attainment of the designated use within a practical timeframe. Considerations to determine if a pollution control mechanism is appropriate to place a water body in Category 4b include, but are not limited to: the scale of the project (e.g., geographic extent affected, duration, etc.) and the anticipated level of impact on water quality. The EGLE works closely with the USEPA to develop any new listings in Category 4b.

Assessment methodologies used for streams and rivers are also used for channelized streams, when appropriate, including rapid bioassessment of macroinvertebrate and fish communities according to the five-year rotating watershed cycle.

An assessment unit is listed in Category 4c when sufficient water quality data and information are available to determine all the following:

- A specific designated use is not supported (e.g., the other indigenous aquatic life and wildlife designated use is not supported based on a P51 poor macroinvertebrate community rating).
- The cause of the designated use nonattainment is due to something other than a pollutant (e.g., channel maintenance activity or beaver dam).
- No pollutant would cause the designated use nonattainment if the above cause did not occur.

Assessment units are only placed in Category 4c when EGLE monitoring staff determines (using P51 or other appropriate techniques) that sufficient water quality data and information are available to clearly indicate that the Category 4c listing requirements explained in the preceding paragraph fully apply.

Key factors considered by EGLE monitoring staff to help differentiate whether pollutants or other causes are responsible for the observed nonattainment include: water/sediment chemistry and microbiological data when such data are available for the assessment unit, riparian land use characteristics, and P51 habitat metric scores, particularly those for the epifaunal substrate/available cover, embeddedness, sediment deposition, channel alteration, channel sinuosity, bank stability, bank vegetative protection, and riparian vegetative zone width metrics.

It should be noted that EGLE recognizes sediment to be a pollutant. If EGLE aquatic biologists determine that a pollutant (including riparian sediment) is responsible for an assessment unit not supporting a designated use, then that assessment unit is listed in Category 5. Additionally, if channel modification activities in an upstream assessment unit result in sedimentation problems in a downstream assessment unit to a point which causes a designated use to not be supported, then that downstream assessment unit is listed in Category 5.

Michigan uses a multiple category system; therefore, placement of an assessment unit in Category 4c based on a determination that a designated use is not supported and the cause is not a pollutant does not preclude placement of that assessment unit in Category 5 (or any other category) based on a designated use support determination for a different designated use.

Assessment units that do not support a designated use due to multiple causes may be listed in multiple categories for that designated use. For example, an assessment unit may have a TMDL completed for sedimentation; therefore, the assessment unit is listed in Category 4a for the other indigenous aquatic life and wildlife designated use. The same assessment unit may have a mercury TMDL scheduled but not yet completed; therefore, the assessment unit is also listed in Category 5 for the other indigenous aquatic life and wildlife designated use (see Table 3.3, Assessment Unit 10). In this case, the assessment unit is reported in both Categories 4a and 5 for the other indigenous aquatic life and wildlife designated use.

The following example (Table 3.3) adapted from USEPA guidance, illustrates Michigan's use of a multiple category system.

Table 3.3: Examples of assessment unit assignment to categories using a multiple category system with three designated uses.

S = Supporting NS = Not Supporting - = Not Assessed ? = Insufficient Information
/ = Designated use does not apply to assessment unit

Assessment Unit	*Designated use A*	*Designated use B*	*Designated use C*	*Assigned Categories*
Assessment Unit 1	S	S	S	1
Assessment Unit 2	NS	NS	NS	5
Assessment Unit 3	S	S	-	2, 3
Assessment Unit 4	S	S	?	2, 3
Assessment Unit 5	S	-	?	2, 3
Assessment Unit 6	S	NS (nonpollutant)	S	2, 4c
Assessment Unit 7	S	?	NS	2, 3, 5
Assessment Unit 8	S	NS (nonpollutant)	/	2, 4c, 3*
Assessment Unit 9	-	NS (TMDL approved)	NS	3, 4a, 5
Assessment Unit 10	-	NS (TMDL approved) NS	-	3, 4a, 5

*Currently designated uses that do not apply to an assessment unit are assigned not assessed in ATTAINS (e.g., coldwater fishery).

Justification for designated use support determination for each assessment unit is contained in ATTAINS. A comprehensive list of designated use support determinations is provided in Appendix B.

3.12 Impairment Cause and Source

When a determination is made that a designated use is not supported (i.e., an assessment unit is placed in Category 4 or 5), the cause and source of impairment are identified, if known. Generally, the cause of impairment is the parameter(s) used to determine that the designated use is not supported unless a biological indicator is used. The source of impairment is determined using supporting contextual information and BPJ.

In addition, sediment toxic substance concentration data may be used to support other assessment types to make support determinations for the other indigenous aquatic life and wildlife, fish consumption, or other designated uses. Sediment data are collected from water bodies when there is direct knowledge or reasonable expectation of heavy metal or organic chemical contamination at levels that may impair biological communities by direct toxicity or cause fish consumption problems. Contaminated sediments may be listed as the source of impairment when sediment pollutant concentrations exceed screening concentrations (MacDonald et al., 2000; Jones and Gerard, 1999; and Ontario Ministry of the Environment, 1993) or when sediment toxicity test results demonstrate excessive toxicity.

3.13 Delisting Category 5 Assessment Units

Assessment units are removed from the Section 303(d) list (i.e., moved from Category 5 to another category) by EGLE using representative data and the current assessment methodology. Data analysis used to remove an assessment unit from the Section 303(d) list must be at least as rigorous a data analysis as was originally used to list the water body. Specific instances that justify the removal of assessment units from Category 5 include:

- A TMDL has been developed for all pollutants and approved by the USEPA (assessment unit is placed in Category 4a).
- A corrective, remediation action plan has been approved to be implemented or the problem source(s) has been removed, thereby, eliminating the need for a TMDL (assessment unit is placed in Category 4b or when water quality is reevaluated and it is determined that the designated use is supported, the assessment unit is placed in Category 2 or Category 1).
- The source of impairment for the initial designated use support determination was an untreated Combined Sewer Overflow (CSO) and updated information reveals that the untreated CSO has been eliminated or control plan elements have been implemented in a legally binding document that includes a schedule for elimination of the untreated discharge but data are not yet available to document restoration (assessment unit is placed in Category 3 unless the corrective action program has not yet been completed, then it is placed in Category 4b).
- Reassessment of the assessment unit using updated monitoring data or information, techniques, or WQS, indicates that the water body now supports the designated use (assessment unit is placed in Category 1 or Category 2).
- Reexamination of the monitoring data or information used to make the initial designated use support determination reveals that the decision was either incorrect or inconsistent with the current assessment methodology.
- Reassessment of a water body indicates that the cause of impairment is not a pollutant (assessment unit is placed in Category 4c).
- The assessment unit is determined to be within Indian Country, as defined in 18 U.S.C., Section 1151. These water bodies are not considered waters of the state of Michigan, and therefore, are not appropriate to include on the Section 303(d) list.

3.14 Assessment Methodology Changes

Minor edits and clarification changes were made to update the 2020 assessment methodology for the 2022 IR. Included was the recognition of a Category 5alt (Section 3.1.1) as a potential option for impaired waters where an alternative plan is a more effective approach.

CHAPTER 4: ASSESSMENT RESULTS: THE GREAT LAKES, BAYS, CONNECTING CHANNELS (ST. MARYS, ST. CLAIR, AND DETROIT RIVERS), AND LAKE ST. CLAIR

4.1 TROPHIC STATUS

Overall phosphorus loading reductions in the Great Lakes are attributable, in part, to effluent nutrient limits in NPDES permits issued to municipal and industrial facilities. For Great Lakes protection, Michigan's WQS restrict point source discharges of phosphorus to one milligram per liter (mg/L) as a maximum monthly average. Lower limits may be, and often are, imposed to protect designated uses in receiving or downstream waters.

Legislation passed in 1977 that reduced the allowable phosphorus content in household laundry detergents sold in Michigan to less than 0.5 percent phosphorus by weight has contributed to the reduction of phosphorus discharged from point sources. Legislation passed in 2009 reduced the allowable phosphorus content in any cleaning agent sold in Michigan intended for use in household clothes washing machines and, beginning July 1, 2010, dishwashers to 0.5 percent by weight expressed as elemental phosphorus. This legislation has the effect of further reducing phosphorus loads from wastewater treatment plants and on-site treatment systems. NPS phosphorus reduction efforts continue and are aided by legislation that went into effect in 2012 banning the use of phosphorus-containing lawn fertilizers. The current trophic status of each of Michigan's Great Lakes is presented in Table 4.1.

Table 4.1: Trophic status of the Great Lakes bordering Michigan.

Lake	Trophic Status (nutrient level)
Superior	Ultra-Oligotrophic* (very low)
Huron	Ultra-Oligotrophic* (very low)
Saginaw Bay	Eutrophic† (high)
Michigan	Oligotrophic* (low)
Erie (Central Basin)	Mesotrophic* (moderate)
Western Basin	Eutrophic* (high)

*Scofield et al., 2020; †USEPA, 2011

4.2 Water Chemistry of the Great Lakes Connecting Channels

Quality assured data through 2019 were used for assessment updates for this reporting cycle. Refer to discussions of broader trends and results around Michigan as analyzed in the most recent WCMP report (EGLE, 2019a).

4.3 Water Chemistry of Saginaw Bay and Grand Traverse Bay

Quality assured data through 2019 were used for assessment updates for this reporting cycle. Refer to discussions of broader trends and results around Michigan as analyzed in the most recent WCMP report (EGLE, 2019a). Saginaw Bay and Grand Traverse Bay monitoring efforts continue and will continue to be summarized in periodic reports with connecting channels (see Section 4.2) and rivers and streams (see Section 6.2).

4.4 Fish Contaminants

Several projects have been implemented in the Great Lakes basin to monitor temporal and spatial trends in fish contaminant levels:

- The USEPA, Great Lakes National Program Office, collects and analyzes whole lake trout from the open waters of Lakes Superior, Michigan, Huron, and Ontario, and walleye from Lake Erie.
- Michigan's whole fish contaminant trend monitoring effort, initiated in 1990, focuses on fish collected from ten fixed stations located in the Great Lakes bays and connecting channels.

In addition, edible portion fish tissue contaminant monitoring was conducted in 2018 and 2019 from 7 locations in Michigan's Great Lakes and Connecting Channels. Notable findings from these recent results include:

- PFOS concentrations in fish tissue samples from Lake St. Clair continue to support a fish consumption advisory (see Figure 4.1).
- Toxaphene and DDT caused an advisory based on concentrations in fish tissue found in Lake Erie samples.

- Broadly, PCBs and dioxins cause restricted consumption advisories for certain species of gamefish. Edible portion sampling is often targeted toward known sites of contamination, sites popular with sport anglers, and sites with public access.

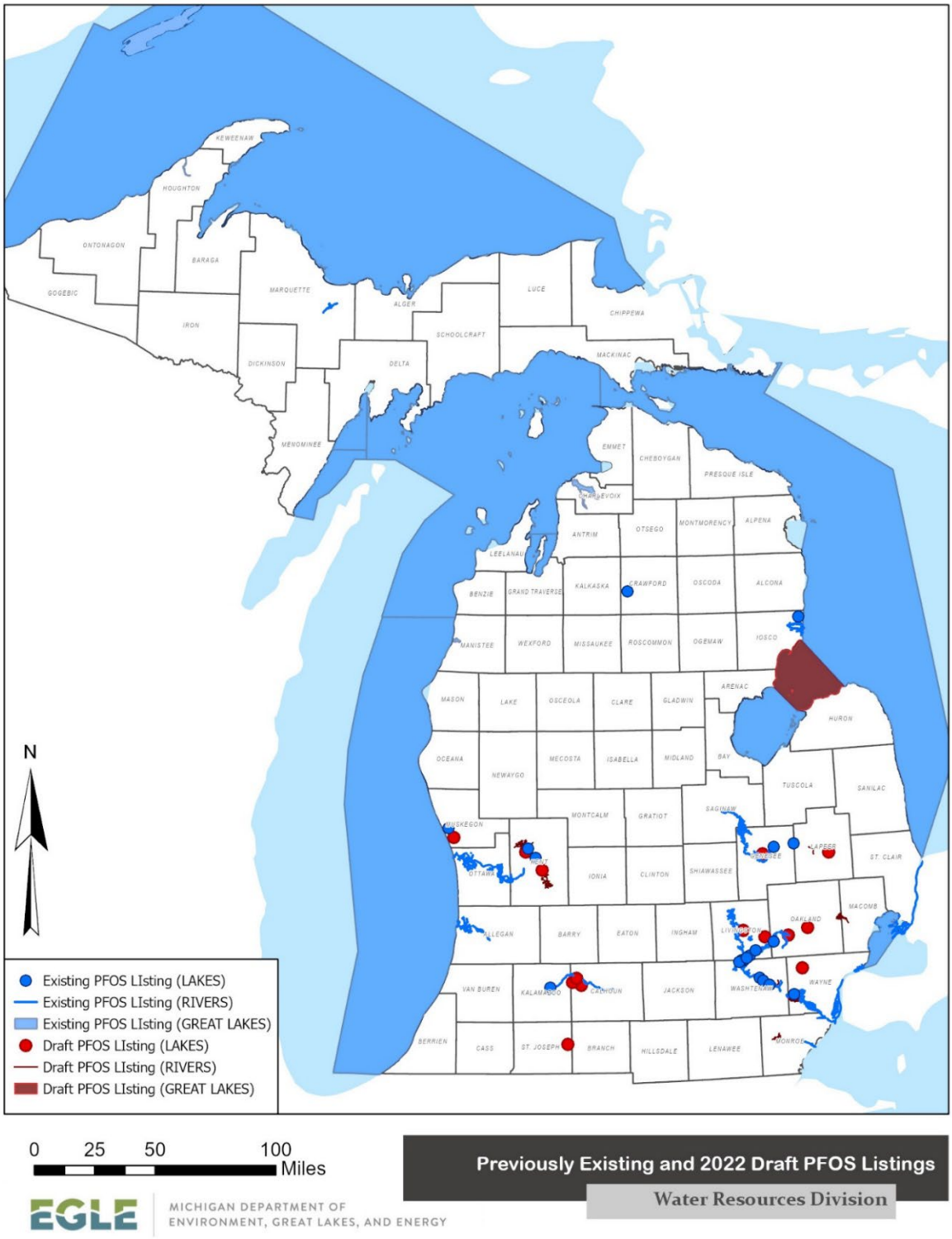


Figure 4.1: Existing and Draft Fish Consumption Impairments based on PFOS in fish tissue data. The outer Saginaw Bay (Lake Huron) Draft PFOS Listing reflects a new assessment unit number, for an area with an existing PFOS Listing; for practical purposes it does not reflect new data or new listing, simply a newly created assessment unit.

4.5 *E. coli*

In 2019, 115 publicly accessible beaches on the Great Lakes and Connecting Channels were monitored and 92 reported no exceedances of the *E. coli* WQS for total body contact. There were 23 beaches that reported a total of 41 exceedances.

In 2020, 116 publicly accessible beaches on the Great Lakes and Connecting Channels were monitored and 92 reported no exceedances of the *E. coli* WQS for total body contact. There were 24 beaches that reported a total of 57 exceedances.

The Michigan Beach Web site (egle.state.mi.us/beach) provides access to a database containing beach closings and *E. coli* data collected by local health departments (LHD) and annual reports summarizing the data. Currently, although 635 public beaches located along the Great Lakes and Connecting Channels are listed in the database, all are not monitored. Data for Great Lakes beaches in Michigan are also available at watersgeo.epa.gov/beacon2/.

4.6 Saginaw Bay Support Summary

The narrative nutrient criteria under R 323.1060(2) of the Part 4 Rules states, "In addition to the protection provided under subrule (1) of this rule, nutrients shall be limited to the extent necessary to prevent stimulation of growths of aquatic rooted, attached, suspended, and floating plants, fungi or bacteria which are or may become injurious to the designated uses of the surface waters of the state."

Rule 1060(2) may be assessed to support the other indigenous aquatic life and wildlife designated use, by using nutrient expression by biological indicators. Following Sections 3.6.1.2 and 3.6.2.2., a determination of not supporting will be made based on a weight of evidence approach using various nutrient indicators.

Since 2016, EGLE has conducted monitoring to document shoreline conditions at beaches along Saginaw Bay to better understand the geographic scope, frequency, and duration of possible nutrient-related impacts to the bay and its shoreline areas (e.g., nearshore algae blooms, beach/shoreline organic material, and water chemistry including possible cyanotoxin impacts). Four beaches were monitored from 2016 to 2021, increasing to 10 beaches or shoreline areas starting in 2018 for a more extensive understanding of the entire bay. These data were useful along with other ongoing and past research, including the NOAA Multi-stressor work and historic information, in assessing the other indigenous aquatic life and wildlife use support in the Saginaw Bay during the 2022 IR cycle.

The repeated, persistent, and extensive cyanobacteria blooms impacting the inner portion of Saginaw Bay, as evidenced by both NOAA satellite imagery as well as EGLE's recent shoreline monitoring data have been determined to be excessive/nuisance conditions leading to ecological imbalance. Both internal and external information were reviewed, leading to the not supporting assessment of the other indigenous aquatic life and wildlife designated use.

The routine observation of visible blooms during sampling efforts from 2016 to 2020 at Saginaw Bay beaches found they typically start in early July and bloom through September, confirming the shoreline extent that blooms and potentially associated cyanotoxins often impact. Additionally, the confirmation of widespread, persistent blooms often throughout much of the inner portion of Saginaw Bay waters during the same period were demonstrated by satellite imagery processed by the NOAA (Wynne et al., 2021). Total phosphorus, chlorophyll a, and Secchi data from 8 long-term monitoring stations on Saginaw Bay and the 10 shoreline sites were also used in the weight of evidence approach to complement visual bloom and satellite imagery data. These data, along with information from NOAA's multistressor study showing extensive filamentous algae beds in the southwest inner portion of Saginaw Bay, lend support to assessing the entirety of the inner portion of Saginaw Bay as not supporting the other indigenous aquatic life and wildlife designated use based on excessive and nuisance cyanobacteria conditions.

4.7 Lake Erie Support Summary

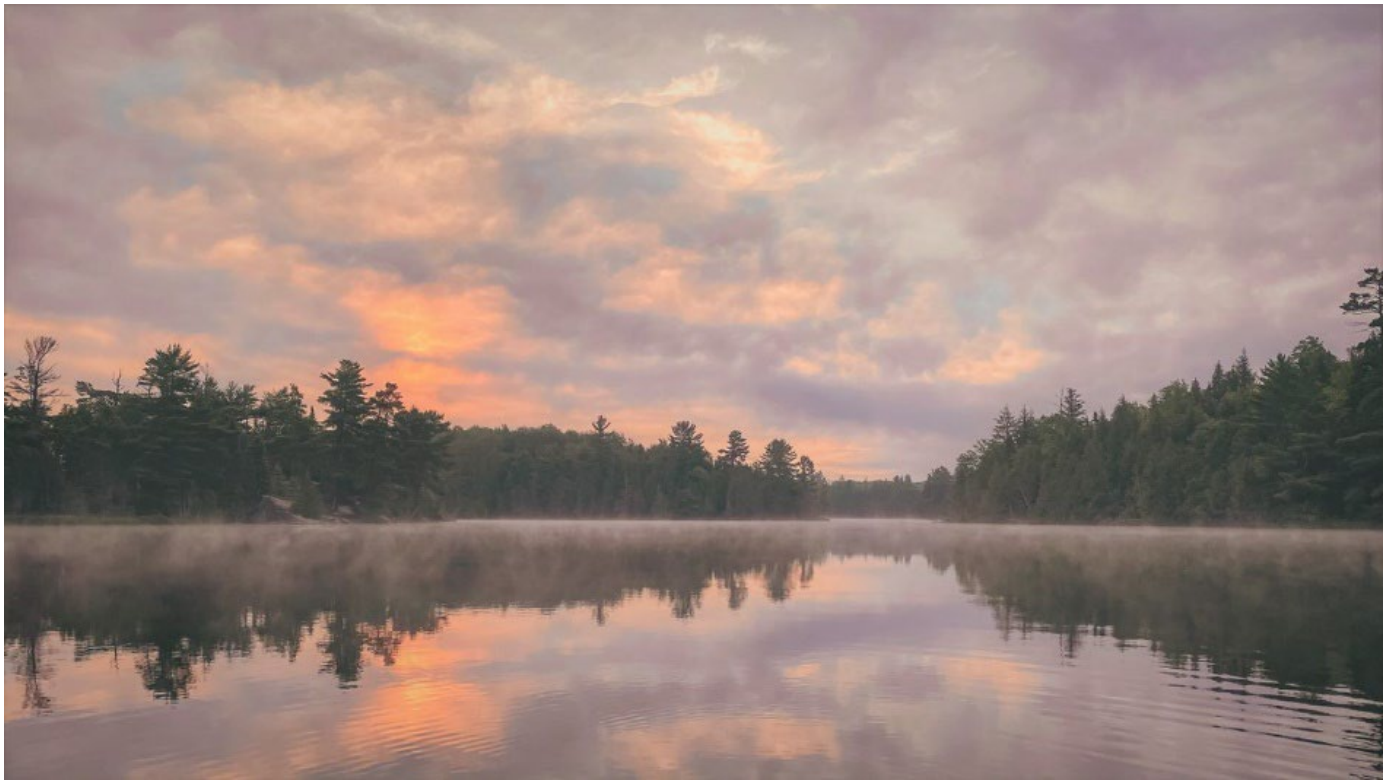
In 2016 the other indigenous aquatic life and wildlife designated use was listed as impaired in Michigan's portion of the western basin of Lake Erie based on repeated, persistent, and extensive cyanobacteria blooms, indicating excessive/nuisance nutrient conditions leading to ecological imbalance. Similarly, the 2018 review brought an impairment designation for the public water supply use in portions of Lake Erie, which are critical assessment zones for drinking water intakes, following the relevant assessment methodology (Chapter 3, Section 3.9.1.5).

As stated in 2016, because of the complexity of the cyanobacteria bloom problem, Michigan continues to believe the best approach for solving the issues in western Lake Erie is through the collaborative process established under Annex 4 of the Great Lakes Water Quality Agreement and the Western Basin of Lake Erie Collaborative Agreement (Collaborative Agreement) as they afford a holistic, multi-jurisdictional perspective that does not exist in a traditional TMDL process. Nonetheless, if the current collaborative processes fail to restore designated use support, we recognize a TMDL or other approach allowed by the USEPA to address impaired waters under the CWA will be required.

Michigan's TMDL schedule is aligned with the TMDL vision process described in Section 8.3.3 and Michigan's 2015 TMDL vision identifies TMDL expectations through 2022. The TMDL vision process will continue in 2022 by establishing the series of priorities for Michigan's TMDL Program over the next ten years (2023-2032). Nutrient impacts to Michigan waters will be a primary focus of this next series of actions for the TMDL program; part of this next prioritization will be an evaluation of progress under the collaborative agreements related to Lake Erie. While Michigan remains strongly committed to reducing phosphorus loadings to western Lake Erie as outlined in the Domestic Action and Adaptive Management Plans, the development of a TMDL will be the likely route forward if target reductions leading to the support of designated uses are not met by the 2025 goal of the Collaborative Agreement.

CHAPTER 5: ASSESSMENT RESULTS: INLAND LAKES AND RESERVOIRS

5.1 TROPHIC STATUS



Carlson's TSI is used by EGLE to assess and classify Michigan's 730 public access lakes (see Section 1.2.2). This classification system is based on an index derived from a combination of four field measurements: (1) summer Secchi depth (transparency); (2) total phosphorus concentration (epilimnetic); (3) chlorophyll *a* concentration (photic zone), and (4) macrophyte abundance. The numerical value of the index increases as the degree of eutrophication increases. Historically, inland lake monitoring efforts have been directed toward obtaining baseline data for all 730 public access lakes.

The EGLE and USGS completed a cooperative project in 2010 that sampled 730 public access inland lakes greater than 25 acres as part of the Lake Water Quality Monitoring Assessment Project. The majority (72 percent) of Michigan's public access lakes that were sampled from 2001 through 2010 have moderate (mesotrophic) or low (oligotrophic) nutrient levels (Table 5.1) (Fuller and Taricska, 2012).

Table 5.1: Trophic status summary of Michigan's public access

Lakes sampled from 2001 through 2010 (N=730).

Trophic Status	Number of Lakes
Oligotrophic (low nutrients)	129 (18%)
Mesotrophic (moderate nutrients)	399 (54%)
Eutrophic (high nutrients)	174 (24%)
Hypereutrophic (excessive nutrients)	28 (4%)

The development of processes to evaluate additional lines of useful data in assessment methods for inland lakes (see Sections 3.6.1.2 and 3.6.2.2) resulted in the decision to assess five inland lakes as impaired, each with a well-supported history of nutrient expression issues. A blend of information including trophic status monitoring showing a history of eutrophic and hypereutrophic conditions; complaints and reports of algae and cyanobacteria blooms; satellite imagery showing bloom conditions; aquatic nuisance control records demonstrating repeated extensive treatments; and SWAS staff's professional experience with nutrient expression at these lakes, were used to find lakes to not support the Other Indigenous Aquatic Life and Wildlife designated use based on nutrient causes. These lakes include: Diane Lake (Hillsdale County), Hess Lake (Newaygo County), Narrow Lake (Eaton County), Union Lake (Branch County), and Reeds Lake (Kent County). The same assessment process is useful in identifying lakes with limited monitoring data that would benefit from additional sampling to better inform future assessments.

During 2019, 240 lakes were sampled as part of the CLMP, under the Michigan Clean Water Corps (for additional information see MiCorps.net). Of these, 108 lakes were sampled for the three primary trophic status indicators (secchi depth, total phosphorus, and chlorophyll-a). Thirty-six of these were classified as oligotrophic, 61 mesotrophic, 10 eutrophic, and 1 hypereutrophic. The CLMP program did not operate in 2020 due to a temporary lack of funding.

5.2 Fish Contaminants

n 1990, Michigan initiated a fixed station fish contaminant trend monitoring project to measure spatial and temporal trends of certain bioaccumulative contaminants. Adult fish are collected from each site at a target interval of two to five years and analyzed as whole fish samples. Fish have been collected from seven inland lakes (Gogebic, South Manistique, Higgins, Houghton, Gun, Gull, and Pontiac) as part of the fish contaminant trend monitoring project. Whole fish fixed station trend monitoring data collected since 1990 were reviewed and general trend conclusions for inland lakes are summarized below:

- Lindane, terphenyl, PBB, heptachlor, and aldrin were quantified only rarely in the fish sampled. However, heptachlor epoxide and dieldrin (breakdown products of heptachlor and aldrin) were quantified in most of the samples analyzed.

- In addition to heptachlor epoxide and dieldrin, several chemicals were quantified in fish consistently, indicating that they are ubiquitous in the aquatic environment. These include mercury, hexachlorobenzene, total PCB, total chlordane, and total DDT.

- Fish from inland lakes tended to have higher concentrations of mercury than the same species from the Great Lakes or connecting channels.

- Total PCB concentrations declined at all of the inland lake trend sites monitored between 1990 and 2015, with an average decline of eight percent per year.

- Total DDT concentrations declined at all of the inland lake trend sites monitored between 1990 and 2015, with an average decline of seven percent per year.

- Total chlordane concentrations declined at all of the inland lake trend sites monitored between 1990 and 2015 where a trend could be detected, and the average decline was eight percent per year. No trend was detected at two inland lakes because chlordane concentrations were consistently below the analytical quantification level.

- Significant trends in mercury concentrations have been detected at four of the seven inland lake trend sites. Mercury concentrations in walleye from Lake Gogebic declined two percent per year between 1991 and 2015, declined in largemouth bass from Gull Lake at a rate of two percent per year between 1991 and 2015, while increasing in South Manistique Lake walleye by one percent per year between 1991 and 2015 and four percent per year in lake trout from Higgins Lake between 1991 and 2015.

In addition, edible portion fish tissue contaminant monitoring was conducted in 2018 and 2019 from 44 inland lakes and reservoirs. Edible portion sampling is often targeted toward known sites of contamination, sites popular with sport anglers, and sites with public access. Results of the edible portion monitoring are used by EGLE in determining the status of the fish consumption designated use for a given water body. Noteworthy among these are 12 new fish consumption designated use impairments based on PFOS in fish tissue (see Figure 4.1). In addition:

- DDT, was identified as a new cause of impairment based on concentrations in fish tissue found in five water bodies.
- PCBs and Dioxins were identified as a new cause of impairment based on concentrations in fish tissue found in 3 water bodies.
- Hg was identified as a new cause of impairment based on concentrations in fish tissue found in 11 water bodies.

The edible portion fish tissue results are also used by the MDHHS to update fish consumption advisories.

5.3 BEACHES

In 2019, a total of 135 publicly accessible beaches on inland lakes were monitored and 110 had no exceedances of the *E. coli* WQS for total body contact. There were 25 beaches that reported a total of 55 exceedances.

In 2020, a total of 157 publicly accessible beaches on inland lakes were monitored and 143 had no exceedances of the *E. coli* WQS for total body contact. There were 14 beaches that reported a total of 23 exceedances.

The Michigan Beach Web site (egle.state.mi.us/beach) provides access to a database containing beach closings and *E. coli* data collected by LHDs and annual reports summarizing the data. Currently, 612 publicly accessible beaches located on inland lakes are listed in the database, although not all beaches are monitored.

CHAPTER 6: ASSESSMENT RESULTS: RIVERS

6.1 Biological Integrity

All available biological assessments (e.g., fish and macroinvertebrate communities, targeted and probabilistic study designs) are evaluated using the assessment methodology (Chapter 3) and potentially used to determine designated use support. As part of EGLE's water quality monitoring program, sites are selected using both targeted and probabilistic study designs to assess the biological integrity of rivers and streams using macroinvertebrate communities. Procedure 27 (MDEQ, 2015) is used to estimate the number of river miles supporting the other indigenous aquatic life and wildlife designated use. Results from the 2012 through 2016 cycle were combined to determine a statewide designated use support status estimate of 95 percent for the other indigenous aquatic life and wildlife designated use in Michigan rivers and streams. Results from this project will also be used to assess temporal trends in biological integrity.

6.2 Water Chemistry

EGLE and its partners collect water samples from many rivers and streams throughout the state as part of the WCMP and other special studies and analyze them for a variety of parameters. Quality assured data through 2019 were used for assessment updates for this reporting cycle. Refer to discussions of broader trends and results around Michigan as analyzed in the most recent WCMP report (EGLE, 2019a).

In 2019 EGLE developed aquatic life water quality values for both chloride and sulfate thereby providing additional thresholds to more fully protect life in lake and streams by being able to assess concentrations of these parameters in waters all around Michigan. Based on these new values, 7 stream reaches were found to be impaired for both the Warmwater Fishery and the Other Indigenous Aquatic Life and Wildlife designated uses based on chloride data; these included the Shiawassee River (Genesee County), Thread Creek (Genesee County), Sashabaw Creek (Oakland County), Rouge River watershed (Bishop Creek and the Upper Rouge River), Belle River (St. Clair County), and Rush Creek (Ottawa County). Additionally, County Line Drain (Arenac/Iosco County) was found impaired based on both chloride and sulfate data.

6.3 Fish Contaminants

In 1990, Michigan initiated a fixed station fish contaminant trend monitoring project to measure spatial and temporal trends of certain bioaccumulative contaminants. Adult fish are collected from each site at a target interval of two to five years and analyzed as whole fish samples. Carp were collected periodically from five river impoundment trend monitoring sites since 1990. These sites were located on the Muskegon, Grand, Kalamazoo, St. Joseph, and Raisin Rivers. Whole fish fixed station trend monitoring data collected between 1990 and 2015 were reviewed and general trend conclusions for rivers are summarized below:

- Lindane, terphenyl, PBB, heptachlor, and aldrin were quantified only rarely in the fish sampled. However, heptachlor epoxide and dieldrin (breakdown products of heptachlor and aldrin) were quantified in most of the samples analyzed.
- In addition to heptachlor epoxide and dieldrin, several chemicals were quantified in fish consistently, indicating that they are ubiquitous in the aquatic environment. These include mercury, hexachlorobenzene, total PCBs, total chlordane, and total DDT.
- Average total PCB concentrations were highest in carp from the Kalamazoo River site. The Kalamazoo River has extensive areas of PCB contaminated sediments, a problem that is being addressed under state and federal programs.
- Total PCB concentrations declined at all 5 river trend sites, with an average decline of seven percent per year between 1990 and 2015.
- Total DDT concentrations declined at all but 1 river trend site, with an average decline of eight percent per year between 1990 and 2015. The exception was the Grand River site (6th Street Dam impoundment in Grand Rapids) where no trend in DDT in carp was detectable between 1990 and 2014.
- Total chlordane concentrations declined at all 5 river trend sites, with an average decline of seven percent per year between 1990 and 2015.
- Mercury concentrations decreased three percent per year in fish from the River Raisin. No significant trends in mercury concentration were measured in the Grand, Kalamazoo, Muskegon, or St. Joseph Rivers.

Edible portion fish tissue contaminant monitoring was conducted in 2018 and 2019 in 21 rivers around Michigan. Edible portion sampling is often targeted toward known sites of contamination, sites popular with sport anglers, and sites with public access. Results of the edible portion monitoring are used by EGLE in determining the status of the fish consumption designated use for a given water body and by the MDHHS to update the fish consumption advisories. The fish consumption advisory was updated to reflect that 11 of these water bodies were assessed as not supporting. Of note, based on the locations monitored in 2018 and 2019, 5 rivers and streams were assessed as not supporting the fish consumption designated use based on PFOS in fish tissue (Figure 4.1).

6.4 Microorganisms

In 2019, a total of five publicly accessible beaches on rivers were monitored and four reported no exceedances of the *E. coli* WQS for total body contact. There was one beach that reported one exceedance.

In 2020, a total of seven publicly accessible beaches on rivers were monitored with none reporting exceedances of the *E. coli* WQS for total body contact.

The Michigan Beach Web site (egle.state.mi.us/beach) provides access to a database containing beach closings and *E. coli* data collected by LHDs. Currently, 59 public beaches located on rivers are listed in the database.

For the 2022 reporting cycle, EGLE monitored 102 river sites across the state for *E. coli*, including the Escanaba, Pere Marquette, Boyne, portions of the Shiawassee, Pigeon-Wiscoggin, and both St. Joseph Rivers (Lake Erie and Lake Michigan basins). The EGLE data used in the 2022 cycle was primarily collected in 2020, since 2019 data had already been considered for the 2020 update of the IR. Watershed councils, conservation districts, tribal nations, and local organizations submitted data sufficient for determining use attainment status for an additional 90 riverine sites; including large portions of the Huron and River Raisin monitored as part of a grant to the Huron River Watershed Council. Based on this *E. coli* monitoring by EGLE and others, about 3,754 miles were listed as not supporting the Total Body Contact recreation designated use, and more than 600 miles of rivers and streams were determined to be supporting the use. To view the newly assessed waters, select the "*E. coli* monitoring" tab of the *E. coli* Pollution and Solution Mapper (accessible from Michigan.gov/EcoliTMDL).

6.5 Contaminated Sediments

Following the development of new assessment methods in the 2018 IR incorporating sediment chemistry and bulk sediment toxicity data, this 2022 IR assessment continued the use of these data to assess portions of Michigan Rivers. Nine river reaches were reviewed, with only one (Tributary to Indian Mill Creek, Lower Grand River watershed) being identified as impaired for the other indigenous aquatic life and wildlife designated use based on the combined sediment toxicity and chemistry results.

CHAPTER 7: ASSESSMENT RESULTS - WETLANDS

7.1 Designated Use Support Summary

Michigan's WQS apply to all surface waters of the state, including wetlands. However, some criteria may not be applicable to wetlands. For example, a highly productive wetland with abundant vegetation in shallow water and high organic content in the sediment may naturally exhibit low dissolved oxygen levels in the water column.

Based on Rule 100(10) of the WQS, use attainability studies are allowed for certain wetlands to address this situation.

Michigan's wetlands are currently assessed for designated use support on an as needed basis. Michigan uses a multiple category system (i.e., assessment units may be placed in one or more category, see Section 3.11). Details regarding the listed wetlands follow.

- Tobico Marsh (Bay County), a 680-acre marsh adjacent to Saginaw Bay, is not supporting the fish consumption designated use due to elevated PCB concentrations in carp and northern pike populations. Carp and northern pike were collected and analyzed between 2007 and 2012. These new data did not result in a change to the fish consumption advisory.

- Ruddiman Creek Lagoon (21 acres in Muskegon County) is not supporting the fish consumption, and total and partial body contact recreation designated uses. This wetland was the subject of a major sediment remediation project completed in 2006 that involved the removal of approximately 86,000 cubic yards of sediments contaminated with PCBs, metals, and polynuclear aromatic hydrocarbons.

- Clark's Marsh (Iosco County), a 420-acre marsh adjacent to the Au Sable River, is not supporting the fish consumption designated use due to elevated PFOS in bluegill and pumpkinseed sunfish sampled in 2011. This marsh is adjacent to the former Wurtsmith Air Force Base, an area of which was used regularly for fire suppression training with fire-fighting foams containing perflourinated compounds.

CHAPTER 8: WATER BODIES NOT SUPPORTING DESIGNATED USES AND CWA SECTION 303(D) REQUIREMENTS

8.1 INTRODUCTION

The purpose of this chapter is to provide additional information regarding water bodies that are determined to not support one or more designated uses (i.e., water bodies that are listed in Categories 4 or 5; see Section 3.11 for a description of the categories).

Section 303(d) of the CWA and the USEPA's Water Quality Planning and Management Regulations (40 CFR, Part 130) require states to develop TMDLs for water bodies that are not meeting WQS (i.e., water bodies that are listed in Category 5).

The TMDL process establishes the allowable loadings of pollutants for a water body based on the relationship between pollution sources and in-stream water quality conditions. TMDLs provide states a basis for determining the pollutant reductions necessary from both point sources and NPS to restore and maintain the quality of their water resources.

8.2 Impairment Cause and Source

When a determination is made that a designated use is not supported (includes both Categories 4 and 5), the cause and source (when known) of impairment is identified (see Section 3.12). Each assessment unit may be listed for one or more causes and sources of impairment. Summary information on causes and sources statewide are readily available at multiple scales (from statewide down to local subwatershed) from the USEPA's How's My Waterway Web site, newly released in June 2020 and accessed at mywaterway.epa.gov. See Section 1.1 for additional information.

8.3 TMDL Development

8.3.1 The TMDL Process

Michigan's Section 303(d) list consists of assessment units that are listed in Category 5 (see Appendix C). A TMDL is developed for each cause (see Section 8.2) or a TMDL may address more than one related cause.

Development of a TMDL is typically preceded by collection of water quality data by EGLE or its contractors to document current pollutant loads within the water body of concern and further define potential sources of the pollutant. These data, in addition to any other relevant information, form the basis for determining the necessary pollutant load reductions. A TMDL document is comprised of several sections including identification of the impaired assessment unit and cause of impairment, description of water quality studies conducted to identify the extent and source(s) of the impairment, and calculation of necessary load reductions for the point source and NPS to achieve WQS. The TMDL also identifies any past, current, or future known actions to remedy the impairment and a monitoring schedule to track improvements following implementation of the TMDL.

The TMDL document is typically developed by staff members of EGLE. The draft document is made available for public review on EGLE's Web site for at least 30 days. The announcement for the public comment period is published in the EGLE calendar. During the public comment period, EGLE staff normally hold a public meeting in a community near the impaired water body to describe the TMDL and receive comments. Local stakeholders, including the general public, LHDs, local government, and county extension officials are sought to attend the meetings to contribute their expertise in identifying pollutant sources and discuss source reduction/elimination. Following the comment period, the TMDL is modified as appropriate to address comments received.

The TMDL is finalized following the public comment period and submitted to the USEPA, Region 5, for their review and approval. The USEPA has 30 days to review and approve or disapprove a TMDL. After a TMDL is approved by the USEPA, the water body is removed from the Section 303(d) list (Category 5) and reclassified as Category 4a. For additional information regarding delisting Category 5 assessment units see Section 3.13.

8.3.2 TMDLs Completed

In 2014, EGLE shifted the TMDL focus from the strict pace requirements to the newly-developed Long-term Vision for Assessment, Restoration, and Protection under the Clean Water Act Section 303(d) Program. The EGLE developed an approach to TMDL prioritization for the 2016-2022 time period. In 2019 the EGLE statewide *E. coli* TMDL was approved by USEPA. Similarly, in 2019 the USEPA approved the updated Ford Lake and Belleville Lake Phosphorus TMDL, replacing the 2004 version.

Additional information regarding approved TMDLs is available at Michigan.gov/TMDL, including a link to the newly developed TMDL Watershed Screening Tool. The TMDL Watershed Screening Tool is a Web-based mapping application that illustrates watersheds with USEPA-approved TMDLs with the exception of the statewide mercury TMDL, to be added in the future.

8.3.3 TMDL Schedule

Per Michigan's 2016-2022 Prioritization Framework for the Long-Term Vision for Assessment, Restoration, and Protection Under the Clean Water Act Section 303(d) Program

In December 2013, the USEPA announced the "Long-Term Vision for Assessment, Restoration, and Protection under the Clean Water Act Section 303(d) Program" (TMDL Vision). The TMDL Vision includes six goals: Engagement, Prioritization, Protection, Integration, Alternatives, and Assessment. An evaluation of the accomplishments of the TMDL Vision's goals is to be completed in 2022.

"Prioritization" is defined by the TMDL Vision as a systematic approach developed by individual states to prioritize watersheds or waters for TMDL development, restoration, and protection for incorporation into the 2016 Integrated Report. Once a state identifies its priorities, it will be expected to address all of them between 2016 and 2022 through a combination of TMDLs, alternative approaches, program integration, public engagement improvements, and protection activities. In keeping with this approach, priorities identified in Michigan's TMDL Vision document will be assigned a TMDL date of 2022, signifying their anticipated completion by the end of 2022. Similarly, those TMDLs that were not identified as a priority in Michigan's first TMDL Vision document will be assigned a 'low' TMDL priority in ATTAINS, signifying their reevaluation for prioritization during the next TMDL Vision review process. The full TMDL Vision document can be found on Michigan's TMDL Web site, available electronically at Michigan.gov/TMDL. This document was submitted by the EGLE and agreed upon by USEPA Region 5 in September 2015.

In the past, Michigan did not prioritize TMDLs based solely on watershed location, cause, or pollutant. When a water body was identified as impaired, it was added to the TMDL schedule with a goal of completing a TMDL within 13 years of the first listing (per USEPA guidance). The TMDL schedule published in the 2014 IR ran through 2031. In contrast, the TMDL Vision approach focuses less on TMDL production and more on how the Section 303(d) Program can support water quality objectives of Michigan. Therefore, the TMDL Vision allows the opportunity to better align TMDL priorities with WRD priorities.

In 2009, the WRD identified five major goals to define aspects of this mission: (1) Enhance Recreational Waters; (2) Ensure Consumable Fish; (3) Protect and Restore Aquatic Ecosystems; (4) Ensure Safe Drinking Water; and (5) Protect Public Safety. For each goal, measurable outcomes (measures of success) are identified. The 2016 TMDL Vision priorities are linked to these goals and measures of success to ensure better engagement and integration with other WRD programs. The 2016 TMDL Vision priorities are summarized below and described more fully along in the TMDL Vision document, available as noted above.

8.3.3.1 Statewide Pathogen TMDL

Michigan has over 600 public beaches on the Great Lakes and connecting channels, over 600 inland lake beaches, and over 1,400 publicly maintained boat launches making our waters accessible to everyone. Michigan also has over 76,000 miles of rivers, almost 900,000 acres of inland lakes and reservoirs, and over 40,000 square miles of Great Lakes and bays (including Lake St. Clair), all of which are designated for Total Body Contact recreation from May 1 through October 31 and for Partial Body Contact Recreation year-round. Michiganders and EGLE are proud of their beautiful beaches and care about water quality and keeping the people of Michigan and our visitors safe while recreating in Michigan's waters.

EGLE has worked toward achieving its priority goal of clean beaches for recreation through an extensive investment of resources. However, in 2013, EGLE estimated that 48 percent of the rivers and streams exceed the Total Body Contact Recreation designated use and in 2018, 26 percent of monitored beaches had closures due to bacterial pollution (EGLE, 2019b). To help attain the goal of enhancing recreational waters and tie together the efforts that Michigan continues to expend on reducing *E. coli* contamination of surface waters, EGLE made it a priority to develop a pathogen TMDL that addresses all waters impaired by *E. coli.*

This TMDL identifies waters where action is needed, sets an *E. coli* concentration target based on protecting the Total and Partial Body Contact Recreation designated uses, and identifies needed pollutant reductions in all waters that are not meeting these designated uses. The statewide *E. coli* TMDL applies to impaired waters only, including inland lakes, rivers, and streams, beaches, and the Great Lakes. Since its approval by the USEPA in 2019, the list of included waters has been appended in the 2018, 2020, and now the 2022 reporting cycles.

The statewide *E. coli* TMDL eliminates the need for numerous individual watershed-based *E. coli* TMDLs and the associated repetitive paperwork burden, long wait periods, and staff time spent on TMDL development. A statewide TMDL saves EGLE significant resources that would have been spent writing watershed-based TMDLs, while providing a faster path to implementation. For example, we can accelerate water quality restoration through implementation in NPDES permits, particularly MS4 permits, by more than a decade. Interested stakeholders can be assisted with source assessment, monitoring, and restoration solutions in their watershed to provide more site-specific information to enhance TMDL implementation at the local level. In these ways, our statewide *E. coli* TMDL aligns with the purpose of the USEPA's TMDL Vision, which emphasizes a path to better implementation of

the Clean Water Act Section 303(d) program, water quality restoration, and coordination of water programs. More information on the statewide *E. coli* TMDL can be accessed at Michigan.gov/EcoliTMDL. To view included waters, visit the *E. coli* Pollution and Solution Mapper and select the "*E. coli* monitoring" tab.

8.3.3.2 Statewide Mercury TMDL

Reducing human and wildlife exposure of mercury is also a priority in Michigan. The Michigan Department of Community Health continues to issue general fish consumption advisories and guidelines for all inland lakes in Michigan, and specific recommendations for Lakes Huron, Michigan, and Superior, and several hundred miles of rivers and streams due to mercury concentrations in fish tissue. Because of the widespread impairment of Michigan's waters due to mercury, a statewide TMDL approved in 2018 for inland waters primarily impacted by atmospheric deposition of mercury included needed mercury reductions from air sources and water dischargers to protect and restore inland waters. Since its approval by the USEPA in 2019, the list of included waters has been appended during the 2020 and now the 2022 reporting cycles.

8.3.3.3 Additional TMDL Activities per Michigan's Vision

The following TMDLs will be submitted for USEPA approval prior to 2022 as part of Michigan's TMDL Vision.

- Trap Rock River and Owl Creek Copper TMDLs.

Michigan's Section 303(d) list, including assessment unit information and TMDL year, is presented in Appendix C.

8.3.4 Changes to the Section 303(d) List

The 2020 Section 303(d) list is provided in Appendix C. This list reflects the deletion and addition of assessment units or causes of impairment since the 2020 IR. Section 303(d) delisted assessment units may or may not support designated uses. For example, it may have been determined that the assessment unit is not supporting one or more designated uses but a TMDL is not required, or a cause of impairment may have been removed but a TMDL is still required to address a different cause of impairment. A brief delisting reason is provided in Appendix D1. Deletions and additions to the Section 303(d) list are presented in Appendix D1 and D2, respectively.

CHAPTER 9: PUBLIC PARTICIPATION IN THE IR

9.1 INTRODUCTION

EGLE provides opportunities for public participation in the development of the IR. The following information is a summary of those opportunities, the comments or information received from the public, and EGLE's response.

9.2 REQUEST FOR DATA

EGLE's WRD requested ambient water quality data (chemical, biological, or physical) that were obtained by other governmental agencies, nongovernmental organizations, or the public for Michigan surface waters since January 1, 2019.

All water quality data submitted to the EGLE, WRD, before March 19, 2021, was evaluated according to EGLE's assessment methodology (see Chapter 3) and potentially used to help prepare this IR. This request was published on EGLE's Calendar from January 29 through March 19, 2021, and an e-mail sent via EGLE list-serve to over 1,600 members with specific interest in the IR and TMDL programs. Data were received from the following organizations both during the Request for Data as well as directly through program contacts: Little Traverse Bay Bands of Odawa Indians, Big Flower Creek Association, Bay Mills Indian Community, Huron River Watershed Council, Ottawa Conservation District, and Saginaw Chippewa Indian Tribe. Table 9.1 summarizes whether these outside data were used and, if so, how and, if not, why.

Table 9.1: Summary of outside data received and their use in the 2022 IR.

Organization	Data Used?	How (if Yes or Partial), Why (if No)
Little Traverse Bay Bands of Odawa Indians	Yes	Data reviewed and used to update relevant Assessment Units
Big Flower Creek Association	Yes	*E. coli* data used for assessment decisions
Bay Mills Indian Community	Yes	*E. coli* data used for assessment decisions
Huron River Watershed Council	Yes	*E. coli* data used for assessment decisions
Ottawa Conservation District	Yes	*E. coli* data used for assessment decisions
Saginaw Chippewa Indian Tribe	Yes	*E. coli* data used for assessment decisions

9.3 Public Notice of Draft Assessment Methodology

A draft version of Chapter 3, the assessment methodology, was made available on EGLE's Web site for public review and comment. This announcement was published on EGLE's Calendar on February 12, 2021. Public comments to be considered in the development of Chapter 3 were due March 15, 2021. One public comment on the draft assessment methodology was received. Additionally, no comments on the draft assessment methodology were received from the USEPA; comment summaries and responses are presented below. All comments received and responses are included in their entirety in Appendix E.

Comment #1:

> … we believe that EGLE should revise the methodology to allow for the consideration of existing data on foam containing per- and polyfluoroalkyl substances ("PFAS") when the agency assesses designated use support for surface waters of the state. We also believe that in addition to formally listing surface waters as impaired due to PFAS-containing foam (hereafter "PFAS foam") where appropriate, EGLE should report on all instances of foam containing PFASs in the Integrated Report in accordance with section 305(b) of the Clean Water Act (National Wildlife Federation, Need Our Water, Huron River Watershed Council).

EGLE Response:

> … Because there are no established water quality standards related to PFAS in foams there are no plans to use those data in water quality assessment as recommended in your comments. The use of foam information for future monitoring efforts will continue to be the primary function in the monitoring and assessment process. Water chemistry and fish tissue monitoring for PFAS around Michigan continues to be a significant focus of the Water Resources Division using scientifically established and protective water quality values and public health thresholds. Please note that while analyzing foam composition is not part of our assessment process for PFAS, EGLE uses reports of PFAS-containing foams to identify and prioritize where to monitor for potential PFAS-related water quality concerns.
>
> Additionally, as noted in your comment letter, information on the locations of confirmed PFAS-containing foams is currently readily available through the MPART web site for public information. The integrated report process, and the related 305(b) list, is not intended to be a water quality data storage/reporting system, rather the compilation of the assessment decisions made using relevant data. Because PFAS foam data are not specifically incorporated in the assessment of designated use support for the Integrated Report, and because PFAS-containing foam location data are already available, there is no plan to report those data in the 305(b) list.

9.4 Public Notice of the Draft IR

A draft 2022 Integrated Report was made available on EGLE's Web site for public review and comment. This announcement was published on EGLE's Calendar on February 22, 2022, and public comments were due by March 25, 2022. Fourteen separate comments were received during the comment period. Comment summaries and responses are presented below. All comments are included in their entirety in Appendix E.

Comment #1:

a. We appreciate the listing of Saginaw Bay as impaired, which is a much-needed step in addressing the nutrient problems that plague this waterbody and reducing the occurrence of cyanobacteria blooms.

b. In addition, we applaud the continued use of the statewide *E. coli* Total Maximum Daily Load (TMDL), which will help protect public health in addition to the designated uses of waterbodies across the state.

c. As explained below, we believe the alternative plan – as structured by EGLE – is insufficient and does not provide comparable accountability to a TMDL. We urge EGLE to reconsider the use of the alternative plan in favor of a TMDL.
   i. The Clean Water Act imposes a "duty" and "obligation" to prepare TMDLs for impaired waterbodies and EGLE cannot simply declare a federal statutory requirement optional.
   ii. Given the failure of non-TMDL approaches so far, there is no reason to believe that a TMDL would conflict with or undermine those approaches and EGLE does not try to explain why that would be the case. In fact, a TMDL could supplement and strengthen those Annex 4-related efforts.
   iii. Of all the reasons outlined above regarding the need for the development of a TMDL, increased accountability and a timeline for implementation may be the most important of all. For these reasons, we urge EGLE to revise its 2022 IR to commit to preparing a TMDL for Michigan's portions of western Lake Erie by 2023.

(*Alliance for the Great Lakes, Environmental Law & Policy Center, Environmentally Concerned Citizens of South Central Michigan (ECCSCM), For Love of Water (FLOW), Freshwater Future, Freshwater Future Canada, Michigan Environmental Council, Michigan League of Conservation Voters*)

EGLE Response:

We appreciate your collective support for the nutrient-related impairment listing for Saginaw Bay and for the additions of impaired waters covered under the existing statewide *E. coli* TMDL. Over the years, your comments related to, and continued interest in, nutrient and other impacts to Michigan waters demonstrate your commitment to the protection and restoration of water quality; we share that commitment and look forward to building partnerships that help address these difficult issues.

Similarly, your thoughtful comments related to the proposed approach of designating Michigan's Lake Erie waters as a category 5-alternative were evaluated and we appreciate the intent to e improve water quality. We continue to look to the Annex 4 process and the collaborative

agreement as the most timely and efficient process to address nutrient impacts at this point, but also acknowledge the important role that the development of a TMDL can bring to the issue as an additional tool to achieve change. Because of this, we have removed the proposed 5-alternative approach from the 2022 IR, leaving Michigan's Lake Erie waters unchanged as a Category 5 and instead propose to assess the need for TMDL development following evaluation of 2025 target nutrient reduction goals attainment under the current approach.

This timeline balances the need to integrate the TMDL process into other existing actions. It also recognizes that significant efforts toward addressing nutrient pollution in Michigan's Lake Erie watersheds are both underway and planned following Michigan's Domestic Action Plan and Adaptive Management Plan.

Comment #2:

a. The initial focus on Cisco is a bit confusing, while they are a keystone species to determine if habitat change is impacting water quality, there does not seem to be an EGLE focus on monitoring those lakes listed in the Table as Cisco lakes. Does the state have a specific water quality standard for cisco lakes? If so, what is this standard and why is it not directly mentioned later in the report?

b. (Little River Band of Ottawa Indians) would be supportive of the State of Michigan reviewing and revising the WQS to be more protective of the State and shared resources.

(*Little River Band of Ottawa Indians*)

EGLE Response:

Cisco are an important component of our Michigan ecosystem as well one whose need for cool, well-oxygenated waters makes it an indicator for habitat loss in lakes. In recent years staff within the Water Resources Division's Surface Water Assessment Section have partnered with the DNR's Fisheries Division to begin more strategic monitoring of known cisco waters, beginning with those suspected to no longer support these fish. Ongoing work between the two agencies will continue to compile historical data and conduct new monitoring in an effort to understand where habitat loss (in the form of oxygenated, cool waters) has occurred and identify those through the designated use assessment process within the Integrated Report.

With regard to water quality standards related to cisco lakes, Rule 323.1065 (Dissolved oxygen, inland lakes) applies to lakes designated for coldwater fish, aimed at protecting the habitats necessary for coldwater fish including trout, salmon, whitefish, and cisco. We are glad to have additional discussions if there are further questions or clarification related to cisco.

We appreciate the ongoing support for reviewing and revising Michigan's WQS, which happens under the Triennial WQS Review process. Input identifying where specific and actionable deficiencies occur in the WQS and identification of actions that might address

those are always welcomed during the triennial review process and can be offered up or discussed at other times by contacting our WQS program specialist, Kevin Goodwin at GoodwinK@Michigan.gov.

Comment #3:

a. I fully support the listing of the Saginaw Bay and several of smaller tributaries of the Saginaw Bay as indicated in the 2022 Integrated Report. The inclusion of the Bay and tributaries as impaired because of excessive algal growth resulting from high nutrient levels, especially in near shore areas, which has been further contaminated with waste matter runoff containing ecoli and pathogens id (*sic*) long overdue.

b. Since I moved to the Saginaw Bay watershed over 40 years ago and having lived on the shore of Saginaw Bay for the past 20 years I have been a member of many organizations which have pushed locally and state wide for some protection of the Saginaw Bay. With the listing as impaired waters, contamination limits can finally be set and controls be implemented, where practical, to sustain the Saginaw Bay as a viable economic resource for the area for years to come.

(F.P. Frauson)

EGLE Response:

Your supportive comment and interest in the protection and restoration of Saginaw Bay is appreciated.

Comment #4:

…For these reasons we are in strong support of the proposed listing of the inner Saginaw Bay on the 303(d) list as impaired due to high nutrient loading and E. coli. We note that the Saginaw River is not named and we hope this is an oversight. The Saginaw River provides over 70% of the daily flow into the Saginaw Bay and we believe it should be included on the 303(d) list as a major contributor to the Saginaw Bay impairments.

(*Partnership for the Saginaw Bay Watershed*)

EGLE Response:

Your supportive comment and involvement in the protection and restoration of Saginaw Bay is appreciated. As you note, the Saginaw River is not currently listed as impaired for nutrients. However, as the TMDL for Saginaw Bay is developed, all related tributaries and upstream watersheds will be included both in understanding nutrient loading potential as well as identifying where nutrient reductions may be needed and achieved to meet TMDL goals. As such, the Saginaw River and its watersheds will be critical to understanding current conditions and achieving reductions necessary to meet in-Bay goals.

Comment #5 (Identical comments received from seven commenters):

(*Regarding the decision to list Saginaw Bay as impaired*) … this decision is based on too few data points, outdated studies and models, and not enough assessment of water quality trends over time. We are also concerned because MDEGLE has stated it does not intend to develop or implement a plan to collaborate on reducing nutrient losses into Saginaw Bay like has been done in the Western Basin of Lake Erie watershed, or to use the Category 5 alternative designation available for restoration approaches that are more practical than designating a Total Maximum Daily Load (TMDL) limit in the Bay.

a. We urge MDEGLE to reconsider its plan to designate Saginaw Bay as Impaired, so more information about nutrient loading and trends can be collected and sources can be identified to better improve water quality.

b. Alternatively, if Saginaw Bay is designated as Impaired, we urge MDEGLE to work with farmers, regulated facilities, municipalities, and residents to develop a meaningful plan to address the Impairment and prevent the need for a TMDL in the watershed.

(*Farm Bureau County Offices: Arenac, Genesee, Gratiot, Montcalm, Oakland, Sanilac, Tuscola*)

EGLE Response:

We appreciate the collective interest and comments related to the proposed inner Saginaw Bay nutrient impairment and steps to achieve water quality gains. Additional data collection on nutrient loading and sources is an important step in the TMDL development process. However, at this point there is sufficient evidence, collected both historically and very recently, to support the assessment of the inner Saginaw Bay as impaired by nutrients.

We anticipate that more intensive data collection over the next few years, including additional tributary and bay monitoring, will provide the basis for understanding nutrient loading and sources necessary for setting restoration goals. We appreciate and share the concern for adequate loading and sourcing data to help understand where nutrients are currently coming from within the Saginaw Bay watershed. This information will be critical in not just establishing existing conditions but also in understanding where nutrient reductions may be most important, most effective, most feasible, etcetera, all of which will help inform meaningful implementation plans.

It is important to recognize that, while a TMDL development approach is planned for this inner Saginaw Bay impairment, this in no way should be seen as somehow precluding the development of meaningful plans and the opportunity to form effective working partnerships. Rather, targets laid out in a TMDL and the reductions identified to meet those goals lend themselves very well to the local-level development and implementation of watershed management plans (or multiple smaller plans). These are prime opportunities to form partnerships and advance water quality in ways that also balance

local conditions and needs, particularly when dealing with pollutants like nutrients that likely have a significant non-point source component.

Nutrient pollution reduction in the Western Basin of Lake Erie has initially turned to the Domestic Action Plan process and work already conducted under Annex 4 of the Great Lakes Water Quality Agreement as an exception to the immediate development of a TMDL. Because of the multi-jurisdictional nature of that impairment and because a process was already in place to address nutrient inputs which represents a more effective and efficient path forward, the development of a TMDL was not Michigan's initial approach. However, because the inner Saginaw Bay and all of its tributaries fall within Michigan, the development of a TMDL is the clear path forward for the inner Saginaw Bay as the most efficient and effective way to begin addressing water quality concerns related to nutrients.

Comment #6

(*Comments only related to Statewide E. coli TMDL Addendum, posted for Public Comment concurrently*)

(*New Flavo Dairy*)

EGLE Response:

Comments forwarded to TMDL program for response related to Statewide *E. coli* TMDL addendum.

Comment #7

EPA notes that most of the waterbodies with the public water supply use in the 305(b) list (Appendix B) are either not assessed or had insufficient information to assess for this use, and two waterbodies were on the 303(d) list (Appendix C) for not supporting the public water supply use (i.e., two Lake Erie intakes due to cyanobacteria).

a. EPA encourages EGLE to strengthen their monitoring strategy and program to more thoroughly collect data for the purposes of public water supply use assessment.

b. EGLE also may want to consider different methodologies for Great Lakes assessment units vs. inland assessment units for the public water supply use.

c. We also encourage EGLE to assess waters for the public water supply use that are hydrologically connected to groundwater and water systems that are directly influenced by surface water—that is, not just where there are surface intakes.

(*Region 5, U.S. EPA*)

EGLE Response:

We appreciate the comments related to increased focus on public water supply assessments including considerations for enhancing data availability and evaluation methods. These comments will be considered as we look toward the development of the 2024 Integrated Report and associated Assessment Methodology development.

Comment #8

(*Comments related to Statewide E. coli TMDL Addendum, posted for Public Comment concurrently*)

(*Regarding the decision to list Saginaw Bay as impaired*) … this decision is based on too few data points, outdated studies and models, and not enough assessment of water quality trends over time. We are also concerned because MDEGLE has stated it does not intend to develop or implement a plan to collaborate on reducing nutrient losses into Saginaw Bay like has been done in the Western Basin of Lake Erie watershed, or to use the Category 5 alternative designation available for restoration approaches that are more practical than designating a Total Maximum Daily Load (TMDL) limit in the Bay.

a. We urge MDEGLE to reconsider its plan to designate Saginaw Bay as Impaired, so more information about nutrient loading and trends can be collected and sources can be identified to better improve water quality.

b. Alternatively, if Saginaw Bay is designated as Impaired, we urge MDEGLE to work with farmers, regulated facilities, municipalities, and residents to develop a meaningful plan to address the Impairment and prevent the need for a TMDL in the watershed.

(*Michigan Farm Bureau*)

EGLE Response:

Comments forwarded to TMDL program for response related to Statewide *E. coli* TMDL addendum.

See EGLE Response to Comment #5 (above) for other relevant responses.

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