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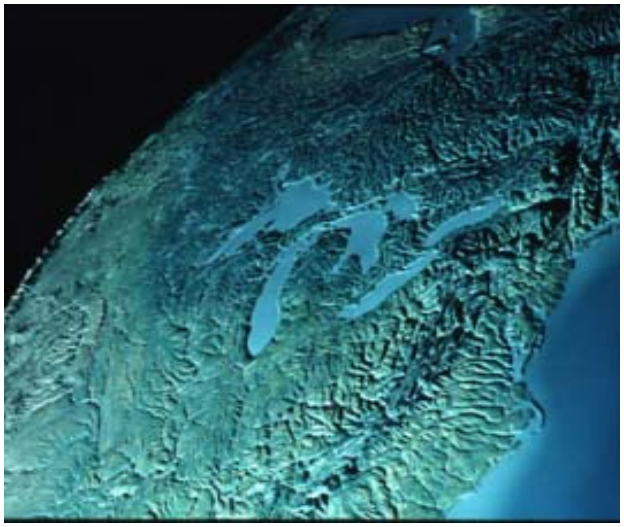
WATER QUALITY AND POLLUTION CONTROL IN MICHIGAN 2008 SECTIONS 303(d), 305(b), AND 314 INTEGRATED REPORT



Michigan Department of Environmental Quality
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Due to the extensive number of pages contained in these documents, all appendices are available electronically at http://www.michigan.gov/deqwater under Water Quality Monitoring, Assessment of Michigan Waters.

LIST OF ACRONYMS

ADB	Assessment Database (USEPA)
ANS	Aquatic Nuisance Species
AOC	Areas of Concern
BCC	Bioaccumulative Chemicals of Concern
BEACH Act	Beaches Environmental Assessment and Coastal Health Act of 2000
BMP	Best Management Practice
BPJ	Best Professional Judgment
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CAFO	Concentrated Animal Feeding Operation
CAZ	Critical Assessment Zone
CMI	Clean Michigan Initiative
CSO	Combined Sewer Overflow
CWA	Clean Water Act
DDT	Dichlorodiphenyltrichloroethane
GIS	Geographic Information System
GLEC	Great Lakes Environmental Center
HCV	Human Cancer Value
HNV	Human Noncancer Value
HUC	Hydrologic Unit Codes
IR	Integrated Report
LaMP	Lakewide Management Plan
LHD	Local Health Department
LWMD	Land and Water Management Division
MDA	Michigan Department of Agriculture
MDCH	Michigan Department of Community Health
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
MS4	Municipal Separate Storm Sewer System
MSU	Michigan State University
MTBE	Methyl Tert Butyl Ether
NHD	National Hydrography Dataset
ng/L	Nanograms per liter
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
pg/L	Picograms per liter
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
WB	Water Bureau
WCMP	Water Chemistry Monitoring Project
WQS	Water Quality Standards

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 2006 reporting cycle, the MDEQ is fulfilling these CWA reporting requirements in 2008 through the submission of an 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 regulatory framework that guides the MDEQ'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 degree of designated use support, the amount of information known about the water body's water quality status, and the type of impairment preventing designated use support.

This IR includes a description of the scope of Michigan waters covered; a summary of MDEQ programs designed to protect and restore water quality; an overview of water quality monitoring in Michigan; a description of Michigan's current assessment methodology; 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 in the development of this IR.

With the biennial development of each Section 305(b) report, Section 303(d) report, or IR, Michigan continues to refine its data management and assessment methodology. Michigan underwent extensive data management changes to prepare the 2008 IR. All data (i.e., records) were transferred from the Michigan developed Water Body System to the USEPA Assessment Database (ADB). Due to the significant differences in the structures of the two databases, Michigan's assessment methodology underwent extensive revisions to ensure that all relevant designated uses are evaluated for all water bodies. A few changes were also made regarding data interpretation.

Designated use support summaries are reported for Great Lakes (including connecting channels and bays), inland lakes and reservoirs, rivers, and wetlands in Tables 5.2, 5.3, 6.2, 7.2, and 8.1, respectively. Overall, many of Michigan's surface waters are impacted by polychlorinated biphenyls (PCBs) 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. Excluding PCBs and mercury, 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). Similar to the 2006 reporting cycle, the MDEQ is fulfilling these CWA reporting requirements in 2008 through the submission of an IR. Where possible, Michigan's 2008 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 IRs prepared by the USEPA dated October 12, 2006 (IR Guidance).

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 upon request or at http://www.michigan.gov/deqwater under DEQ Laws and Rules, Rules, Water, Part 4). Michigan's WQS, initially promulgated in December 1973, were most recently revised and promulgated in January 2006 pursuant to 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 the MDEQ'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 degree of designated use support, the amount of information known about the water body's water quality status, and the type of impairment preventing designated use support. It should be noted that prior to the 2006 IR, an assessed water body (or water body segment) was placed into only one of the five reporting categories.

The remainder of this chapter includes a description of the scope of Michigan waters covered in this IR. Chapter 2 summarizes MDEQ programs designed to protect and restore water quality. Chapter 3 contains an overview of water quality monitoring in Michigan. Chapter 4 details Michigan's current assessment methodology. Chapters 5, 6, 7, and 8 are more technical and 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 9 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 10 includes information regarding the public participation process in the development of this IR.

2008 IR Highlight

Data Management and Assessment Methodology Updates

With the biennial development of each Section 305(b) report, Section 303(d) report, or IR, Michigan continues to refine its data management and assessment methodology.

Michigan underwent extensive data management changes to prepare the 2008 IR. All data (i.e., records) were transferred from the Michigan developed Water Body System to the USEPA ADB. During this migration, records were georeferenced using the National Hydrography Dataset and renamed using a 12-digit hydrologic unit code (HUC)-based naming convention (a crosswalk table providing the old water body identification numbers and the corresponding new assessment unit identification numbers is provided in Appendix E).

As a result of this transition, Michigan has a true multiple category system. In other words, each water body (e.g., lake or stream segment) has a unique identifier with all applicable designated uses associated with it in the ADB. Previously, a water body often had multiple identifiers, each one associated with a different designated use.

These data management changes advanced Michigan's mapping capabilities for Section 305(b) and Section 303(d) listings and several statewide maps for rivers are included in this IR. Additional maps and/or georeferencing data are available upon request. In addition, use of the ADB makes Michigan's IR listings compatible with the USEPA's national reporting system.

Due to the significant differences in the structures of the two databases, Michigan's assessment methodology underwent extensive revisions to ensure that all relevant designated uses are evaluated for all water bodies (see Chapter 4). A few changes were also made regarding data interpretation.

Due to these substantial data management and assessment methodology changes, designated use support summary tables (e.g., Tables 5.2, 5.3, 6.2, 7.2, and 8.1) are not directly comparable to previous IRs.

Similar to previous IRs, trends in designated use support are not discussed in this IR. 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. As assessment coverage increases and water bodies are evaluated for the first time or when more sophisticated and sensitive monitoring techniques are applied (e.g., low level PCB analysis), the proportion of supporting versus not supporting water bodies will change between reporting cycles. However, such a proportion change between reporting cycles may not constitute a real overall change in water quality.

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. Most of Michigan also has an abundant supply of high quality groundwater.

Table 1.1 Michigan Atlas (all values are approximations)

Topic	Number	Area	Length	Source
State population	10.1 million			United States Census Bureau 2006 Estimate
State surface area		96,760 mi^2		Sommers, 1977
Great Lakes, Great Lakes bays, and Lake St. Clair	4	41,615 mi^2 (~45% of total Great Lakes area)		USGS National Hydrography Dataset (1:100,000 scale)
Inland lakes and reservoirs with surface area ≥ 0.1 acre	35,000	824,476 acres		USGS National Hydrography Dataset (1:100,000 scale)
Rivers and streams (including connecting channels) (NHD types CanalDitch and StreamRiver)			52,368 mi	USGS National Hydrography Dataset (1:100,000 scale)
Wetlands		5,583,400 acres		USFWS National Wetland Inventory

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. Recent years have witnessed rapid rates of urbanization and housing development that influence pollutant and hydrologic loadings to surface waters tributary to the Great Lakes. 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.

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

The Great Lakes contain 20% 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% (by surface area) of the 4 bordering Great Lakes (38,865 of a total area of 86,910 square miles). Significant Great Lakes bays include Grand Traverse 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 5).

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

Great Lake	Canadian* (miles^2)	United States* (miles^2)	Michigan† (miles^2)	Total* (miles^2)
Superior	11,100	20,600	16,400	31,700
Michigan	---	22,300	13,250	22,300
Huron	13,900	9,100	9,100	23,000
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

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 urban areas. Lake Huron water quality has benefited from pollutant control and remedial efforts occurring in the Saginaw Bay watershed, and Lake Erie water quality has improved dramatically in the last two decades because of substantial reductions in the discharge of conventional and toxic pollutants, including nutrients, persistent organics, metals, and oils.

Aquatic nuisance species (ANS) continue to have dramatic indirect and direct effects on the Great Lakes (see Section 2.24.2). ANS are responsible for increases in water clarity (especially in Lake Erie) 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 is also showing that ANS are causing changes in nutrient cycling and availability and contributing to increased plant and algae growth in many nearshore areas.

The Great Lakes have problems with selected persistent bioaccumulative chemicals. Fish consumption advisories in the Great Lakes serve as constant 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 35,000 inland lakes (includes lakes, ponds, and river impoundments) with a surface area of at least one-tenth of an acre or greater. Approximately 11,000 of these inland lakes are larger than 5 acres in surface area, and over 2,000 are more than 50 acres. Approximately 36% of the total inland lake acreage is designated for coldwater fisheries protection and the remaining 64% is designated for warmwater fisheries protection.

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” (formerly referred to as significant public lakes) (Table 1.3). The list of public assess 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 public lakes 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 152 inland lakes that are deemed “cisco lakes.” The cisco (*Coregonus artedi*) is a member of a subfamily of trout and salmon (Salmonidae*),* usually occupying the cooler and deeper niches of high quality freshwater lakes. In North America, cisco can be found from Alaska to New England. Ciscos are, or were, present in at least 152 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 MDEQ and MDNR initiated a study to assess the status of the cisco populations in southwest Michigan. The intent of this ongoing study is to identify lakes in which populations are extant and increase awareness of this species so that best management practices (BMPs) are promoted.

Although Michigan’s inland lakes generally have good to excellent water quality, some water quality issues remain. Of the public access lakes that do not meet WQS, the primary cause is fish consumption advisories for PCBs or mercury. A statewide mercury-based fish consumption advisory applies to all of Michigan’s inland lakes, reservoirs, and impoundments. The majority of Michigan’s public access lakes have moderate or low nutrient levels; however, nutrient levels are high enough in several lakes to warrant corrective action through the development and implementation of a TMDL. Many lakes with moderate to high nutrient levels are located in the southern Lower Peninsula where large population centers and fertile soils exist. Many lakes with low nutrient levels are located in the northern Lower Peninsula and Upper Peninsula where the population density is lower, soils are less fertile, and lakes tend to be larger and deeper. Contaminated sediments are also an issue in several inland lakes, and remediation efforts are being planned or have been undertaken.

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
- Alcona Dam Pond
- Brownlee
- Cedar
- Crooked
- Hubbard*
- Jewell
- North
- Vaughn

ALGER
- AuTrain Basin
- AuTrain Lake
- Deer†
- Fish
- Grand Sable
- Kingston
- Nawakwa

ALLEGAN
- Allegan
- Baseline
- Big
- Duck
- Eagle
- Green*
- Hutchins
- Kalamazoo
- Lower Scott
- Miner
- Osterhout
- Selkirk
- Swan
- Swan Creek Pond

ALPENA
- Beaver*
- Fletcher Pond

ANTRIM
- Bellaire*
- Benway
- Birch
- Clam
- Elk*
- Ellsworth
- Intermediate*
- Lake of the Woods
- St. Clair
- Torch
- Wilson

BARAGA
- Beaufort
- Big Keewaydin
- King
- Parent
- Prickett Dam
- Ruth
- Vermilac

BARRY
- Baker
- Barlow†
- Big Cedar†
- Bristol
- Carter
- Chief Noonday
- Clear
- Cloverdale
- Crooked
- Deep
- Duncan
- Fine
- Fish*
- Gun
- Jordan
- Leach
- Lime†
- Little Cedar†
- Long (Hope Twp)
- Long (Johnstown Twp)*
- Long (Yankee Springs Twp)
- Lower Crooked
- Middle
- Payne
- Pine
- Thornapple

BENZIE
- Ann*
- Betsie
- Crystal*
- Herendeene
- Little Platte
- Lower Herring
- Pearl
- Platte
- Stevens
- Turtle
- Upper Herring

BERRIEN
- Paw Paw

BRANCH
- Archer*
- Bartholomew†
- Cary
- Coldwater*
- Craig
- East Long*
- George
- Gilead
- Kenyon
- Lavine
- Marble*
- Matteson
- Morrison
- North
- Oliverda
- Randall

BRANCH cont'd
- Rose (Lake of the Woods)
- Silver
- South
- Union

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

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

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

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

CHIPPEWA
- Caribou
- Carp
- Frenchmans
- Hulbert†
- Monacle*
- Shelldrake Imp

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

CLINTON
- Ovid
- Park

CRAWFORD
- Jones
- K.P.
- Margrethe
- Section One
- Shupac

DELTA
- Boney Falls
- Camp 7
- Corner
- Dana
- Pole Creek Lake
- Round
- Skeels

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.

DICKINSON
- Antoine
- Bass
- Carney
- Edey
- Hamilton
- Louise†
- Mary*
- Norway
- Pickeral
- Rock
- Sawyer
- Silver
- Six Mile

EATON
- Narrow
- Saubee†

EMMET
- Crooked
- Larks
- Paradise
- Pickeral
- Round

GENESEE
- C.S. Mott Imp
- Fenton
- Holloway Resv
- Kearsley Resv
- Lobdell
- Ponemah
- Thread

GLADWIN
- Lake Four
- Pratt
- Secord Imp
- Wiggins
- Wixom Imp

GOGEBIC
- Allen
- Bass
- Beatons
- Bobcat
- Chaney
- Cisco
- Clark*
- Clearwater
- Crooked†
- Dinner
- Duck
- Eel
- Gogebic*
- Henry Imp
- Lac Vieux Desert
- Loon†
- Langford
- Little Oxbow
- Lake Pomeroy
- Marion
- McDonald

GOGEBIC cont'd
- Moon
- Moosehead
- Moraine
- Noorwood†
- Ormes
- Sunday
- Taylor*
- Thousand Island*

GRAND TRAVERSE
- Arbutus
- Bass
- Bass
- Boardman
- Bridge†
- Brown Bridge Pond
- Cedar
- Cedar Hedge*
- Dubonnet
- Duck*
- Fife
- Green*
- Long
- Silver
- Spider

HILLSDALE
- Baw Beese
- Bear*
- Bird
- Carpenter†
- Cub
- Diane
- Hemlock
- Long (Reading Twp)*
- Long (Stubin Co., IN)
- Round
- Sand North†
- Sand Middle†
- Sand South†
- Wilson†

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

INGHAM
- Lansing

IONIA
- Long
- Morrison
- Sessions
- Woodard

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

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

ISABELLA
- Coldwater*
- Halls
- Littlefield*
- Stevenson

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

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

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

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.

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

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

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

LAPEER
- Big Fish
- Davidson
- Long
- Minnewanna
- Nepessing
- Otter

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

LENAWEE
- Allens
- Deep
- Devils
- Hudson
- Round
- Round
- Sand

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

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

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

MACOMB
- Stony Creek Imp

MANISTEE
- Arcadia
- Bear
- Canfield
- Healy
- Manistee
- Pine*
- Portage

MARQUETTE
- Anderson
- Ann†
- Arfelin
- Bass
- Bass
- Big Shag
- Dead River Storage Basin
- Engmans
- Greenwood Resv
- Horseshoe

MARQUETTE cont'd
- Independence*
- Ives†
- Johnson
- Little
- Little Shag
- Michigamme
- McClure Storage Resv
- Mountain†
- Pike
- Pine†
- Rush†
- Silver†
- Sporley*
- Squaw
- Witch
- Wolf

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

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

MENOMINEE
- Long

MIDLAND
- Sanford

MISSAUKEE
- Crooked
- Goose
- Long
- Missaukee
- Sapphire

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

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

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

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.

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

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

OCEANA
- Crystal
- McLaren
- Pentwater
- Schoolsection
- Silver
- Stony

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

ONTONAGON
- Bond Falls
- County Line

OSCEOLA
- Big
- Diamond
- Hicks
- Rose
- Sunrise
- Todd
- Wells

OSCODA
- McCollum
- Mio Dam
- Pond
- Tea

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

OTTAWA
- Crockery
- Macatawa
- Pigeon
- Spring

PRESQUE ISLE
- Big Tomahawk
- Emma
- Essau
- Grand
- Long
- Lost
- May
- Nettie
- Shoepac
- Sunken

ROSCOMMON
- Higgins*
- Houghton
- St. Helen

SCHOOLCRAFT
- Boot
- Colwell
- Dodge
- Gemini
- Gulliver*
- Indian*
- Island
- Kennedy
- McDonald
- Petes
- Ross
- Snyder

ST JOSEPH
- Big Fish
- Clear
- Corey*
- Crotch
- Fisher's
- Klinger*
- Long
- Long
- Palmer
- Pleasant*
- Portage
- Prairie River*
- Sand
- Sturgeon
- Tamarack†
- Thompson*
- Three Rivers Imp

TUSCOLA
- Caro Reservoir
- Murphy
- North

VAN BUREN
- Ackley
- Banksons
- Brandywine
- Cedar
- Clear
- Cora
- Eagle
- Eleven
- Fish
- Fourteen
- Gravel
- Halls
- Huzzy's
- Lake of the Woods
- Maple
- North Scott
- Round
- Rush
- Saddle
- School
- Section
- Shafer
- South Scott
- Three Legged
- Three Mile
- Upper Jeptha
- Upper Reynolds
- VanAuken
- Wolf†

WASHTENAW
- Big Portage
- Blind†
- Bruin*
- Cedar
- Crooked
- Ford
- Four Mile
- Green
- Half Moon*
- Joslin
- Mill
- Mud
- North
- Pickerel†
- South*
- Sugar Loaf
- Winnewanna

WAYNE
- Belleville
- Newburgh

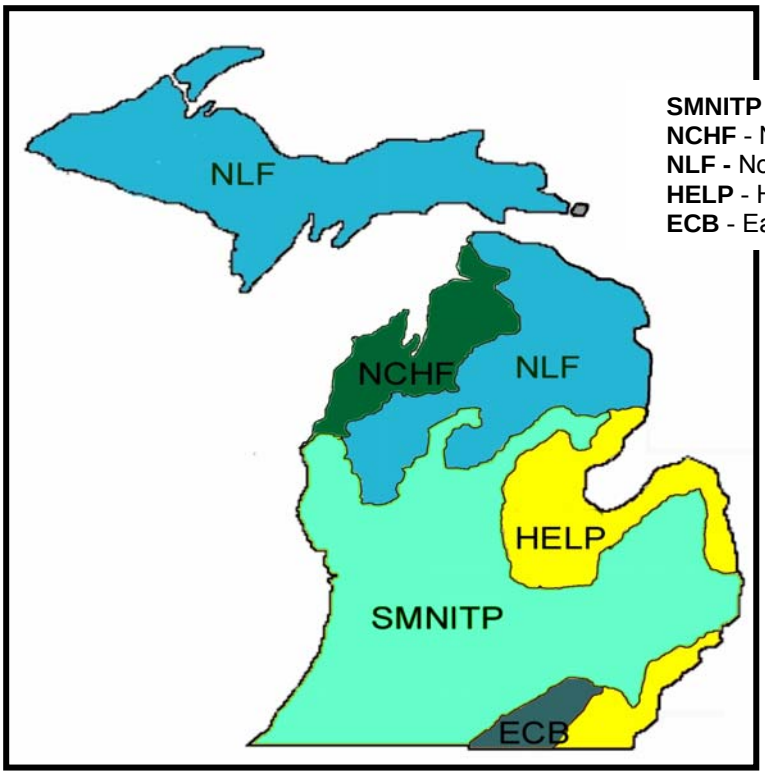
WEXFORD
- Berry
- Cadillac
- Hodenpyl Dam Pond
- Long
- Mitchell

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, being entirely intermittent in some portions of the ecoregion and entirely perennial in others. These rivers typically drain soils with much poorer nutrient content than in bordering ecoregions to the south.

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



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

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

Michigan's aquatic resources include approximately 5,583,400 acres of wetlands, some of exceptional quality and rarity. About 15% of Michigan's land area is wetland. Several inventories of wetlands in Michigan have been undertaken by different agencies. At this time, however, no practical method has been developed to accurately track all wetlands gains and losses on a statewide basis. Sources of wetland loss include permitted activities; unpermitted activities (i.e., violations of Section 404 and state law); agricultural and silvicultural practices, which 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.

Estimates of wetland losses since European settlement range from 35%, based on the Michigan Natural Features Inventory presettlement inventory to 50% based on the United States Fish and Wildlife Service (USFWS) Status and Trends reporting. During 2006, the MDEQ, Wetlands Unit, housed in the Land and Water Management Division (LWMD), contracted 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 contract specifies updating 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. At the conclusion of this effort, the MDEQ will be able to readily quantify wetland gains/losses in the state over the last 30 years, which happens to be the same time period wetland regulations have been in effect. Completion of this project is expected in the fall/winter of 2008.

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 (GIS).

The Great Lakes Coastal Wetlands Consortium has recently completed a GIS-based inventory of Great Lakes coastal wetlands in cooperation with the Great Lakes state and provinces. This inventory will be available through the Consortium's Web site at http://www.glc.org/wetlands.

Part 303, Wetlands Protection, of the NREPA requires the MDEQ 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 on the Internet at http://www.michigan.gov/deqwater under Wetlands Protection, Wetland Inventory Maps or by submitting a request for a large-format print to the MDEQ, LWMD. The county wetland inventories were produced by overlaying data from the following sources: the USFWS National Wetland Inventory maps, 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.

CHAPTER 2
WATER PROTECTION PROGRAMS

The MDEQ has a number of 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, provide technical and financial assistance to reduce pollutant runoff, ensure compliance with state laws, and educate the public about water quality issues. This chapter provides descriptions of Michigan's water quality protection programs and highlights several special initiatives and costs/benefits.

2.1 Abandoned Well Management

Unplugged abandoned wells threaten the quality of drinking water obtained from privately owned and community public drinking water supply wells. The WB has implemented a comprehensive Abandoned Well Management Program to coordinate statewide abandoned well location and plugging activities. Plugging abandoned wells protects the groundwater source aquifers that are used by nearly one-half of Michigan's citizens for drinking water. The goal of the Abandoned Well Management Program is to identify and properly plug as many abandoned wells as possible.

The WB also administers an Abandoned Well Management Grants Program that is funded by the Clean Michigan Initiative (CMI). Abandoned well management grants target and fund the location and plugging of abandoned wells in community public water supply wellhead protection areas.

The MDEQ conducts training and public education/outreach activities to raise the level of public awareness concerning the environmental and public health threats associated with unplugged abandoned wells. Groundwater protection seminars that include abandoned well-related topics are sponsored for general audiences. Technical training programs covering abandoned well plugging techniques and requirements are conducted for registered water well drilling contractors, local health department (LHD) staff, environmental consultants, and other state of Michigan departments.

The Michigan Department of Agriculture (MDA) administers a cost share grants program, the "Farm*A*Syst" Program that can pay up to 90% of the cost for plugging abandoned wells on agricultural lands.

LHDs enforce abandoned well plugging requirements through field inspections and review of abandoned well plugging records that are submitted by registered well drilling contractors and property owners. The WB conducts compliance and enforcement actions in cooperation with the Office of Criminal Investigations, the Michigan Department of Attorney General, and LHDs. Many successful enforcement actions have been taken in recent years.

2.2 Aquatic Nuisance Control

The MDEQ has the authority, under Part 33, Aquatic Nuisance Control, of the NREPA, to regulate the use of pesticides to control treatment of nuisance aquatic plants, algae, and swimmer's itch. Each application for a permit must undergo a thorough review to assess the environmental impact to the water body and any human health and safety issues. A large majority of these treatments are carried out by commercial pesticide applicators licensed by the MDA. The MDEQ works with the MDA to assure those treatments and the applicators comply with the requirements of the permits and the pertinent laws. Program staff also review new chemical products proposed for use in Michigan waters, survey Michigan lakes to determine the composition of the native plant community and presence of exotic plant species, and seek to educate riparian property owners about the management of aquatic plants and a variety of related lake management issues.

The staffing for the program was significantly expanded at the end of 2003. This expansion allowed the MDEQ, in 2004, to provide a much faster turnaround time on the review and issuance of permits and avoid the backlogs that had plagued the program in recent years. Legislation enacted in 2004 transferred the statutory authority for the program from the Public Health Act to the NREPA. This legislation also significantly increased the penalties for violations.

2.3 Beach Protection

In Michigan, the authority to close beaches to the public rests with the LHD. LHDs also have jurisdiction to test and otherwise evaluate water quality at bathing beaches to determine whether the water is safe for bathing purposes. Beach monitoring results collected by the LHDs and swimming advisories are readily made available to the public by the LHDs via the MDEQ's statewide beach monitoring Web site (http://www.deq.state.mi.us/beach). Signs are posted at bathing beaches stating whether or not the beach has been tested for *E. coli*. Since 2000, the MDEQ has provided grants to LHDs to support and augment beach monitoring throughout Michigan. These grants are funded by a combination of state CMI bond money and federal Beaches Environmental Assessment and Coastal Health Act (BEACH Act) funds. The BEACH Act authorizes the USEPA to award program development and implementation grants to eligible states, territories, tribes, and local governments. These annual grants support microbiological monitoring of coastal recreation waters, including the Great Lakes, which are adjacent to beaches or similar points of access used by the public. BEACH Act grants also support development and implementation of programs to notify the public of the potential exposure to disease-causing microorganisms in coastal recreation waters.

2.4 Biosolids

The treatment of municipal wastewater generates a residue called biosolids. Biosolids may be disposed of through incineration or landfilling, or they may be recycled. Because biosolids contain nutrients and can therefore have a beneficial use as fertilizer or soil conditioner, recycling is an effective alternative to incineration or landfilling. The MDEQ encourages the use of biosolids to enhance agricultural and silvicultural production in Michigan. However, if biosolids are not properly handled and enter surface water or groundwater, their associated chemical character could severely degrade water quality. To prevent such problems, the land application of biosolids is a regulated activity.

Under federal regulations, criteria for biosolids management have been established. National Pollutant Discharge Elimination System (NPDES) and state groundwater discharge permits require management of biosolids and other residuals from wastewater treatment facilities. Permittees are required to develop and obtain MDEQ approval of a Residuals Management Program. The MDEQ district staff also inspect the facilities generating the biosolids and the land application sites.

2.5 Coastal Management

The Coastal Zone Management Act, originally passed in 1972, enables coastal states, including Great Lakes states, to develop a Coastal Management Program to improve protection of sensitive shoreline resources, to identify coastal areas appropriate for development, to designate areas hazardous to development, and to improve public access to the coastline. Michigan was one of the first states to have its Coastal Management Program approved in 1978. Through Michigan's Coastal Management Program, the MDEQ, Environmental Science and Services Division, provides financial and technical assistance to local units of government to address shoreline issues and improve their coastal resources.

2.6 Community Water Supply

The MDEQ oversees approximately 1,470 community water systems that furnish drinking water year-round to residential populations of 25 or more, to ensure that the USEPA's minimum standards for safe drinking water and Michigan Safe Drinking Water Act, 1976 PA 399, as amended (Act 399), requirements are met. Over the last decade, 99% or more of the population have been served by community water supplies meeting all health standards. Since 1998, the Drinking Water Revolving Loan Fund has provided low interest loans for projects designed to protect community water supply systems.

2.7 Compliance and Enforcement

The MDEQ, WB, Enforcement Unit, is responsible for conducting escalated enforcement actions taken by the WB. Such actions are conducted in response to violations of state water pollution control statutes and rules, violations of surface water discharge permits, and violations of administrative or judicial orders. Enforcement Program goals are to bring the entity into compliance as quickly as possible, to restore any natural resource damages caused by the violation, assess appropriate penalties, eliminate financial gain that may have been realized as a result of noncompliance, and drive improvements in water quality. The Enforcement Unit serves as the WB's liaison with the Michigan Department of Attorney General and also works with the USEPA and the United States Department of Justice on joint state/federal enforcement cases.

Enforcement actions are generally progressive in nature. They include any number of possible actions, including issuance of notices of violation, preparation of final orders of abatement, settlement via administrative consent orders, or referrals to the Michigan Department of Attorney General for civil or criminal litigation.

MDEQ staff collect effluent samples from NPDES facilities to evaluate compliance with permit limits. In addition, the MDEQ has an Aquatic Toxicology Laboratory that conducts acute and chronic whole effluent toxicity tests from selected facilities each year. Whole effluent toxicity tests usually are conducted consistent with the five-year rotating watershed schedule, such that facilities are tested two years prior to permit reissuance.

The MDEQ conducts special studies to support water quality enforcement actions. These studies may include water, sediment, biological, and/or toxicity sampling, depending on the specific issue. Water quality monitoring in response to spills is also conducted. Monitoring activities to support enforcement actions are implemented as needed, and are always developed with input from Enforcement Unit and Field Operations Division staff.

2.8 Conservation Reserve Enhancement

The MDEQ works closely with the MDA to implement the Conservation Reserve Enhancement Program, a federal-state-local conservation partnership designed to reduce significant environmental effects related to agriculture. The Conservation Reserve Enhancement Program is being implemented in four critical watersheds (Saginaw Bay, Macatawa River, River Raisin, and western Lake Erie basin) that have intense agricultural land use. The objectives of the program are to improve and protect water quality and to promote and enhance wildlife habitat by providing incentives to Michigan citizens for implementing conservation practices for a period of 15 years. Eligible conservation practices include grass plantings, filter strips, riparian buffer strips, field windbreaks, and wetland restoration. The MDEQ also supplies Section 319 and CMI funds for livestock exclusion, implementation of Natural Resources Conservation Service approved conservation practices, Conservation Reserve Enhancement Program technical assistance, and permanent conservation easements.

2.9 Contaminated Sediment

The Contaminated Sediment Program consists of activities to coordinate and implement remediation at sites of environmental contamination that impact water quality. Sites range from current incidents of spills or losses of pollutants due to accidents or poor facility operations, to historic incidents where pollutants have been in the environment for many years. Some of these sites impact surface waters directly. Others may impact surface waters by the movement of contaminated groundwater, through treatment and permitted discharge of contaminated groundwater, or through discharges of contaminated groundwater to treatment facilities. The MDEQ staff investigate sites of environmental contamination, make recommendations regarding proposed site remediation and treatment, evaluate treatment proposals and pollutant discharges from remediation systems, and provide other technical and project management support as necessary. As part of the CMI, $25 million was set aside for the investigation and remediation of contaminated sediments in Michigan lakes, rivers, and streams. Summaries of these projects are contained in the MDEQ's Consolidated Report (MDEQ, 2007).

2.10 Drinking Water Contamination Investigation

The MDEQ assists LHDs in conducting drinking water quality investigations in areas of known or suspected environmental contamination. Such technical assistance may involve monitoring design, analytical support, toxicological assessment, and/or health advisory notice development.

The MDEQ is also responsible for administering drinking water replacement activities. Administration is primarily accomplished through contracts awarded to local units of government and/or private well drillers to extend community water lines and to replace contaminated water wells. Provision of bottled water, installation of treatment devices, and well abandonment is also addressed through this program.

The MDEQ also administers a statewide contract to monitor drinking water quality in wells adjacent to sites of environmental contamination and to replace contaminated water wells.

Contaminated wells are replaced with water wells drilled to a deeper, protected aquifer, or the homes are connected to community water that is extended into the area.

2.11 Environmental Health

Working closely with LHDs, the MDEQ protects public health and the environment through administration of regulatory programs dealing with manufactured housing communities, campgrounds, and public swimming pools. The MDEQ also assures that suitable site conditions are present for proposed residential or commercial developments dependent on individual on-site sewage systems and wells, and regulates the proper collection and disposal of wastes by septic tank pump and haul operators.

2.12 Great Lakes

The Great Lakes form a portion of the international boundary between the United States and Canada, and both countries have jurisdiction over their use. The first Great Lakes Water Quality Agreement between the two federal governments was developed in 1972 and established objectives and criteria for the restoration and enhancement of water quality in the Great Lakes system. A revised Great Lakes Water Quality Agreement was signed in 1978 recognizing the need to understand and effectively reduce toxic substance loads to the Great Lakes. The 1978 Great Lakes Water Quality Agreement adopted general and specific objectives and outlined programs and practices necessary to reduce pollutant discharges to the Great Lakes system. Under the 1987 Protocol Amending the 1978 Great Lakes Water Quality Agreement, the United States and Canadian governments identified 43 of the most polluted areas in the Great Lakes basin that had serious water quality problems known to cause Beneficial Use Impairments of the shared aquatic resources. These areas have been formally designated by the two governments as Areas of Concern (AOCs). Three AOCs were subsequently restored and delisted.

Ten AOCs are exclusively under Michigan jurisdiction: Clinton River, Deer Lake, Kalamazoo River, Manistique River, Muskegon Lake, River Raisin, River Rouge, Saginaw River/Bay, Torch Lake, and White Lake (Figure 2.1). The Menominee River AOC is shared with Wisconsin, and the Detroit River, St. Clair River, and St. Marys River are binational AOCs. The later AOCs are managed jointly by a binational governance structure created under the Four Agency Letter of Commitment (also called the Four Agency Agreement) that was signed on April 17, 1998, by the Environment Canada, USEPA, MDEQ, and Ontario Ministry of the Environment.

Figure 2.1. Great Lakes AOC (Environment Canada, 2007)

The 1987 Protocol called for cleanup of the AOCs through the development of Remedial Action Plans. Each Remedial Action Plan is required to identify problems that have led to Beneficial Use Impairments, identify actions needed to restore the beneficial uses, and provide documentation when beneficial uses are restored. Both federal governments play an active role in the implementation of the Remedial Action Plans. All of Michigan's 14 AOCs have completed Remedial Action Plans that are currently at various stages of implementation. Information regarding Michigan's AOCs and Remedial Action Plans is available at http://www.michigan.gov/deqwater in the Areas of Concern section under the Great Lakes, or from the Michigan Statewide Public Advisory Council at http://www.glc.org/spac/. A copy of the state's Guidance for Delisting Michigan's Great Lakes Areas of Concern can be found at http://www.michigan.gov/deqwater in the Areas of Concern section under Great Lakes.

The 1987 Protocol required the development and implementation of Lakewide Management Plans (LaMPs) for each of the Great Lakes. The purpose of the LaMPs is to address critical pollutants and provide a strategy to protect and restore beneficial uses impacted in the open waters of each Great Lake. The USEPA, in cooperation with other government and nongovernment agencies, has developed LaMPs for Lake Erie, Lake Michigan, and Lake Superior. Each LaMP includes an assessment of Beneficial Use Impairments, causes of the impairment, and recommendations on actions necessary to restore the beneficial uses. In undertaking the development of the LaMPs, the stakeholders recognized the need to address

other water quality issues unique to each Great Lakes basin. The LaMPs are updated biennially, with the next updates due in 2008.

A LaMP has not yet been developed for Lake Huron. Instead, the MDEQ, the USEPA, Environment Canada, the Ontario Ministry of the Environment, and the Ontario Ministry of Natural Resources have formed the core of a Lake Huron Binational Partnership to coordinate environmental activities in the Lake Huron basin. A flexible membership is being promoted that is inclusive of other agencies and levels of government, tribes, nongovernment organizations, and the public on an issue-by-issue basis. The group developed a Lake Huron Binational Partnership Action Plan and updates it biennially on the same schedule as the LaMPs.

2.13 Groundwater Discharge

The MDEQ's Groundwater Discharge Program regulates discharges to the ground through the development and issuance of permits and self-certifications. A "program review team" was established to develop and implement recommendations as needed for the Groundwater Discharge Program. Some specific program accomplishments include the conversion of the groundwater permit database into the NPDES Management System to increase permitting effectiveness, section procedure updates to consolidate and streamline groundwater permitting procedures, development and implementation of the Groundwater Expired Permit Initiative to address permits that expired prior to March 1, 2005, and review of the groundwater permit application to improve permit applications and decrease processing time.

2.14 Industrial Pretreatment

The MDEQ implements federal and state rules designed to limit pollution from industrial discharges to municipal wastewater treatment facilities. In 1983, the USEPA approved Michigan's pretreatment program and formally delegated industrial pretreatment program authority to Michigan. To assure that pollutant discharges are controlled, many municipalities have been required to develop and implement local industrial pretreatment programs as a condition of their NPDES permit. Michigan operates under a two-tiered system: municipalities subject to industrial pretreatment program regulation with design flows greater than five million gallons per day must develop a federal local industrial pretreatment program, while municipalities subject to industrial pretreatment program regulation with design flows less than or equal to five million gallons per day must develop a Michigan local industrial pretreatment program.

Municipalities developing industrial pretreatment programs are required to submit them to the MDEQ, WB, for review and approval. Subsequent changes to an approved local industrial pretreatment program, as well as periodic reports of local program operations, must also be submitted for review. MDEQ field staff conduct periodic inspections of local industrial pretreatment programs to identify deficiencies and initiate actions necessary to assure effective operation. Information derived from inspections and reports submitted by the municipalities are entered into the Permit Compliance System database.

2.15 Infrastructure Security

Due to terrorist attacks on September 11, 2001, and recent federal legislation and state authorizations, the MDEQ actively participates in numerous Infrastructure Security Program activities. The federal Public Health Security and Bioterrorism Preparedness and Response Act of 2002 requires drinking water systems to comply with requirements by certain dates as a part of the nation's homeland security efforts. The MDEQ plays a critical role in training and

assisting the drinking water and wastewater system personnel to comply with the federal Infrastructure Security Program. The MDEQ helps to protect supply systems from malevolent acts by providing training to complete vulnerability assessments and emergency response plans, participating in water security tabletop exercises, and helping local units of governments to receive the Threat Advisory Notification System.

2.16 Inland Lakes and Streams

The Inland Lakes and Streams Program is responsible for the protection of the natural resources and the public trust waters of the inland lakes and streams of the state. The program oversees and regulates activities including dredging, filling, constructing or placement of a structure on bottomlands, constructing or operating a marina, interfering with natural flow of water, or connecting a ditch or canal to an inland lake or stream.

The most common projects associated with inland lakes and streams regulated under Part 301, Inland Lakes and Streams, of the NREPA include shore protection, permanent docks or boat hoists, beach sanding, and dredging or excavation. Other types of activities may also require permits.

2.17 National Pollutant Discharge Elimination System

Discharges to state surface waters from municipal, industrial, and commercial facilities must be authorized by permit under the NPDES Program. All Concentrated Animal Feeding Operations (CAFOs) in Michigan are also required to obtain an NPDES permit, except for those CAFOs that are granted a "No Potential to Discharge" determination by the MDEQ. The purpose of an NPDES permit is to control the discharge of pollutants into surface waters of the state to protect the environment. The USEPA delegated the program to Michigan, and the MDEQ has responsibility for processing NPDES permits. The maximum term for an NPDES permit is five years, after which they must be reissued.

The MDEQ reissues NPDES permits according to the five-year rotating watershed cycle (Figure 3.1). Under this approach, all of the permits in each individual watershed expire and are reissued in the same year. This approach allows the MDEQ to consider cumulative impacts of all dischargers on water quality in the watershed. Discharges to lakes, streams, and wetlands must not cause a violation of Michigan WQS. As part of the permit issuance process, limits are developed for pollutants to avoid a violation of WQS and ensure compliance with the treatment technology regulations of the CWA. Draft permits are prepared containing pollutant limits and any appropriate special conditions. The draft permits are placed on public notice, allowing the opportunity for public comment.

The MDEQ was instrumental in amending the NREPA in 2004 to establish NPDES permit fees to assist in funding the NPDES Program.

Permits for regulated storm water discharges are also processed and issued by the MDEQ under the NPDES. The Storm Water Program is also funded by fees collected from the dischargers. Under Phase I of the Storm Water Program, individual NPDES permits were issued to owners or operators of municipal separate storm sewer systems (MS4) serving a population of 100,000 or greater. In 2003, the MDEQ promulgated rules to obtain the legal authority to implement Phase II requirements. As a result, owners or operators of MS4s serving populations less than 100,000 within urbanized areas were required to apply for NPDES permits by March 2003. Phase II permittees include cities, villages, townships, county road commissions, and county drain commissions, among others. A jurisdictional-based general

permit, as well as the watershed-based general storm water permit, is used to provide permit coverage.

The MDEQ uses two types of general permits for industrial storm water discharges. The standard permit, used by the majority of dischargers, requires the permittee to have a certified storm water operator and develop a Storm Water Pollution Prevention Plan. The deluxe storm water general permit is similar to the standard permit, but also requires some monitoring of the storm water discharge. The latter is used for sites with secondary containment structures and sites that have environmental contamination. Industrial general permits and certificates of coverage are reissued on a five-year rotating watershed basis.

The MDEQ has continued implementation of the state's Combined Sewer Overflow (CSO) Control Program, which has resulted in annual reductions of the volume of untreated combined sewage discharged to the surface waters of the state. Through implementation of the CSO Control Program, numerous CSO discharges are being eliminated at various locations around the state, while at other locations, treatment and disinfection of combined sewage discharges that comply with WQS and protect public health are being provided on an increasing basis.

2.18 Nonpoint Source Control

The Nonpoint Source (NPS) Program assists local units of government, nonprofit entities, and other state, federal, and local partners to reduce NPS pollution statewide. The basis for the program is watershed management; the MDEQ provides assistance and funding to develop watershed management plans and to implement NPS control activities in these plans. The NPS Program consists of five parts:

- Technical assistance to help organizations develop and implement watershed management plans, including BMP selection, land use planning activities, and engineering review of site plans.
- Information and education, including activities/tools created by the MDEQ and grantees, to educate people about NPS of pollution.
- Grants to implement BMPs, land use planning tools, and information/education activities.
- Compliance and enforcement, including response and investigation of complaints, follow-up requiring corrective actions, and occasionally participating in escalated enforcement actions.
- Monitoring and field investigations to identify NPS problems and evaluate the effectiveness of corrective or preventive actions.

To date, the NPS Program has provided technical and financial assistance to implement BMPs resulting in over 24,200 acres of conservation tillage practices in watersheds around the state. A total of 194,127 linear feet (over 36 miles) of eroding stream banks have been stabilized and more than 5,700 acres of permanent conservation easements have been secured. In addition, 443,830 linear feet of filter strips have been installed, protecting over 5,600 acres of land adjacent to streams; 14,692 acres of wetlands have been created or restored through NPS grants and through partnership with the Conservation Reserve Enhancement Program; over 6,900 acres of critical areas highly susceptible to erosion have been treated; and more than 80 miles have been fenced for animal exclusions.

As of December 1, 2007, the MDEQ has awarded over 350 grants for the implementation of NPS pollution control projects. The program has seen dramatic reductions in pollutant loadings into our state’s surface waters. BMPs will reduce sediment loads by nearly 740,000 tons, based on all years’ previous BMP implementations. Large reductions in nutrient (phosphorus and nitrogen) loads are also occurring.

More than 130 watershed management plans have been developed at the local level utilizing MDEQ grants. Watershed management plans serve as guides for communities to protect and improve water quality. A list of MDEQ-approved watershed management plans that meet CMI and/or Section 319 criteria for implementation is available at http://www.michigan.gov/deqnps.

Water quality data often are used to evaluate the effectiveness of BMPs. The specific information required depends upon the problem being addressed, but may include biological, chemical, or physical data. The MDEQ's NPS Environmental Monitoring Strategy (NPS Strategy) explains in detail how monitoring is used to support NPS efforts (MDEQ, 2005a). Specifically, it describes how the MDEQ's NPS monitoring priorities are set, how monitoring is used to track improvements in water quality following implementation of NPS controls, and how the monitoring results are communicated and used in program decisions. The NPS Strategy divides NPS monitoring into four broad categories, including statewide trend monitoring, problem identification monitoring, TMDL development and effectiveness monitoring, and NPS control effectiveness monitoring.

The NPS Program staff have identified a number of priority watersheds in which to focus pollution control activities to achieve the restoration and protection goals identified in the NPS Program Plan. Some of the priority watersheds support designated uses (i.e., no waters listed in Categories 4 or 5 (see Section 4.11) excluding the fish consumption designated use and designated uses that are not supported due to atmospheric deposition and/or contaminated sediments) and are considered to be high quality watersheds. Efforts will be focused on protection of these priority, high-quality watersheds. The objective is to address uniquely high priority state needs to protect waters that currently are not identified as Categories 4 or 5 due to NPS pollution and assure that they remain unimpaired. The use of the words "threat" or "threatened" in this section does not imply that the water body is expected to not support one or more designated uses by the next reporting cycle; rather, the use of these words is consistent with USEPA guidelines contained in the Federal Register Vol. 68, No. 205, October 23, 2003, Nonpoint Source Program and Grants Guidelines for States and Territories Section III.B.3. The following high quality watersheds will be a focus for protection activities beginning in 2008:

Lake Superior Basin

- **Huron River**

  The Huron River watershed is a relatively pristine un-impounded watershed with a high quality coldwater biological community. There is a very large, diverse, and active group of stakeholders who have been working together for well over a year on locating resources to protect the watershed. The watershed contains large parcels of corporately owned land that will soon become parceled and sold; therefore, the watershed may be subjected to land use changes including private development.

Lake Michigan Basin

- **Lake Charlevoix**

  Lake Charlevoix is a high quality oligotrophic lake and its largest tributary, the Jordan River, is a state designated Natural River. Lake Charlevoix is Michigan's fourth largest inland lake with the second longest shoreline and the fifth largest watershed. The Lake Charlevoix Watershed Advisory Committee is one of the most active in northern

Michigan and has more participation by local governments than many other watershed groups. The primary NPS threats are sediment and nutrients.

- **Manistee River**

  The Manistee River supports one of Michigan's best coldwater fisheries and is particularly renowned for salmon. The Manistee River system's high water quality has resulted in the federal designation of three distinct river reaches as Wild and Scenic rivers, including the lower portion of the mainstream and two tributaries: the Pine River and Bear Creek. The Pine River is also a state designated Natural River as is the upper portion of the Manistee River mainstream. Another significant tributary, the Little Manistee, is the sole source of steelhead eggs for Michigan's fish stocking program, which also provides eggs to other hatchery programs throughout the Midwest. The Manistee River also supports one of the few remaining naturally reproducing Lake Sturgeon populations in Michigan. The primary NPS threat in this river system is excessive sand bedload from sediment erosion. Water quality protection efforts are conducted jointly by many local, state, and federal organizations that coordinate actions through several watershed committees including the Lower Manistee River Partnership, Bear Creek Watershed Council, Little Manistee River Partnership, Pine River Watershed Restoration Committee, and Upper Manistee River Watershed Committee.

- **Pere Marquette River**

  Often referred to as one of the finest trout streams in the Midwest, the Pere Marquette River is rather unique in Michigan for a river of its size in that it has remained free-flowing with no dams on the mainstream. Partly because of its high water quality, the Pere Marquette River has been designated both a federal Wild and Scenic River and a state Natural River, which provide it special protection status. Some of the earliest watershed protection efforts in Michigan were taken in the Pere Marquette watershed, and the Pere Marquette Watershed Council remains active in implementing additional protection measures. Excessive sand bedload in the river from sediment erosion is the most significant environmental issue, although there are signs of potential nutrient enrichment in some areas.

- **Lake Michigan Tributary- Duck Creek**

  Duck Creek is one of the remaining watersheds in the area that is not covered by a watershed management plan. Based on Muskegon Conservation District data, this coldwater stream may be vulnerable due to temperature problems. With the planned expansion of the Michigan Adventure amusement park near Muskegon and the resulting land use changes, this watershed would benefit from the development and implementation of a Watershed Management Plan to protect existing high quality waters. The MDEQ staff have been working with the local community for the last three years to develop a proposal with planned participation by decision makers. A local entity recently received money from the West Michigan Strategic Alliance Green Infrastructure Program to look for opportunities to incorporate smart growth and low impact development in the area around Michigan Adventure.

- **Looking Glass River- Remy-Chandler Drain**

  The Remy-Chandler Drain is a tributary of the Looking Glass River. The headwaters are in urban East Lansing and it then flows through agricultural land around DeWitt.

Development (the Eastwood Town Center) and mixed drain management practices (Ingham and Clinton County Drain Offices) have resulted in a water body with large hydrologic fluctuations. This has caused a significant amount of bank and in-stream erosion that delivers sediment to the Looking Glass River. Efforts are needed to determine the specific sources of the hydrologic fluctuations, which is a joint agreed-upon goal with the drain commissioners. Addressing these sources would help reduce a significant cause of sediment input to the main channel and serve as a highly visible demonstration action.

- **Kalamazoo River- Augusta Creek and Gull Creek (Including Gull Lake)**

  The Augusta Creek and Gull Creek watershed within the Kalamazoo River watershed include a number of high quality streams and lakes. Gull Lake is a large, historically oligotrophic lake supporting a coldwater fishery. While phosphorus levels in the watershed remain at acceptable levels, development pressures are a concern. Agriculture is also a potential source of nutrients. There are three proposed CAFOs in the watershed (both new and expanding operations). Therefore, preservation of the riparian lands is critical to provide an adequate buffer between agricultural operations and the water bodies.

- **Kalamazoo River- Spring Brook**

  Spring Brook Creek is a coldwater tributary to the Kalamazoo River immediately downstream (north) of the city of Kalamazoo. A 1991 MDEQ biological survey conducted on Spring Brook indicated that this stream had the highest habitat quality for fish and other aquatic life of any coldwater stream of similar size that was sampled in southwestern Michigan. Brown trout of varying sizes were observed, indicating that populations were self-sustaining. High numbers and diversity in aquatic insects indicated that an excellent food source was available for the fish species present. A more recent biosurvey, conducted in 2004, found that approximately one mile of the riparian zone had been completely removed and replaced by subdivisions and lawns near Riverview Drive. A survey conducted further upstream, at DE Avenue, found a largely unimpacted riparian zone and an excellent macroinvertebrate community. Pollutants associated with development including sediment, phosphorus, and thermal inputs are the primary threats in this watershed.

- **St. Joseph River- Fawn River**

  Based on results of Soil and Water Assessment Tool modeling, the Fawn River watershed was identified in the St. Joseph River Watershed Management Plan as one of the top three critical subwatersheds for mitigation of agricultural concerns. Sediments and nutrients are the primary pollutants of concern. Recent MDEQ biological surveys indicated largely “excellent” macroinvertebrate populations, minimal disturbance of stream habitat despite abundance of agricultural land use, diverse stream habitat, wide wooded floodplain, and “good” water quality.

- **St. Joseph River- Prairie River**

  Channelization and agricultural land drainage have been identified as a concern in this St. Joseph River watershed. Improved management practices could assist with maintaining and improving water quality. A 2002 MDEQ biological survey report indicated that macroinvertebrate communities were “acceptable” (although nearly

excellent) to “excellent.” Stream habitat was mostly “fair” with one station “good.” A 2005 MDEQ biological survey reported support of the coldwater fisheries designated use at the Bowers Road station; although, this segment is designated as warmwater. Another site farther downstream supported an abundance of warmwater taxa rating acceptable with warmwater metrics; although, this segment is designated as coldwater.

- **St. Joseph River- Rocky River**

  The St. Joseph River Watershed Management Plan identified the Paw Paw, Dowagiac, and Rocky Rivers subwatersheds as the highest priority (top three critical areas) for preservation efforts based on: (1) a scoring system for percentage of wetland and forest cover and trout lakes and streams in the subwatershed; (2) the three subwatersheds form a contiguous land mass surrounded on all sides by urban and developing areas; (3) potential for regional cooperation; and (4) existence of watershed management plans with Rocky River and Dowagiac River already having plans, and Paw Paw River under development.

  This river is relatively undeveloped along the river corridor; but, it is threatened by development along the US-131 corridor in the vicinity of the city of Three Rivers. There is good potential for protection through land use planning and such efforts are underway in a current grant project. Some natural trout production takes place in the cold headwaters. Macroinvertebrate communities and habitat are generally “good;” but, there are undetermined sources of sediments in the watershed that may be natural. Historic channelization in tributaries has resulted in limited available habitat for biological communities.

Lake Huron Basin

- **Au Sable River**

  The Au Sable River is often referred to as providing the finest brown trout fly fishing east of the Rocky Mountains. It is both a federally designated Wild and Scenic River and a state designated Natural River. The primary NPS threat to this world-class trout stream is sand bedload from sediment erosion. There is significant local interest in protecting the Au Sable River and actions coordinated through the Au Sable River Watershed Restoration Committee have increased recently following the successful implementation of numerous stormwater runoff controls in the city of Grayling, which were designed to decrease stormwater runoff from the city to the Au Sable River by 80%.

- **Rifle River**

  The Rifle River has completed a watershed implementation grant and is currently still implementing practices through the efforts of their Rifle River Restoration Committee. This committee is well supported by the two Resource Conservation and Development councils that cover this area. The Rifle River is a state designated Natural River and is heavily used for recreation (fishing and canoeing). The Rifle River is threatened by sediment inputs from uncontrolled livestock access, gully erosion sites, stream bank erosion, and erosion from road stream crossings. Urban storm water discharges from the city of West Branch also pose a potential threat to this coldwater stream.

- **Tittabawassee River - Cedar River**

  The Cedar River, a tributary to the Tittabawassee River, has stretches that are declared blue ribbon trout streams. The watershed is threatened by sediment inputs from uncontrolled livestock access, gully erosion sites, stream bank erosion, and erosion from road stream crossings. The watershed remains relatively undeveloped and should be a focus for protection efforts. The local community currently has two watershed grants to implement BMPs and permanent conservation easements.

Lake Erie Basin

- **West Branch of the Upper St. Joseph River (Headwaters of the Maumee River)**

  Drainage from the West Branch of the Upper St. Joseph River (located in Hillsdale County) flows through three states before entering Lake Erie from the Maumee River. The West Branch of the St. Joseph River is important because it is the headwaters of the system, contains unique mussel populations and habitat, and receives significant amounts of sediment and pesticides. It is also one of the last remaining watersheds in the area without an MDEQ approved watershed management plan; although, it is covered by a larger tristate watershed planning effort that provides background information and a framework for a planning project to build upon.

  There is coordination among the Hillsdale Conservation District, the Nature Conservancy, and the St. Joseph River Watershed Initiative. The Nature Conservancy operates an Upper St. Joseph River watershed project in Angola, Indiana, focused on protection of the East Fork of the West Branch. This tributary contains a mussel community that represents the best remaining example of a biological community that was once common in western Lake Erie basin rivers.

  The St. Joseph River Watershed Initiative is a group working on behalf of the entire tristate St. Joseph watershed and acts as a coordinator by using its resources and expertise to gather data, identify critical areas, and lead management planning in the subbasins. The overall goal of the St. Joseph River Watershed Initiative is to reduce the loads of sediment, pesticides, pathogens, and nutrients to meet target loads by organizing stakeholders in the subbasins and developing watershed plans. The St. Joseph River Watershed Initiative prepared a watershed plan for the larger tristate St. Joseph watershed and submitted it to the MDEQ for Section 319 approval. The MDEQ provided comments in response; but, to date, the plan has not been resubmitted nor does it have CMI approval. Although the plan has been approved by Indiana for Section 319, a watershed plan should be developed and implemented for the Michigan portion of the watershed.

- **Clinton River- Stony Creek and Paint Creek**

  Stony and Paint Creeks are hydrologically separate subwatersheds; however, they are considered as one by the Stony/Paint subwatershed group due to their close proximity and shared communities within their drainage areas. Both creeks are high quality, coldwater tributaries of the Clinton River.

  Stony Creek continues to retain many high quality characteristics, but is threatened by increasing development, particularly in the southern end of the subwatershed. Stony

Creek is home to a wealth of unique natural areas that are already protected in both the public and private domains.

Paint Creek is managed as a trout stream from Lake Orion to its confluence with the Clinton River. Brown trout reproduce in Paint Creek, but are supplemented with an annual stocking by the MDNR. Much of the stream is bordered by public land and recreational trails, making it valued by the public in southeast Michigan due to its numerous recreational opportunities and high potential for sport fishing.

As the Stony Creek/Paint Creek area continues to develop, the potential for negative environmental effects will increase. This will include both water quality impacts from erosion, sedimentation, and increased inputs of storm water pollutants, as well as water quantity impacts resulting from more impervious surfaces and the loss of wetlands, woodlands, and riparian vegetation.

Fourteen communities, two counties, and two school districts were involved in the development of the Stony/Paint Watershed Management Plan and they continue to meet regularly.

2.19 Septage

Septage is a domestic waste pumped from septic tanks, portable toilets, etc. The Septage Program regulates the septage hauling industry and septage disposal practices. Companies, as well as the vehicles they use, must be licensed. In addition, a permit is required to apply septage to the land. Septage may be taken to a municipal wastewater treatment facility or may be applied to agricultural land. The MDEQ administers the program with assistance from participating LHDs.

2.20 Soil Erosion and Sedimentation Control

The Soil Erosion and Sedimentation Control Program is administered under the authority of Part 91, Soil Erosion and Sedimentation Control, of the NREPA. Part 91 provides for the control of erosion and prevention of off-site sedimentation from earth change activities. Part 91 is administered and enforced by state, county, and municipal agencies with oversight by the MDEQ.

The MDEQ's major responsibilities are to train staff of the Part 91 agencies in the proper administration and enforcement of Part 91 and to conduct periodic audits of the administering agencies to ensure their Soil Erosion and Sedimentation Control Programs are in compliance with Part 91.

2.21 Source Water Assessment

The reauthorization of Act 399 requires federal guidance and defines state requirements for a Source Water Assessment Program. Act 399 requires the state to identify the areas that supply public tap water, inventory contaminants and assess source water susceptibility to contamination, and inform the public of the results. In 1998, the MDEQ convened a Source Water Assessment Program Advisory Committee composed of key stakeholders to assist with Source Water Assessment Program development. Michigan's Source Water Assessment Program was approved by the USEPA in October 1999.

Information on nearly 18,000 drinking water sources serving approximately 10,600 noncommunity water systems and 1,250 community water systems was collected over a 6-year period. Potential sources of contamination were inventoried, and susceptibility to contamination was determined. The completed Source Water Assessment Program Report and all data were transmitted to the USEPA in December 2004. The Source Water Assessment Program Report is available at http://www.michigan.gov/deqwater under Drinking Water, Source Water Assessment. The MDEQ also continues to encourage surface water suppliers to plan and implement protection activities. Ira Township in St. Clair County is the first community to receive state approval for their Source Water Intake Protection Program.

2.22 Wellhead Protection

The MDEQ's Wellhead Protection Program assists local communities that utilize groundwater for their municipal drinking water supply systems to protect their water source. A Wellhead Protection Plan minimizes the potential for contamination by identifying and protecting the area that contributes water to municipal water supply wells. Such protection help avoids costly groundwater cleanups.

Under the Wellhead Protection Grant Program communities using groundwater continue to develop wellhead (source water) protection programs.

2.23 Wetlands Protection

2.23.1 Wetland Regulation

The MDEQ, LWMD, has administered a statewide wetland regulatory program for over 25 years. It also manages Michigan's wetland resources through public education, with programs to encourage wetland preservation and restoration, by cooperating with governmental and nongovernmental agencies to encourage the evaluation and management of wetlands on a local and watershed basis, and through a developing monitoring and assessment program.

Michigan's Goemaere-Anderson Wetland Protection Act was passed in 1979, and is now codified as Part 303 of the NREPA. Through passage of the Wetland Protection Act, Michigan took direct legislative action to regulate and minimize wetland losses. This act provides for the preservation, management, protection, and use of wetlands; requires permits to alter wetlands; and provides penalties for illegal wetland alteration. A wetland is defined in Part 303 as:

> ". . . land characterized by the presence of water at a frequency and duration sufficient to support, and that under normal circumstances does support, wetland vegetation or aquatic life and is commonly referred to as a bog, swamp, or marsh."

The Wetland Protection Act further defines regulated wetlands as those wetlands contiguous to the Great Lakes or Lake St. Clair, an inland lake, pond, river, or stream; and noncontiguous wetlands greater than five acres in size. The state also has the authority to regulate any noncontiguous wetlands that are determined to be essential to the preservation of the natural resources of the state once the landowner has been notified. Part 303 requires that persons planning to conduct certain activities in regulated wetlands apply for, and receive, a permit from the state before beginning the activity.

Michigan's Wetland Protection Program was approved by the USEPA in accordance with the requirements of Section 404(h) of the CWA in August 1984. With this approval, Michigan became the first state to assume administration of Section 404. The CWA limits state

assumption of Section 404 authority in "traditionally navigable waters." The United States Army Corps of Engineers, Detroit District, retains Section 404 jurisdiction in these waters, which includes the Great Lakes, connecting channels (such as the Detroit River), and river mouth areas upstream to the limits of the traditional navigational channel or the Great Lakes ordinary high water mark.

The MDEQ processes approximately 5,000 to 6,000 permit applications per year under Section 404, funded in part by permit fees but primarily by state general funds. About 3,000 of these applications propose wetland impacts; the remainder propose to alter lakes and streams only. MDEQ staff work with permit applicants to redesign proposals, when necessary, to avoid and minimize resource impacts.

Michigan's regulatory program generally requires mitigation for all wetland impacts, although staff may waive this requirement for projects impacting less than one-third acre if no reasonable opportunity for mitigation exists, or for projects having a basic purpose of creating or restoring wetlands. Mitigation may be considered only after the applicant has demonstrated avoidance and minimization of impacts, and it has been determined that a project is otherwise permitable. A mitigation proposal must result in no net loss of wetlands upon completion of a project. Mitigation requirements and ratios are established by rule and are defined by staff as a condition of the permit decision. Financial assurances are required to ensure completion of any mitigation project that is not completed in advance of associated impacts. Mitigation sites must be permanently protected through a conservation easement or deed restriction. Administrative rules defining the establishment and use of mitigation banks were promulgated in 1997 (see R 281.951, Wetland Mitigation Banking). Three mitigation banks are currently listed in Michigan's Wetland Mitigation Bank Registry. A number of other mitigation bank sites are currently under consideration or development. Mitigation resulted in an overall ratio of 1.7 acres of created or restored wetland for each acre impacted by permitted activities during 2000 through 2004.

Part 303 authorizes regulation of wetlands by a local unit of government provided that the local unit uses the same definition of wetlands as Part 303, and permit criteria that are consistent with Part 303. In 2004, the MDEQ initiated a program to encourage the protection of wetlands by local units of government. Workshops to explain and encourage local wetland regulation have been conducted at a number of locations across the state in cooperation with the East Michigan Environmental Action Council and the Tip of the Mitt Watershed Council. As of September 2005, 42 local units of government have notified the MDEQ that they regulate wetlands through an ordinance.

2.23.2 Wetland Restoration

Michigan's State Wetland Conservation Plan outlines both short- and long-term goals for the achievement of no net loss of wetlands. Short-term objectives include the restoration of 50,000 acres of wetlands (1% of historic losses) by 2010. Long-term objectives, with no specific timeframe, include the restoration of 500,000 acres (10% of historic losses). Tracking of wetland gains under various restoration programs was limited in the initial years following completion of the State Wetland Conservation Plan. However, recent summaries indicate that an estimated 19,100 acres of wetland were restored in Michigan from 2000 to 2004 through a variety of voluntary state, federal, and private partnership programs.

The State Wetland Conservation Plan recommended continuation of an interagency team to coordinate wetland restoration and other actions in Michigan. In response, the MDEQ organized and now leads the Wetland Work Group, an informal interagency team including

various state, federal, and nongovernmental organizations concerned with wetland restoration and management.

In addition to the efforts outlined above, LWMD staff have been working closely with MDEQ, Water Bureau, Nonpoint Source 319 staff and watershed groups to assist in locating areas that have a high potential for wetland restoration. Using existing datasets and GIS technology, LWMD staff created a GIS layer that highlights these Potential Wetland Restoration Areas and ranks them in terms of their potential (high, moderate, and low). Maps were generated for 30 watersheds across the state utilizing these data, and are available to outside agencies and the public through the Michigan Spatial Data Library at the following web address: http://www.mcgi.state.mi.us/mgdl/?action=thm. This dataset is already in use by a large number of state, federal, and nongovernmental organizations concerned with wetland restoration and management.

2.23.3 Watershed Planning

Planning for wetland management on a watershed scale will not only promote effective and comprehensive management of the aquatic ecosystem as a whole, but can improve regulatory decisions by providing better information on the functional importance of wetland areas on a local or regional basis. To encourage consideration of wetland issues, the LWMD provides technical assistance to local watershed planning organizations. The Wetland Work Group established two major goals for this effort: (1) develop watershed management plans that incorporate wetland restoration and protection as major components; and (2) use these plans as models for future projects. This effort was successful in generating 30 watershed management plans that incorporate wetlands to a significant degree.

The LWMD completed a project in 2007 to develop and test the use of a more formal landscape-scale wetland assessment method on the Paw Paw River watershed in southwest Michigan. Methods developed by the USFWS and utilized by the LWMD make use of GIS data, including National Wetland Inventory maps, to provide a preliminary evaluation of wetland functions in a cost effective manner across an entire watershed. From this preliminary information, planners on the Paw Paw River Watershed Committee are now making more effective decisions regarding the need for wetland protection, restoration, or management in the watershed to meet defined goals. In addition, this analysis was included in the Section 319 Request for Proposal as one possible tool watershed groups could create and utilize to manage, protect, and restore wetlands in the context of watershed management planning. There are currently numerous projects in Michigan making use of this analysis under supervision of an LWMD expert, and several more efforts that have already been completed.

2.23.4 Protection of Exceptional Wetland Resources

The LWMD is taking a number of steps to ensure that Michigan's rarest, most significant, and most vulnerable wetland resources are protected to the greatest extent possible.

On April 21, 2004, Michigan Governor Jennifer M. Granholm signed Executive Directive 2004-4, directing the MDEQ to extend Part 303 of the NREPA, protection to critical, noncontiguous wetlands located on public lands. This Executive Directive requires the MDEQ to designate critical, small, isolated wetlands as "essential to the preservation of the natural resources of the state," thus extending regulatory protection to these vulnerable wetland sites. The process of compiling and updating information on previously nominated sites in a GIS format has been initiated. Site inspections to confirm the current condition of wetland sites, and completion of the designation process, will continue in the coming years.

The MDEQ also provides for protection of wetlands through the use of conservation easements that offer comprehensive and permanent protection to these properties. Conservation easements over exceptional wetland sites may be provided to fulfill mitigation requirements, as appropriate. Wetlands that are avoided during the planning of an authorized construction project may also be protected under an easement. The MDEQ now holds over 1,100 recorded conservation easements, covering 12,600 acres of land. The LWMD is currently developing a compliance monitoring framework for MDEQ-held easements.

In addition, the LWMD is cooperating with the USEPA and the Michigan Natural Features Inventory through a state wetland program development grant to generate additional technical information regarding rare wetland ecosystems in Michigan. This funding will also provide additional LWMD staff to assist the management of Great Lakes coastal wetland systems.

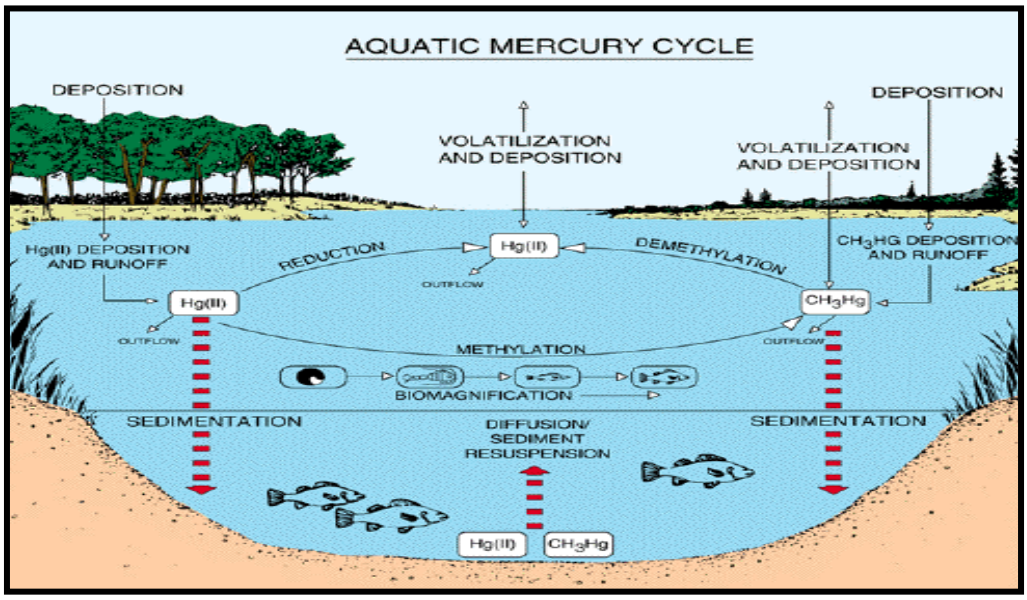
2.24 Water Protection Program Special Initiatives

2.24.1 Mercury Reduction/Prevention Efforts

There is widespread atmospheric mercury deposition into Michigan's surface waters. The organic form of mercury, methylmercury, is a highly bioaccumulative, toxic pollutant that is harmful to wildlife and human health. Elemental mercury is converted to the organic form through natural processes that occur particularly in inland lakes (Figure 2.2). The cycle of mercury in the environment has caused elevated mercury concentrations in inland lake sediments and fish tissues throughout the state. As a result of elevated mercury concentrations in fish tissue, there is a generic, statewide, mercury-based fish consumption advisory that applies to all of Michigan's inland lakes (MDCH, 2004).

The MDEQ's mercury reduction initiative focuses on quantifying mercury concentrations in the environmental media, identifying all sources that contribute mercury to the environment, and reducing or eliminating these sources. Numerous tools will be utilized including regional agreements, state legislation, statewide regulations and policies, the state permitting processes, outreach/education and pollution prevention efforts, as well as voluntary partnerships with various stakeholders. For example, the MDEQ will continue to work with the University of Michigan, Michigan State University (MSU), USGS, USEPA, and Michigan Department of Community Health (MDCH) to collect data on mercury concentrations in air, water, sediment cores, fish, eagles, and herring gulls. The MDEQ will continue to implement limits on air and water discharges including the requirement for discharges to surface waters to develop and implement mercury minimization plans. The MDEQ will continue to participate in the Binational Toxics Strategy with the USEPA and Environment Canada, the Environmental Council of States Quicksilver Caucus, USEPA's mercury roundtable efforts, and the Great Lakes Regional Collaboration - Mercury in Products Phase-Down Strategy. MDEQ will also continue to work with various sectors on pollution prevention and energy efficiency initiatives to reduce mercury use and release.

Figure 2.2 Generalized mercury cycle in an aquatic system.



2.24.2 Aquatic Nuisance Species

As defined in R 324.3101 of Part 31 of the NREPA, "Aquatic nuisance species" means a nonindigenous species that threatens the diversity or abundance of native species or the ecological stability of infested waters, or commercial, agricultural, aquacultural, or recreational activities dependent on such waters.

Significant and detrimental changes in the Great Lakes ecosystem have occurred in recent years due to ANS. For example, Lake Erie and Saginaw Bay water clarity has improved dramatically because of the filtering capabilities of the zebra mussels. This change has contributed to excessive aquatic plant and algae growth and reduced dissolved oxygen levels, among other issues.

ANS that are an immediate concern to Michigan's aquatic ecosystems include but are not limited to zebra mussels (*Dreissena polymorpha*); three fish species: sea lamprey (*Petromyzon marinus*), ruffe (*Gymnocephalus cernuus*), and round goby (*Neogobius melanostomus*); three zooplankton species: the spiny water flea (*Bythotrephes cederstroemi*), fishhook flea (*Cercopagis pengoi*), and a third water flea species (*Daphnia lumholtzi*); and three plant species: Eurasian milfoil (*Myriophyllum spicatum*), curly-leaf pondweed (*Potamogeton crispus*), and purple loosestrife (*Lythrum salicaria*). Other exotic species that have the potential to invade Michigan's aquatic ecosystems include four plants: flowering-rush (*Butomus umbellatus*), European frog-bit (*Hydrocharis morsus-ranae*), hydrilla (*Hydrilla verticillata*), and European water chestnut (*Trapa natans*); and the New Zealand mud snail (*Potomopyrgus antipodarum*) (Hart et al., 2000).

The federal Non-Indigenous Aquatic Nuisance Prevention and Control Act of 1990 (amended by the National Invasive Species Act of 1996) addresses the issue of invading species. This law has five purposes:

- Prevent unintentional introductions.
- Coordinate research, control, and information dissemination activities.
- Develop and carry out environmentally sound control methods.

- Minimize economic and ecological impacts.
- Establish a research and technology program to benefit state governments.

State legislation enacted in 2005, including Public Acts 74-81, provide additional state prevention and control mechanisms. These laws establish lists of prohibited and restricted species and penalties for possession, create an Invasive Species Council addressing both terrestrial and aquatic species, establish an Invasive Species Fund to be used for administration and information/education, and require the creation of a Web site providing information about ANS to the public. The MDNR is the lead agency.

Michigan's Aquatic Nuisance Species State Management Plan was updated in 2002 and includes key recommendations for legislation and policy, research and monitoring, and information and education. Implementation of the plan is coordinated by Michigan's Aquatic Nuisance Species Council, established by Executive Order No. 2002-21 in November 2002. Michigan's Aquatic Nuisance Species State Management Plan Update and information regarding Michigan's Aquatic Nuisance Species Council are available at http://www.michigan.gov/deqwater under Great Lakes, Aquatic Invasive Species.

Several publications, including the *Aquatic Nuisance Species Handbook for Government Officials,* which provide information regarding identification, management, and environmental impacts of exotic species in Michigan and in the Great Lakes area, are available at http://www.michigan.gov/deqwater under Great Lakes, Aquatic Invasive Species.

2.25 Cost/Benefit Assessment

The activities described in this chapter are carried out by several MDEQ divisions and offices. Full quantification of expenditures is not possible at this time. However, the WB alone spent approximately $45 million in Fiscal Year 2006 and $45.7 million in Fiscal Year 2007 for the implementation of water quality protection, restoration, and monitoring programs. Sources include federal funds, state general funds, CMI state bond funds, and fees. These expenditures support MDEQ 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, tourism currently is Michigan's second largest source of jobs and revenue, after manufacturing. Citizens and out-of-state tourists spend billions of dollars each year in Michigan, much of that on outdoor sports and recreation that depend on clean water, air, and forests. Popular activities include hunting, fishing, boating, and swimming at Great Lakes and inland beaches. The revenues from these activities far exceed 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 3
WATER QUALITY MONITORING

Environmental monitoring is an essential component of the MDEQ mission. Comprehensive water quality monitoring is necessary to improve natural resource management, maintain sustainable ecosystems, and protect public health. Although the MDEQ 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, the MDEQ 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 MDEQ 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 8-digit HUCs. Water quality assessment efforts focus on a subset (approximately 20%) of these major watersheds each year (Figure 3.1).

In January 1997, the MDEQ 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:

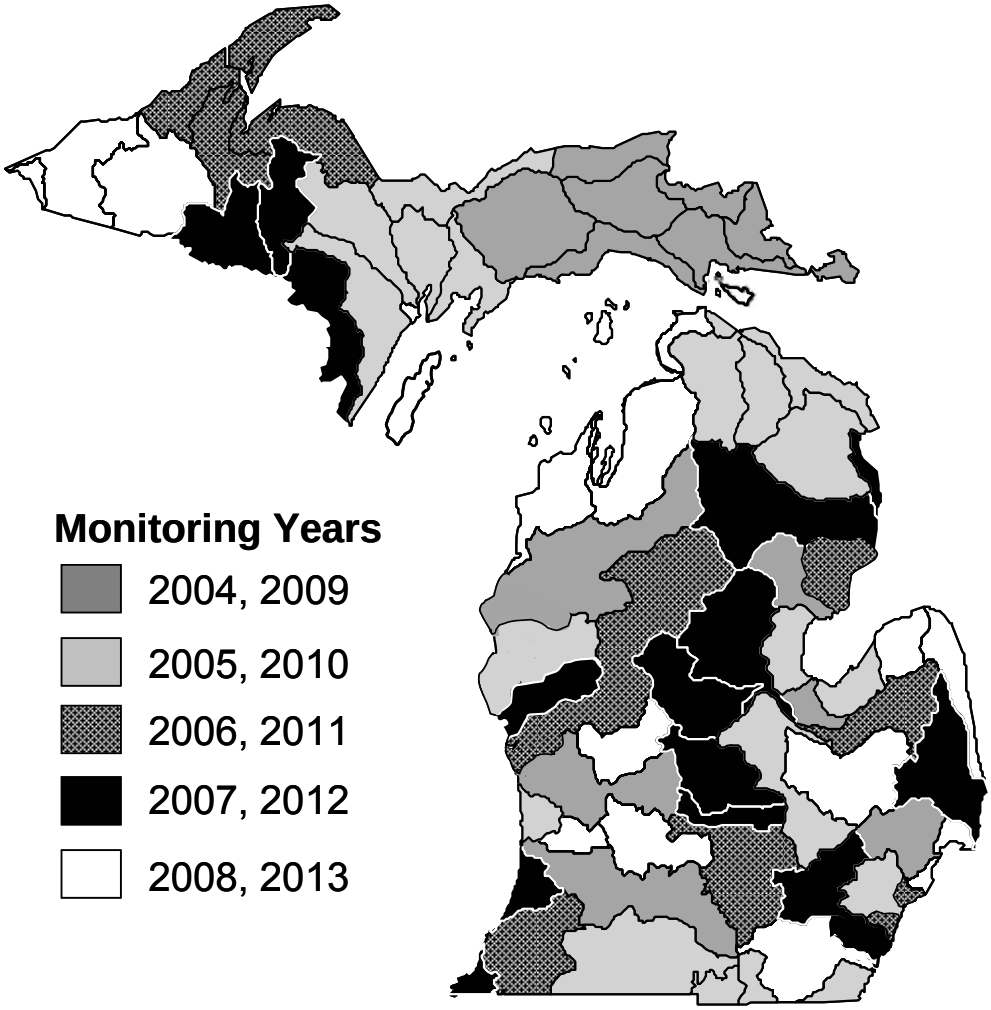
- Assess the current status and condition of waters of the state and determine whether WQS are being met.
- Measure spatial and temporal water quality trends.
- Evaluate the effectiveness of water quality protection programs.
- Identify new and emerging water quality issues.

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 (MDEQ, 2005b) (available at http://www.michigan.gov/deqwater under Water Quality Monitoring, Assessment of Michigan

Waters). Another impetus for the update was a requirement by the USEPA that states produce a comprehensive monitoring program strategy that serves all water quality management needs and addresses all state waters. The purpose of the update was to: (1) describe ongoing monitoring activities (including monitoring objectives, study design, indicators, data analysis, data management, and reporting); (2) identify potential future monitoring activities, to the extent possible; (3) identify program gaps and a timeline for addressing them; and (4) specify resource needs (staff, funding, and technical).

The Strategy does not specifically address wetland monitoring. The LWMD is currently developing a Wetland Monitoring and Assessment Strategy for submittal to the USEPA, Region 5. A draft is currently under internal review and completion is expected in 2008. Talks are underway with the MDEQ, WB, to incorporate limited wetland monitoring into their existing surface water quality monitoring scheme.

Figure 3.1 Five-Year Rotating Watershed Cycle



CHAPTER 4
ASSESSMENT METHODOLOGY

4.1 Introduction

Michigan's assessment methodology describes the data and information used to determine designated use support, explains how these data and information are used to determine designated use support for surface waters of the state, and describes how data are reported using five categories. Ultimately, this methodology describes the process used to develop several of 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 MDEQ technical staff and managers with considerable knowledge of local watershed conditions/issues and expertise in aquatic and fisheries biology, limnology, ecology, environmental engineering and chemistry, microbiology, and mammalian/aquatic toxicology.

4.2 Data and Information Used to Determine Designated Use Support

The MDEQ considers data and information collected and submitted by the MDEQ, its grantees and contractors, other agencies, and the public (including volunteer monitoring groups). Sources of data and information include:

- The MDEQ's water quality monitoring program data 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 3).

  As part of the MDEQ'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 water quality. Targeted monitoring is used to fulfill specific monitoring requests, assess known or potential AOCs or areas where more information is needed, achieve assessment coverage of a watershed, and provide information to support and evaluate the effectiveness of MDEQ water protection programs (e.g., NPDES, NPS, and Site Remediation). All site-specific data are considered to determine designated use support. Generally, the other types of monitoring are conducted using targeted study designs.

- Michigan's 2006 IR, which serves as a baseline for the 2008 IR and is modified using new data and information.

- Fish Consumption Advisories established by the MDCH as of May 2007.

- 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 the MDEQ in a notice on the MDEQ Web-based Calendar in the following publications: April 30, May 14, May 28, June 11, and June 25, 2007.

- 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 42 U.S.C. 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, the MDEQ applies a cutoff date for data considered for the IR. For the 2008 IR, the MDEQ considered all water quality data collected by the MDEQ and its grantees/contractors within the two-year period immediately following the data considered for the 2006 IR. In other words, data collected during the period from January 1, 2005, to December 31, 2006, were considered for the 2008 IR. Data collected prior to January 1, 2005, that were unable to be used for the 2006 IR were considered for the 2008 IR using the current assessment methodology. Data collected after the December 31, 2006, cutoff date were considered for inclusion in the 2008 IR on a case-by-case basis as determined appropriate by the MDEQ. A similar cutoff date was not applied to water quality data submitted to the MDEQ by other parties in response to the water quality data solicitation announcements released by the MDEQ in April, May, and June 2007.

The quality assurance/quality control requirements for water, sediment, and fish tissue chemistry and biological data collected by the MDEQ are described in the MDEQ's Quality Management Plan (MDEQ, 2005c). To ensure acceptable data quality, the MDEQ also requires all grantees or vendors receiving state or federal money for the purpose of conducting water quality monitoring to prepare quality assurance project plans prior to sample collection (MDEQ, 2002a). Other data, such as data submitted by outside agencies or the public, must satisfy the MDEQ'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 the MDEQ's quality assurance/quality control requirements or data that are collected and analyzed using techniques that are less rigorous than techniques used by the MDEQ to make designated use support determinations (e.g., data collected by volunteers) 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 modified. Data may not be of adequate quality if field or laboratory methods changed. In addition, the quantity of data; duration, frequency, magnitude, and timing of WQS exceedances; analytical method sensitivity; and contextual information (e.g., naturally occurring conditions, weather and flow conditions, etc.) are considered. 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 that are collected for this purpose may be considered.

4.3 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 [Rule 100; R 323.1100(1)(a)-(g)] of the Part 4 rules, WQS, promulgated under Part 31, Water Resources Protection, of the NREPA). 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)].

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 ADB). 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 concentration in fish tissue or PCB concentration in the water column. This assessment methodology attempts to list the main assessment types and parameters that are used to determine support for each designated use; although, there may be additional assessment types and/or parameters that apply on a case-specific basis. In those situations, evaluations are made consistent with WQS and justification for designated use support determination is provided in the ADB.

Michigan uses the principle of independent applicability when making a support determination for each designated use for each water body. If data for more than one parameter are available that are used to determine support for the same designated use, then each data type is evaluated independently to determine support for the designated use. If any one type of data indicates that 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. Some particular data types or situations may require consideration of multiple data types in combination. 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 and human noncancer value (HNV) (non-drinking water) (R 323.1057); therefore, both the other indigenous aquatic life and wildlife, and fish consumption designated uses are not supported. Another example includes the situation where water column copper concentrations exceed the WQS and lead to both poor macroinvertebrate and warmwater fish communities; therefore, both the other indigenous aquatic life and wildlife, and warmwater fishery 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.

This section of the IR describes how data and information are generally used by the MDEQ to make a decision to report for a water body, one of the following conditions for each designated use: supporting, not supporting, insufficient information, or not assessed. Assessment types or data that are not specifically discussed in this assessment methodology (including uncommon data or unusual circumstances) are considered on a case-by-case basis using best professional judgment (BPJ) and are evaluated consistent with WQS. When BPJ is used to make a designated use support determination, justification is documented in the designated use comment field in the ADB record. Water bodies listed as having insufficient information will generally be revisited in the correct basin year as resources allow (Figure 3.1).

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

4.4.1 Assessment Type: No Specific Indicator or Assessment Method

The MDEQ 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. Information regarding the support of these designated uses is evaluated on a case-by-case basis using BPJ.

4.5 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).

4.5.1 Assessment Type: Physical/Chemical

4.5.1.1 Dissolved Oxygen Concentration

The number of instantaneous dissolved oxygen measurements needed to make a support determination for the warmwater fishery designated use is made on a case-by-case basis using BPJ. Continuous data collected over a longer time period (e.g., two weeks) are preferred over periodic single samples. Consideration of contextual information is especially important when making designated use determinations using dissolved oxygen concentrations (sample collection time of day, weather conditions, etc.). Ambient dissolved oxygen data are compared to WQS per R 323.1064 and R 323.1065, depending on water body type.

4.5.1.2 Temperature

The amount of temperature data needed to make a support determination for the warmwater fishery designated use is made on a case-by-case basis using BPJ. Ambient temperature data are compared to WQS per R 323.1069, R 323.1070, R 323.1072, R 323.1073, and R 323.1075, depending on water body type.

4.5.1.3 Ammonia (un-ionized) Concentration

The number of total ammonia measurements needed to make a support determination for the warmwater fishery designated use is made on a case-by-case basis using BPJ. Supporting site-specific pH and temperature data are generally required. Continuous pH and temperature data over a longer time period are preferred. Calculated un-ionized ammonia data are compared to standards per R 323.1057.

4.5.1.4 Dissolved Solids

Designated use support determination using dissolved solids data is made on a case-by-case basis using BPJ and R 323.1051.

4.5.1.5 pH

The number of pH measurements needed to make a designated use support determination is made on a case-by-case basis using BPJ. Ambient pH data are compared to WQS per R 323.1053.

4.5.2 Assessment Type: Biological

4.5.2.1 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 selected using targeted study designs.

Rivers and streams with no site-specific fish community biosurvey results are considered not assessed.

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.

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 1%. One bioassessment result is generally considered sufficient to make this determination.

Using P51, a determination of not supporting or 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 1%, or if fewer than 50 fish are collected or if the relative abundance of fish with anomalies exceeds 2% (applies to both warmwater and coldwater fisheries) depending on the quality and amount of supporting contextual information available. For example, a poor fish community result may require the collection of additional information to determine data representativeness. In this case, a determination of insufficient information is made. 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, 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. 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 was expected to recover.

Fish community data for wadeable streams and rivers collected using methods other than P51 are evaluated on a case-by-case basis using BPJ. Biological integrity data regarding instances

where P51 is not appropriate (e.g., wetlands, lakes, ephemeral water bodies, nonwadeable rivers, etc.) will be evaluated on a case-by-case basis using BPJ. For example, one of the factors considered to determine support of the coldwater fishery designated use in coldwater lakes is the presence of indicator species such as cisco.

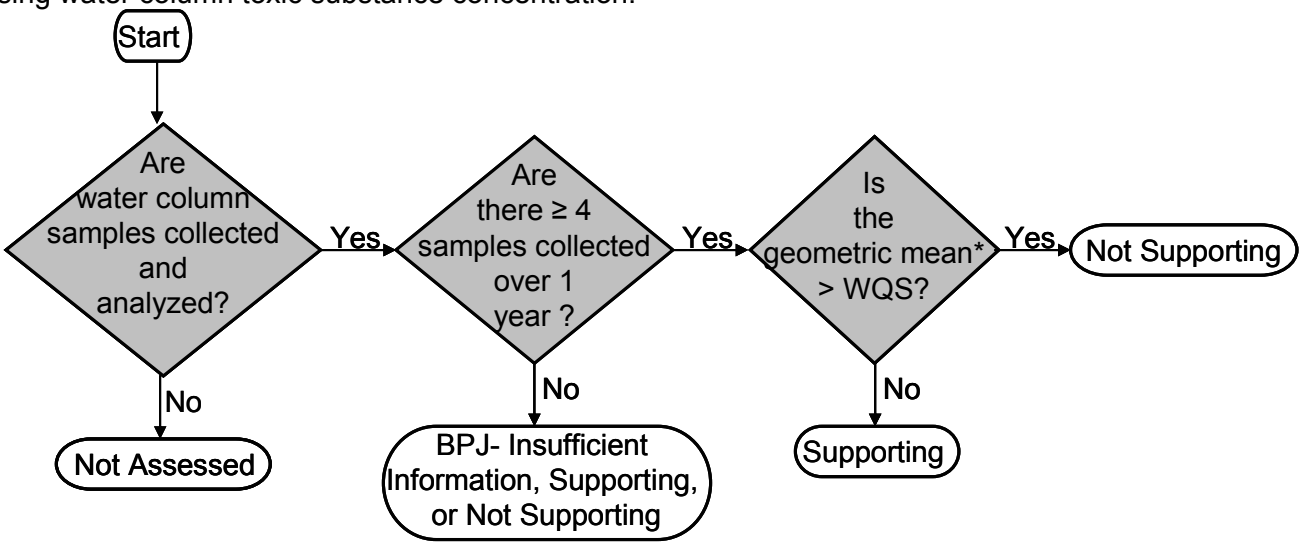
4.6 Designated Use: Other Indigenous Aquatic Life and Wildlife

4.6.1 Assessment Type: Physical/Chemical

4.6.1.1 Water Column Toxic Substance Concentrations

To determine other indigenous aquatic life and wildlife designated use support for toxic substances, ambient water column chemical concentrations are compared to Wildlife, Aquatic Maximum, and Final Chronic Values per R 323.1057 using Figure 4.1. Water chemistry monitoring sites are selected using both targeted and probabilistic study designs. All site-specific water column chemistry data are used to determine other indigenous aquatic life and wildlife designated use support.

Figure 4.1. Determination of other indigenous aquatic life and wildlife designated use support using water column toxic substance concentration.



* Geometric mean is used per R 323.1207(1)(g)(iii)

4.6.1.2 Water Column Nutrient Concentrations

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 per R 323.1060 using BPJ since Michigan does not have numeric standards for ambient concentrations of plant nutrients. Samples collected during the period of July through September, when the impacts due to nutrient expression are most likely to occur, are particularly important for making designated use support determinations.

For inland lakes, Carlson trophic status index (TSI) in conjunction with aquatic macrophyte surveys, are considered to determine designated use support. Individual TSI values are calculated for each trophic state indicator: summer secchi depth (transparency), total phosphorus concentration (epilimnetic), and chlorophyll *a* concentration (photic zone) (Table 4.1). An overall TSI is determined from the mean of the individual TSI values and the trophic status classification is determined based on the criteria listed in Table 4.2. Inland lakes

classified as oligotrophic, mesotrophic, or eutrophic are generally determined to support the other indigenous aquatic life and wildlife designated use. Inland lakes that are classified as hypereutrophic are generally listed as insufficient information or not supporting.

Table 4.1. Carlson TSI Equations	
$TSI_{SD} = 60 - 33.2 \log_{10}SD$	SD = Secchi depth transparency (m)
$TSI_{TP} = 4.2 + 33.2 \log_{10}TP$	TP = total phosphorus concentration (ug/l)
$TSI_{CHL} = 30.6 + 22.6 \log_{10}CHL$	CHL = chlorophyll *a* concentration (ug/l)

Table 4.2 Michigan Inland Lakes Trophic Status Classification Criteria				
Trophic State	Carlson 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	48-61	20-50	0.9-2.3	6-22
Hypereutrophic	>61	>50	<0.9	>22

4.6.1.3 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 in conjunction with other assessment types (e.g., biological) is used to determine the other indigenous aquatic life and wildlife designated use support based on this narrative standard.

4.6.2 Assessment Type: Biological

4.6.2.1 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. Biosurvey sites are selected using both targeted and probabilistic study designs. All site-specific 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.

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 insufficient information is made for water bodies with macroinvertebrate communities rated poor (total P51 macroinvertebrate community score -5 to -9) depending on the quality and amount of supporting contextual information available. For example, a poor macroinvertebrate community result from a biosurvey conducted as part of probabilistic monitoring may require the collection of additional information to determine data representativeness. In this case, a determination of insufficient information is made. 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, 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 (see Section 4.5.2.1).

Macroinvertebrate data for wadeable streams and rivers collected using methods other than P51 are evaluated on a case-by-case basis using BPJ. Biological integrity data regarding instances where P51 is not appropriate (e.g., wetlands, lakes, ephemeral streams, etc.) will be evaluated on a case-by-case basis using BPJ.

Nonwadeable rivers are assessed using Michigan's Qualitative Biological and Habitat Survey Protocols for Nonwadeable Rivers (MDEQ, Nonwadeable Procedure, in preparation). 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.

4.6.2.2 Bacteria, Algae, Macrophytes, and Fungi

Site-specific visual observation 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 4.6.1.2).

A determination of not supporting may 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 made using BPJ, P51 offers the following guidance to make these determinations for streams:

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

For inland lakes, 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 4.6.1.2).

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

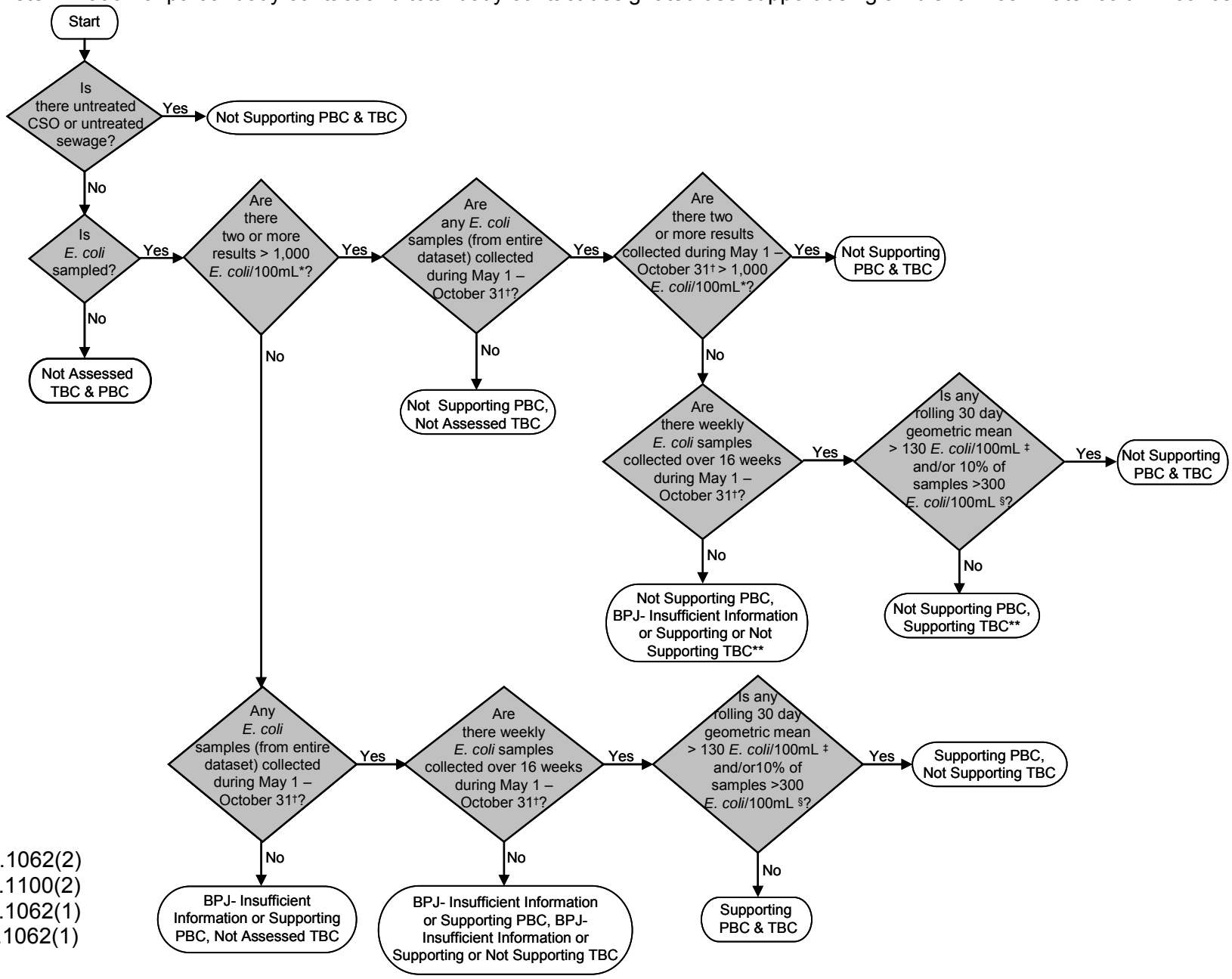
The partial body contact designated use applies to all water bodies year-round while the total body contact designated use applies to all water bodies during May 1 to October 31.

4.7.1 Assessment Type: Pathogen Indicators

4.7.1.1 E. coli

Michigan uses ambient *E. coli* concentration to determine partial body contact and total body contact designated use support using Figure 4.2.

Figure 4.2. Determination of partial body contact and total body contact designated use support using ambient *E. coli* water column concentration.



* See R 323.1062(2)
† See R 323.1100(2)
‡ See R 323.1062(1)
§ See R 323.1062(1)

** It is possible to arrive at a decision of supporting for total body contact and not supporting for partial body contact if *E. coli* concentrations are low during the total body contact recreation season (May 1 – October 31) and high during the nonrecreation season.

4.8 Designated Use: Fish Consumption

Michigan uses a variety of assessment types and parameters to determine fish consumption designated use support. Data considered include the concentration of bioaccumulative chemicals of concern (BCCs) (as listed in Table 5 of the Part 4 rules) in the water column, fish tissue mercury concentration, fish consumption advisories issued by the MDCH, and final chronic values.

4.8.1 Assessment Type: Physical/Chemical

4.8.1.1 Water Column and Fish Tissue Mercury Concentrations

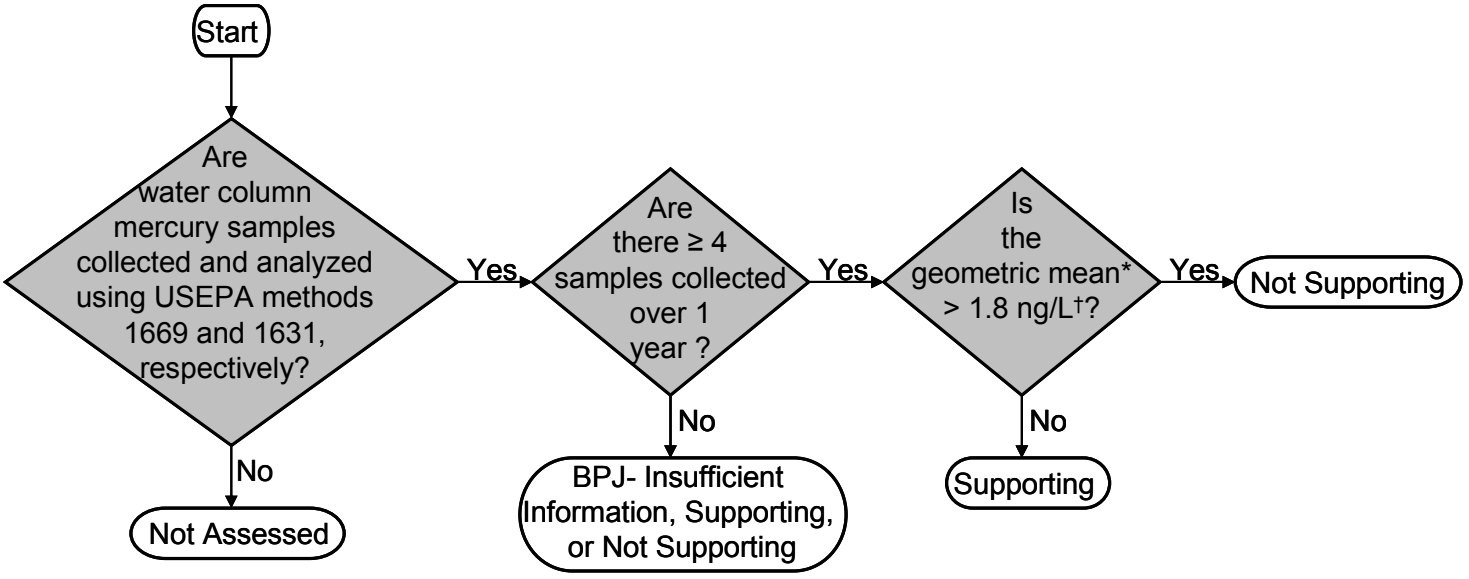
To be conservative, site-specific water column and fish tissue data are used together to determine fish consumption designated use support. Ambient water column mercury concentrations are compared to the HNV (non-drinking water) WQS (1.8 nanograms per liter [ng/L]); and fish tissue mercury concentrations are compared to Michigan's fish tissue value for mercury (0.35 milligrams per kilogram [mg/kg]).

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 mg/kg) was derived using the same exposure scenario used to derive Michigan's HNV (non-drinking 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.

The fish tissue mercury value is not an ambient WQS; however, the MDEQ considers the direct use fish tissue mercury data appropriate to help determine fish consumption designated use support.

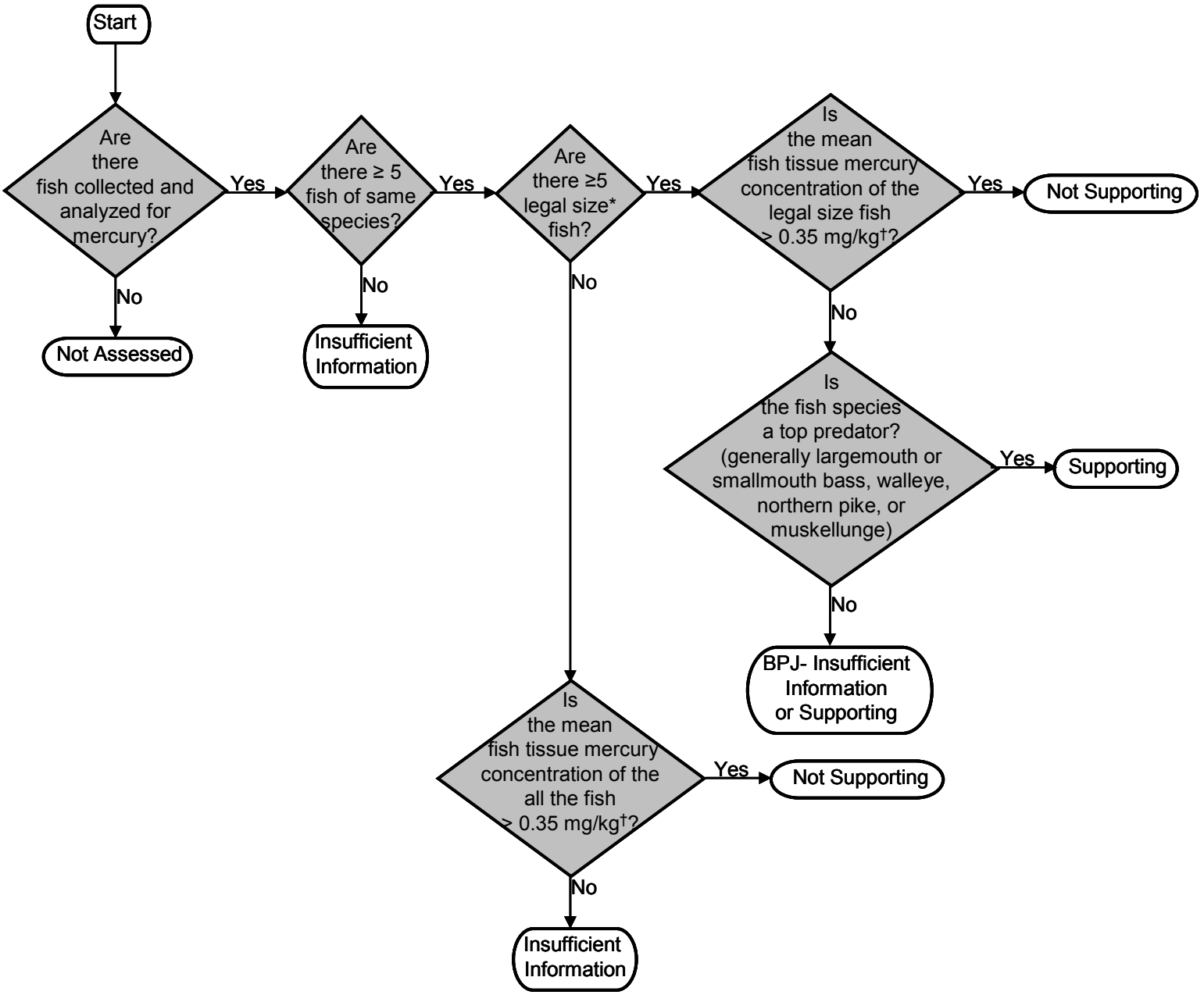
Fish consumption designated use support for mercury is determined by using Figure 4.3 to make a decision for water column mercury concentration, using Figure 4.4 to make a decision for fish tissue mercury concentration, and finally using Table 4.3 to determine overall fish consumption designated use support for mercury using the results from the Figures 4.3 and 4.4 decision processes. The overall designated use support for mercury determination from Table 4.3 is used for the Sections 305(b) and 303(d) reporting process.

Figure 4.3. Determination of fish consumption designated use support using water column mercury concentration. This figure must be used in conjunction with Figure 4.4. The final overall fish consumption designated use support determination using mercury data is made using Table 4.3.



* Geometric mean is used per R 323.1207(1)(g)(iii).
† Michigan WQS HNV (non-drinking water) for mercury.

Figure 4.4. Determination of fish consumption designated use support using fish tissue mercury concentration. This figure must be used in conjunction with Figure 4.3. The final overall fish consumption designated use support determination using mercury data is made using Table 4.3.



* Legal size fish refers to the current minimum size limit regulations described in Michigan's Fishing Guide and Inland Trout and Salmon Guide published by the MDNR.

† Michigan's fish tissue value for mercury.

Table 4.3. Overall fish consumption designated use support determination for mercury using water column and fish tissue mercury concentration.		
Decision based on mercury water column data (from Figure 4.3)	Decision based on mercury fish tissue data (from Figure 4.4)	Overall fish consumption designated use support for mercury
Supporting	Supporting	Supporting
Supporting	Not Supporting	BPJ*- Supporting, Not Supporting, or Insufficient Information
Supporting	Not Assessed/ Insufficient Information	Supporting
Not Supporting	Supporting	Not Supporting
Not Supporting	Not Supporting	Not Supporting
Not Supporting	Not Assessed/ Insufficient Information	Not Supporting
Not Assessed/ Insufficient Information	Supporting	Supporting
Not Assessed/ Insufficient Information	Not Supporting	Not Supporting
Not Assessed/ Insufficient Information	Not Assessed/ Insufficient Information	Not Assessed/ Insufficient Information

* In addition to the elements discussed in Section 4.2, the size and species of fish collected and analyzed, and the existence or potential for site-specific mercury fish consumption advisories, are considered when making designated use support decisions using BPJ.

4.8.1.2 Water Column PCB Concentration

To determine fish consumption designated use support for PCBs, the ambient water column PCB concentration is compared to the 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% exceedance of the WQS for total PCBs. If there are no appropriate PCB data, then a water body is considered not assessed. Water bodies with one or more ambient water column PCB sample results greater than the HCV are determined to not support the fish consumption designated use.

4.8.1.3 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 (non-drinking water) per R 323.1057 using Figure 1 (see Section 4.6.1.1).

4.8.2 Assessment Type: Other Public Health Indicators

4.8.2.1 Fish Consumption Advisories for BCCs other than Mercury (Primarily PCBs, DDT, Chlordane, and Dioxin)

For contaminants other than mercury, a water body is considered to not support the fish consumption designated use if the MDCH has issued a site-specific fish consumption advisory

for that water body. The MDCH bases their advisories on fish tissue contaminant data collected as part of the Michigan Fish Contaminant Monitoring Program and recommendations made by the MDEQ.

4.9 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)].

4.9.1 Assessment Type: Physical/Chemical

4.9.1.1 Toxic Substances in Water Column

To determine public water supply designated use support for toxic substances other than BCCs, ambient water column chemical concentrations are compared to the HNV and HCV for drinking water per R 323.1057 using Figure 1 (see Section 4.6.1.1).

Public water supply designated use support determination for BCCs is problematic and there is generally insufficient information available to make a determination. The HNV and HCV for drinking water (surface WQS) calculations use an exposure scenario that includes human consumption of 15 grams of fish and two liters of water daily. The majority of human exposure to a BCC using this scenario would be from the consumption of fish. In other words, the relative human exposure to a BCC in surface waters via water consumption is minimal. Currently, Michigan's rules do not contain a methodology to derive human health values that protect solely for the consumption of two liters of untreated surface water per day. Maximum contaminant levels, the maximum permissible level of a contaminant in water that is delivered to any user of a public water system, used by the MDEQ, Drinking Water and Environmental Health Section, do not include a specific fish consumption component in the calculation.

WQS (HNV and HCV for drinking water) and maximum contaminant levels are calculated differently and have different purposes. Due to the inconsistency between these values, comparisons of ambient water column BCC concentration to HNVs and HCVs for drinking water are not made. For example, the ambient PCB concentration at the point of a community water supply intake may exceed the PCB HCV drinking water value (0.026 ng/L) while the finished (i.e., treated) water may be determined to be below the PCB maximum contaminant level (0.5 micrograms per liter [ug/L]). The MDEQ, Surface Water Assessment Section and Drinking Water and Environmental Health Section, will work together and with the USEPA to determine a long-term solution for this issue.

4.9.1.2 Taste and Odor

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

4.10 Assessment Units and Determination of Geographic Extent

Michigan uses the National Hydrography Dataset coding scheme to georeference water bodies when generating the Sections 305(b) and 303(d) lists. As a base assessment unit, Michigan uses 12-digit HUCs. 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.

Generally, 12-digit HUCs are used as a base assessment unit for the public water supply designated use. For inland intakes, the geographic extent of the assessment unit is the 12-digit HUC in which the intake is located.

For public water supply intakes that are located in the Great Lakes or connecting channels, a concept of a Critical Assessment Zone (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 3000 feet for the most sensitive intakes to 1000 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.

Ultra low-level PCB monitoring conducted by the MDEQ in the Great Lakes connecting channels and selected tributaries 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.

4.11 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.

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 timeframe.
- 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.

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 (2010). 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 9 for additional information regarding TMDLs).

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 of 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 in watersheds monitored in 2004, 2005, and 2006 (Figure 3.1) are only placed in Category 4c when MDEQ monitoring staff determine (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. A similar evaluation of potential Category 4c listings for channelized stream segments in other watersheds will be carried out by the MDEQ according to the five-year rotating watershed cycle.

Key factors considered by MDEQ 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 the MDEQ recognizes sediment to be a pollutant. If MDEQ 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 4.4 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 4.4) adapted from USEPA guidance, illustrates Michigan's use of a multiple category system.

Table 4.4. 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. In designated use support summary tables (e.g., Tables 5.2, 5.3, 6.2, 7.2, and 8.1) Category 3 is reported as two subcategories: insufficient information and not assessed.

	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 the ADB (e.g., coldwater fishery). This issue will be corrected over the next five-year rotating watershed cycle through specific record review process.

4.12 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 is identified. 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 BPJ and supporting contextual information.

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 (McDonald et al., 2000; Jones and Gerard, 1999; and Ontario Ministry of the Environment, 1993) or when sediment toxicity test results demonstrate excessive toxicity.

4.13 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 the MDEQ 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 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 that requires the elimination of the untreated discharge (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 2), or that additional monitoring or information is needed to determine whether the designated use is supported (assessment unit is placed in Category 3). For example, a water body may be moved from Category 5 to Category 3 if one year of new data indicated designated use support, but additional monitoring is needed to ensure continued designated use support.

- Reexamination of the monitoring data or information used to make the initial designated use support determination reveals that the decision was either incorrect of inconsistent with the current assessment methodology.

- Reassessment of a channelized 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 Title 18 of the United States Code, 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.

A summary of all assessment units removed from the Section 303(d) list since the 2006 IR is provided in Appendix D of this IR.

4.14 Assessment Methodology Changes

Extensive organizational changes were made for this IR assessment methodology (see Section 1.1). Some of the significant updates include:

- Transfer of data from the Michigan developed Water Body System to the USEPA ADB. Due to this transfer, modification of information in the ADB will continue over the next reporting cycles.

- Change to a 12-digit HUC-based assessment unit; and consequently, revision of the record naming convention.

- Revision of the entire assessment methodology to include information used to make all designated use support designations rather than methodology for the Section 303(d) list only.

- Rearrangement of the assessment methodology according to designated use.

Substantial assessment methodology and designated use support summary report modifications made based on consideration of available information include:

- Revision of total body contact and partial body contact designated use support determinations for water bodies (Great Lake, public access lake, or river) with no *E. coli* data. Previously, if there were no data, then it was assumed that the total body contact designated use was supported. Currently, if there are no data then the water body is assigned not assessed.

- Change from focus on designated use decisions for total body contact (more restrictive designated use) to consideration of both total body contact and partial body contact during May 1 through October 31.

- Inclusion of water column mercury data to make fish consumption designated use support decisions.

- Evaluation of water column PCB concentration data to make other indigenous aquatic life and wildlife designated use support decisions.

- Inclusion of specific drinking water intakes in the ADB and inclusion of assessment results in the designated use support summary tables under public water supply.

- Inclusion of inland lakes evaluated for the presence of cisco to determine support for the coldwater fishery designated use in the ADB and inclusion of these assessment results in the designated use support summary tables.

- Change in reporting Great Lakes designated use support information from shoreline miles to square miles, with the exception of Great Lakes beach total and partial body contact designated use support information which is still reported in shoreline miles.

- Change in reporting inland lake beach total body contact and partial body contact designated use support information from acres to shoreline miles.

- Revision of specific instances in the designated use summary tables from assuming that assessment units were supporting by default to using specific assessment results only and the not assessed category by default (e.g., Great Lakes shoreline miles, connecting channels, public access lake acres, and river miles were previously assumed to be supporting certain aspects of the other indigenous aquatic life and wildlife designated use).

- Change from reporting only perennial river miles to all river miles resulting in the inclusion of additional mileage in some records.

- Inclusion of not assessed wetland acres in the designated use support summary table.

CHAPTER 5
ASSESSMENT RESULTS: THE GREAT LAKES, BAYS, CONNECTING CHANNELS (ST. MARYS, ST. CLAIR, AND DETROIT RIVERS), AND LAKE ST. CLAIR

5.1 Trophic Status

Reductions in phosphorus loading to Lakes Michigan, Huron (Saginaw Bay), and Erie have substantially contributed to improved water quality. Improvements 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 1 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, reducing the allowable phosphorus content in cleaning agents and water conditioner products sold in Michigan to less than 0.5% phosphorus by weight has also contributed to the reduction of phosphorus discharged from point sources. NPS phosphorus reduction efforts have also contributed to improved Great Lakes water quality. The current trophic status of each of Michigan's Great Lakes is presented in Table 5.1.

Table 5.1 Trophic status of the Great Lakes bordering Michigan.

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

*USEPA, 2007a; †USEPA, 2007b

5.2 Water Chemistry of the Great Lakes Connecting Channels

Great Lakes connecting channel (St. Marys, St. Clair, and Detroit Rivers) monitoring efforts and results through 2005 are summarized in annual reports prepared by the Great Lakes Environmental Center (GLEC) under contract with the MDEQ (most recent reports - GLEC, 2006a and 2007a). Key findings from water chemistry monitoring of the three Great Lakes connecting channels bordering Michigan (Detroit, St. Clair, and St. Marys Rivers) follow:

- Detroit River nutrient concentrations have decreased significantly since the late 1960s, with an order-of-magnitude decline in total phosphorus concentrations from a high of 0.13 mg/L in 1969. Data collected between 1992 and 2004 indicate seasonal fluctuations in phosphorus and nitrogen parameters, with an increasing trend in total phosphorus concentration. Mercury and trace metals data (cadmium, chromium, copper, lead, nickel, and zinc) obtained from 1998 to 2004 indicate a decreasing concentration trend for lead and an increasing concentration trend for mercury, with some apparent seasonal

fluctuations. No trends for cadmium, chromium, copper, nickel, and zinc were indicated. In general, statistically significant differences ($p<0.05$) between upstream and downstream concentrations were not apparent, with the exception of mercury, which was significantly higher at the upstream station.

- St. Clair River total phosphorus concentrations have declined from the 1980s to 2004. Mercury and trace metals data (cadmium, chromium, copper, lead, nickel, and zinc) obtained from 1998 to 2004 indicate that chromium and nickel concentrations decreased, while zinc and lead increased; no trends for cadmium, copper, or mercury were indicated. Spatial analyses indicate that total phosphorus, orthophosphate, ammonia, nitrate, nitrite, cadmium, chromium, copper, lead, nickel, and zinc concentrations increased from upstream to downstream.

- Little historic water chemistry data are available for the St. Marys River, but data obtained from 1998 to 2004 indicate that zinc, ammonia, nitrate, and nitrite concentrations have increased, whereas cadmium, chromium, and nickel concentrations have decreased; no trends for mercury, copper, lead, or total phosphorus were indicated. Nutrient concentrations fluctuated seasonally. Spatial analyses indicate that total phosphorus, orthophosphate, and nitrite concentrations increased from upstream to downstream, as did chromium, copper, lead, and nickel concentrations.

- Comparisons of Great Lakes connecting channel water chemistry data for toxic chemicals with applicable Michigan WQS showed that total PCB concentrations exceeded the applicable Rule 57 water quality value in 59 of the 60 samples collected at all connecting channel locations, and total DDT concentrations exceeded the applicable Rule 57 water quality value in 13 of the 24 samples collected at all connecting channel locations. Mercury exceeded the applicable Rule 57 water quality value in 101 of 245 samples collected at all connecting channel locations. Concentrations of the other trace metals (cadmium, chromium, copper, lead, nickel, and zinc) met the applicable Rule 57 water quality values at all connecting channel locations. Base/neutral and volatile organic compounds were largely not detected above the quantification level.

5.3 Water Chemistry of Saginaw Bay and Grand Traverse Bay

Saginaw Bay and Grand Traverse Bay monitoring efforts and results through 2005 are summarized in annual reports prepared by the GLEC under contract with the MDEQ (most recent reports - GLEC, 2006b and 2007b). Key findings from water chemistry monitoring of Saginaw and Grand Traverse Bays are summarized below.

- Saginaw Bay nutrient and chlorophyll *a* data from 1993 to 2004 reflect mesotrophic to eutrophic conditions. Total phosphorus concentrations remain relatively constant and continue to be above the target total phosphorus concentration of 0.015 mg/L established by the "Michigan Phosphorus Reduction Strategy for the Michigan Portion of Lake Erie and Saginaw Bay" (MDNR et al., 1985). Average annual chlorophyll *a* concentrations also remain relatively constant and often exceed 10 ug/L, an accepted threshold for eutrophic conditions.

- Grand Traverse Bay nutrient, chlorophyll *a*, and water clarity data reflect oligotrophic conditions and excellent water quality. During 1998-2005, the baywide median total phosphorus and chlorophyll a concentrations in Grand Traverse Bay were 0.005 mg/L and 2 ug/L, respectively.

- Comparison of recent Saginaw Bay and Grand Traverse Bay trace metals and mercury water chemistry data with applicable Michigan WQS showed that average mercury concentrations in both bays met the mercury Rule 57 water quality value of 1.3 ng/L. All mean concentrations of cadmium, chromium, copper, lead, nickel, and zinc at all sampling locations in Grand Traverse Bay and Saginaw Bay met applicable Rule 57 water quality values.

5.4 Fish Contaminants

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

- 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.

- 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.

- The federal-state coordinated fillet trend monitoring program collects and analyzes chinook and coho salmon from Lakes Superior, Michigan, and Huron, and rainbow trout from Lake Erie.

The USEPA lake trout data for Lakes Superior, Michigan, Huron, and Ontario indicate that total PCB and DDT concentrations in all four lakes declined between the 1970s and 2000. Also, Lake Michigan lake trout had higher levels of total PCBs and total DDT than lake trout from the other Great Lakes. Concentrations of most contaminants in Lake Superior lake trout were lower than concentrations from the other Great Lakes. The USEPA walleye data for Lake Erie indicate that total PCB concentrations declined since 1977. Additional results and general conclusions from the USEPA lake trout and walleye data and the federal-state chinook and coho salmon fillet trend monitoring, including information regarding PCBs, DDT, chlordane, and toxaphene concentrations, are presented in the Michigan Fish Contaminant Monitoring Program: 2006 Annual Report (Bohr and Zbytowski, 2007).

In 1990, Michigan initiated a fixed station fish contaminant trend monitoring project to measure spatial and temporal trends of certain bioaccumulative contaminants. Trend stations in Great Lakes waters are located in Keweenaw Bay (Lake Superior), Little Bay de Noc and Grand Traverse Bay (Lake Michigan), Thunder Bay and Saginaw Bay (Lake Huron), Lake St. Clair, Brest Bay (Lake Erie), and in the St. Marys, St. Clair, and Detroit Rivers. Adult fish are collected from each site at a target interval of two to five years, and analyzed as whole fish samples. Whole fish fixed station trend monitoring data collected since 1990 were reviewed and general trend conclusions for the Great Lakes and connecting channels are summarized below (Bohr and Zbytowski, 2007):

- Lindane, terphenyl, polybrominated biphenyl (PBB), heptachlor, and aldrin were not quantified in any of 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.

- Apparent toxaphene was found primarily in walleye and lake trout from the Great Lakes and connecting channels. The highest concentrations of apparent toxaphene were quantified in lake trout from Lake Superior.

- All species from the Great Lakes and connecting channels tended to have higher concentrations of chlorinated organic contaminants than the same species from inland lakes.

- Carp from the St. Marys River had lower concentrations of organic contaminants than carp from the St. Clair River, Lake St. Clair, and the Detroit River. Carp and walleye from the St. Marys River had higher concentrations of mercury than carp and walleye from the St. Clair River, Lake St. Clair, and the Detroit River.

- Total PCB, total DDT, and total chlordane concentrations have declined at all 10 Great Lakes and connecting channels trend sites and in nearly all species tested at those sites.

- Dioxin toxicity equivalence concentrations have declined at 3 of the 4 sites tested.

- Mercury concentrations have increased at 6 of the 7 Great Lakes and connecting channels sites where a significant trend was detected.

In addition, edible portion fish tissue contaminant monitoring was conducted recently in Green Bay and Saginaw Bay. Edible portion sampling is often targeted toward known sites of contamination, sites popular with sport anglers, and sites with public access. Results are presented in the Michigan Fish Contaminant Monitoring Program: 2006 Annual Report (Bohr and Zbytowski, 2007).

5.5 Beaches

In 2005, 197 public beaches (owned by a city, county, etc.) on the Great Lakes and connecting channels were monitored and 151 reported no exceedances of the *E. coli* WQS for total body contact. There were 46 beaches that reported a total of 83 exceedances.

In 2006, 207 public beaches were monitored and 157 reported no exceedances of the *E. coli* WQS for total body contact. There were 50 beaches that reported a total of 85 exceedances.

The Michigan Beach Web site (http://www.deq.state.mi.us/beach) provides access to a database containing beach closings and *E. coli* data collected by LHDs. Currently, 593 public beaches located along the Great Lakes are listed in the database. Data for Great Lakes beaches in Michigan are also available at http://oaspub.epa.gov/beacon/beacon_national_page.main.

5.6 Decaying Organic Matter Deposits

Deposits of dead and decaying organic matter are reportedly fouling beaches along the Michigan's Great Lakes shoreline including Grand Traverse Bay, Saginaw Bay, and western

Lake Erie. While increased aquatic vegetation growth is typically associated with elevated nutrient concentrations, many of the shoreline deposits are occurring where ambient phosphorus and nitrogen concentrations are very low. Similar problems are being reported along the Wisconsin Lake Michigan shoreline, the Ohio and Pennsylvania Lake Erie shoreline, and the New York Lake Ontario shoreline, where, like Michigan, shorelines are being fouled by decaying organic matter that may interfere with the enjoyment of beaches and nearshore waters.

Once thought to be caused primarily by the presence of excessive nutrients (phosphorus), there is growing evidence that the increased organic matter deposits may be the result of a complex interaction between nutrients and exotic mussel species (Hecky et al., 2004), changes in wind patterns over the Great Lakes (Waples and Klump, 2002), and fluctuating water levels (Harris, 2004). Research is ongoing to identify the causes and sources for these shoreline deposits with the hope that effective solutions can be found. Although phosphorus concentrations do not appear to be solely responsible for the shoreline deposits, programs and policies intended to reduce phosphorus in all waters of the state remain important components of efforts to improve and protect water quality.

The MDEQ will work closely with the National Oceanic and Atmospheric Administration-funded Great Lakes Environmental Research Laboratory to investigate the factors and processes that are responsible for the increased decaying organic matter deposits.

5.7 Designated Use Support Summary

Designated use support summaries for Michigan waters of the Great Lakes, bays, connecting channels, and Lake St. Clair are presented in Tables 5.2 and 5.3. Michigan uses a multiple category system (i.e., assessment units may be placed in one or more category, see Section 4.11); therefore, Great Lake square miles and shoreline miles and connecting channel miles are not totaled. Key designated use support results for Michigan waters of the Great Lakes, connecting channels, and Lake St. Clair follow. Impairment cause and source information for assessment units not supporting designated uses is presented in Chapter 9.

- Generally shoreline areas of the Great Lakes are not assessed to determine support for the other indigenous aquatic life and wildlife designated use. Water chemistry was monitored specifically around two small areas (one each on Lake Michigan and Little Traverse Bay) in the vicinity of groundwater seeps associated with cement kiln dust remediation sites.

- Considerable progress has been made to eliminate CSO discharges to the Great Lakes connecting channels; however, some CSO discharges still exist. Consequently, all of the St. Clair, Detroit and St. Marys river miles are listed as not supporting the total body contact and partial body contact recreation designated uses due to pathogens with sources listed as CSOs.

- The Michigan waters of the Great Lakes, their connecting channels, Saginaw and Grand Traverse Bays, and Lake St. Clair are listed as not supporting the fish consumption designated use due to elevated concentrations of PCBs, DDT, mercury, chlordane, and/or dioxin. Atmospheric deposition is considered to be the major source of these persistent bioaccumulative chemicals.

- Water chemistry results indicate that all 112 Great Lakes connecting channel miles are not supporting the fish consumption and other indigenous aquatic life and wildlife

designated uses due to elevated concentrations of PCBs in the water column. The primary source of PCBs is atmospheric deposition. Mercury concentrations in the St. Marys and St. Clair Rivers are usually below the 1.3 ng/L WQS, but mercury concentrations in the Detroit River often exceed 1.3 ng/L.

- Periodic taste and odor problems associated with nuisance growths of the blue-green algae, *Microcystis,* occur near the Bay City municipal drinking water intakes in Saginaw Bay. As a result of this occasional problem, two drinking water intake zones in Saginaw Bay are listed as not supporting the public water supply designated use. A nutrient reduction strategy for Saginaw Bay (MDNR et al., 1985) is in place; therefore, a TMDL is not scheduled for this area.

- Deposits of decaying organic matter along some Great Lakes shorelines is a significant problem and may interfere with beach recreational use and access to the water in some places along Saginaw Bay and western Lake Erie. A careful evaluation of available data and scientific information, and a comparison against WQS reveals that there is insufficient information to determine whether designated uses are not supported as a result of the decaying organic matter. Consequently, 142 miles of Saginaw Bay and 37.5 miles of western Lake Erie shoreline are listed as having insufficient information to determine support of the total and partial body contact recreation designated uses.

Table 5.2 Designated use support summary for the Great Lakes, bays, and Lake. St. Clair (approximately 42,167 square miles). No Great Lakes and bays are listed in Category 1 since comprehensive water quality data and/or information are not available for any locations.

* Geographic extent may be reported in two different measurement units for this designated use (mi^2 /shoreline mi). These values represent different assessment units (i.e. shoreline miles do not correspond to the mi^2 also listed).

† The total body contact and partial body contact designated use is reported as shoreline miles for beaches. The total number (shoreline miles) of Great Lakes beaches is not known. Beaches are evaluated for total body contact and partial body contact designated use support and entered into the ADB on a case-by-case basis where information is available. In addition, shoreline miles are evaluated for other indigenous aquatic life and wildlife designated use support and entered into the ADB on a case-by-case basis where information is available. The total number of Great Lakes shoreline miles in the ADB is 260 miles. A number of records exist for beaches or other shoreline miles that have no data available and therefore are not assessed; however, this is not a comprehensive value for all not assessed Great Lakes beaches or other shoreline miles.

‡ Approximately 76.5 square miles (mi^2) of the Great Lakes and bays are protected for the public water supply designated use.

N/A indicates that the designated use is not applicable.

Designated Use	Supporting	Insufficient Information	Not Assessed	Not Supporting			
	Category 2	Category 3	Category 3	Category 4a	Category 4b	Category 4c	Category 5
Agriculture (mi^2)	42,167	0	0	0	0	0	0
Navigation (mi^2)	42,167	0	0	0	0	0	0
Industrial Water Supply (mi^2)	42,167	0	0	0	0	0	0
Warmwater Fishery (mi^2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Coldwater Fishery (mi^2)	0	0	42,167	0	0	0	0
Other Indigenous Aquatic Life and Wildlife (mi^2 /shoreline mi)*†	280 / 4.2	1,262 / 1	40,625/ 255	0	0	0	0
Partial Body Contact Recreation (shoreline mi) †	56.9	193.9	5.2	0.6	0	0	3.5
Total Body Contact Recreation (shoreline mi) †	2.1	248	5.2	0.6	0	0	4.0
Fish Consumption (mi^2)	0	0	0	0	0	0	42,167
Public Water Supply (mi^2) ‡	0	10.5	63	0	3	0	0

Table 5.3 Designated use support summary for the Great Lakes connecting channels (St. Marys, St. Clair, and Detroit Rivers) in Michigan (approximately 112 total miles). No connecting channels are listed in Category 1 since comprehensive water quality data and/or information are not available for any locations.

* Approximately 5 of the 112 connecting channel miles are protected for the public water supply designated use.

N/A indicates that the designated use is not applicable.

Designated Use	Supporting	Insufficient Information	Not Assessed	Not Supporting			
	Category 2	Category 3	Category 3	Category 4a	Category 4b	Category 4c	Category 5
Agriculture (mi)	112	0	0	0	0	0	0
Navigation (mi)	112	0	0	0	0	0	0
Industrial Water Supply (mi)	112	0	0	0	0	0	0
Warmwater Fishery (mi)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Coldwater Fishery (mi)	0	0	112	0	0	0	0
Other Indigenous Aquatic Life and Wildlife (mi)	0	0	0	0	0	0	112
Partial Body Contact Recreation (mi)	0	0	0	0	0	0	112
Total Body Contact Recreation (mi)	0	0	0	0	0	0	112
Fish Consumption (mi)	0	0	0	0	0	0	112
Public Water Supply (mi) *	0	2	3	0	0	0	0

CHAPTER 6
ASSESSMENT RESULTS: INLAND LAKES AND RESERVOIRS

6.1 Trophic Status

Carlson's trophic status index is used by the MDEQ 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 three field measurements: summer Secchi depth (transparency), total phosphorus concentration (epilimnetic), and chlorophyll *a* concentration (photic zone). 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.

During 2005 and 2006, 167 public access lakes (139,536 acres) were sampled and reassessed as part of the Lake Water Quality Monitoring Assessment Project. The majority (69%) of Michigan's public access lakes have moderate (mesotrophic) or low (oligotrophic) nutrient levels (Table 6.1).

During 2005 and 2006, over 200 lakes were sampled each year as part of the Cooperative Lakes Monitoring Program, under the Michigan Clean Water Corps Program (for additional information see http://ww.micorps.net). One hundred and fifteen of these lakes were sampled for the three primary trophic status indicators (Secchi depth, total phosphorus, and chlorophyll *a*) and trophic status classifications were updated. Of these lakes, 36 were classified as oligotrophic, 61 mesotrophic, and 18 eutrophic.

Table 6.1 Trophic status summary of Michigan's public access lakes.

Trophic Status	Number of Lakes	Acres
Oligotrophic (low nutrients)	116 (16%)	164,518 (33%)
Mesotrophic (moderate nutrients)	391 (53%)	202,416 (40%)
Eutrophic (high nutrients)	197 (27%)	119,839 (24%)
Hypereutrophic (excessive nutrients)	26 (4%)	15,703 (3%)
Total Assessed	730	502,476

6.2 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. Fish have been collected from eight inland lakes as part of the fish contaminant trend monitoring project. The lakes are South Manistique, Gun, Gull, Grand Sable, Pontiac, Higgins, Houghton, and Gogebic. Whole fish fixed station trend monitoring data collected since 1990 were

reviewed and general trend conclusions for inland lakes are summarized below (Bohr and Zbytowski, 2007):

- Lindane, terphenyl, PBB, heptachlor, and aldrin were not quantified in any of 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 PCBs, total DDT, and total chlordane concentrations have declined at all of the inland lake trend sites where trends could be detected.

- Significant trends in mercury concentrations have been detected at 4 of the 8 inland lake trend sites. An increasing trend was detected at 2 lakes, and a decreasing trend was detected at the other 2 lakes.

In addition, edible portion fish tissue contaminant monitoring was conducted recently at 21 inland lakes. Edible portion sampling is often targeted toward known sites of contamination, sites popular with sport anglers, and sites with public access. Results are presented in the Michigan Fish Contaminant Monitoring Program: 2006 Annual Report (Bohr and Zbytowski, 2007).

6.3 Beaches

In 2005, a total of 190 public beaches (owned by a city, county, etc.) on inland lakes were monitored and 162 had no exceedances of the *E. coli* WQS for total body contact. There were 28 beaches that reported a total of 39 exceedances.

In 2006, a total of 225 public beaches on inland lakes were monitored and 180 had no exceedances of the *E. coli* WQS for total body contact. There were 45 beaches that reported a total of 93 exceedances.

The Michigan Beach Web site (http://www.deq.state.mi.us/beach) provides access to a database containing beach closings and *E. coli* data collected by LHDs. Currently, 532 public beaches located on inland lakes are listed in the database.

6.4 Designated Use Support Summary

A designated use support summary for Michigan inland lakes and reservoirs is presented in Table 6.2. Michigan uses a multiple category system (i.e., assessment units may be placed in one or more category, see Section 4.11); therefore, inland lake and reservoir acres and shoreline miles are not totaled. Key designated use support results follow. Impairment cause and source information for assessment units not supporting designated uses is presented in Chapter 9.

- Physical and chemical monitoring indicates that approximately 80% of the assessed inland lake and reservoir acres support the other indigenous aquatic life and wildlife designated use. Several water bodies are not supporting this designated use due to nuisance plant/algae growth problems caused by elevated phosphorus concentrations in the water column and/or sediments. Torch (Houghton County) and Crooked (Missaukee County) Lakes are not supporting this designated use due to historical copper stamp sand contamination and sediment problems from a historic wood chemical factory, respectively.

- Water chemistry and fish tissue monitoring indicates that about 7% of the assessed inland lake and reservoir acres support the fish consumption designated use. Atmospheric deposition continues to be a major source of PCBs and mercury to Michigan's inland lakes and reservoirs; however, localized sources are still contributing to mercury and PCB fish contamination problems in some inland lakes and impoundments.

- Cisco population monitoring indicates that approximately 40% of the inland lake acres assessed for the coldwater fishery designated use support the use while the remaining 60% have insufficient information to make a designated use support determination.

- Ten lakes have been listed as having insufficient information to determine support for the warmwater fishery designated use due to the possibility of low pH.

Table 6.2 Designated use support summary for inland lakes and reservoirs (approximately 824,320 acres). No inland lakes or reservoirs are listed in Category 1 since comprehensive water quality data and/or information are not available for any locations.

***** The total body contact and partial body contact designated use is reported as shoreline miles for beaches. The total number (shoreline miles) of inland lake beaches is not known. Beaches are evaluated for total body contact and partial body contact designated use support and entered into the ADB on a case-by-case basis where information is available. The total number of shoreline miles of these inland lake and reservoir beaches in the ADB is 70 miles. A small number of records exist for beaches that have no data available and therefore are not assessed; however, this is not a comprehensive value for all not assessed inland lake and reservoir beaches. Geographic extent may be reported in two different measurement units for this designated use (acres /shoreline mi). These values represent different assessment units (i.e. shoreline miles do not correspond to the acres also listed). Three lakes are listed in their entirety as acres due to non-beach issues (Lee Lake, St. Joseph River watershed; Manistee Lake, Manistee River watershed; and Potters Lake, Flint River watershed).

† Approximately 414 acres of inland lakes and reservoirs are protected for the public water supply designated use.

N/A indicates that the designated use is not applicable.

Designated Use	Supporting	Insufficient Information	Not Assessed	Not Supporting			
	Category 2	Category 3	Category 3	Category 4a	Category 4b	Category 4c	Category 5
Agriculture (acres)	824,320	0	0	0	0	0	0
Navigation (acres)	824,320	0	0	0	0	0	0
Industrial Water Supply (acres)	824,320	0	0	0	0	0	0
Warmwater Fishery (acres)	1,082	752	822,192	0	0	0	295
Coldwater Fishery (acres)	87,115	135,784	601,421	0	0	0	0
Other Indigenous Aquatic Life and Wildlife (acres)	296,975	65,603	451,636	3,188	3,139	0	3,778
Partial Body Contact Recreation (acres/shoreline mi) *	0 / 65	126 / 3.6	823,106 / 1	119 / 0.2	0 / 0	0 / 0	969 / 1
Total Body Contact Recreation (acres/shoreline mi) *	0 / 9.6	126 / 58.2	823,106 / 0.2	119 / 0.2	0 / 0	0 / 0	969 / 1.8
Fish Consumption (acres)	24,431	14,847	489,398	0	435	0	295,471
Public Water Supply (acres) †	0	130	284	0	0	0	0

CHAPTER 7
ASSESSMENT RESULTS: RIVERS

7.1 Biological Integrity

All available biological assessments (e.g., fish and macroinvertebrate communities, targeted and probabilistic study designs) are evaluated using the assessment methodology (Chapter 4) and potentially used to determine designated use support. As part of the MDEQ'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. For the first time, results using MDEQ's Macroinvertebrate Community Status and Trend Monitoring Procedure (MDEQ, Status and Trend Monitoring Procedure, in preparation) are available for watersheds monitored in 2006 (Figure 3.1 and Table 7.1). Results from this project will also be used to assess statewide designated use support status and temporal trends in biological integrity.

Table 7.1 Macroinvertebrate community assessment results for watersheds monitored in 2006 (Cooper, Attainment Status, in preparation) using MDEQ's status and trend procedure (MDEQ, Status and Trend Monitoring Procedure, in preparation).

Watershed/Watershed Group	Number of Survey Stations	Percent Supporting the Other Indigenous Aquatic Life and Wildlife Designated Use
Northern Upper Peninsula (Keweenaw area)	38	100 ± 8
Tawas/ AuGres	24	96 ± 9
Muskegon	50	98 ± 4
Cass	37	91 ± 10
Upper Grand	40	92 ± 8
St. Joseph/ Paw Paw	32	86 ± 13
Detroit/ Ecorse	30	30 ± 16

7.2 Water Chemistry

The MDEQ and its partners collect water samples from many rivers and streams throughout the state as part of the Water Chemistry Monitoring Project (WCMP) and other special studies and analyze them for a variety of parameters. Results from samples collected during 2002-2004 are summarized in the 2006 IR (Edly and Wuycheck, 2006). Key results from 2005 are summarized below. Results from 2006 and 2007 were not available for the preparation of this IR; but, these results will be used for the 2010 IR.

Based on recent WCMP data, the most ubiquitous problem continues to be PCBs. Similar to previous years' results, results from a total of 43 samples (from 10 locations) collected from streams and rivers during 2005 showed that 100% exceeded the most restrictive PCB WQS of 0.026 ng/L (HCV per R 323.1057) (Aiello, WCMP 2005 Report, in preparation). Total PCB

concentrations were highest in a sample collected at the Lower Kalamazoo River (18 ng/L), and lowest in a sample collected at the Thunder Bay River (0.082 ng/L). Because the industrial use of PCBs has been banned, the primary sources of PCBs to water likely are historical sediment contamination and ongoing atmospheric deposition.

Similar to previous years' results, elevated levels of mercury were relatively common in water samples analyzed from 2005. Of the 98 sites monitored, 48 (49%) had geometric mean mercury concentrations exceeding the most restrictive mercury WQS of 1.3 ng/L (Wildlife Value per R 323.1057) (Aiello, WCMP 2005 Report and Probabilistic Report, in preparation). Geometric mean mercury concentrations were highest at Montgomery Creek, Gogebic County (5.9 ng/L) and lowest at the Shiawassee River, Oakland County (0.31 ng/L). Atmospheric deposition and local sources are the primary causes of elevated mercury levels.

All trace metal samples other than mercury from the 98 locations that had sufficient information to make a determination met applicable WQS during 2005 (Aiello, WCMP 2005 Report and Probabilistic Report, in preparation).

A total of 30 dioxin and furan samples were collected at 7 locations during 2001-2003 (Aiello, 2003, 2004, and 2005). This sampling took place at the Tittabawassee River and additional sites within the Saginaw Bay watershed. Of these 30 samples, 20 were collected near the mouth of the Tittabawassee River; all 20 exceeded the Rule 57 HCV (0.0086 picograms per liter [pg/L]) applicable to total 2,3,7,8-TCDD toxicity equivalence concentration, and 4 also exceeded the Rule 57 Wildlife Value (0.0031 pg/L) for 2,3,7,8-TCDD. The remaining ten samples were collected at the Cass, Flint, Shiawassee, Saginaw, and West Branch Tittabawassee Rivers; and a station on the Tittabawassee River immediately upstream of Dow Chemical - Midland's outfall 031. Of these locations, all but the West Branch Tittabawassee River had at least 1 sample that exceeded the HCV.

Numerous emerging issue contaminants, including base/neutral organic compounds, methyl-tert-butyl-ether (MTBE), benzene, toluene, ethylbenzene, and xylene (BTEX), total cyanide, perfluorooctane sulfonates, and perfluorooctanoic acid, have been monitored at the WCMP locations. From 1999 to 2004, a total of 440 samples were analyzed for base/neutral organic compounds, MTBE and BTEX, and 225 samples for total cyanide as part of the WCMP (Aiello, 2003, 2004, and 2005). All samples were below applicable Rule 57 water quality values, and almost all were below analytical quantification. Thus, sampling for these contaminants was discontinued after 2004.

In addition to water sampling in recent years, the USGS and MDEQ evaluated potential trends for 28 water quality constituents (physical properties, major ions, nutrients, bacteria, pH and alkalinity, and suspended sediments) for selected National Stream Quality Accounting Network stations in Michigan (Syed and Fogarty, 2005). Data were collected from 1973 to 1995 from the Au Sable, Clinton, Grand, Kalamazoo, Manistee, Manistique, Muskegon, and Pigeon Rivers. The study results show an overall improvement in water quality at the Clinton, Manistee, and Pigeon Rivers for some parameters. The Clinton and Pigeon Rivers showed significant negative trends (decreasing concentration) in the concentration of nitrogen compounds. The Kalamazoo and Muskegon Rivers showed significant positive trends (increasing concentrations) in nitrogen compounds. Due to data and analysis method limitations, the Clinton River was the only river that could be analyzed for phosphorus trends; it showed a significant negative trend in total phosphorus concentration.

7.3 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 or redhorse sucker were collected periodically from eight river trend monitoring sites since 1990. Whole fish fixed station trend monitoring data collected since 1990 were reviewed and general trend conclusions for rivers are summarized below (Bohr and Zbytowski, 2007):

- Lindane, terphenyl, PBB, heptachlor, and aldrin were not quantified in any of 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 PCBs, total DDT, and total chlordane concentrations have declined at all of the river trend sites where trends could be detected.

- Mercury concentrations decreased in fish from the River Raisin and increased in fish from the Grand River. No significant trends were measured in the Kalamazoo, Muskegon, or St. Joseph Rivers.

The MDEQ uses caged fish to identify sources of bioaccumulative contaminants and identify spatial trends in contaminant concentrations. Caged fish studies were conducted in the Boardman, Flat, Flint, Pere Marquette, Rabbit, and St. Joseph Rivers watersheds in 2003. Caged fish studies were conducted in Little Black Creek, Raisin River, and the South Branch of the Shiawassee River in 2004. Caged fish studies were conducted in the Black Creek, Escanaba, Macatawa, Ottawa, and Saginaw River watersheds in 2005. These rivers are covered by sport fish consumption advisories due to elevated concentrations of PCBs, chlordane, and/or mercury. Results of these studies, including identification of sites where statistically significant uptake of various contaminants was measured, are included in the Michigan Fish Contaminant Monitoring Program: 2005 and 2006 Annual Reports (Bohr and Zbytowski, 2006; and Bohr and Zbytowski, 2007).

In addition, edible portion fish tissue contaminant monitoring was conducted recently at ten river sites. Edible portion sampling is often targeted toward known sites of contamination, sites popular with sport anglers, and sites with public access. Results are presented in the Michigan Fish Contaminant Monitoring Program: 2006 Annual Report (Bohr and Zbytowski, 2007).

7.4 Beaches

In 2005, seven public beaches on rivers were monitored and four reported no exceedances of the *E. coli* WQS for total body contact. There were three beaches that reported a total of ten exceedances.

In 2006, eight public beaches on rivers were monitored and four reported no exceedances of the *E. coli* WQS for total body contact. There were 4 beaches that reported a total of 22 exceedances.

The Michigan Beach Web site (http://www.deq.state.mi.us/beach) provides access to a database containing beach closings and *E. coli* data collected by LHDs. Currently, 34 public beaches located on rivers are listed in the database.

7.5 Designated Use Support Summary

A designated use support summary for Michigan rivers and streams is presented in Table 7.2. Michigan uses a multiple category system (i.e., assessment units may be placed in one or more category, see Section 4.11); therefore, river miles are not totaled. Key designated use support results follow. Impairment cause and source information for assessment units not supporting designated uses is presented in Chapter 9.

- Over 7,000 river miles are not supporting one or more designated uses indicated by poor biological communities. The majority of these river miles have been highly modified by channel maintenance activities carried out primarily by Michigan's county drain commissions. These channel maintenance activities (including channel straightening, dredging, riparian vegetation removal, and snag removal) may result in poor biological communities caused by nonpollutants (habitat and/or flow alterations); therefore, these river miles are placed in Category 4c. The number of river miles listed in Category 4c has increased from 2,888 miles in the 2006 IR (even though some river miles were moved out of Category 4c) mainly due to updates in the assessment methodology. In the 2008 IR all river miles are reported, compared to the 2006 IR where only perennial river miles were reported (see Section 4.14).

- Of the approximately 3,717 river miles assessed for the total body contact recreation designated use, about 34% were determined to support this designated use. Approximately 42% of these 3,717 river miles have TMDLs completed with approximately 11% scheduled to have TMDLs completed over the next several years.

- Water column PCB monitoring using highly sophisticated and sensitive sampling/analytical techniques indicates that 100% of the assessed river miles are not attaining PCB WQS; therefore, a significant number of river miles are listed as not supporting the fish consumption designated use and/or the other indigenous aquatic life and wildlife designated use. Atmospheric deposition is considered to be the major source of this persistent bioaccumulative chemical.

- Approximately 97% of the 37,330 river miles assessed for the fish consumption designated use are determined to not support this designated use. The primary causes are PCBs and mercury (in fish tissue and water column). Atmospheric deposition is considered to be the primary source of these persistent bioaccumulative chemicals.

- A 17.7-mile reach of the River Raisin (Lenawee County) is not supporting the public water supply designated use because nitrate-nitrogen concentrations in the source water are above the USEPA's maximum contaminant level for nitrates of 10 mg/L. A USEPA-approved TMDL is in place to remediate this problem. This listing for River Raisin does not strictly follow the assessment methodology (i.e., the listing encompasses an area much larger than the 12-digit HUC; see Section 4.10) since the listing was created prior

to the 2008 assessment methodology update and was meant to encompass a stretch of the river between two distinct drinking water intakes.

- Figure 7.1 illustrates the fish consumption designated use support statewide. The primary causes for river miles to not support the fish consumption designated use; mercury in fish tissue, mercury in water column, PCB in fish tissue, and PCB in water column; are presented in Figures 7.2 through 7.5. These four figures also show sampling locations for corresponding parameters. Sampling locations that do not overlay river miles that are not supporting the fish consumption designated use may have insufficient information to determine use support or may indicate designated use support. Please note that a color copy of Figure 7.1 is required to view all information. This IR is available in color at http://www.michigan.gov/deqwater under Water Quality Monitoring, Assessment of Michigan Waters.

- Figure 7.6 illustrates the other indigenous aquatic life and wildlife designated use support statewide. The primary causes for river miles to not support the other indigenous aquatic life and wildlife designated use; habitat alterations, mercury in water column, PCB in water column; are presented in Figures 7.7 through 7.9. These three figures also show sampling locations for corresponding parameters. Sampling locations that do not overlay river miles that are not supporting the other indigenous aquatic life and wildlife designated use may have insufficient information to determine use support or may indicate designated use support. Please note that a color copy of Figure 7.6 is required to view all information. This IR is available in color at http://www.michigan.gov/deqwater under Water Quality Monitoring, Assessment of Michigan Waters.

Table 7.2 Designated use support summary for rivers in Michigan (approximately 52,254 total miles). No rivers are listed in Category 1 since comprehensive water quality data and/or information are not available for any locations.

* Approximately 508 of the 52,254 river miles are protected for the public water supply designated use.

Designated Use	Supporting	Insufficient Information	Not Assessed	Not Supporting			
	Category 2	Category 3	Category 3	Category 4a	Category 4b	Category 4c	Category 5
Agriculture (mi)	52,254	0	0	0	0	0	0
Navigation (mi)	52,254	0	0	0	0	0	0
Industrial Water Supply (mi)	52,254	0	0	0	0	0	0
Warmwater Fishery (mi)	4,625	414	45,256	1,149	21	465	324
Coldwater Fishery (mi)	3,523	533	47,940	138	2	51	66
Other Indigenous Aquatic Life and Wildlife (mi)	25,446	1,676	8,225	1,135	109	6,738	10,487
Partial Body Contact Recreation (mi)	25	453	49,999	1,432	1	0	344
Total Body Contact Recreation (mi)	1,272	493	48,536	1,555	1	0	396
Fish Consumption (mi)	1,220	26	15,399	22	1,364	0	34,698
Public Water Supply (mi) *	0	0.1	490	18	0	0	0

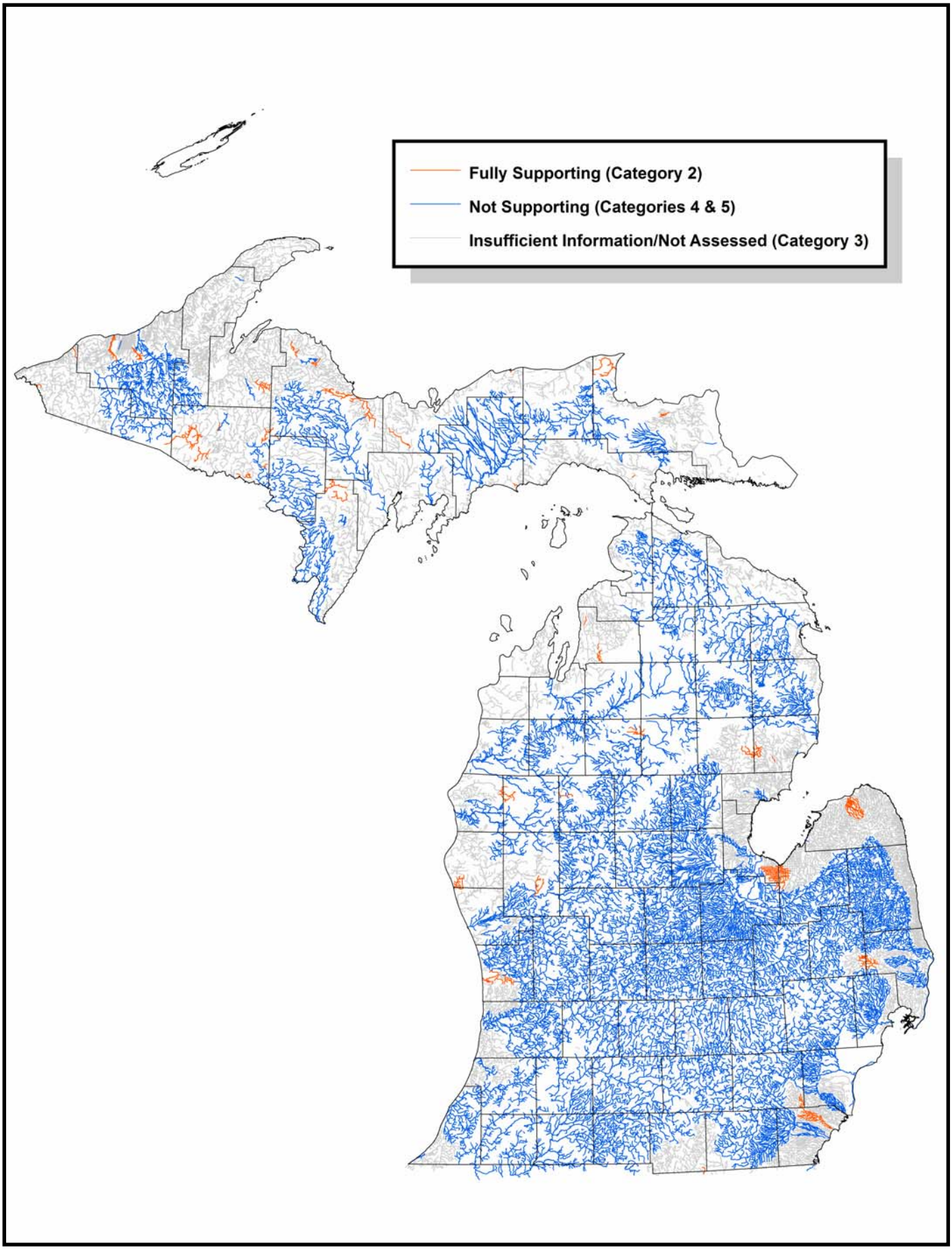


Figure 7.1 Fish consumption designated use support summary for Michigan rivers.

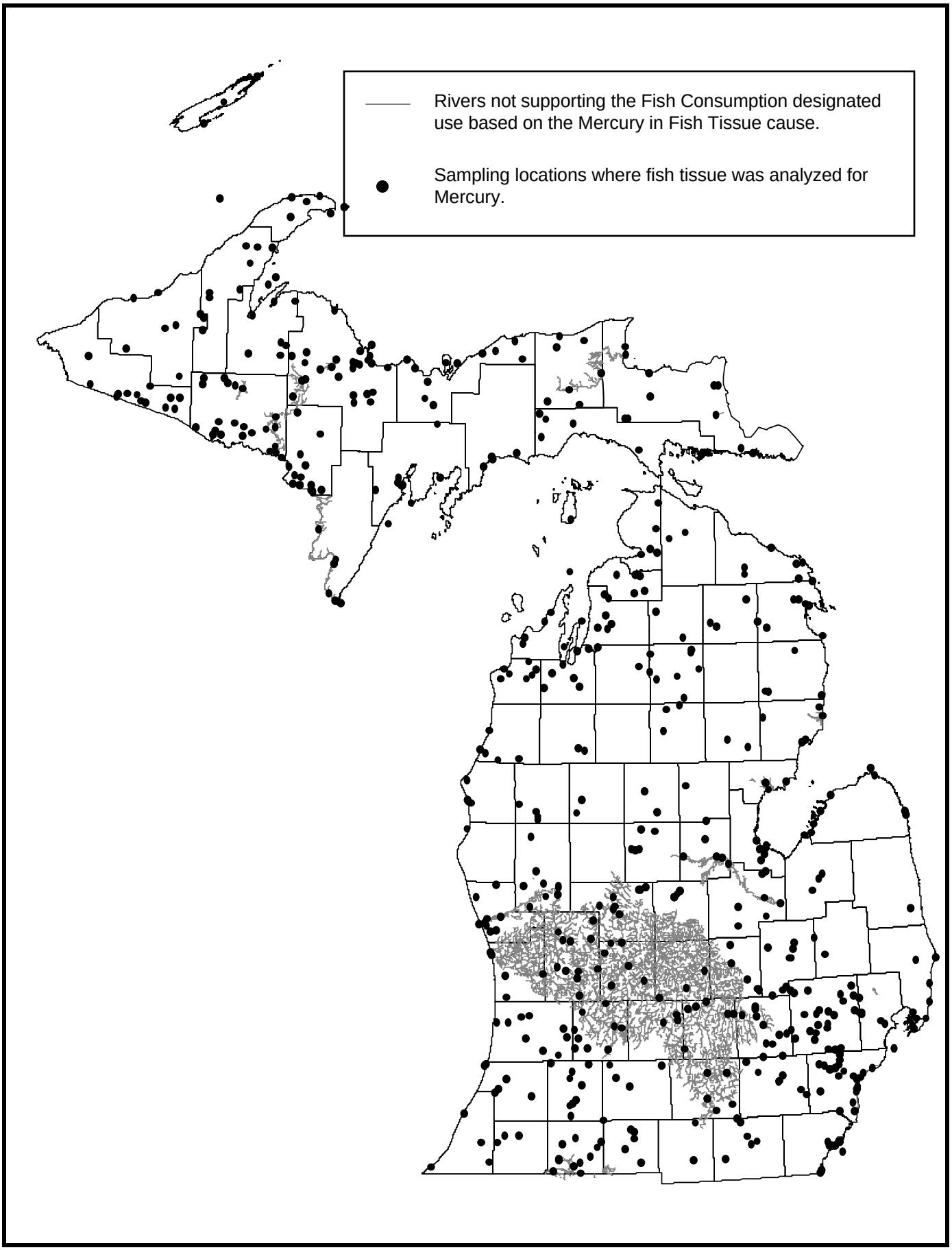


Figure 7.2 Rivers not supporting the fish consumption designated use based on mercury in fish tissue

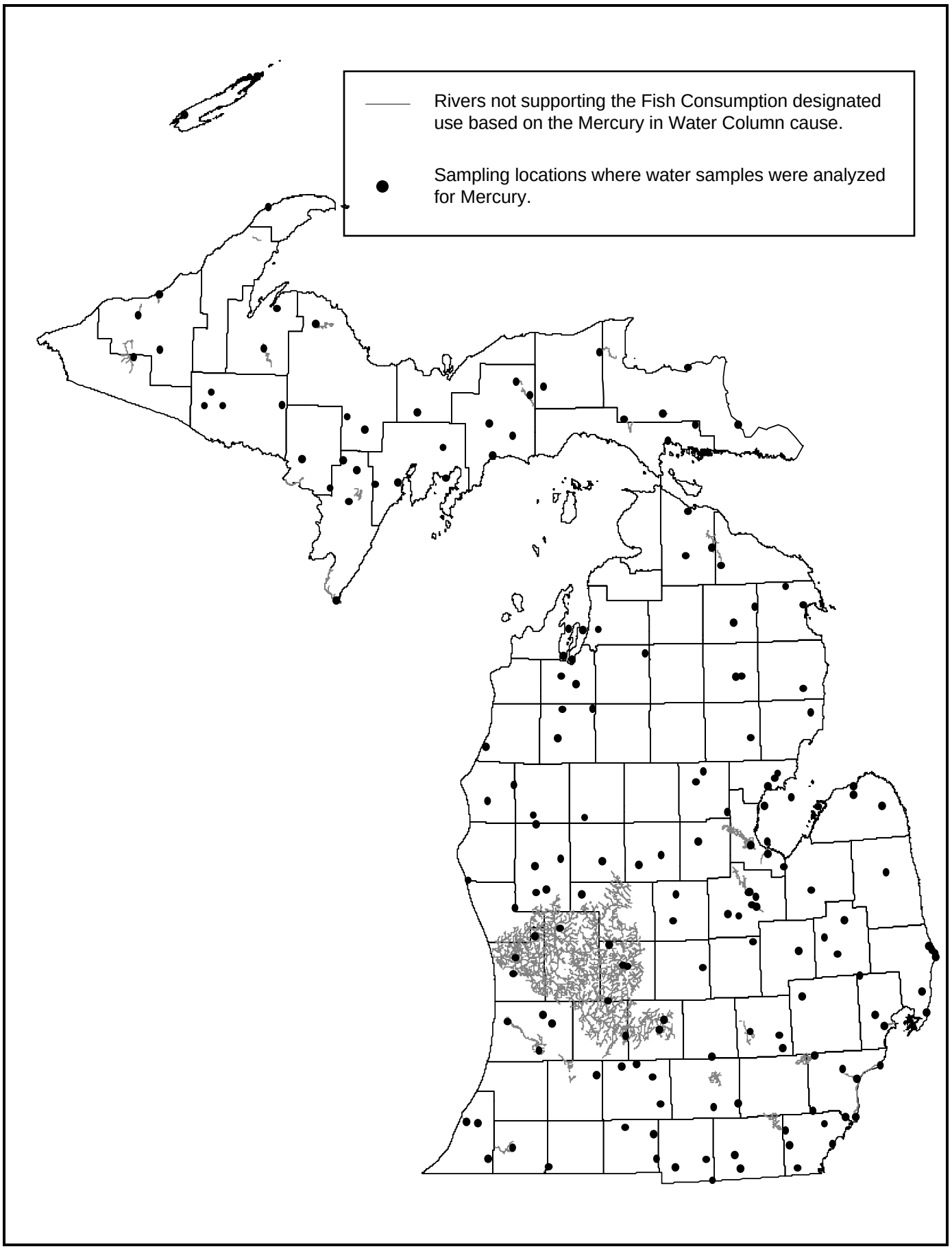


Figure 7.3 Rivers not supporting the fish consumption designated use based on mercury in water column

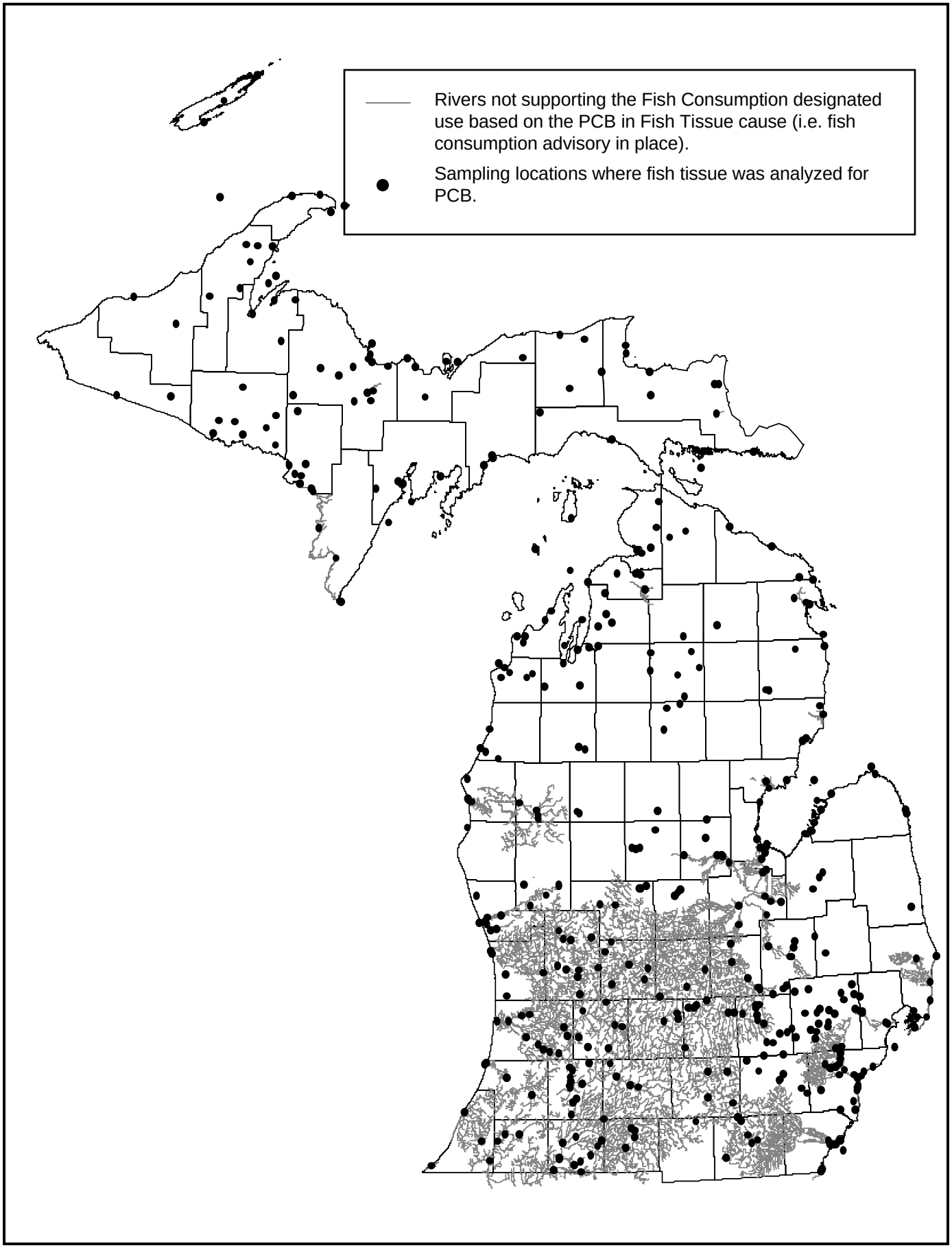


Figure 7.4 Rivers not supporting the fish consumption designated use based on PCB in fish tissue

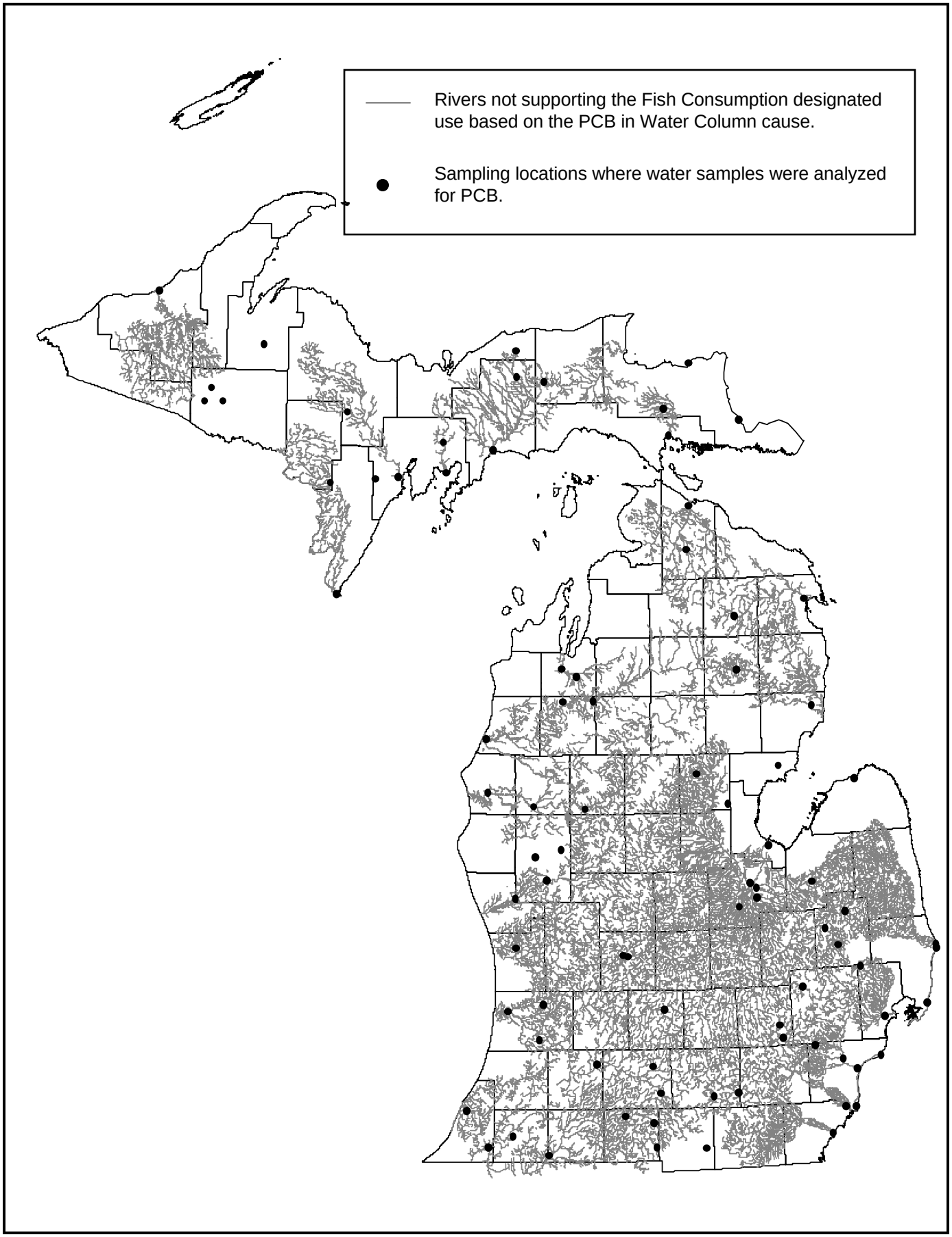


Figure 7.5 Rivers not supporting the fish consumption designated use based on PCB in water column

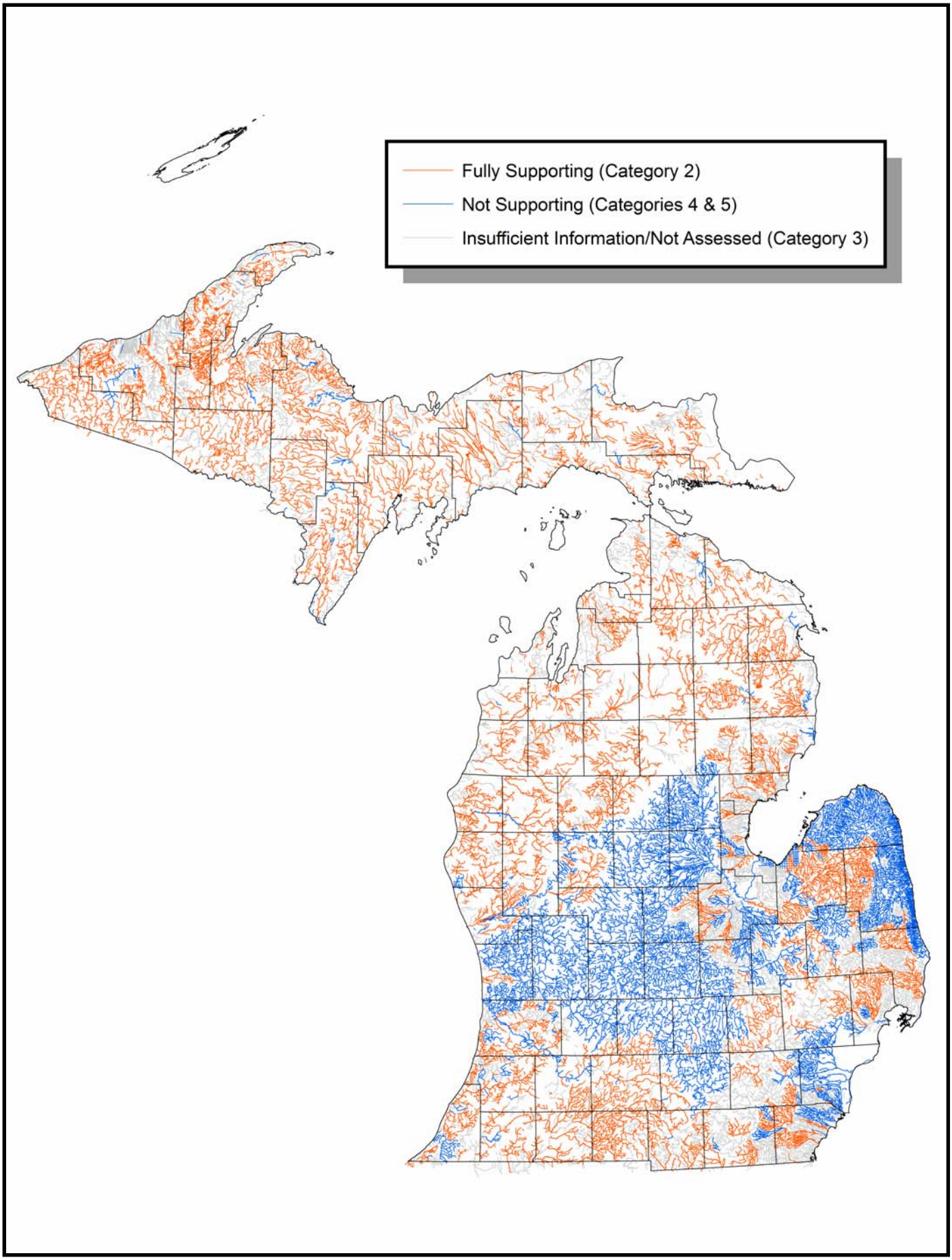


Figure 7.6 Other indigenous aquatic life and wildlife designated use support summary for Michigan rivers.

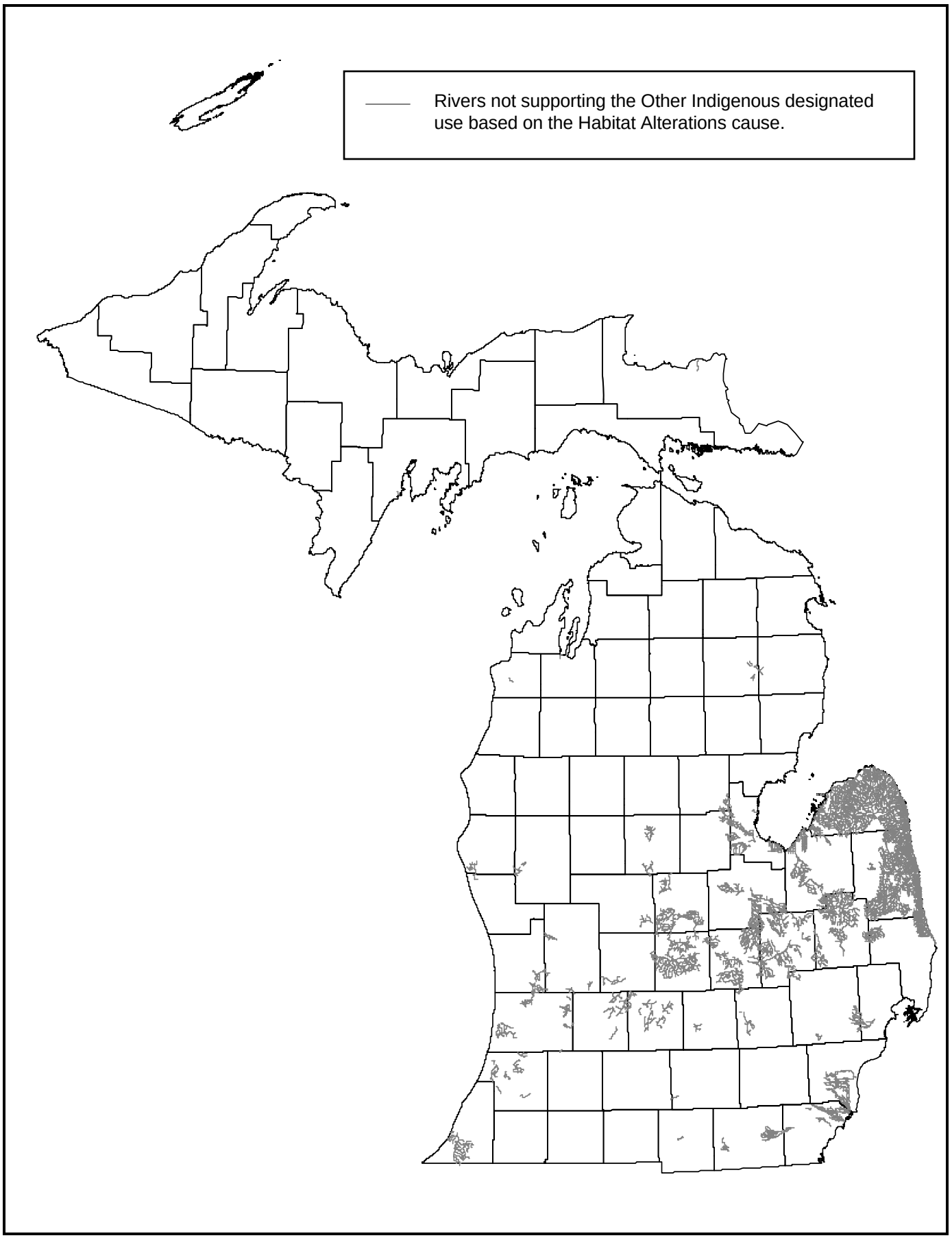


Figure 7.7 Rivers not supporting the other indigenous aquatic life and wildlife designated use based on habitat alterations

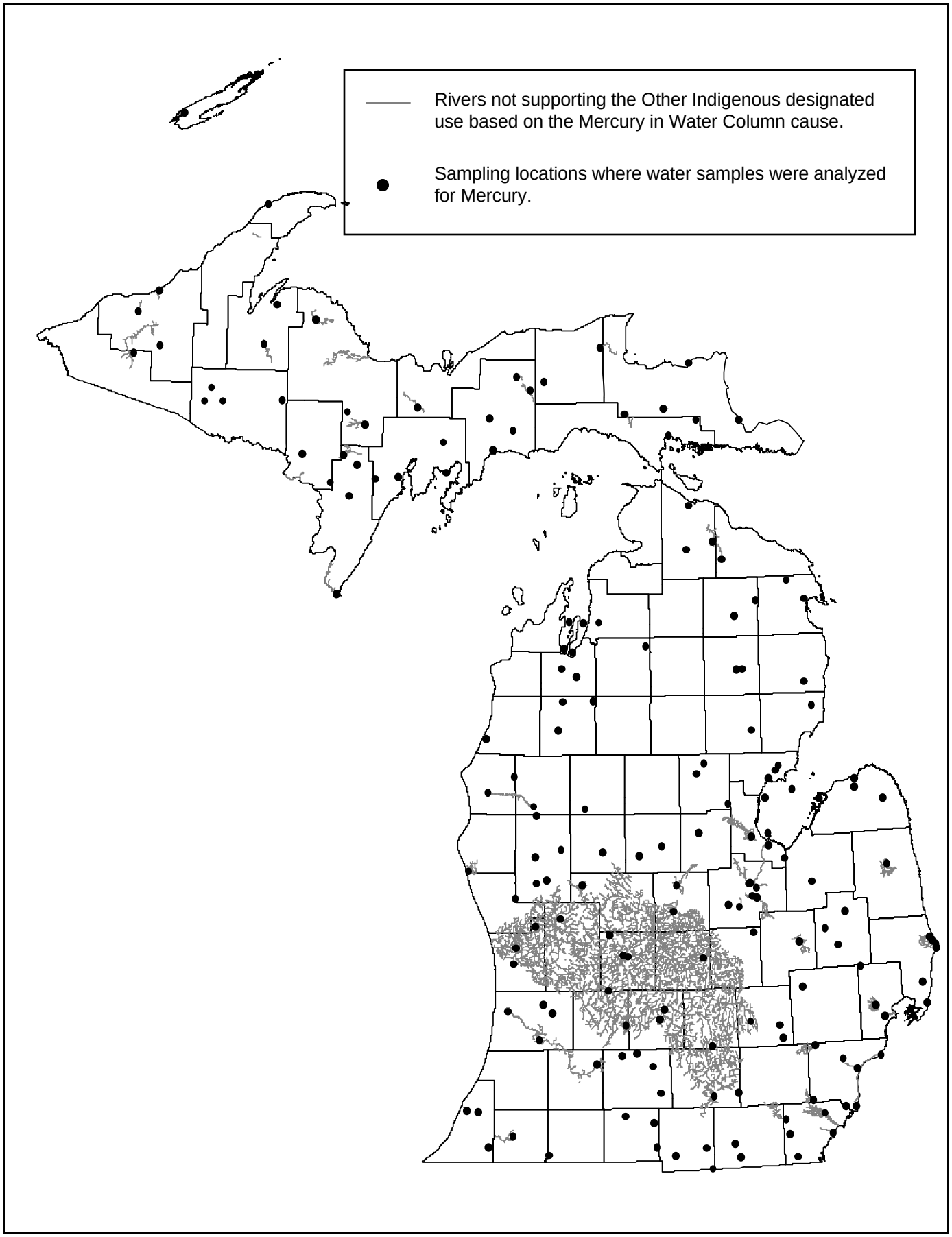


Figure 7.8 Rivers not supporting the other indigenous aquatic life and wildlife designated use based on mercury in water column

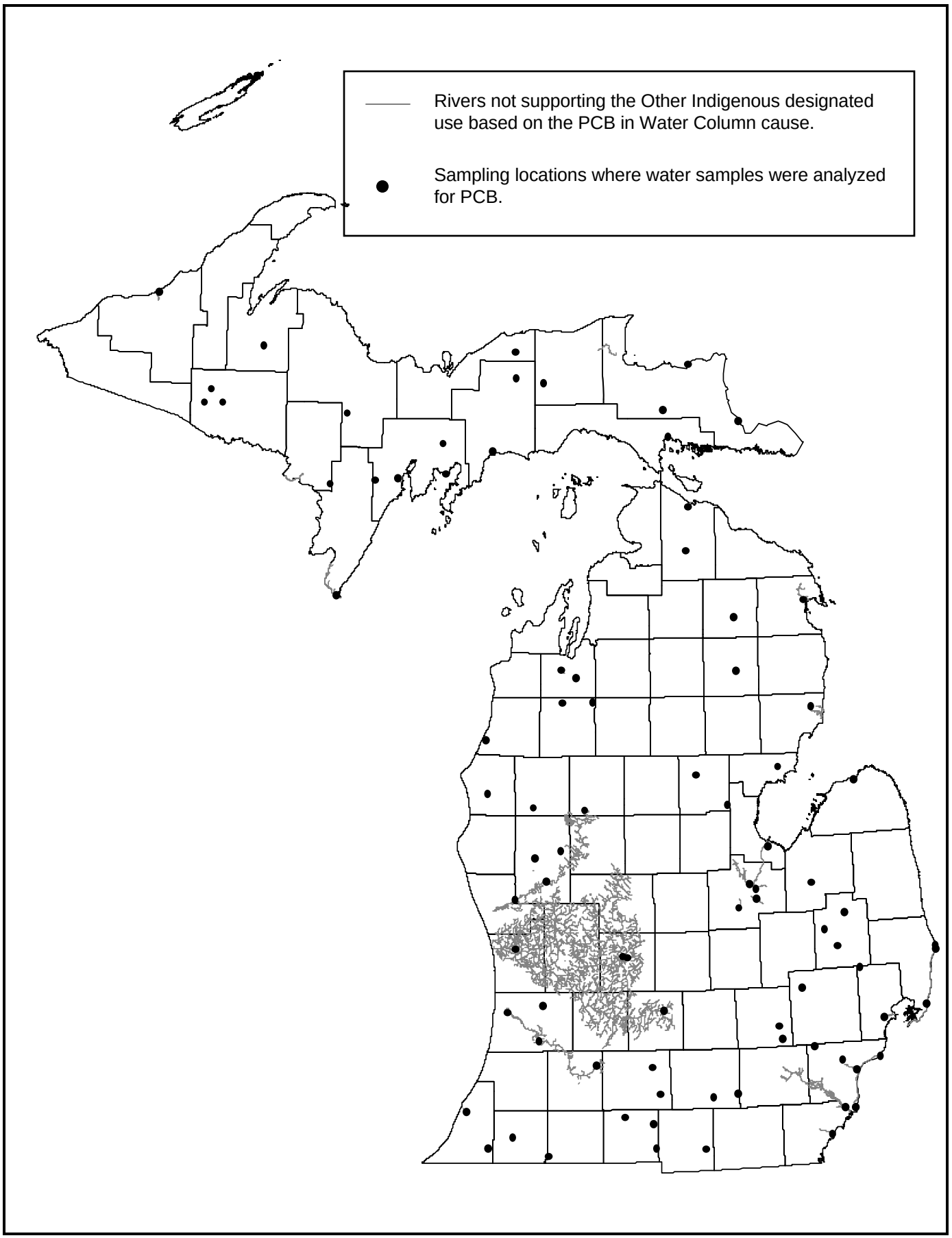


Figure 7.9 Rivers not supporting the other indigenous aquatic life and wildlife designated use based on PCB in water column

CHAPTER 8
ASSESSMENT RESULTS: WETLANDS

8.1 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. The known designated use support information is listed in Table 8.1. Michigan uses a multiple category system (i.e., assessment units may be placed in one or more category, see Section 4.11); therefore, wetland acres are not totaled. Details regarding the four listed wetlands follow. Impairment cause and source information for assessment units not supporting designated uses is presented in Chapter 9.

- A 10-acre wetland in the Escanaba River watershed (Marquette County) previously listed as not supporting designated uses was remediated in 1997. The other indigenous aquatic life and wildlife designated use of this wetland was restored by the reduction of nickel contamination from an upstream point source discharge.

- A small wetland area in the Grand River watershed (0.25 acres in Jackson County) is listed as having insufficient information to determine if the other indigenous aquatic life and wildlife designated use is supported due to point sources discharges and contaminated groundwater.

- Tobico Marsh (Bay County) is not supporting the fish consumption designated use due to elevated PCB concentrations in carp and northern pike populations. This 680-acre marsh is adjacent to Saginaw Bay.

- Ruddiman Creek Lagoon (21 acres in Muskegon County) is not supporting the fish consumption designated use. This wetland is the subject of a major sediment remediation project that involves the removal of approximately 80,000 cubic yards of sediments contaminated with PCBs, metals, and polynuclear aromatic hydrocarbons.

Table 8.1 Designated use support summary for Michigan wetlands (approximately 5,583,400 total acres). All wetland acres are not entered in the ADB. Wetlands that have specific information are entered into the ADB on a case-by-case basis. No wetlands are listed in Category 1 since comprehensive water quality data and/or information are not available for any locations. N/A indicates that the designated use is not applicable.

Designated Use	Supporting	Insufficient Information	Not Assessed	Not Supporting			
	Category 2	Category 3	Category 3	Category 4a	Category 4b	Category 4c	Category 5
Agriculture	5,583,400	0	0	0	0	0	0
Navigation	5,583,400	0	0	0	0	0	0
Industrial Water Supply	5,583,400	0	0	0	0	0	0
Warmwater Fishery	0	0	5,583,400	0	0	0	0
Coldwater Fishery	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Other Indigenous Aquatic Life and Wildlife	10	0.25	5,583,389.75	0	0	0	0
Partial Body Contact Recreation	0	0	5,583,400	0	0	0	0
Total Body Contact Recreation	0	0	5,583,400	0	0	0	0
Fish Consumption	0	0	5,582,699	0	0	0	701
Public Water Supply	N/A	N/A	N/A	N/A	N/A	N/A	N/A

CHAPTER 9
WATER BODIES NOT SUPPORTING DESIGNATED USES AND CWA SECTION 303(D) REQUIREMENTS

9.1 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 4.11 for a description of the categories). Section 303(d) of the CWA and the USEPA's Water Quality Planning and Management Regulations (Title 40 of the Code of Federal Regulations, 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 source and NPS to restore and maintain the quality of their water resources.

9.2 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 4.12). Each assessment unit may be listed for one or more causes and sources of impairment. The following tables are sorted by cause or source with the greatest geographic extent listed first.

9.2.1 Great Lakes and Connecting Channels

All of Michigan's Great Lakes, bays, and Lake St. Clair are listed as not supporting one or more designated use. Cause and source of impairment information follows:

Table 9.1 Michigan Great Lakes and bays not supporting designated uses listed by cause of impairment.

Cause	Total mi^2
Toxic organics	
PCBs in fish tissue	42,167
Dioxin	41,937
Pesticides	
Chlordane	29,944
DDT	4,397
Metals	
Mercury in fish tissue	31,720
Nutrients	3
Taste and odor	3
Pathogens	4.6 shoreline mi

Table 9.2 Michigan Great Lakes and bays not supporting designated uses listed by source of impairment.

Source	Total mi^2
Atmospheric deposition	42,167
Agriculture	4,373
Contaminated sediment	1,136
Industrial point source discharge	3
Source unknown	3
Collection system failures	3 shoreline mi
Illicit connections	0.6 shoreline mi
Waterfowl	0.4 shoreline mi
Source unknown	1 shoreline mi

All Great Lakes connecting channel miles are listed as not supporting one or more designated use. Cause and source of impairment information follows:

Table 9.3 Michigan connecting channel river miles not supporting designated uses listed by cause of impairment.

Cause	Total miles
Toxic organics	
PCBs in water column	112
PCBs in fish tissue	112
Dioxin	26
Metals	
Mercury in fish tissue	71
Mercury in water column	26
Pathogens	112
Pesticides	
DDT	26

Table 9.4 Michigan connecting channel river miles not supporting designated uses listed by source of impairment.

Source	Total miles
Atmospheric deposition	112
CSOs	112
Source unknown	24

9.2.2 Inland Lakes and Reservoirs

Many inland lakes and reservoirs that do not support one or more designated uses are impacted by atmospheric deposition of mercury and/or PCBs. Specific cause and source of impairment information follows:

Table 9.5 Michigan inland lake and reservoir acres not supporting designated uses listed by cause of impairment.

Cause	Total acres
Metals	
Mercury in fish tissue	230,922
Copper	3,139
Zinc	480
Mercury in water column	86
Toxic organics	
PCBs in fish tissue	141,241
Dioxin	18,569
PCBs in water column	387
Polycyclic Aromatic Hydrocarbons	480
Pesticides	
Chlordane	35,516
DDT	86
Nutrients	6,880
Excess algal growth	1,660
Pathogens	1,089 2 shoreline mi

Table 9.6 Michigan inland lake and reservoir acres not supporting designated uses listed by source of impairment.

Source	Total acres
Atmospheric deposition	295,550
Source unknown	16,991 1.8 shoreline mi
Municipal point source discharges	5,605
Contaminated sediment	5,412
Agriculture	2,978 0.2 shoreline mi
Mine tailings	2,659
Industrial point source discharges	1,992
Unspecified storm sewer	1,129
CSOs	969
Internal nutrient recycling	566
Sewerage discharge in unsewered areas	119
Construction- site clearance	2
Illicit connections	0.2 shoreline mi
Waterfowl	0.2 shoreline mi

9.2.3 Rivers

Many rivers that do not support one or more designated uses are impacted by atmospheric deposition of mercury and/or PCBs. Specific cause and source of impairment information follows:

Table 9.7 Michigan river and stream miles not supporting designated uses listed by cause of impairment.

Cause	Total mi
Toxic organics	
PCBs in water column	34,754
PCBs in fish tissue	14,844
Dioxin	3,124
PBBs	144
Petroleum hydrocarbons	13
Metals	
Mercury in water column	7,179
Mercury in fish tissue	6,884
Copper	34
Lead	13
Chromium	13
Flow alterations	7,632
Habitat alterations	7,028
Pathogens	1,963
Sedimentation/siltation	1,529
Oxygen depletion	1,136
Nutrients	632
Organic enrichment (sewage)	187
Pesticides	
Chlordane	149
DDT	144
Excess algal growth	106
Impairment unknown	63
Thermal impacts	57
Total suspended solids	47
Oil and grease	37
Unionized ammonia	31
Total dissolved solids	19
Aquatic plants	19
Solids (suspended/bedload)	13

Table 9.8 Michigan river and stream miles not supporting designated uses listed by source of impairment.

Source	Total mi
Atmospheric deposition	35,838
Habitat alterations	8,077
Hydromodifications	7,439
Source unknown	4,310
Municipal permitted discharges	1,801
Stormwater permitted discharges	1,768
Agriculture - crop production	1,457
Agriculture - grazing	1,452
Agriculture - animal feeding/handling	1,407
Urban related runoff/stormwater	1,147
Spills and unpermitted discharges	972
Industrial permitted discharges	482
Legacy/historical pollutants	431
Land application/waste sites	369
Natural	136
Boating and marinas	5
Resource extraction	85
Construction	46
Groundwater loadings	19
Turf management	4

9.2.4 Wetlands

Two wetlands, Tobico Marsh (680 acres in Bay County) and Ruddiman Creek Lagoon (21 acres in Muskegon County), are not supporting the fish consumption designated use. Cause and source of impairment information follows:

Table 9.9 Michigan wetland acres not supporting designated uses listed by cause of impairment.

Cause	Total acres
Toxic organics	
PCBs in fish tissue	701
PCBs in water column	21

Table 9.10 Michigan wetland acres not supporting designated uses listed by source of impairment.

Source	Total acres
Atmospheric deposition	701
Groundwater loadings	680
Land application/waste sites	680

9.3 TMDL Development

9.3.1 The TMDL Process

Michigan's Section 303(d) list consists of assessment units that are listed in Category 5. In addition to the information used to determine designated use support (see Section 4.2), several references are used to develop the Section 303(d) list: Title 40 of the Code of Federal Regulations, Parts 122, 123, and 130; USEPA Guidance for Water Quality-Based Decisions: The TMDL Process, April 1991; and New Policies for Establishing and Implementing TMDLs (August 8, 1997, Robert Perciasepe memo to USEPA Regional Administrators).

Development of a TMDL is typically preceded by collection of water quality data by the MDEQ 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 of the MDEQ, and the draft document is public noticed on the MDEQ Calendar for 30 days to allow for public comment. During the public comment period, MDEQ staff holds a public meeting in a community near the impaired water body to describe the TMDL and take comment. 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. Once a TMDL is approved by the USEPA, the water body is removed from

the Section 303(d) list and reclassified as Category 4a. The water body is reclassified as a Category 2 (WQS attained) only after the water quality has been reassessed for the pollutant(s) of concern, and WQS are met.

9.3.2 TMDLs Completed

In 2005, 2006, and 2007, 41 TMDLs were developed and approved for a variety of parameters (Table 9.11). Additional information regarding approved TMDLs is available at http://www.michigan.gov/deqwater under Water Quality Monitoring, Assessment of Michigan Waters, Total Maximum Daily Loads.

Table. 9.11 Number of TMDLs Completed in 2005, 2006, and 2007.

Year	Parameter	Number
2005	Pathogen	7
	Biota	6
	Dissolved Oxygen	1
	Nitrate	1
2006	Pathogen	8
	Dissolved Oxygen	2
2007	Pathogen	5
	Biota	6
	Dissolved Oxygen	3
	Phosphorus	2

9.3.3 TMDL Schedule

Assessment units are prioritized for TMDL development considering the existing TMDL schedule (i.e., the number of TMDLs currently scheduled for each year), Michigan's five-year rotating watershed cycle (Figure 3.1), available resources to complete TMDLs, data and supporting information quality and quantity, complexity of the problem and severity of the pollution, and the USEPA's recommendation to develop TMDLs within 13 years of listing.

The number of TMDLs projected to be developed in 2008 and over the next 13 years is 4336 (Table 9.12). This table was generated by counting the number of Category 5 causes for an assessment unit; therefore, some TMDLs may be double counted (i.e., an assessment unit may have two causes, such as PCB in water column and PCB in fish tissue, that would be handled under one TMDL but are counted twice in this table). The number of TMDLs scheduled appears to have increased dramatically compared to previous IRs and the number of TMDLs completed. However, this discrepancy is a result of the MDEQ's updated assessment methodology and assignment of assessment unit geographic extent (see Section 4.10). In many instances, TMDLs completed contain multiple assessment units.

TMDLs for organic chemicals with atmospheric sources (e.g., PCBs, chlordane, DDT, and dioxin) are generally scheduled starting in 2008. Discussions are underway to address how to best approach TMDL development for waters impaired primarily by atmospheric sources of mercury and PCBs. Most will likely be addressed by a common approach; therefore, a majority of these TMDLs are scheduled for development in 2011 (mercury) and 2010 (PCBs).

Table 9.12 Projected number of TMDLs per year.

Year: Number	Year: Number
2008: 129	2015: 8
2009: 50	2016: 18
2010: 2279	2017: 22
2011: 940	2018: 17
2012: 228	2019: 3
2013: 76	2020: 0
2014: 543	2021: 23

9.3.4 Changes to the Section 303(d) List

Modifications to the 2006 Section 303(d) list to create the 2008 Section 303(d) list are provided in Appendix D. This list reflects the addition of 581 listings since the 2006 IR. This value was generated by counting the number of Category 5 causes for an assessment unit; therefore, some TMDLs may be double counted (i.e., an assessment unit may have two causes, such as PCB in water column and PCB in fish tissue, that would be handled under one TMDL but are counted twice in this value). Forty-three water body IDs were removed from the 303(d) list since the 2006 IR. Transition from the Michigan developed Water Body System to the USEPA ADB, including georeferencing using the National Hydrography Dataset, renaming using a 12-digit HUC-based naming convention, and including all river miles rather than perennial river miles only, resulted in changes in the geographic extent of some records.

CHAPTER 10
PUBLIC PARTICIPATION IN THE IR

10.1 Introduction

The MDEQ 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 the MDEQ's response.

10.2 Request for Data

The MDEQ, WB, requested ambient water quality data (chemical, biological, or physical) that was obtained by other governmental agencies, nongovernmental organizations, or the public for Michigan surface waters since January 1, 2005. All water quality data submitted to the MDEQ, WB, before July 9, 2007, was evaluated according to the MDEQ's assessment methodology (see Chapter 4) and potentially used to help prepare this IR. This request was published on the MDEQ's calendar on April 30, May 14, May 28, June 11, and June 25, 2007, and e-mailed to key individuals in the MDNR's Fisheries Division, MDA, Michigan Department of Transportation, United States Forest Service, USFWS, and USEPA. Data were received from the following organizations: Clinton River Watershed Council, River Raisin Watershed Council, Woldumar Nature Center, Tip of the Mitt, Sierra Club, Institute for Fisheries Research, and United States Forest Service.

10.3 Public Notice of Draft Assessment Methodology

A draft version of Chapter 4, the assessment methodology, was made available on the MDEQ's Web site for public review and comment. This announcement was published on the MDEQ's calendar on July 9, July 23, and August 6, 2007. Public comments to be considered in the development of Chapter 4 were due August 9, 2007; however, no comments were received.

10.4 Public Notice of the Draft IR

A draft version of this IR was made available on the MDEQ's Web site for public review and comment from January 28 through February 25, 2008. This announcement was published on the MDEQ's calendar on January 21, February 4, and February 18, 2008.

The MDEQ recognizes the importance of public comments and thanks individuals and organizations that provided input, expressed water quality concerns, or posed questions.

Requests for clarification of the draft appendices and additional georeferencing data that was not included in the draft appendices were received via phone from Matt Meersman, Southwest Michigan Planning Commission; Matthew Groves, ENSR; Natalie Trotter, Tetratech; and Molly Wade, City of Ann Arbor. Concerns from Bruce Jones regarding Saginaw Bay were heard via phone.

The following section summarizes the MDEQ response to public comments pertaining to the Draft 2008 IR. Copies of public comments, generally in their entirety, are presented in Appendix F.

Comment #1:
The value listed for the area of Crystal Lake, Benzie County, in Draft IR Appendices is questionable (Daniels). How can we obtain the GIS layer for the 10- and 12-digit HUCs and the layer of Assessment Units from the MDEQ (Huron River Watershed Council)?

Response:
Georeferencing for the 2008 IR was completed using USGS's National Hydrography Dataset (NHD) 1:100,000-scale data. This dataset is used because it provides consistent statewide coverage. The lake acreage for Crystal Lake, Benzie County, using 1:100,000-scale data is 9,668 acres.

In the future, the MDEQ may move to using higher resolution data (1:24,000-scale). At this time, using higher resolution data, Crystal Lake is 9,874 acres (in other words, the MDEQ recognizes that lake acreage values may change).

As the commenter demonstrated, there may be quite a range in reported lake area depending on the source, methods, etc. The USEPA advocates the use of the NHD for consistent Sections 305(b) and 303(d) reporting. The MDEQ recognizes that the measurements of water bodies reported in the IR are the best estimates available on a statewide basis.

The 12-digit HUC layer is available at http://datagateway.nrcs.usda.gov/. The 10-digit HUC layer can be derived by dissolving 12-digit HUC data. NHD datasets can be downloaded at http://nhd.usgs.gov. Georeference data for specific assessment units or watersheds are available upon request.

Comment #2:
Names and physical characteristics should be corrected to reflect definitions familiar to the watershed (Daniels, Alliance for the Great Lakes, Sierra Club, Ogar, Sagady). Additional comments regarding specific naming and mapping questions within the Crystal Lake watershed were presented (Daniels).

Response:
Names and maps were generated using NHD information (see response to Comment #1) as a starting point. Additional information was added by hand for instances where all river segments in a 12-digit HUC were unnamed (e.g., records that were previously named "miscellaneous waters in HUC" were given general names). At this time, it is an impossible task to add naming detail by hand to each of the approximately 6,900 records above and beyond the information provided by the NHD. In addition, we are unable to provide the level of detail requested for the Crystal Lake watershed in the maps above and beyond USGS's NHD 1:100,000-scale data. Requests to modify NDH information can be submitted to USGS directly at http://nhd.usgs.gov/.

Comment #3:
An easily viewed map and common names are needed to make the 2008 list more accessible to the public (Alliance for the Great Lakes, Ogar, Sagady).

Response:
The MDEQ agrees that a mapping application is an ideal way to present the extensive information presented in the IR appendices. Unfortunately, maps were unable to be included in the draft report. Several descriptive maps for rivers are included in this final IR (see Figures 7.1 through 7.9). It is the MDEQ's intention to continue working on mapping applications of IR data that will be accessible to the public. As discussed in Section 1.1 of this IR, Michigan underwent extensive data management changes to prepare the 2008 IR. All data (i.e., records) were transferred from the Michigan developed Water Body System to the USEPA ADB. During this migration, records were georeferenced using the NHD and renamed using a 12-digit HUC-based naming convention (a crosswalk table providing the old water body identification numbers and the corresponding new assessment unit identification numbers is provided in Appendix E). These data management changes advanced Michigan's mapping capabilities for Section 305(b) and Section 303(d) listings. In addition, use of the ADB makes Michigan's IR listings compatible with the USEPA's national reporting system. See also response to Comment #2.

Comment #4:
Because the MDEQ's water database people mixed the table displays of Categories 5, 4a, 4b and 4c together, it is impossible to easily determine which streams and rivers are the ones to be newly condemned to Category 4c and non-accountability for fish and biotic damage by drain commissioners (Sagady).

Response:
Michigan underwent extensive data management changes to prepare the 2008 IR as discussed in Section 1.1. As a result of this transition, Michigan has a true multiple category system. In other words, each water body (e.g., lake or stream segment) has a unique identifier with all applicable designated uses associated with it in the ADB. Previously, a water body often had multiple identifiers, each one associated with a different designated use. To better illustrate the multiple category system, the MDEQ revised the appearance of the IR Appendices. All designated uses, support determinations, and associated information are displayed for each assessment unit. This extensive dataset can be displayed in a myriad of ways. Queries of the ADB are available upon request.

Comment #5:
The use of MDEQ's rapid bioassessment procedure in small tributaries that possess excellent water quality and contain high numbers of sensitive macroinvertebrates but limited biodiversity leads to inappropriate designations of poor or fair (Daniels).

Response:
The development of P51 metrics included the use of first order coldwater streams to establish reference conditions. In addition, the MDEQ considers all available biological assessments (e.g., fish and macroinvertebrate communities, and targeted and probabilistic study designs), which are evaluated using the assessment methodology (Chapter 4) and potentially used to determine designated use support. This includes information received as part of the public participation process that may have been collected with methods other than P51.

Comment #6:
There should be a provision for a watershed to "test out" of not supporting designations (Daniels).

Response:
Section 4.13 Delisting Category 5 Assessment Units addresses the conditions that must be met to move a water body out of Category 5.

Comment #7:
All available water quality data should be accessed for complete assessment (Daniels). We would like to receive information about the data collection conducted by MDEQ for all of the listings in this draft IR, preferably receiving copies of the reports generated from the data gathering efforts (Huron River Watershed Council).

Response:
The MDEQ considers data and information collected and submitted by the MDEQ, its grantees and contractors, other agencies, and the public (including volunteer monitoring groups). Sources of data and information are described in Section 4.2 of this IR. Michigan Surface Water Information Management System (MiSWIM) is available at http://www.michigan.gov/deqwater by clicking on MiSWIM, and is a useful application to obtain MDEQ data. In addition, many MDEQ reports are available at the same Web site under Water Quality Monitoring. Specific reports or data are available upon request or MDEQ technical reports are available from the Library of Michigan, Government Documents, Technical Services - 3rd Floor, Michigan Library and Historical Center, 702 West Kalamazoo Street, Lansing, Michigan.

Comment #8:
Commenter does not fully understand the designated use interpretations of HUC 040601040305 (Crystal Lake watershed). Commenter provides specific questions regarding total and partial body contact, fishery, fish consumption, and navigation designated uses (Daniels).

Response:
Two beaches (Beulah and Bellows) have insufficient information to determine total body contact designated use support. See Figure 4.2 of this IR to fully understand the data requirements for this designated use. Beulah Beach and Bellows Beach were monitored in 2001 and in 2004. Monitoring data for both years showed that bacteria levels met WQS most of the time---only two WQS exceedances were reported for Beulah and three for Bellows. These beaches have not been monitored since 2004, which is why the MDEQ reported the status as Insufficient Information. The MDEQ delegates the decision of which beaches to monitor to the LHD. Funds are limited for beach monitoring and the LHD has selected beaches for monitoring that reported more WQS exceedances and have more beach visitors per year.

Warmwater and coldwater fisheries are listed as not assessed for Crystal Lake. Section 4.5.2.1 discusses the assessment methodology for the fishery designated uses. The MDEQ does not have specific assessment techniques to determine designated use support using biological communities in lakes. The assessment methodology for the following designated uses is explained in Section 4.4: Agriculture, Navigation, and Industrial Water Supply. The assessment methodology for the fish consumption designated use is explained in Section 4.8. See also Section 4.3 of this IR, Determination of Designated Use Support, for additional information. All "not assessed lakes" (NAL) were erroneously listed for "Public Water Supply" rather than "Industrial Water Supply" in the naming convention. This error will be corrected in the final Appendices.

Comment #9:
The map for the Upper Grand River watershed included in draft Appendix A contains an error. Will maps of TMDL sites or surveyed drains be included in the final report? (Berry)

Response:
It appears that Ionia, Clinton, and Shiawassee Counties were mislabeled on the draft map for HUC 0405004: Upper Grand. This error is corrected in the final Appendix.

Extensive data management changes that occurred to prepare the 2008 IR (data transfer to the USEPA ADB and georeference using the NHD) advanced Michigan's mapping capabilities for Section 305(b) and Section 303(d) listings. The MDEQ agrees that a mapping application is an ideal way to present the extensive information presented in the IR appendices. Unfortunately, maps were unable to be included in the draft report. Several descriptive maps for rivers are included in this final IR (see Figures 7.1 through 7.9). It is the MDEQ's intention to continue working on mapping applications of IR data that will be accessible to the public. Unfortunately, we do not have the capability to map designated county drains at this time since statewide georeference data or a comprehensive list are not available. The MDEQ continues to work to make Sections 305(b) and 303(d) listing information more complete and accessible by including maps.

Comment #10:
We object to the 2015 timing of the Mitchell Creek TMDL and request a pull ahead to 2008 in light of the threat to public health, the presence of a septage disposal site and cow feed lot in the watershed, and the finding by Three Lakes Association that 17 nearby creeks all met state *E.coli* standards.

The listing is in error with respect to creek length. The creek length should be listed as 1.41 miles not 1.14 miles. The MDEQ *E.coli* monitoring study reported on September 26, 2007 includes six (6) stations. The distance from station US-1 to DS-M is 1.41 miles as determined by GPS coordinates (Termaat, Milton Neighbors, and others).

Response:
The MDEQ is sensitive to the concerns of the Milton Neighbors with regards to potential exposure of citizens to E. coli at levels that exceed the WQS. Unfortunately, many such sites exist statewide as evidenced by the number of water body segments listed for E. coli TMDL development between 2008 and 2021, including 4.6 miles of Great Lakes shoreline, 67 miles of the connecting channels (e.g., St. Marys and Detroit Rivers), 1,089 acres of inland lakes and reservoirs, and 1,963 miles of streams and rivers.

The scheduling of a TMDL takes into consideration many issues, including the existing TMDL schedule (i.e., the number of TMDLs already scheduled for each year), Michigan's five-year rotating watershed cycle (Figure 3.1), available resources to complete TMDLs, data and supporting information quality and quantity, complexity of the problem and severity of the pollution, and the USEPA's recommendation to develop TMDLs within 13 years of listing.

Monitoring in preparation for TMDL development, when appropriate, is generally scheduled during the appropriate basin monitoring year. The upcoming basin monitoring years for the Mitchell Creek watershed are 2008, 2013, and 2018. The TMDL is generally scheduled two years following monitoring.

The projected schedule for TMDL development is described in Table 9.12 of the draft 2008 Sections 303(d) and 305(b) IR, as follows:

TMDL Year	*Number of TMDLs*
2008	*129*
2009	*50*
2010	*2279*
2011	*940*
2012	*228*
2013	*76*
2014	*543*
2015	*8*

The MDEQ staff and its contractors are generally able to complete a maximum of 15 TMDLs per year given its current resources. Although many of the water body segments in the above schedule may be combined into a single TMDL, thereby reducing the apparent TMDL burden, in general, there is little capacity before 2014 to develop additional TMDLs. Due to the TMDL development load before 2014 and the next scheduled monitoring cycle for the Mitchell Creek watershed of 2013, a proposed date of 2015 was chosen for TMDL development (e.g., two years following the scheduled basin monitoring).

There are two phases to restoring an impaired water body identified on the Section 303(d) list: TMDL development and TMDL implementation. TMDL development serves the primary purpose of identifying the pollutant reductions necessary to meet WQS. The TMDL does not describe specific actions that must occur to achieve WQS nor does extensive monitoring necessarily precede TMDL development. Monitoring is typically conducted prior to TMDL development to confirm WQS exceedances; however, due to limited monitoring resources, this monitoring is typically not an in-depth identification of all potential sources. The monitoring that has been conducted, to date, on Mitchell Creek is sufficient to develop a TMDL, although more extensive monitoring will likely be conducted two years prior to the scheduled TMDL.

The point at which actions occur to restore the designated use of an impaired water body following TMDL development is TMDL implementation. TMDL implementation may be initiated at the local level, and may include more extensive monitoring to identify sources and the extent of the water quality impairment, measures to educate those in the watershed about the impacts of their actions on water quality, and actions to control certain sources. These actions are often achieved with the assistance of state and federal grants and can occur without an established TMDL. Due to the limited state resources to develop TMDLs, local efforts to remedy a water quality impairment prior to TMDL development are encouraged and MDEQ staff will work with local stakeholders in this effort, to the extent our resources allow.

In summary, the MDEQ does not support advancing the Mitchell Creek TMDL from 2015 to 2008 for the reasons described above; however, MDEQ staff will be glad to work with the local citizenry to develop a strategy to address the water quality impairment in Mitchell Creek prior to TMDL development.

Georeferencing has been changed to reflect a stream length of 1.41 miles.

Comment #11:
The draft IR adds approximately 60 new listings of water bodies and waterways that are not supporting designated uses due to the presence of PCBs in the water column or in fish tissue. We would like to know what data has been collected to prompt this significant addition to the IR. Why do some water bodies have TMDLs scheduled for PCBs and mercury, while the designated use of fish consumption is not assessed for the vast majority of other water bodies and waterways? Will the MDEQ be developing ~60 TMDLs for PCBs in 2010 or will there be one umbrella TMDL? (Huron River Watershed Council)

Response:
Substantial assessment methodology and designated use support summary report modifications were made in the 2008 IR based on consideration of available information. These changes are discussed in Section 4.14, Assessment Methodology Changes, of this IR. One of these changes pertains to the evaluation of PCB data. For the 2008 IR, water column PCB concentration data were evaluated to make other indigenous aquatic life and wildlife designated use support decisions. Previously, water column PCB concentration data were only used to make fish consumption designated use support decisions. In many instances the additions to the 2008 Section 303(d) list using PCB data reflect the inclusion of the other indigenous aquatic life and wildlife designated use support as not supporting for a water body that was already listed for not supporting the fish consumption designated use based on PCB water column data.

Only water bodies with sufficient site-specific mercury and/or PCB data are included on the Section 303(d) list. Details of the assessment methodology are presented in Chapter 4 of this IR. The MDEQ is currently developing a strategy for the PCB TMDLs scheduled for 2010. It has not been decided if the TMDLs will be handled together or separately.

Comment #12:
AUID: 040900050105-08 is listed as "miscellaneous waters" and also as a 156-acre freshwater lake. It appears to be a stretch in the Proud Lake Recreation Area. The AUID matches with a reach u/s of Dawson Rd. from the 2006 report. Is this the same listing or is it a new one for an unnamed lake? (Huron River Watershed Council)

Response:
See response to Comment #2. This AUID has been renamed "Includes: Huron River u/s to Hubbell Pond" and corresponds to the following 2006 WBIDs: 061203U (Huron River Watershed) and 061206U (Dawson Rd. u/s 2 miles). The former WBID 061206U corresponds to AUIDs 040900050106-05 and 040900050105-08 (both of these AUIDs also have attributes from WBID 061203U Huron River Watershed).

Comment #13:
12-digit HUC: 040900050109 should be listed as Nichwagh Lake rather than Inchwagh Lake (Huron River Watershed Council).

Response:
This error has been corrected.

Comment #14:
What is the data source for the not supporting listing of Horseshoe Lake Drain (040900050301-03) due to sedimentation/siltation, and why has the schedule for TMDL development been moved back one year from 2009 to 2010? This reach was delisted in 2006 and is now being listed again in this IR. We would like to know why (Huron River Watershed Council).

Response:
The Horseshoe Lake Drain has been on the Section 303(d) list continuously since 1998 due to a poor-rated macroinvertebrate community observed in 1997 (MDEQ Report Number MI/DEQ/WB-05/025). A July 2007 reassessment of the biological community confirmed a poor-rated macroinvertebrate community. The TMDL has been postponed until 2010 to allow for additional data collection prior to TMDL development.

Comment #15:
AUID: 040900050109-02 is described in the draft IR as "miscellaneous waters within HUC" but this name should be changed to the waterway's actual name of Yerkes Drain (Huron River Watershed Council)

Response:
See response to Comment #2. This AUID has been renamed "Unnamed Tributary to Nichwagh Lake Outlet (locally known as Yerkes Drain)."

Comment #16:
Strawberry Lake's TMDL for phosphorus that was completed in 2000 indicates that the designated use is threatened, not impaired, and so this listing should reflect that the water body is attaining the use (Huron River Watershed Council).

Response:
Section 303(d) of the CWA requires that states list "threatened" water bodies. The purpose of the 2000 Total Phosphorus TMDL was to provide an in-lake total phosphorus goal that will maintain Strawberry Lake's current water quality and minimize the potential impacts that threaten the lake's water quality due to rapid development and growth in its watershed. The water quality of Strawberry Lake remains threatened and, therefore, assigned Category 4a for that very reason and the fact that it has a USEPA-approved TMDL. Existing and future watershed management plans need to be sure they incorporate, define, and implement strategies that maintain or reduce pollutant loads to the upper Huron River watershed to prevent water quality and designated use impairments to water bodies such as Strawberry Lake. Such implementation and assurances could offset the need to maintain Strawberry Lake as threatened and enable the lake to be redefined as supporting (i.e., Category 2).

Comment #17:
AUID: 040900050309-05 is described in the draft IR as "miscellaneous waters within HUC" but this name should be changed to the waterway's actual name of Honey Creek. Also, while Honey Creek is listed as a 12-digit HUC (04090050308), the impaired AU appears to be (mis)placed in a different HUC (040900050309). Please clarify the location of the impaired reach (Huron River Watershed Council).

Response:
See response to Comment #2. The AUID 040900050309-05 was renamed "Honey Creek upstream from Huron River Confluence to Wagner Road. Includes unnamed tributary to Honey Creek." This reach is listed as not supporting the total body contact recreation designated use.

Comment #18:
AUID: 040900050402-04 is described in the draft IR as "miscellaneous waters within HUC" but this name should be changed to the waterway's actual name of Malletts Creek. It appears that MDEQ's HUCs lump Swift Run and Malletts Creek drainages together, which is confusing (Huron River Watershed Council).

Response:
See response to Comment #2. This AUID was renamed "Unnamed tributary to Huron River upstream to Packard Road (Mallets Creek)."

Comment #19:
Why is Willow Run Drain (AUID 040900050404-01) expected to attain full designated use for fish consumption in 2014? Is there any data to support this (Huron River Watershed Council)?

Response:
The USEPA required Michigan to use the ADB as part of the listing process for the 2008 IR. The ADB requires all sites listed in Category 4b to specify a date when WQS would be expected to be met. The Willow Run Drain (AUID 040900050404-01) listing was not updated as part of the 2008 listing process. The 2014 date was selected as a place holder until this listing could be more completely reviewed. The Willow Run Drain listing will be evaluated as part of the 2010 IR development process and a more definitive date will be selected.

Comment #20:
The TMDL for *E. coli* at Phillips Lake Camp Dearborn Lake No. 5 Beach (AUID: 040900050105-09) is scheduled for 2019; this impairment should be addressed much sooner than 11 years from now so that the water body can be used for total and partial body contact recreation (Huron River Watershed Council) (Huron River Watershed Council).

Response:
The Phillips Lake Camp Dearborn No. 5 Beach was listed on the 2008 CWA Section 303(d) list as requiring a TMDL in 2019 due to exceedances of the E. coli WQS and impairment of the total and partial body contact recreation designated uses. As noted in response to Comment #10, there are several factors taken into consideration when scheduling an impaired water body for TMDL development, including resources to develop TMDLs and the monitoring cycle year for the watershed of concern.

TMDLs are generally scheduled two years following the appropriate monitoring cycle year to allow for data collection in preparation for the TMDL. The next monitoring cycle year for the Huron River watershed, of which the Phillips Lake Camp Bearborn No. 5 Beach is a part, is 2012. The MDEQ is therefore willing to reschedule the TMDL to 2014.

Comment #21:
The draft IR indicates insufficient information is available to determine whether total body contact recreation is being supported at Independence Lake County Park Beach (AUID: 040900050302-02). Washtenaw County Public Health ought to be able to provide MDEQ with bathing beach monitoring results in order to acquire sufficient information to make a determination (Huron River Watershed Council).

Response:
See Figure 4.2 of this IR to fully understand the data requirements for the total body contact recreation designated use. The MDEQ decided that there was insufficient information available to determine support status for the total body contact recreation designated use because there were less than 16 samples collected per year.

Comment #22:
Barton Pond is the primary source of drinking water for the City of Ann Arbor (AUID: 040900050309-01) and, as such, the City follows state and federal monitoring requirements at its intake. The draft IR states that the designated use of public water supply has not been assessed. We suggest that the MDEQ revisit this item by reviewing the monitoring data collected by the City (and sent to the state). Perhaps a classification of fully supporting is more appropriate here (Huron River Watershed Council).

Response:
In general, comprehensive source water monitoring and reporting is not a compliance requirement for public water supplies at this time. Ambient surface water monitoring data collected as part of the MDEQ's Water Chemistry Monitoring Project were used to determine compliance for the public water supply designated use for most intakes. The MDEQ will reevaluate the IR assessment methodology and data and information used to determine support for the public water supply designated use in 2010.

Comment #23:
The framework for identifying impairments based on fish tissue contamination (Figure 4.4, p. 47) is not sufficiently protective. While Michigan has established a threshold of 0.35 mg/kg mercury in fish as the level of concern, it is clear that moderate consumption of fish at lower concentrations can still lead to exposures exceeding the U.S. Environmental Protection Agency (EPA) reference dose of 0.1 µg/kg-day. For example, a 110 lb. woman of childbearing age regularly eating 8 oz./week of any fish covered in the Michigan Fish Advisory recommendations for inland waters (i.e., the maximum recommended rate) would have mercury exposure 60 percent higher than EPA's reference dose.

Given this, the last diamond decision point in Figure 4.4 ("Is the fish species a top predator?...") should include the possibility of identifying a water as "Not supporting", in particular in the situation where the answer is "Yes." As it is, the framework is confusing, as it implies greater concern about species which are not top predators, when in fact for PBT chemicals, there is concern about exposure via species higher on the food web, due to the higher concentrations that develop through biomagnification (National Wildlife Federation).

Response:
Michigan's fish tissue mercury value development method is similar to the USEPA's development method for the national fish tissue criterion. Michigan's fish tissue mercury value (0.35 mg/kg) was derived using the same exposure scenario used to derive Michigan's HNV

(non-drinking water) WQS of 1.8 ng/L. These exposure factors are described in R 323.1057 of the Part 4 rules. 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. The 15 grams per day value is based on regional fish intake levels.

If fish classified as top predators have tissue concentrations below the fish tissue mercury value, then it is logical to assume that fish lower on the food chain would also be below the value. If other types of fish, like omnivorous fish, have tissue concentrations below the fish tissue mercury value, it is possible that top predators might exceed the value due to bioaccumulation. To be conservative, the assessment methodology makes a distinction between these types of fish. As a result, more weight, not less, is given to higher trophic level fish.

Comment #24:
The protocol outlined in Table 4-3 (p. 48) is insufficiently protective, in particular in the second scenario (for water column data indicating "Supporting" and fish tissue data indicating "Not supporting"). Given in particular that the Michigan fish tissue protocol is not as protective as it could be (based on EPA's reference dose, and the approach of some other state programs), any exceedance of the fish tissue criterion of 0.35 mg/kg should result in an automatic listing, regardless of water column data. In these situations, it could be that site-specific factors (e.g., higher methylation rates, other factors promoting mercury uptake) lead to higher fish tissue concentrations even at relatively low ambient water concentrations. (National Wildlife Federation)

Response:
The 1.8 ng/L value for mercury in the water column is a WQS that is included in the Part 4 rules. The 0.35 mg/kg is Michigan's fish tissue value, which is not included in the rules. When there are conflicting results, we may place more weight on the WQS; however, it is appropriate to evaluate all data and information in this case using BPJ rather than applying independent applicability in the strictest sense. In general, we would need to consider the strengths and weaknesses of each dataset (water and fish tissue) as well as contextual information about the assessment unit in question.

Comment #25:
The Integrated Report only references water column PCB concentrations (Section 4.8.1.2, p. 48), which in comparing to the Human Noncancer Value can lead to a listing decision. However later in the report (e.g., Section 7.3 p. 69), fish contaminant monitoring is discussed. Presumably, fish tissue PCB data are obtained for a number of water bodies during a reporting period, and there is no reason these data (assuming adequate quality) should not be used in making listing determinations. They may in fact already be used in such a manner, but that should be clarified. In either case, the MDEQ should have in place for PCBs a protocol similar to that in place for mercury (with the caveats noted above), as presented in Section 4.8.1 (pp. 45-48). (National Wildlife Federation)

Response:
In addition to PCB water column concentration, the MDEQ uses fish consumption advisories for PCBs. As described in Section 4.8.2.1, for contaminants other than mercury, a water body is considered to not support the fish consumption designated use if the MDCH has issued a site-specific fish consumption advisory for that water body. The MDCH bases their advisories on fish tissue contaminant data collected as part of the Michigan Fish Contaminant Monitoring Program and recommendations made by the MDEQ. Essentially, the MDEQ/MDCH process for developing fish consumption advisories for non-mercury contaminants is used as a proxy.

Using a listing methodology similar to that used for mercury would be redundant. The trigger levels used for PCB advisories are accepted by all the Great Lakes states.

Comment #26:
The draft Integrated Report notes (p. 79) that TMDLs for mercury (for inland lakes) are generally scheduled for 2011, and TMDLs for organic pollutants with significant atmospheric sources (including PCBs) are scheduled for development starting in 2008. However, the text then states that TMDL development for mercury and PCBs will proceed in 2010 and 2011, respectively – the timing should be clarified. (National Wildlife Federation)

Response:
This error has been corrected with the following update to section 9.3.3: TMDLs for organic chemicals with atmospheric sources (e.g., PCBs, chlordane, DDT, and dioxin) are generally scheduled starting in 2008. Discussions are underway to address how to best approach TMDL development for waters impaired primarily by atmospheric sources of mercury and PCBs. Most will likely be addressed by a common approach; therefore, a majority of these TMDLs are scheduled for development in 2011 (mercury) and 2010 (PCBs).

Comment #27:
The document states that a strategy is under development to address waters impaired primarily by atmospheric sources of mercury and PCBs (p. 79). However, while there is earlier discussion of ongoing state and regional efforts to address mercury (Section 2.24.1, p. 30), there is no discussion of similar PCB reduction efforts. Assuming such an initiative is in place (or at least contemplated), this should be highlighted in the same section; alternatively, existing PCB reduction efforts could be briefly summarized. (National Wildlife Federation)

Response:
The discussion of the development of mercury TMDLs was accelerated by the USEPA's proposed option to TMDL development called Category 5m. At this time, there is no such approach proposed by the USEPA for PCBs. See also response to Comment #11.

Comment #28:
On the issue of existing efforts, text on p. 30 should refer to the "Binational Toxics Strategy" rather than "Binational Strategy", and the reference in that section to the Region 5 "Mercury Workshop" should be clarified – presumably it is also referring to Michigan participation in the Region 5 Mercury in Products Phase-Down Strategy (National Wildlife Federation).

Response:
This comment is addressed with the following corrections to the text of this IR: "Binational Strategy" changed to "Binational Toxics Strategy," and "Region 5 Mercury Workshop" changed to "Great Lakes Regional Collaboration - Mercury in Products Phase-Down Strategy."

Comment #29:
The document should clarify whether MDEQ envisions developing individual mercury and PCB TMDLs for individual listed waters, or whether the "common approach" noted on p. 79 implies that a smaller number of TMDLs (e.g., regional or a single state TMDL) will be developed for these water bodies for each pollutant. The fact that waters impaired largely by atmospheric deposition are not separated into a subcategory of Category 5 on the list implies to us that MDEQ is not proposing to delay TMDL development for such waters, while components of a "comprehensive mercury reduction program" are implemented in the meantime, an approach described in recent EPA guidance.

If in fact the state is planning on development of a small number of TMDLs, presumably the state may be looking to other examples (e.g., regional TMDLs in Minnesota and the Northeast Regional Mercury TMDL covering seven Northeastern states) for additional guidance. (National Wildlife Federation)

Response:
At this time, the MDEQ is unable to provide additional details regarding TMDL development for mercury or PCBs. As discussed in response to Comments #11 and #27 and the IR text, the MDEQ is currently developing strategies for both PCB and mercury TMDLs by considering all available information and options.

Comment #30:
Durfee Creek (041000060105-04) in Lenawee County should have the designated uses for Warm Water Fishery and Other Indigenous Aquatic Life and Wildlife changed from Fully Supporting and Insufficient Information, respectively, to Not Supporting due to WQS violations for dissolved oxygen and unlawful discharges of waste from the Vreba-Hoff CAFO. Causes should be listed as organic enrichment (animal waste) and dissolved oxygen and a TMDL should be scheduled as soon as possible (Bean/Tiffin Watershed Coalition).

Response:
Warmwater fishery: Durfee Creek is classified by the USGS as an intermittent stream. As such, it is not expected to have flows during some periods of the year and there will be times when insufficient stream flow exists to create conditions under which the dissolved oxygen standard is attained. The WB has attempted to monitor DO concentrations in Durfee Creek in the past, but has been unable to do so since the stream had no flow present during the critical summer months. Biological data for fish were collected in 2003 and data analysis resulted in a determination that the fish community rated acceptable. The WB believes that there is not enough information to justify a determination of not supporting for this designated use. Based on the additional information that was provided, the warmwater fishery designated use support status will be changed from fully supporting to insufficient information, and the WB will attempt to monitor dissolved oxygen and the fish communities in the future.

Other indigenous aquatic life and wildlife: The MDEQ does not agree with the recommendation that this designated use be listed as not supporting and a TMDL scheduled as soon as possible. Although recent biological monitoring studies conducted on Durfee Creek found acceptable macroinvertebrate communities, the MDEQ believes further macroinvertebrate community assessments still need to be conducted before a designated use support decision can be made. Consequently, Durfee Creek is listed in Category 3 (insufficient information available to determine designated use support) in the 2008 IR.

Comment #31:
Medina Drain (041000060106-03) in Lenawee County should have the designated uses for Total Body Contact Recreation, Partial Body Contact Recreation, Warm Water Fishery, and Other Indigenous Aquatic Life and Wildlife listed as Not Supporting due to E. coli, dissolved oxygen, and organic enrichment violations. TMDLs should be scheduled as soon as possible (Bean/Tiffin Watershed Coalition).

Response:
Total Body Contact Recreation and Partial Body Contact Recreation are currently listed as not supporting due to E. coli with a TMDL scheduled for 2012. At this time, the MDEQ does not plan to change the TMDL date for these designated uses.

The MDEQ does not agree that the Other Indigenous Aquatic Life and Wildlife designated use be changed from Insufficient Information to Not Supporting and that a TMDL should be scheduled as soon as possible. Macroinvertebrate community assessments in 2005 and 2006 indicate acceptable macroinvertebrate communities that were previously assessed as poor. The MDEQ believes further macroinvertebrate community assessments still need to be conducted before a designated use support decision can be made. Consequently, Medina Drain is listed in Category 3 (insufficient information available to determine designated use support) in the 2008 IR.

Medina Drain is classified by the USGS as an intermittent stream. As such, it is not expected to have flows during some periods of the year. There will be times when insufficient stream flow exists to create conditions under which the dissolved oxygen standard is attained. The Warmwater Fishery designated use is currently listed as Not Supporting and has not changed from the Category 4b designation from the 2006 IR. A Category 4b designation is defined as WQS is not attained, but a TMDL is not scheduled because other approved pollutant control mechanisms designed to attain applicable WQS within a reasonable timeframe are in place, such as sediment remediation agreements, contracts, or decisions. Due to current enforcement activities with the Vrebra-Hoff CAFO, a TMDL has not been scheduled. Further monitoring will be completed to determine if there should be any changes to the support status for this designated use.

Comment #32:
Silver Creek (041000060201-02) in Lenawee County should have the designated use for Other Indigenous Aquatic Life and Wildlife changed from Fully Supporting to Not Supporting due to the extreme loss in the mussel population from drain work and agricultural practices. A TMDL should be scheduled as soon as possible (Bean/Tiffin Watershed Coalition).

Response:
The macroinvertebrate community in Silver Creek was assessed in 2005 using P51, finding the overall macroinvertebrate community acceptable. P51 includes sampling for mussels. In the 2005 survey, a Sphaeriidae species was found upstream of Mulberry Road. There was evidence of channel modification by a drain commissioner; however, it was determined that these activities were not recent. The MNFI mussel survey in 2004 found empty shells of Lampsilis siliquoidea (fatmucket) but no live individuals. The MNFI information suggests that this species prefers the habitat that is available in Silver Creek. Based on the available information, the MDEQ maintains a supporting designation for the Other Indigenous Aquatic Life and Wildlife designated use.

Comment #33:
Manure discharges to Rice Lake Drain (AUID: 04100020302-02) and exceedances of the *E. coli* standard were documented by Jackson District staff in 2003. Cryptosporidium was also found in the drain in 2005. No follow up monitoring has been conducted. Rice Lake Drain should be listed for not supporting the total and partial body contact uses, with a TMDL scheduled as soon as possible (Bean/Tiffin Watershed Coalition).

Response:
The source of the manure spills, an improperly operated CAFO manure lagoon system, is currently being addressed under a Consent Order to improve facility operations and prevent spills from reoccurring. Rice Lake Drain will be listed on the 2008 Section 303(d) list as needing further assessment (Category 3) for attainment of the total and partial body contact recreation

designated uses. Monitoring will be considered after the implementation of the terms of the Consent Order by the facility.

Comment #34:
MDEQ must do more to educate the public to get the message out about the significance of the Integrated Report. Public Comment should be actively sought, not passively through a notice in the local newspapers. MDEQ should have a public workshop or other public meeting to explain the 303(d) report, what it means, what data is used, its various elements, and then get input from knowledgeable local resources beyond existing MDEQ databases (Ogar).

Response:
The IR is a culmination of numerous MDEQ activities and programs. Active public participation is included in many of these programs; for example, NPDES, NPS, and TMDL programs as well as local monitoring efforts. The MDEQ's current public participation process for the IR includes several avenues and opportunities for other agencies and the public to provide input; however, the MDEQ does not conduct public meetings throughout the state as this activity has significant resource implications. If specific groups are interested in holding a meeting or providing more input regarding the IR, the MDEQ is willing to assist those efforts.

Comment #35
Section 2.4 Biosolids page 13 "Because biosolids contain nutrients and can therefore have a beneficial use as fertilizer or soil conditioner, recycling often is more effective than incineration or landfilling." It's not clear exactly what is meant by "more effective" - more effective than what, and more effective AT what? Also - the final sentence on that page states that land application of biosolids is a regulated activity. It is not regulated when it is animal waste that is being applied. Concentrated animal feeding operations are now required to have NPDES permits for water discharge - but the land application of manure is not regulated by that permit in the way that the process of land-applying human biosolids is regulated. For example, there is no residuals management plan - and there should be (Sierra Club).

Response:
To clarify the intended meaning, the following modification was made to the sentence of concern: "Because biosolids contain nutrients and can therefore have a beneficial use as fertilizer or soil conditioner, recycling is an effective alternative to incineration or landfilling." As defined in the first sentence of Section 2.4, "The <u>treatment of municipal wastewater</u> generates a residue called biosolids (emphasis added)." The information presented in this section does not apply to animal waste.

Comment #36:
Section 2.17 NPDES page 19: Concentrated animal feeding operations should be added to the list of facilities that require a NPDES permit for water discharge (Sierra Club).

Response:
The following sentence was added to the first paragraph of Section 2.17, National Pollutant Discharge Elimination System, of the IR: "All Concentrated Animal Feeding Operations (CAFOs) in Michigan are also required to obtain an NPDES permit, except for those CAFOs that are granted a "No Potential to Discharge" determination by the MDEQ."

Comment # 37:
Michigan fails to have a placeholder in the evaluation process for all violations of narrative water quality standards (Sagady).

Response:
The MDEQ disagrees with this statement. Narrative standards are used to make designated use support decisions. Section 4.6.1.3, Physical Characteristics, of this IR addresses a variety of narrative standards included in R 323.1050. Additional nonnumeric concepts are included where appropriate; for example, Section 4.6.2.2 Bacteria, Algae, Macrophytes, and Fungi; and Section 4.9.1.2 Taste and Odor. Lastly, it is stated in Section 4.3, Determination of Designated Use Support, "Assessment types or data that are not specifically discussed in this assessment methodology (including uncommon data or unusual circumstances) are considered on a case-by-case basis using best professional judgment (BPJ) and are evaluated consistent with WQS." Additional narrative standards would be addressed under this provision.

Comment #38:
In the 2006 report, MDEQ designated 3263 miles of rivers and streams under Category 4c, which means the fish and biotic communities are impaired because of so-called "management" through channelization by drain commissioners. Allegedly, no pollutant is involved, even through such "management" causes significant turbidity and siltation that destroys aquatic habitat for fisheries and beneficial aquatic organisms. Michigan has a rule against causing excessive turbidity and siltation in its narrative water quality standards. Many southern Michigan rivers are choked with turbidity from poor practices from agricultural and development sources. But Michigan isn't showing this to be impaired water quality from a pollutant for thousands of river and stream miles in Michigan which have these impairments.

In year 2008, MDEQ proposes to designate over 6900 miles of rivers and streams under Category 4c to be the playland for county drain commissioners to create agriculture and development sewers out of Michigan's streams and rivers---- more than a doubling from year 2006 (Sagady).

Response:
As described in Sections 4.14, Assessment Methodology Changes, and 7.5, Designated Use Support Summary of the Rivers Chapter, the MDEQ has changed from reporting only perennial river miles to all river miles. This change resulted in the inclusion of additional mileage in some records. Many of the additional river miles included in Category 4c are not new listings, per se. In many cases, the geographic extent of existing assessment units in Category 4c was extended to include headwater reaches and small tributaries. These headwater reaches were previously not included in any assessment unit. The geographic extent of these listings will be examined and updated with each subsequent IR.

Regarding the use of Category 4c, the MDEQ has addressed similar comments in the 2006 IR. The MDEQ maintains its position regarding the use of Category 4c. Please refer to Appendix P of the 2006 IR (Edly and Wuycheck, 2006) for detailed response. In addition, Section 4.11, Assessment Unit Assignment to Categories, of this IR contains explanation of the methods used to determine the assignment of Category 4c

Comment #39:
The treatment of exotic species should be addressed in the IR. (The term "exotic species" means any species that is not native to a particular ecosystem, including its seeds, eggs, spores, or other biological material capable of propagating that species. Exotic species which have invaded or been introduced in Michigan waters and established themselves there are "invasive species.")

The IR notes that exotic species have caused “significant and detrimental changes in the Great Lakes ecosystem.” IR at 31. Yet, even though Michigan has acknowledged that exotic species are “pollutants,” the IR fails to (1) include waters impaired or threatened by exotic species in the category of waters requiring a TMDL, (2) identify exotic species as a cause of the impairments or threats, and (3) develop TMDLs to address the impairments or threats caused by exotic species. The Michigan Department of Environmental Quality (“DEQ”) must revise the IR to correct these defects.

Response:
To improve clarity and consistency, the term aquatic nuisance species (ANS) will be used in Section 2.24.2 and throughout this IR. As defined in R 324.3101 of Part 31 of the NREPA, "Aquatic nuisance species" means a nonindigenous species that threatens the diversity or abundance of native species or the ecological stability of infested waters, or commercial, agricultural, aquacultural, or recreational activities dependent on such waters.

As stated in the IR, the MDEQ agrees that ANS continue to have dramatic indirect and direct effects on the Great Lakes. However, MDEQ disagrees with the National Wildlife Federation’s statement that, “The IR indicates that exotic species are preventing compliance with the State’s narrative criterion for exotic species and keeping the state’s waters from attaining designated uses.” At this time, the MDEQ has not identified any specific situations where ANS are a cause of an assessment unit to not support one or more designated uses. While ANS may be present in Michigan water bodies, the presence of these species may be a symptom of an impairment caused by something other than ANS (e.g., a pollutant such as nutrients).

Although the 2008 IR assessment methodology does not explicitly address the issue of ANS, it does not preclude the consideration of ANS in the listing process (see section 4.3) or other programs. In fact, ANS are accounted for in MDEQ’s biological monitoring program and appropriate TMDLs. For example, all species present are included and evaluated as part of the MDEQ’s rapid biological assessment procedure. In the 2001 Lake Allegan TMDL, an unbalanced fish community dominated by carp and channel catfish (87% of the fishery) was cited as a reflection of the hypereutrophic status of the lake. A balanced fishery of no more than 30% carp/catfish was identified as a desired attribute for the lake. Furthermore, the MDEQ does not share the commenter’s claim that Michigan has a narrative standard for ANS.

The MDEQ recognizes the potential for ANS to cause greater problems in the future; therefore, measures are being taken to control and manage ANS. For example, Michigan passed ballast water control legislation in 2005. The MDEQ has implemented a permit program to prevent the introduction of additional ANS by prohibiting the discharge of ballast water. Ongoing control programs are in place to manage sea lamprey reproduction and protect Great Lakes fisheries. In addition, Michigan’s Aquatic Nuisance Species State Management Plan is currently being updated. The Nonindigenous Aquatic Nuisance Species State Management Plan, approved in 1996 as Michigan’s plan under the auspices of the National Invasive Species Act, was last updated in 2002. The purpose of the current update is to summarize accomplishments since the last update and provide guidance for continuing ANS control efforts.

The MDEQ intends to work closely with USEPA and other states to further address this issue.

Comment #40
Michigan currently makes total body contact recreation and partial body contact recreation designated use support determinations for water bodies based on two factors- whether there is the presence of untreated combined sewer overflows or untreated sewage and the results of *Escherichia coli* monitoring. The MDEQ must go beyond these two factors and evaluate damages to recreational uses caused by algae-infested waters and shores. Where nutrients create algal blooms that impair or threaten the recreational use of a beach, the water body should be included on Michigan's Section 303(d) list of waters that do not support their designated uses and require the development of Total Maximum Daily Loads (TMDLs). Saginaw Bay and western Lake Erie should be included on the Section 303(d) list for these recreational use impairments; and the MDEQ should conduct a similar evaluation of other Great Lakes shorelines to include other water bodies on the Section 303(d) list that are adversely impacted by these problems. (Alliance for the Great Lakes, Aruber, Sagady, Sierra Club, Ingels, Ogar)

Response:
The CWA Section 303(d) requires states to identify water bodies that do not attain WQS. As such, the MDEQ uses any data or scientific information for making these determinations that is related to the WQS. The assessment methodology (Chapter 4 of this IR), therefore, does not restrict the MDEQ to making total body contact and partial body contact recreation designated use support determinations based solely on the two factors mentioned - presence of untreated CSOs or untreated sewage, and the results of E. coli monitoring. Section 4.3 of the assessment methodology states that "This assessment methodology attempts to list the main assessment types and parameters that are used to determine support for each designated use; although, there may be exceptions." To clarify this statement, the following modification was made for the final IR: "This assessment methodology attempts to list the main assessment types and parameters that are used to determine support for each designated use; although, there may be additional assessment types and/or parameters that apply on a case-specific basis. In those situations, evaluations are made consistent with WQS and justification for designated use support determination is provided in the ADB."

The MDEQ recognizes that the shoreline deposits of decaying organic matter is a significant problem and may interfere with beach use and access to the water in some places along Saginaw Bay and western Lake Erie. These deposits are also being reported along other Great Lakes shorelines, including Grand Traverse Bay and the eastern shore of Lake Michigan where ambient phosphorus and nitrogen concentrations are very low. Once thought to be caused primarily by the presence of excessive phosphorus, there is growing evidence that the shoreline deposits are the result of multiple factors, including exotic mussels, wind patterns, water levels, shoreline alteration, climate change, development and changes in hydrology in the watershed, and nutrients. Section 5.6 was added to the final IR to provide information regarding this issue.

A careful evaluation of available data and scientific information and a comparison against WQS reveal that there is not enough information to determine whether designated uses are not supported as a result of the decaying organic matter, even though it is widely recognized to be a serious problem. Microorganisms have been identified in the decaying matter; however, the standards apply only to ambient water. Water is routinely monitored at Saginaw Bay beaches and those areas where WQS are not attained have been listed on the 303(d) list. The WQS require that nutrients be limited to the extent necessary to prevent stimulation of plant/algae growths that are or may become injurious to the designated uses. However, it is widely believed that nutrients are only one of the many factors contributing to this problem and the relative importance of nutrients compared with other causes is unclear. The presence of the

shoreline deposits where phosphorus concentrations are significantly less than those in Saginaw Bay indicate that this is a legitimate question. The WQS also require that the state's surface waters not have any "deposits" in "unnatural quantities which are or may become injurious to any designated use." Deposits of decaying organic material occur naturally in aquatic systems, and are frequently observed along the Great Lakes and inland lakes. There is currently no measure to determine what "unnatural quantities" are and the MDEQ does not have enough information from other sites against which to compare deposits along Saginaw Bay to begin to establish that measurement. Any measurement or process used to make such a determination needs to be transferable and meaningful to other areas of the Great Lakes and inland lakes.

Since insufficient information is available to determine that WQS are not met as a result of the shoreline deposits along Saginaw Bay and western Lake Erie, the MDEQ has elected to list Saginaw Bay and western Lake Erie in Category 3 for the total body contact recreation, partial body contact recreation, and other indigenous aquatic life and wildlife designated uses.

The MDEQ plans to work with the research community, other governmental agencies, and the public toward an understanding of the causes/sources responsible and a solution to the shoreline deposit problem, and to obtain the necessary information to determine whether or not WQS are attained.

Please note the MDEQ's decision to not include the Saginaw Bay and western Lake Erie shorelines on the 2008 Section 303(d) list for recreational use impairments does not mean that the MDEQ is taking no actions to protect and enhance the water quality of these water bodies. See the Response to Comment #41 for more information about the MDEQ's actions to reduce pollutant loads to the Saginaw Bay watershed.

Comment #41:
The algae problem in Saginaw Bay and the muck accumulation on its shorelines is unsightly, unpleasant, unhealthy and unsafe. Children and adults are unable to picnic/play at the waters edge or swim in the Bay due to the foul smelling muck; boaters are unable to motor boat or water ski in the Bay. The shoreline muck accumulation is adversely affecting beach marketability. The algae accumulation results in safety issues from direct contact with *E. coli* in the muck as well as from physical entrapment caused by the muck's quicksand-like character. It is unbelievable the MDEQ does not consider the excessive algae and shoreline muck accumulation to be problems. The MDEQ must be in denial. (Vachon, Place, Elftman, Reinhart, Sagady, Pfenninger, Ogar)

Response:
The MDEQ is not "in denial" and completely agrees that the deposits of decaying organic matter along the shore of Saginaw Bay are a serious problem. The LHDs have advised the public to avoid contact with the decaying material as a precautionary measure to address potential public health concerns because there are no available public health-related standards. The MDEQ has and will continue to pursue a number of corrective actions aimed at reducing the quantity of pollutants entering Saginaw Bay. In addition, the MDEQ will continue to work closely with the research community and others to investigate the causes/sources responsible for the shoreline deposits. Several key MDEQ actions that have been implemented or will be implemented to reduce nutrient and other pollutant loadings to Saginaw Bay include:

- *Revisions have been made to the MS4 NPDES permit to reduce the discharge of pollutants to the maximum extent possible. These permits apply to urbanized areas such as Bay City, Saginaw, and Flint.*

- *The MDEQ has placed CAFOs under NPDES permit. The CAFO permits require certain measures be put in place to minimize the discharge of animal wastes to surface waters.*

- *The MDEQ will continue to pursue and/or support legislation to: ban phosphorus fertilizers, limit the amount of phosphorus in dishwater detergents, enact a statewide sanitary code, and develop a numeric WQS for phosphorus.*

- *The MDEQ is continuing to conduct wastewater sanitary surveys to identify areas where there is widespread failure of septic tank/tile fields or illicit connections to surface waters.*

- *Revisions to Part 31 of the NREPA have been established to protect the ecosystem from undergoing further changes due to the introduction of ANS from oceangoing vessels.*

- *Convened a Phosphorus Policy Advisory Committee in 2006 to advise the MDEQ on phosphorus management and control strategies to protect Michigan's surface waters.*

- *Formed the Saginaw Bay Coastal Initiative (SBCI) in August, 2006 to enhance the economic development of the Saginaw Bay coastal area and the quality of its parks, beaches, and other natural areas and improve water quality in Saginaw Bay and its associated waterways. Through the SBCI, the MDEQ and other state agencies will work closely with citizens, local governments officials, multiple regional and federal agencies, and the tribes to achieve economic development and water quality objectives.*

- *Funded and implemented the Conservation Reserve Enhancement Program (CREP) on more than 47,000 acres in the Saginaw Bay watershed to reduce sediment and nutrient inputs.*

- *Provided financial assistance through a state initiative under CREP to exclude animals from over 26 miles of stream banks to reduce sediment and nutrient inputs to Saginaw Bay.*

- *Formed the Saginaw Bay Science Committee Pathogen Work Group to evaluate the potential human health risks associated with potential pathogens that may be present in the algal material on the Saginaw Bay shoreline, and to provide the MDEQ with associated information and recommendations.*

- *Awarded $10.6 million from 1990 through 2007 for 59 grant projects in the Saginaw Bay watershed that have supported the implementation of BMPs at 717 sites, resulting in the following estimated pollutant load reductions: 122,000 tons/year of sediment, 135,000 pounds/year of phosphorus, and 289,000 pounds/year of nitrogen.*

- *Established effluent limitations for phosphorus in NPDES permits issued to municipal and industrial point source dischargers in the Saginaw Bay watershed.*

- *Established CSO control requirements in NPDES permits issued to municipal point source dischargers. Six communities have spent over $143 million to eliminate 52*

untreated CSO outfalls to the Saginaw Bay watershed. There are no uncontrolled CSOs in the watershed; that is, all CSOs receive primary treatment prior to discharge.

Comment #42:
The MDEQ needs to revisit the State of Michigan Phosphorus Reduction Strategy for the Michigan Portion of Lake Erie and Saginaw Bay which has not been updated since 1991 or start over. This Strategy is not an adequate measure to address the serious nutrient and phosphorus problems in Saginaw Bay and western Lake Erie. The MDEQ needs to include Saginaw Bay and western Lake Erie on the Section 303(d) list of waters that do not support their designated uses and require the development of Total Maximum Daily Loads (TMDLs). The MDEQ should move to a TMDL strategy for the Saginaw Bay/Lake Huron nearshore areas to address the nutrient overload (Ryman, du Rivage, Vachon, Place, Elftman, Alliance for the Great Lakes, Sagady, Sierra Club).

Response:
The MDEQ agrees that the State of Michigan Phosphorus Reduction Strategy for the Michigan Portion of Lake Erie and Saginaw Bay needs to be updated. However, we believe it is an adequate alternative plan to achieve a supporting status for the public water supply designated use. Therefore, the acreage not supporting the public water supply designated use in Saginaw Bay will continue to be listed in Category 4b rather than Category 5 in the 2008 IR. The MDEQ also plans to obtain new data to evaluate the support status of the public water supply designated use.

Comment #43:
Saginaw Bay is dying at an extremely fast rate; it has become a cesspool for the entire Saginaw River watershed. Several species of fish (including salmon and steelhead) in Lake Huron are being adversely impacted by the excessive algae and chemical contamination problems that are currently plaguing Saginaw Bay. Exotic shoreline grasses are blocking views of the Bay and impeding navigation. Please start the clean up process immediately. Michigan's elected officials need to secure funds to help restore municipal sewer systems and farmers/ homeowners need to cut back their use of fertilizer and chemicals. Michigan's elected officials need to be held accountable for their lack of action to stop the MDEQ from playing games. (Monto, Ryman, Mayotte, Binkley, Reinhart, Bristow).

Response:
The MDEQ does not agree that Saginaw Bay "is dying at an extremely fast rate," nor has it "become a cesspool for the entire Saginaw River watershed." The Saginaw Bay watershed is one of Michigan's most ecologically diverse areas. It provides vital habitat for millions of migrating waterfowl and songbirds and over 90 fish species. Over 138 endangered or threatened species of fauna and flora find suitable habitat conditions in the Saginaw Bay watershed. The walleye fishery of the Saginaw Bay/River is considered "world class" by many fishermen.

The MDEQ is also well aware that the Saginaw Bay watershed is suffering from water quality problems, including: chemical contamination that has impaired the fish consumption designated use, exotic species invasions, blue green algae blooms in the ambient water that impair the public water supply designated use, shoreline deposits that have negatively affected people's enjoyment of the bay, and elevated E. coli levels in the ambient water that have closed some Saginaw Bay beaches.

The MDEQ and other state agencies are committed to working with citizens, local government officials, multiple regional and federal agencies, and the tribes to protect and improve water quality in Saginaw Bay and its associated waterways. Several of the MDEQ's actions and activities that are part of this water quality protection/improvement effort are described in the Response to Comment #41.

The MDEQ is not "playing games" with the Saginaw Bay watershed. Instead, the MDEQ is committed to monitoring the water quality conditions of the Saginaw Bay watershed and implementing its various water protection programs appropriately to ensure that all designated uses of the Saginaw Bay watershed are supported.

Comment #44:
Did the MDEQ list Saginaw Bay in the draft Integrated Report as not assessed for the total body contact recreation, partial body contact recreation, warmwater fishery and coldwater fishery designated uses due to the water quality data cutoff date of December 31, 2006? (Sierra Club)

Response:
The water quality data cutoff date of December 31, 2006, did not influence the MDEQ's initial decision to list Saginaw Bay in the draft IR as not assessed for the total body contact recreation, partial body contact recreation, warmwater fishery, or coldwater fishery designated uses. Please note that the December 31, 2006 water quality data cutoff date only applies to water quality data collected by the MDEQ and its grantees/contractors and case-by-case decisions to consider water quality data collected after that cutoff date are allowed. As explained in Chapter 4 of the draft IR,, surface water quality monitoring data submitted by the general public or outside agencies in response to the MDEQ Web-based Calendar announcements published on April 30, May 14, May 28, June 11, and June 25, 2007, were also considered. In addition, a special decision was made to consider water quality data collected by the MDEQ and its grantees/contractors for the Saginaw Bay watershed after the December 31, 2006, cutoff date in the designated use support decision making process.

Comment #45:
Millions of gallons of partially or untreated sewage are periodically discharged to the upper reaches of the Saginaw Bay watershed by large and small communities located in Saginaw and Genesee counties. These discharges contain various levels of fecal coliform bacteria, other pathogens and helminths (parasitic, intestinal worms) that are not affected by chlorination. These pollutants are causing the nearshore waters of Saginaw Bay to be unfit for swimming and impairing the public water supply designated use of Saginaw Bay at the Bay City Water Treatment Plant's raw water intake. The Section 303(d) list in the Integrated Report needs to recognize these designated use impairments, and acknowledge that pollutants in the partially or untreated sewage discharges are responsible for causing those impairments. (Laura Ogar)

Response:
MDEQ records do not support the contention that millions of gallons of untreated or inadequately treated sewage are being discharged to the Saginaw Bay watershed by municipalities, including those located in Saginaw or Genesee Counties. Considerable progress in municipal wastewater treatment has been achieved throughout the Saginaw Bay watershed. All CSOs in the watershed are receiving primary treatment (i.e., settling and chlorination). Primary treatment with chlorination of these CSOs is in full compliance with final performance criteria in an NPDES permit, court order, or other enforceable document issued or entered between the MDEQ and the municipal discharger.

The MDEQ acknowledges that sanitary sewer overflows (SSOs) to the Saginaw Bay watershed still occur and additional work needs to be done to eliminate those discharges entirely. However, SSOs to the Saginaw Bay watershed occur infrequently, are low in volume, and enforcement actions are immediately initiated by the MDEQ whenever an SSO occurs.

Where E. coli monitoring data show Saginaw Bay nearshore waters exceed the microorganism WQS set forth in R 323.1062, the MDEQ has included those waters on the Section 303(d) list as not supporting of the total body contact recreation and/or partial body contact recreation designated uses.

There is no evidence to indicate that the public water supply designated use at any drinking water intake in Saginaw Bay (including the Bay City Water Treatment Plant's raw water intake) is not supported due to E. coli, other pathogens, or helminth contamination.

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