

Draft Assessment Methodology for the Water Quality and Pollution Control in Michigan 2008 Sections 303(d), 305(b), and 314 Integrated Report

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 Integrated Report to satisfy the requirements of Sections 305(b) and 303(d) of the federal Clean Water Act.

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

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. 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.

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 areas of concern 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., National Pollutant Discharge Elimination System (NPDES), Nonpoint Source, 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 Integrated Report, which serves as a baseline for the 2008 Integrated Report and is modified using new data and information.
- Fish Consumption Advisories (FCAs) established by the Michigan Department of Community Health (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, 1976 PA 399, as amended.
- 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 Natural Resources and Environmental Protection Act, 1994 PA 451, as amended.

To ensure adequate time for proper data analysis, the MDEQ applies a cutoff date for data considered for the Integrated Report. For the 2008 Integrated Report, 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 Integrated Report. In other words, data collected during the period from January 1, 2005, to December 31, 2006, were considered. Data collected after the December 31, 2006, cutoff date were considered for inclusion in the 2008 Integrated Report 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, 2005). 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, 2002b). 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 data set 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 water quality standards (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.

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, Water Quality Standards, promulgated under

Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended). 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 cold water fisheries (R 323.1100(4-7)). Several specific inland waters are designated and protected as public water supply sources (R 323.1100(8)). In addition, all Michigan waters of the Great Lakes and connecting waters shall meet the human cancer and human noncancer values for drinking water (which is handled under the public water supply designated use).

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 Assessment Database (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 polychlorinated biphenyl (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 exceptions. In those situations, justification for designated use support determination is provided in the Integrated Report.

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.

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 values (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.

This section of the Integrated Report 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. Water bodies listed as having insufficient information will generally be revisited in the correct basin year as resources allow.

1. Designated Uses: Agriculture, Navigation, Industrial Water Supply

1.1 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.

2. Designated Use: Warmwater Fishery and Cold Water 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 cold water fisheries per R 323.1100(4-7).

2.1 Assessment Type: Physical/Chemical

2.11 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 standards per R 323.1064 and R 323.1065, depending on water body type.

2.12 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 standards per R 323.1069, R 323.1070, R 323.1072, R 323.1073, and R 323.1075, depending on water body type.

2.13 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.

2.14 Dissolved Solids

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

2.15 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 standards per R 323.1053.

2.2 Assessment Type: Biological

2.21 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 cold water 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 (-5 to -10). 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 cold water streams using P51 are determined to support the cold water 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 cold water 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 cold water 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 the extent of the affected reach. 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.

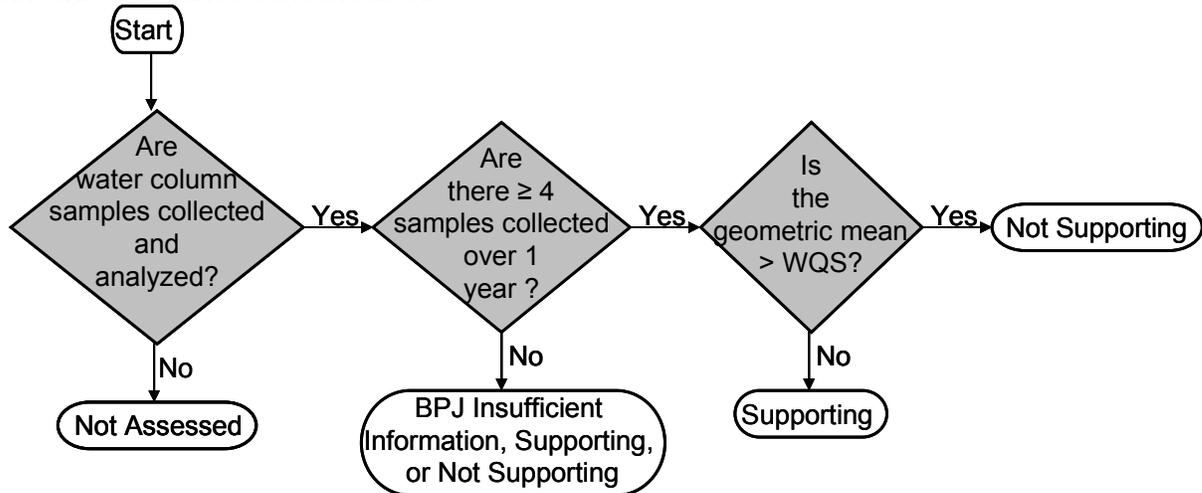
3. Designated Use: Other Indigenous Aquatic Life and Wildlife

3.1 Assessment Type: Physical/Chemical

3.11 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 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 1. Determination of other aquatic life and wildlife designated use support using water column toxic substance concentration.



3.12 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.

3.14 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.

3.2 Assessment Type: Biological

3.21 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 the extent of the affected reach. 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 explanation in Section 2.21).

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 (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.

3.22 Bacteria, Algae, Macrophytes, and Fungi

Site-specific visual observation of bacteria, algae, macrophytes, and fungi is 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.

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:

- *Cladophora* and/or *Rhizoclonium* greater than ten 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.

4. Designated Use: Partial Body Contact Recreation (PBC) and Total Body Contact Recreation (TBC)

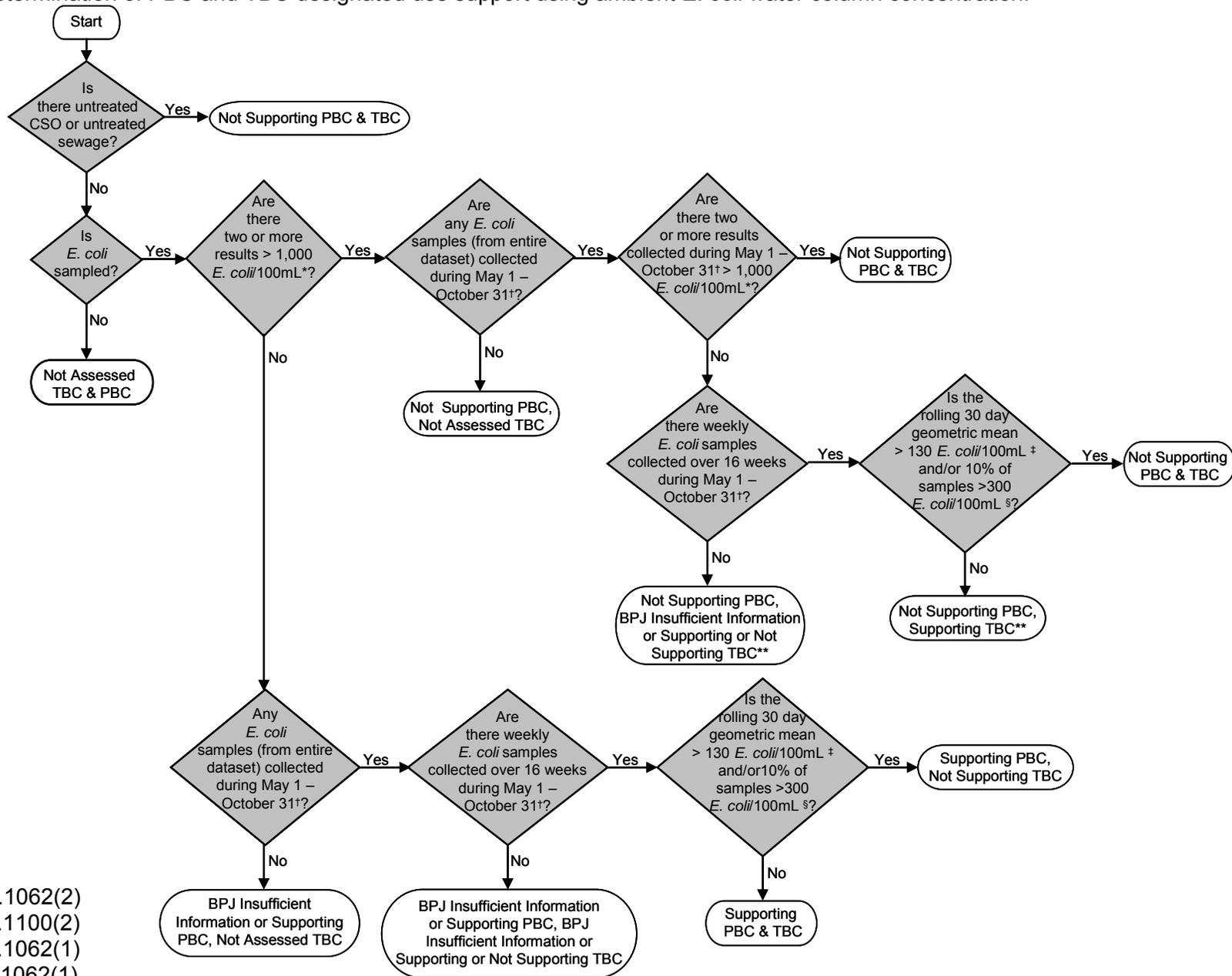
The PBC designated use applies to all water bodies year-round while the TBC designated use applies to all water bodies during May 1 to October 31.

4.1 Assessment Type: Pathogen Indicators

4.11 *E. coli*

Michigan uses ambient *E. coli* concentration to determine PBC and TBC designated use support using Figure 2.

Figure 2. Determination of PBC and TBC 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 TBC and not supporting for PBC if *E. coli* concentrations are low during the TBC recreation season (May 1 – October 31) and high during the nonrecreation season.

5. 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, WQS, in the water column; fish tissue mercury concentration; and FCAs.

5.1 Assessment Type: Physical/Chemical

5.11 Water Column and Fish Tissue Mercury Concentrations

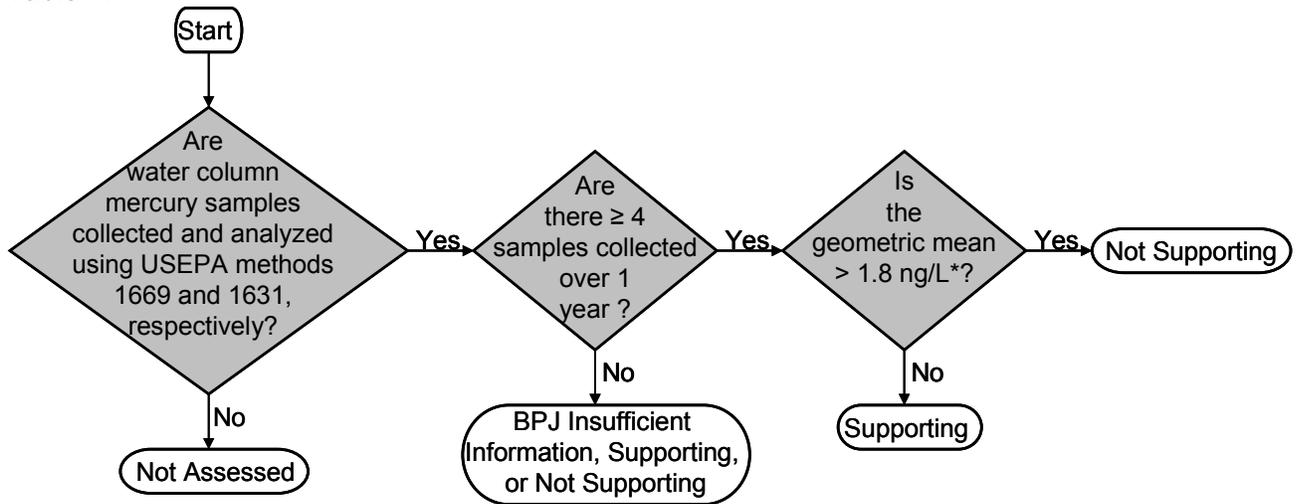
To be conservative, site-specific water column and fish tissue data are used together to determine fish consumption designated use support. Ambient water column mercury concentrations are compared to the human noncancer WQS (1.8 nanograms per liter [ng/L]); and, fish tissue mercury concentrations are 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 United States Environmental Protection Agency's (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 human noncancer 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.

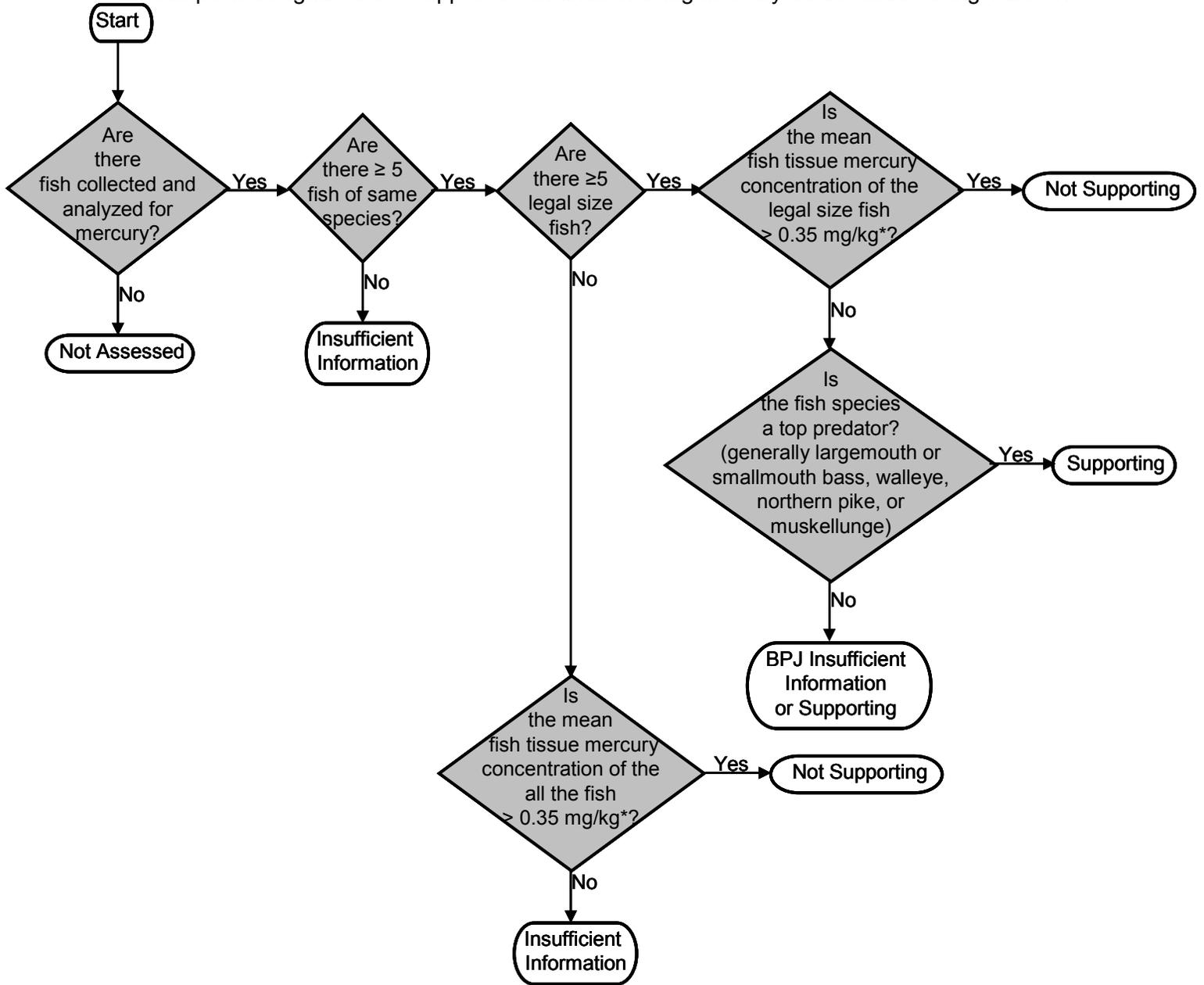
Fish consumption designated use support for mercury is determined by using Figure 3 to make a decision for water column mercury concentration, using Figure 4 to make a decision for fish tissue mercury concentration, and finally using Table 1 to determine overall fish consumption designated use support for mercury using the results from the Figures 3 and 4 decision processes. The overall designated use support for mercury determination from Table 1 is used for the Sections 305(b) and 303(d) reporting process.

Figure 3. Determination of fish consumption designated use support using water column mercury concentration. This figure must be used in conjunction with Figure 4. The final overall fish consumption designated use support determination using mercury data is made using Table 1.



*MWQS human noncancer value for mercury

Figure 4. Determination of fish consumption designated use support using fish tissue mercury concentration. This figure must be used in conjunction with Figure 3. The final overall fish consumption designated use support determination using mercury data is made using Table 1.



*Michigan's fish tissue value for mercury

Table 1. 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 1)	Decision based on mercury fish tissue data (from Figure 2)	Overall fish consumption designated use support for mercury
Supporting	Supporting	Supporting
Supporting	Not Supporting	BPJ Supporting or Insufficient Information
Supporting	Not Assessed/ Insufficient Information	BPJ Insufficient Information or Supporting
Not Supporting	Supporting	BPJ Not Supporting or Insufficient Information
Not Supporting	Not Supporting	Not Supporting
Not Supporting	Not Assessed/ Insufficient Information	BPJ Insufficient Information or Not Supporting
Not Assessed/ Insufficient Information	Supporting	BPJ Insufficient Information or Supporting
Not Assessed/ Insufficient Information	Not Supporting	BPJ Insufficient Information or Not Supporting
Not Assessed/ Insufficient Information	Not Assessed/ Insufficient Information	Not Assessed/ Insufficient Information

5.12 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 (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 data set 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 human cancer value are determined to not support the fish consumption designated use.

5.13 Water Column BCC Concentration other than Mercury and PCB

To determine fish consumption designated use support for BCCs other than mercury and PCB in the water column, ambient water column chemical concentrations are compared to human health values per R 323.1057 using Figure 1 (see section regarding the other indigenous aquatic life and wildlife designated use).

5.2 Assessment Type: Other Public Health Indicators

5.21 FCAs 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 FCA 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 MDEQ.

6. Designated Use: Public Water Supply

Several specific inland waters are designated and protected as public water supply sources (R 323.1100(8)). In addition, all Michigan waters of the Great Lakes and connecting waters shall meet the human cancer and human noncancer values for drinking water (which is handled under the public water supply designated use).

6.1 Assessment Type: Physical/Chemical

6.11 Toxic Substances in Water Column

To determine public water supply designated use support for toxic substances, ambient water column chemical concentrations are compared to human noncancer and cancer values for drinking water per R 323.1057 using Figure 1 (see section regarding the other indigenous aquatic life and wildlife designated use).

6.12 Taste and Odor

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

Assessment Units and Determination of Geographic Extent

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

Streams and rivers are listed in terms of miles. Wetlands are listed in terms of acres. 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.

Ultra low-level PCB monitoring conducted by the MDEQ in the Great Lakes Connecting Channels and selected tributaries indicates that PCB concentrations exceed the WQS (0.026 ng/L) in all waters sampled. Based on these results, all perennial 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.

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 Total Maximum Daily Load (TMDL) is not needed.
 - Category 4a: A TMDL to address the impairment causing pollutant has been approved or established by the USEPA.
 - Category 4b: Other approved pollution control mechanisms are in place and are reasonably expected to result in attainment of the designated use within a practical time frame.
 - Category 4c: Impairment is not caused by a pollutant (e.g., impairment is due to lack of flow or stream channelization).
 - Category 5: Available data and/or information indicate that at least one designated use is not being supported or is threatened, and a TMDL is needed.

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 X 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 X.X) 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 3 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 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.

The following example table, adapted from USEPA guidance, illustrates Michigan's use of a multiple category system.

Table 2. 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 x.x and x.x in Chapter X) 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 (non-pollutant)	S	2, 4c
Assessment Unit 7	S	?	NS	2, 3, 5
Assessment Unit 8	S	NS (non-pollutant)	/	2, 4c, 3*
Assessment Unit 9	-	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. This issue will be corrected over the next five-year rotating watershed cycle through specific record review process.

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. 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.

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 at least as rigorous a data analysis as was originally used to list the water body. Specific instances that justify the removal of assessment units from Category 5 include:

- A TMDL has been developed for all pollutants and approved by the USEPA (assessment unit is placed in Category 4a).
- A corrective, remediation action plan has been approved to be implemented or the problem source(s) has been removed, thereby, eliminating the need for a TMDL (assessment unit is placed in Category 4b or when water quality is reevaluated and it is determined that the designated use is supported, the assessment unit is placed in Category 2 or Category 1).
- The source of impairment for the initial designated use support determination was an untreated Combined Sewer Overflow and updated information reveals that the untreated Combined Sewer Overflow has been eliminated, control plan elements are in place, or the NPDES permit contains an appropriate Combined Sewer Overflow corrective program that has not yet been completed (assessment unit is placed in Category 2, 2, or 4b, respectively).
- 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).
- Reexamination of the monitoring data or information used to make the initial designated use support determination reveals that the decision was either incorrect or inconsistent with the current assessment methodology.
- Reassessment of a 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 U.S. 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 Integrated Report is provided in Appendix X of this Integrated Report.

Assessment Methodology Changes

Extensive organizational changes were made for this Integrated Report assessment methodology. Some of the substantial organizational 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.
- 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.

Additional assessment methodology modifications made based on consideration of available information include:

- Revision of TBC and PBC 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 TBC 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 TBC (more restrictive designated use) to consideration of both TBC and PBC during May 1 through October 31.
- Inclusion of water column mercury data to make fish consumption designated use decisions.

Due to these substantial changes, designated use support summary tables (e.g., Tables x.x and x.x in Chapter X) are not directly comparable to previous Integrated Reports. Transfer of data to the ADB is significant because this update resulted in complete reorganization and renaming of records.

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