Wisconsin's 2016 Water Quality Report to Congress

Integrated Report of Water Quality – Executive Summary

Prepared by the Wisconsin Department of Natural Resources
Division of Environmental Management
Bureau of Water Quality

WISCONSIN
DEPT. OF NATURAL RESOURCES

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Previous reports were published in 2014, 2012, 2010, 2008 (data submittal only), 2006, 2004, 2002, 2000, 1996, 1994, 1992, 1990, 1988, 1987, and earlier. WDNR's earlier documents are available for review at the GEF II building, 101 S. Webster Street, Madison. Later versions are available electronically.

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INTRODUCTION

Wisconsin hosts bountiful natural resources, including a variety of Great Lakes, inland lakes, rivers, streams, wetlands, aquifers, and springs. Every other year the Wisconsin Department of Natural Resources (WDNR) assembles water quality information and reports status and trends to the United States Environmental Protection Agency (EPA), which in turn shares this information with the United States Congress.

This executive summary report highlights the process and results of this 2016 Biennial Water Quality Report to Congress, which was last published April 2014. The Water Quality Report to Congress fulfills reporting requirements under Sections 303(d), 305(b), and 314 of the Clean Water Act.

KEY POINTS

- Wisconsin has made great strides in surface water quality assessment and the assessment program continues to increase the number of assessed waters in the state. Through the combined use of careful study design, systematic assessment protocols, and innovative information technology tools that expedite the assessment and documentation process, more rivers, streams, and lakes have been assessed in this 2016 cycle than in previous cycles. There has been an 85% increase in assessed river and stream miles from 2008 to 2016 (Figure 1).

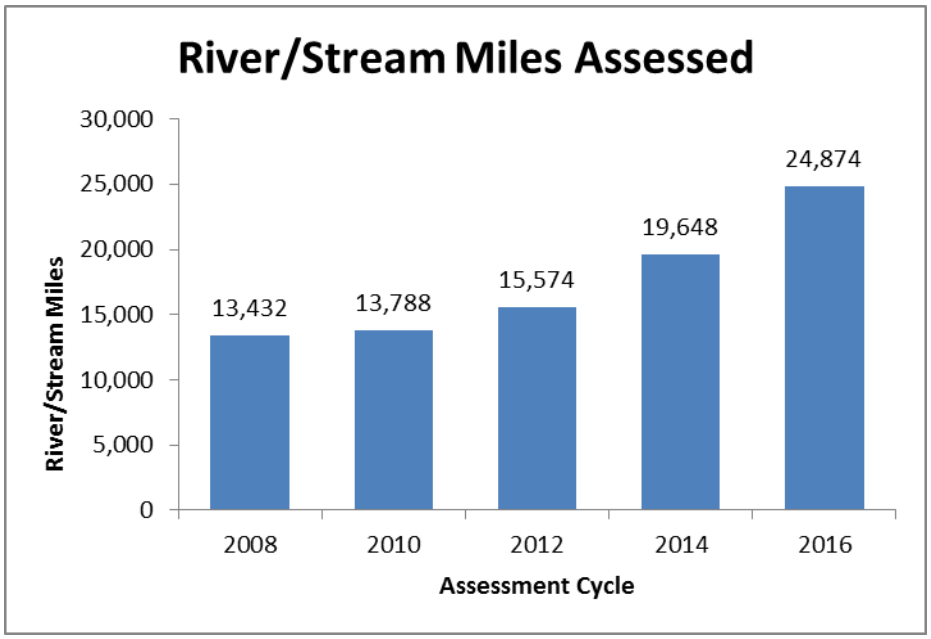

Figure 1. Total river and stream miles assessed during each assessment cycle since 2008.

- The 2016 draft 303(d) impaired waters list has 225 waterbody segments newly proposed for listing. There are 10 waterbody segments proposed for removal from the list. There are 70 listed waters that had a pollutant added and 14 listed waters that had a pollutant removed. The number of proposed new listings is higher than in 2014 (192 waterbody segments); this increase is mostly due to the fact that new parameters (temperature and chronic toxicity due to chlorides) were systematically assessed for all waters in the state with available data.

- The Water Action Volunteers (WAV) Program involves citizen monitors in the collection of stream water quality data that may be used by the WDNR and their partner organizations. The WAV program has grown steadily throughout its 20 year history (Figure 2). In 2015, volunteers monitored a record 751 unique stream sites (making 4,500+ site visits) in 59 counties across the three levels of the WAV program. In addition 150 new volunteers were trained in total phosphorus monitoring protocols. These new monitors, along with returning volunteers, monitored 198 unique stream sites for total phosphorus. The year 2015 also marked a shift to volunteers entering their data in the WDNR's Surface Water Integrated Monitoring System (SWIMS) database directly, which aligns with data management protocols of other volunteer monitoring programs.

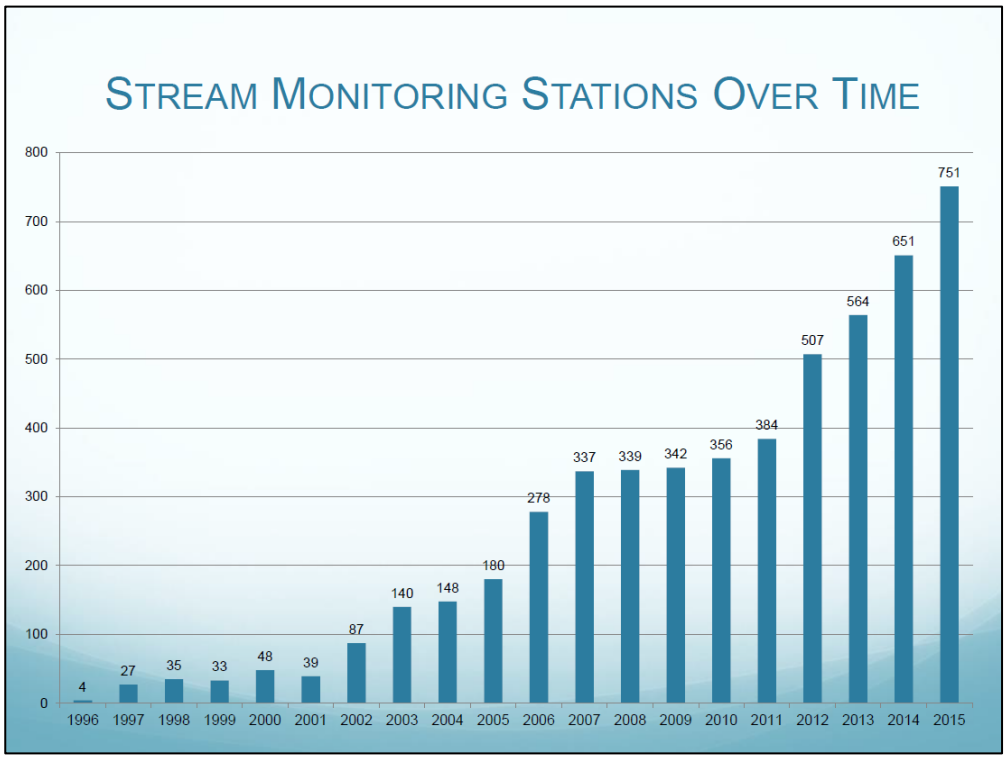

Figure 2. The number of unique river and stream sampling stations visited by WAV program volunteers from 1996 to 2015.

- The U.S. EPA recently developed a new Clean Water Act (CWA) 303(d) Program Vision with an emphasis in prioritizing the work that is most important to meet state water quality goals as states, tribes, territories, and EPA implement CWA 303(d) Program responsibilities with existing resources. In addition to Total Maximum Daily Load (TMDL) analyses the new Vision allows for consideration and use of other tools to achieve applicable water quality standards, including protection plans and alternatives to TMDLs. WDNR continues to work with EPA to develop alternative restoration plans, such a Nine Key Element Plans. The EPA has identified nine key planning elements that are critical for protecting and improving water quality. Plans that reflect the nine key elements help assess the contributing causes and sources of nonpoint source pollution within a defined watershed area and then prioritize pollutant reduction strategies to restore or protect water quality.

- CWA Section 303(d) requires each state to prioritize waterbodies identified on their impaired waters list for TMDL development. During the 2016 assessment cycle a new prioritization framework was developed. Past priority rankings were evaluated to determine if TMDL development could be completed based on available staff and fiscal resources. The primary change in the prioritization process is the incorporation of a systematic and objective modeling analysis that identifies watershed areas at a 12-digit Hydrologic Unit Code (HUC-12) scale experiencing the most ecological degradation and vulnerability to future degradation. Priority areas identified by the model are further screened by WDNR staff experts to remove areas already addressed by a TMDL or alternative restoration plan. The new approach also focuses planning efforts on the two most commonly identified pollutants on the impaired waters list: total phosphorus and total suspended solids.

- Wisconsin recently released a comprehensive Water Quality Monitoring Framework for 2015 – 2020 (Figure 3). The strategic monitoring plan is designed to guide ambient monitoring through 2020 with an updated framework including media-specific studies, protocol inventory, and field procedures that reflect advances in study designs to answer questions aligned with federal and state program requirements and goals.

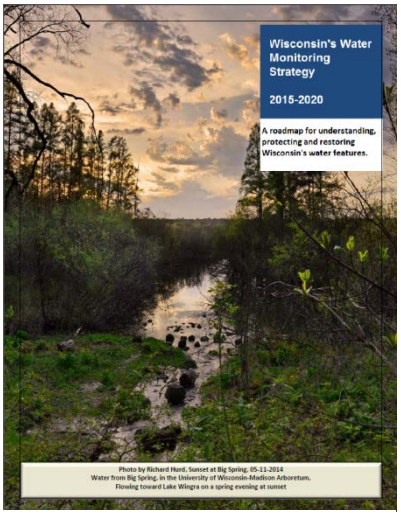

Figure 3. Wisconsin's Water Monitoring Strategy 2015 – 2020. Click to open [PDF].

Water Quality Standards

Designated Uses

As part of water quality standards, each waterbody is assigned a Designated Use. Classifying waters into each Designated Use category involves science that reflects an evaluation of the resource and its natural characteristics. Wisconsin's designated uses are:

- Fish and Aquatic Life: All surface waters are considered appropriate for the protection of fish and other aquatic life. Surface waters vary naturally with respect to factors like temperature, flow, habitat, and water chemistry. This variation allows different types of Fish and Aquatic Life communities to be supported. Five subcategories for fish and aquatic life uses are outlined in s. NR 102.04, Wis. Adm. Code.
- Recreational Use: All surface waters are considered appropriate for recreational use unless a sanitary survey has been completed to show that humans are unlikely to participate in activities requiring full body immersion.
- Public Health and Welfare: All surface waters are considered appropriate to protect for incidental contact and ingestion by humans. All waters of the Great Lakes as well as a small number of inland waterbodies are also identified as public water supplies and have associated water quality criteria to protect human health. Fish consumption use also falls under this category.
- Wildlife: All surface waters are considered appropriate for the protection of wildlife that relies directly on the water to exist, or relies on it to provide food for existence.

Assessment Methodology

Chapter NR 102, Wisconsin Administrative Code, establishes water quality standards for surface waters of the State, and describes the Designated Use categories and the water quality criteria necessary to support these uses. The state is responsible for assigning designated uses and conducting periodic assessments of these uses on individual waterbodies. Implementation of our surface water quality standards is described in various guidance documents, including guidance on assessment of surface water quality data against applicable water quality standards.

WDNR's water quality assessment goal is to use clearly defined and publicly accessible methods for collection and analysis of data to ensure scientifically defensible assessment decisions. Wisconsin's Consolidated Assessment and Listing Methodology (WisCALM) was updated in 2016. A full version of the 2016 WisCALM guidance document is provided on WDNR's webpage.

WisCALM – Year 2016 Changes to Assessment Methodology

- Methods for assessing the Public Water Supply Designated Use were added.
- Corrections and clarifying language was added to Section 4.6 Lake Impairment Assessment: Public Health and Welfare Uses.
- References were added to incorporate the stream/river Natural Community validation process.

- A minor revision of the stream/river total phosphorus (TP) assessment method and associated assessment automation was incorporated in existing guidance.
- Total phosphorus (TP) delisting protocol was incorporated.
- Guidelines for assessment unit delineation were added.

Data Used for Assessment

Data submitted by the public and data collected through WDNR's monitoring program are used for assessments. The monitoring data used to make assessment decisions are stored in the Surface Water Integrated Monitoring System (SWIMS) and the Fisheries Database. Assessment data for the State's Integrated Report are stored in the State's Water Assessment, Tracking and Electronic Reporting System (WATERS). The public can view spatial (or GIS) data and written information about each waterbody using the WDNR's interactive mapping tool, the Surface Water Data Viewer (SWDV), and the searchable water detail pages (http://dnr.wi.gov/water/watersearch.aspx).

Agencies and individuals submitting data for assessments must: meet minimum data requirements, demonstrate that sample collection occurred at appropriate sites, during appropriate periods, and use certified laboratories for sample analysis. If the quality assurance procedures are not adequate, staff may use this data to initiate further investigations by Department staff. If quality assurance procedures are adequate, WDNR may use this data to assess the water for possible impairment listing.

WDNR may assist outside groups in the design and implementation of data quality procedures necessary for data to be used for assessments. WDNR staff will consult with EPA water quality criteria guidance, state Water Quality Standards (WQS), and use professional judgment to interpret the results of field sampling to determine whether or not WQS are achieved. Groups outside of WDNR who regularly collect and submit data to WDNR may work with staff at Central Office to upload data into the SWIMS database to be considered as part of our evaluation and assessment process.

WDNR also supports a Citizen Based Monitoring Program for rivers, streams and lakes. As stated in the WDNR's Water Resources Monitoring Strategy for Wisconsin, "If citizens follow defined methodology and quality assurance procedures, their data will be stored in a Department database and used in the same manner as any Department-collected data for status and trends monitoring defined in the Strategy." Citizen data are currently used for water quality assessments, including broad-scale statewide assessments.

Statewide Designated Use Support Status

The vast number of water resources in the state precludes monitoring and assessing all waters within a reasonable timeframe. WDNR generally prioritizes the collection of water quality data for waters within targeted watershed areas, or waters within areas that are showing degradation or impairment. Over time, additional waters will be monitored, assessed, and updated in the assessment database to ensure the documentation of the state's water conditions are as comprehensive as possible.

WDNR uses four levels of condition in describing a waterbody's current status within the overall water quality continuum (Figure 4). Waters assigned the condition category of "excellent" are considered to be attaining applicable WQS and fully supporting their assessed designated uses. Waters assigned the condition category of "good" or "fair" are also considered to be attaining applicable WQS and supporting their assessed designated uses. Waters assigned the poor condition category may not be attaining WQS or assessed designated use(s). Waters determined to be in poor condition are further evaluated and may be selected for additional monitoring or, if the limited dataset includes overwhelming evidence of impairment (e.g. large magnitude of exceedance), considered "impaired" and added to Wisconsin's Impaired Waters List.

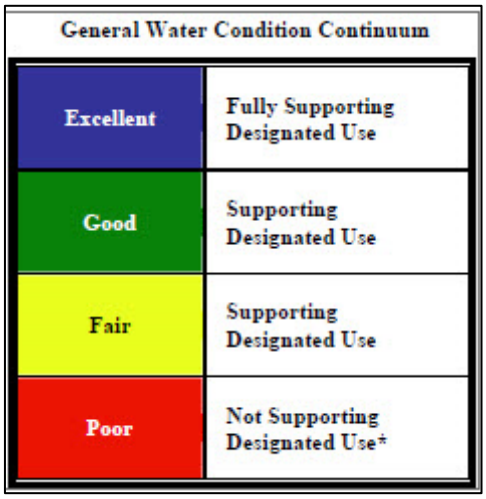

Figure 4. Condition array.

A major goal of the federal Clean Water Act—securing water quality so that our resources are fishable and swimmable—is represented by Wisconsin's designated uses for recreation and fish and aquatic life. A third designated use, public health and welfare, was assessed to a very limited degree. While not an official designated use, fish consumption was also analyzed. Waters are placed in one of the following condition groups, depending on results:

- Fully supporting
- Supporting
- Not supporting
- Not assessed

When water quality criteria for the protection of a designated use are not met, the water is considered "**not supporting**" or "**impaired**". Fish consumption is considered "not supporting" where specific consumption advice is in effect due to elevated contaminants in fish tissue.

River And Stream Assessments for Designated Uses

The state contains an estimated 88,000 stream miles from approximately 54,000 discrete rivers and streams. Nearly 47,000 miles are delineated and documented in the Department's WATERS database, a 12% increase since 2012 (Figure 1). The database contains a majority of the larger streams and rivers in the state.

Fish and aquatic life (FAL) use is the primary assessed use in streams/rivers – 24,876 stream miles (53% of stream miles in the WATERS database) have been assessed for FAL use support (Table 1 and Figure 5). Of the stream

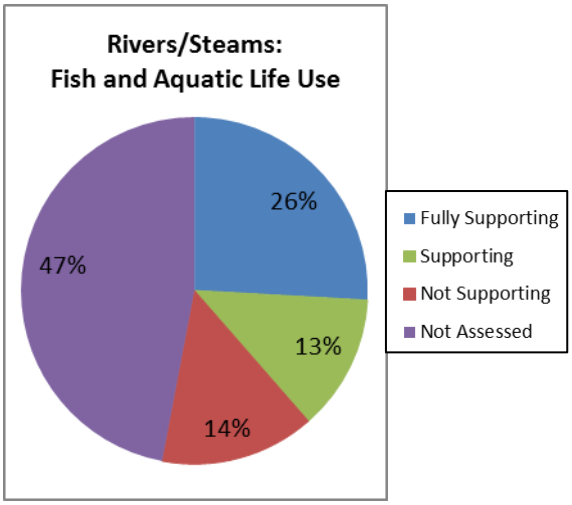

Figure 5. Percentage of river/stream miles by use support for the 2016 Fish and Aquatic Life use assessments.

miles assessed, approximately 73% are supporting FAL uses. The FAL use assessments are primarily based on Indices of Biotic Integrity calculated from macroinvertebrate sample and fish survey data. A very small amount of stream miles have been assessed for fish consumption and recreational uses, as these assessments are often conducted in response to a known problem or specific program need, such as a county health department monitoring program for swimming uses.

Table 1. Summary of river/stream miles assessed and designated use support status.

Use Category	Fully Supporting	Supporting	Not Supporting	Not Assessed	Total Size
Fish Consumption	67	121	1519	45,248	46,954
Fish and Aquatic Life	12,154	5,956	6,765	22,080	46,954
Recreation	4	9	156	46,785	46,954

Lake Assessments for Designated Uses

Recreation (REC) and fish and aquatic life (FAL) uses are the primary designated uses assessed for lakes (Table 2). WDNR assessed FAL use of 822,103 lake acres using a combination of in-lake water quality samples and water clarity data gathered from satellite imagery. Wisconsin's Citizen Lake Monitoring Network data, combined with satellite imagery analysis developed by the WDNR's Bureau of Science Services, contributed greatly to the 2016 assessments. Over 1,200 volunteers sample 800 lake stations each year; this data is extrapolated based on modeling techniques with satellite data to provide assessments for over 6,000 lakes in the state. Based on these assessments, approximately 56% of lake acres are supporting the FAL use (Figure 6).

Table 2. Summary of lake acres assessed and designated use support status.

Assessed Uses	Fully Supporting	Supporting	Not Supporting	Not Assessed	Total Size
Fish Consumption	10,245	18,344	246,564	680,383	955,537
Fish and Aquatic Life	203,650	334,914	283,540	133,433	955,537
Recreation	134,024	1,036	328,441	492,035	955,537

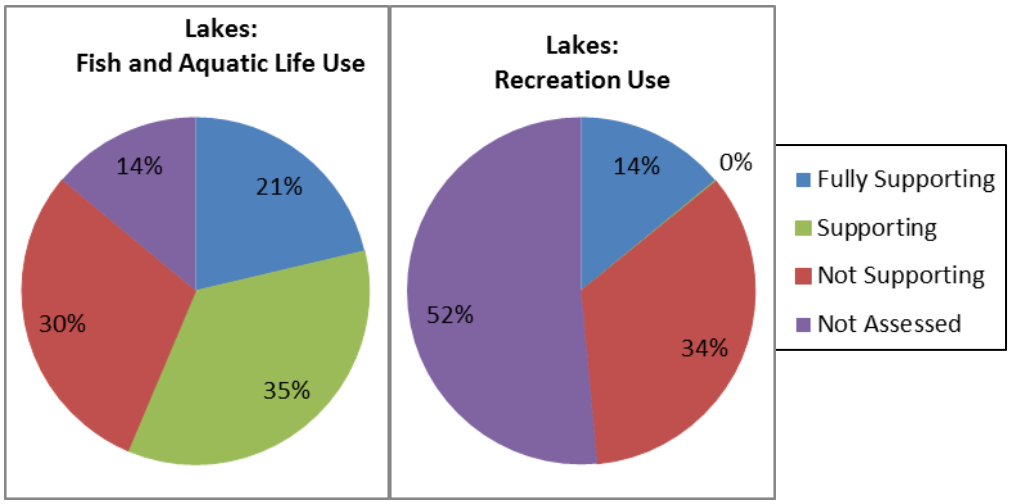

Figure 6. Percentage of lake acres supporting fish and aquatic life use and recreation use.

Impoundment Assessments for Designated Uses

Impoundments are bodies of water created by structures (dams) which hold water either permanently or in a controlled fashion. Many of Wisconsin's large impoundments provide electricity service, controlled through the FERC process. Similar to natural lakes, WDNR primarily assesses the recreation (REC) and fish and aquatic life (FAL) uses for impoundments. Due to landscape and morphological features of impoundments (sediment transport, collection of nutrients and algal debris) a majority of impoundment acres do not support fish and aquatic life use (75,139 acres, 61%) or recreation use (83,663 acres, 68%) (Table 3 and Figure 7). Due, in part, to the accumulation of sediment behind riverine structures and proclivity of pollutants (organic contaminants and metals) to attach to sediment, a large proportion of impoundments (68,545 acres or 55%) do not support fish consumption (i.e., these waters have specific advise that recommend strict limits on the number and type of fish consumed).

Table 3. Summary of impoundment acres assessed and designated use support status.

Assessed Uses	Fully Supporting	Supporting	Not Supporting	Not Assessed	Total Size
Fish Consumption	13,370	9,654	68,545	31,642	123,211
Fish and Aquatic Life	19,174	24,817	75,139	4,081	123,211
Recreation	4,209	65	83,663	35,274	123,211

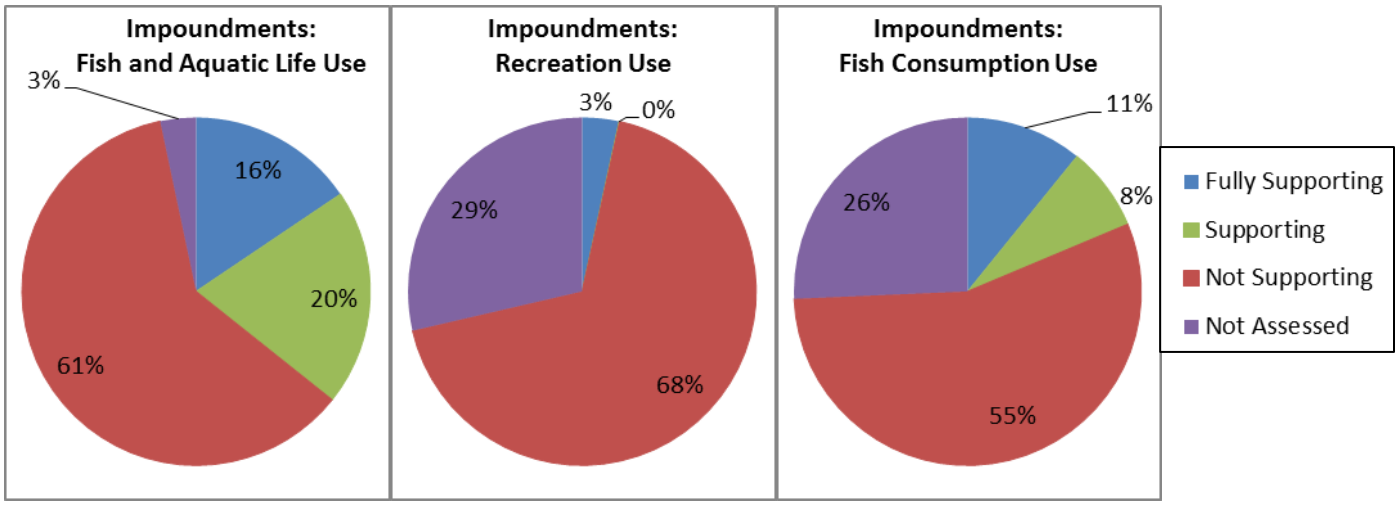

Figure 7. Percentage of impoundment acres supporting three different designated uses.

Beaches Assessments for Designated Uses

Wisconsin's beaches provide wildlife habitat, recreation areas, and tourist destinations. Beaches are especially vulnerable to agricultural, urban and industrial land uses, and some of our beaches are showing the effects of improper land management practices. Still, of the approximately 56 miles of Great Lake and inland beaches assessed, 37 miles (66%) supported recreation use. Conversely, 19 miles (34%) of assessed beaches did not support recreation use, primarily due to elevated levels of *E. coli* – a bacterial indicator of potential risks to human health (Table 4).

Table 4. Summary of Designated Use Support for Great Lake and Inland Beaches - Miles					
Assessed Uses	**Fully Supporting**	**Supporting**	**Not Supporting**	**Not Assessed**	**Total Size**
Recreation	33	4	19	1	57

Great Lakes Shoreline Assessments for Designated Uses

Wisconsin has roughly 1,000 miles of Great Lakes Shoreline, with only a fraction of those shoreline miles considered assessed for fish and aquatic life use (Table 5). Many of these waters are impaired due to sediment contamination from historic discharges or "legacy" pollutants. As staff and fiscal resources allow, WDNR will conduct a more comprehensive assessment of the Great Lakes shorelines in the future.

Table 5. Summary of Designated Use Support for Great Lakes Shoreline - Miles					
Assessed Uses	**Fully Supporting**	**Supporting**	**Not Supporting**	**Not Assessed**	**Total Size**
Fish Consumption			268	700	968
Fish and Aquatic Life		112		856	968

Statewide Condition Assessments

Lake Trophic Status

General Condition Assessments for Wisconsin lakes report whether each lake is in Excellent, Good, Fair, or Poor condition at a point in time. These assessments are based on the Trophic Status Index (TSI), which characterizes lake productivity using chlorophyll-*a*, Secchi depth, or satellite data. Chlorophyll-*a*, the photosynthetic pigment in algae, is the most direct measure of lake productivity and the preferred method of assessment. Secchi depth measures water clarity and is generally deeper in less productive lakes. Water clarity can also be estimated by the spectra of colors observed from satellite imagery. Although chlorophyll-*a* more directly measures lake productivity, it is also the most costly to collect and is available on the smallest amount of lakes. Secchi depth is collected on a large number of lakes by citizen volunteers, and satellite data is obtained on approximately 8,000 lakes greater than 5 acres in area each year. The satellite-based TSI is calculated using the estimated Secchi depth values.

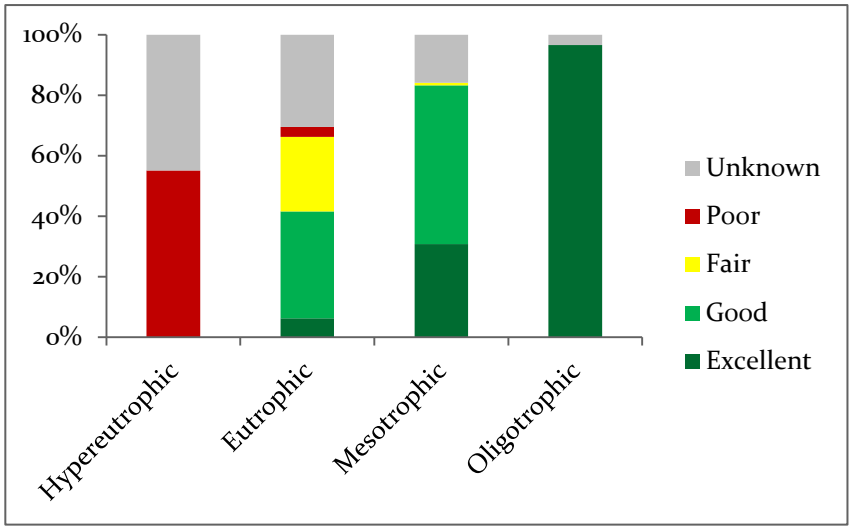

Figure 8. Percent of all assessed lakes in Excellent to Poor condition based on the Trophic Status Index. Unknown condition occurs when a lake is small or has no natural community type assigned.

A total of 4,506 lakes and 915,829 lake acres were assessed for TSI in 2013-2014.

In general, low productivity lakes (e.g., oligotrophic) are more likely to have Excellent water quality, but it is possible to have Excellent water quality in all but hypereutrophic lakes. Of the State's 69 Hypereutrophic lakes, all have Poor or unknown quality. Eutrophic lakes, however, are often naturally occurring and span the range from Excellent to Poor water quality, with the majority in the Good to Fair categories. Only 21 of the State's mesotrophic lakes are fair, and all oligotrophic lakes are Excellent (Figure 8).

Long-Term Trend Water Quality Monitoring

Lake Long-Term Trend (LTT) Network

Anthropogenic nutrient loading is a major stressor of lakes worldwide. Although watershed management efforts have reduced nutrient loading, eutrophication may worsen as agriculture expands, land develops, and precipitation intensifies. The WDNR has been collecting total phosphorus (TP) on 62 lakes for up to 45 years, providing an opportunity to test whether phosphorus concentrations have changed over time. These lakes occur throughout the state in agricultural, urbanized, and forested watersheds and range in size, trophic status, and hydrology. Linear models were used to test for change in annual mean TP over time.

Total phosphorus significantly increased in 6 lakes, decreased in 8 lakes, and did not change in 44 lakes (Figure 9). Lakes with a decreasing trend were located in southern Wisconsin watersheds with significantly more developed land. These lakes were also shallower (mean maximum depth of 29 feet), more eutrophic (median total phosphorus of 56 ug/L), and had an earlier period of record dating back to the mid-1970's. In contrast, most lakes with an increasing TP trend were deeper (mean maximum depth of 67 feet), oligotrophic or mesotrophic (median TP of 12 ug/L), and had a more recent period of record dating back to the late 1980's. Lakes with increasing TP trends were in forested, northern watersheds.

Long-term data sets such as this one elucidate trends in time and space and provide opportunity to understand causes of change, be they environmental drivers or the result of direct management actions. Future analyses will examine potential drivers of changes in TP over time and will also test for trends in other parameters such as: surface water temperature, hypolimnetic dissolved oxygen, water clarity, chlorophyll-*a*, nitrogen, pH, alkalinity, color, calcium, and magnesium.

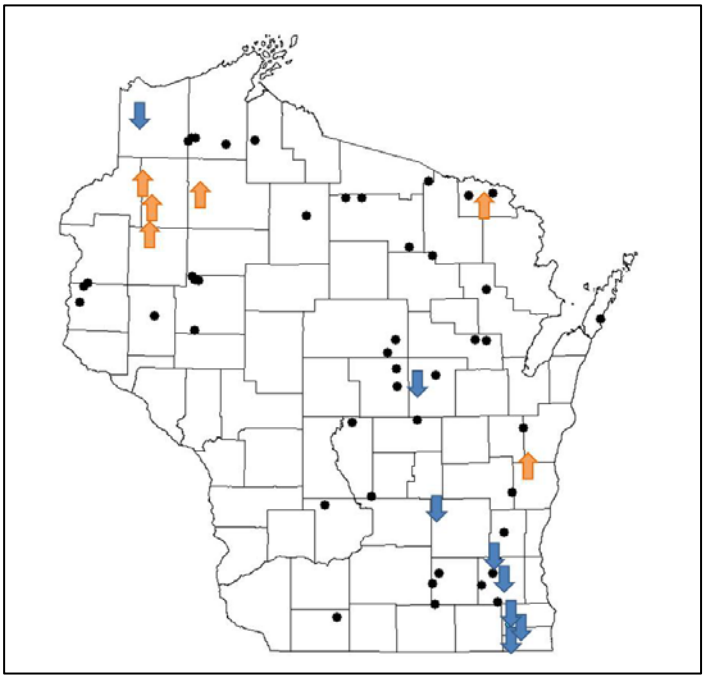

Figure 9. Wisconsin lakes that exhibit a significant increasing (upward orange arrow), significant decreasing (downward blue arrow), or no trend (black circle) in total phosphorus over the past 10 to 45 years.

River Long-Term Trend (LTT) Network

The WDNR has been monitoring water quality at 38 river stations for periods of 15 to 55 years. Long-term trends in these datasets were analyzed with the Fluxmaster model, which estimates linear trends while controlling for the effects of discharge and season on water quality. River water quality trends were highly variable among parameters and regions of the state. Concentrations of total phosphorus and total suspended solids have decreased in most rivers over the last several decades. In contrast, concentrations of chloride and nitrate have increased in most rivers over this period. The largest reductions in total phosphorus occurred in southern Wisconsin, and many of the rivers with large phosphorus reductions also had large suspended solids reductions. Nitrate concentrations increased in most rivers in agricultural basins in Wisconsin. Chloride concentrations increased in nearly all rivers in Wisconsin, even in mostly forested basins.

The reasons for these trends are likely a combination of changes in land management practices, including agricultural production systems, erosion control, and nutrient management, improvements in wastewater treatment, and increases in road salt use. Further analyses will evaluate non-linear trends to identify periods where the most significant changes occurred, and will determine whether trends vary among seasons. These more detailed analyses will provide more certainty about the causes of improvements and declines, and will help target where and when further work is needed.

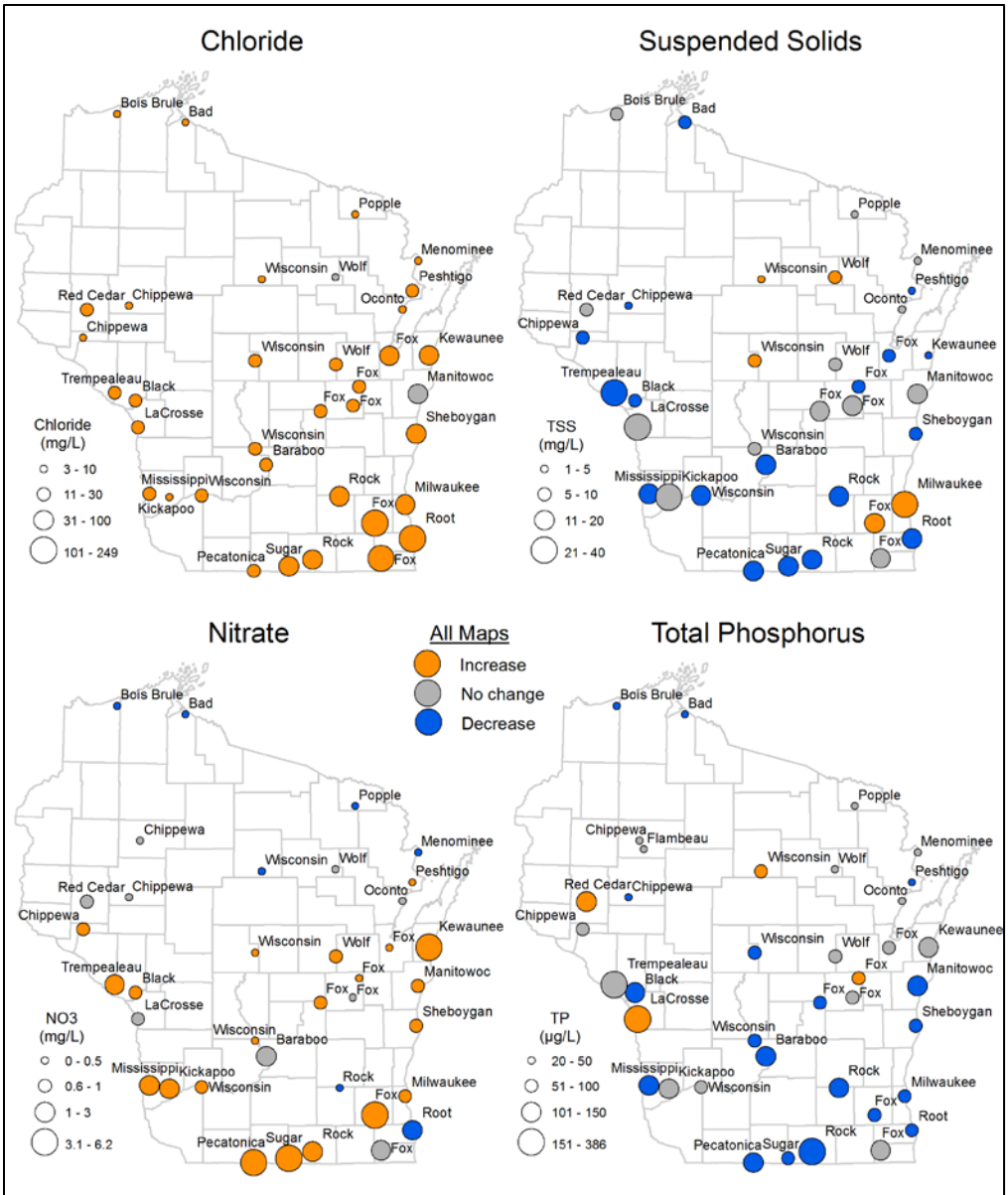

Figure 10. Trends in flow-normalized concentrations of four water quality parameters at long-term river sites in Wisconsin over periods of 10 to 50 years.

INTEGRATED REPORT FIVE-PART CATEGORIZATION

EPA encourages States/Tribes to use a five-category system for classifying all water bodies (or segments) within its boundaries regarding the waters' status in meeting the State's/Tribe's water quality standards (Table 6). The classification system is based on designated uses for reporting on water quality. Each waterbody and designated use combination is assigned a reporting category.

Table 6. EPA Integrated reporting categories.

Category/ Subcategory	Description
Category 1	All designated uses are supported, no use is threatened.
Category 2	Available data and/or information indicate that some, but not all, designated uses are supported.
Category 3	There is insufficient available data and/or information to make a 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.
Subcategory 4a	A State developed TMDL has been approved by EPA or a TMDL has been established by EPA for any segment-pollutant combination.
Subcategory 4b	Other required control measures are expected to result in the attainment of an applicable water quality standard in a reasonable period of time.
Subcategory 4c	The non-attainment of any applicable water quality standard for the segment is the result of pollution and is not caused by a pollutant.
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.

Source: http://water.epa.gov/learn/training/standardsacademy/page7.cfm

WDNR has further refined subcategories. Category 5 (waters not meeting water quality standards and a TMDL is needed) subcategories distinguish among differing types of impaired waters and TMDL priorities. WDNR created 5B to identify waters impaired by mercury mainly from atmospheric sources. Within the last three assessment periods, WDNR has added additional subcategories under Category 5. These additional subcategories are defined in Table 7.

Table 7. WDNR's Integrated Reporting subcategories for impaired waters requiring TMDLs.

Subcategory	Definition
Category 5A	Available information indicates that at least one designated use is not met or is threatened and/or the anti-degradation policy is not supported, and one or more TMDLs are still needed. This is the default category for impaired waters.
Category 5B	Available information indicates that atmospheric deposition of mercury has caused the impairment and no other sources have been identified.
Category 5C	Available information indicates that non-attainment of water quality standards may be caused by naturally occurring or irreversible human-induced conditions.
Category 5P	Available information indicates that the applicable total phosphorus criteria are exceeded; however, biological impairment has not been demonstrated (either because bioassessment shows no impairment or because bioassessment data are not available).
Category 5W	Available information indicates that water quality standards are not met; however, the development of a TMDL for the pollutant of concern is a low

priority because the impaired water is included in a watershed area addressed by at least one of the following WDNR-approved watershed plans: adaptive management plan, adaptive management pilot project, lake management plan, or Clean Water Act Section 319-funded watershed plan (i.e., nine key elements plan).

Of the 7,716 waters assessed for impairment in 2016, 1,321 (17%) were found to not meet water quality standards and are included on the CWA Section 303(d) list (i.e., impaired waters list). Of the state's impaired waters, 134 (10%) have EPA-approved TMDLs (Category 4A). For those impaired waters still requiring TMDLs, 20 waters are categorized as impaired due to suspected naturally occurring sources of pollution (Category 5C), 179 (15%) are impaired due to atmospheric deposition of mercury only (Category 5B), 192 (16%) are impaired due to levels of phosphorus only (5P), and 796 (60%) waters are impaired due to other causes (5A) (see Figure 11).

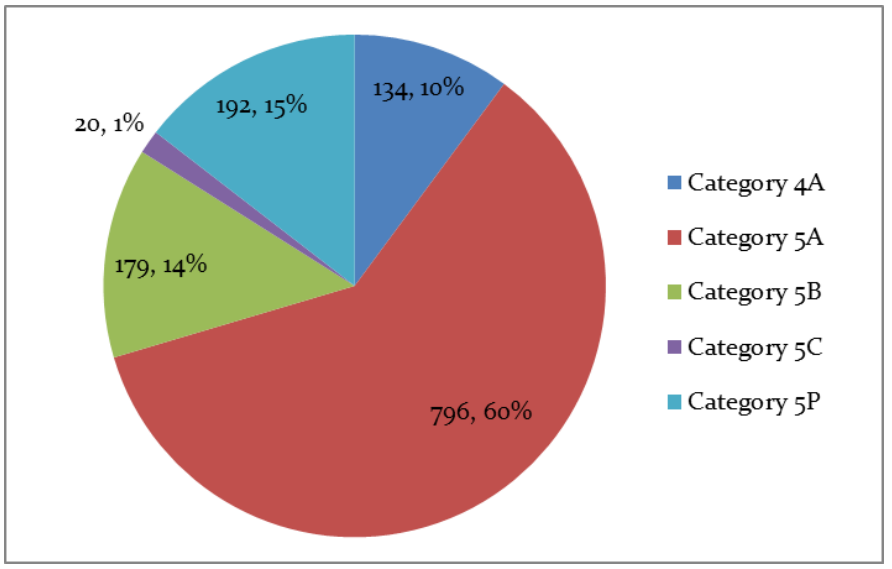

Figure 11. Number and percentage of waters in each impairment category.

CWA Section 303(d) List (Impaired Waters)

Assessing waterbodies against water quality standards and identifying impaired waters that do not meet standards is part of the overarching federal CWA framework for restoring impaired waters. Waters that do not meet their designated uses because of water quality standard violations are impaired. Waterbodies are removed from the list when new data indicates that water quality standards are attained.

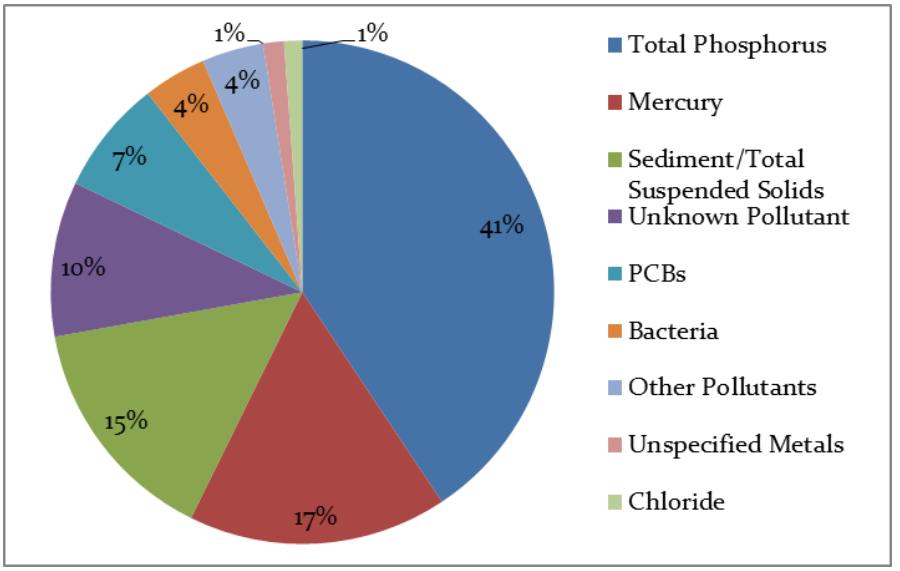

Figure 12. Impairment Pollutants.

The 2016 impaired waters list contains more than 1,700 pollutant/water listing combinations. The primary pollutant listings are total phosphorus, mercury, and total suspended solids (sediment), representing 73% of the current listings (see Figure 12).

Integrated Reporting Summaries by Waterbody Type Groupings

Lakes, Impoundments, Bays, and Harbors

Of the 4,585 assessed lakes, impoundments, bays, and harbors, 4,133 (90%) were found to be supporting all assessed designated uses (Category 2), though this only accounted for 45% of assessed acres. Of the remaining 452 waters that were not supporting at least one designated use, 437 still require TMDLs (Category 5) and 15 are addressed by EPA-approved TMDL studies (Category 4). Over 50% of lake, impoundment, bays, and harbors acres are impaired and require a TMDL (Figure 13). The proportional difference between count and size is due to the high number of large impoundments that are considered impaired. A large portion (41%) of those impairments still requiring TMDLs are due to atmospheric deposition of mercury (Category 5B).

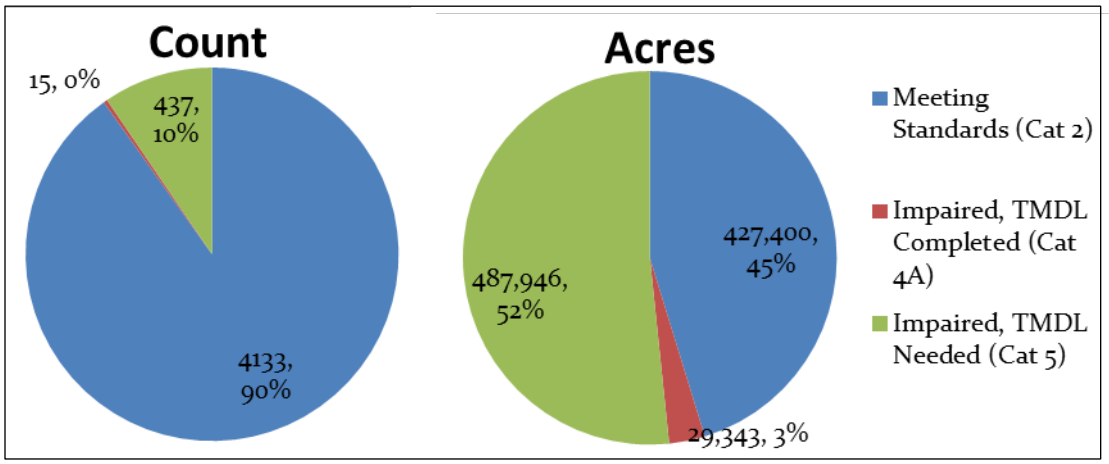

Figure 13. Proportion of assessed lakes, impoundments, bays and harbors that are meeting standards or impaired. Proportions are by count and size of assessed waterbodies.

Beaches and Great Lakes Shoreline Waters

Of the 232 assessed beaches and Great Lakes shoreline waters, 194 (84%)were found to be supporting all assessed designated uses (Category 2). Only 11% of beach and shoreline miles are Category 2, however. The beaches, which are much smaller than the Great Lakes shoreline, account for the high number

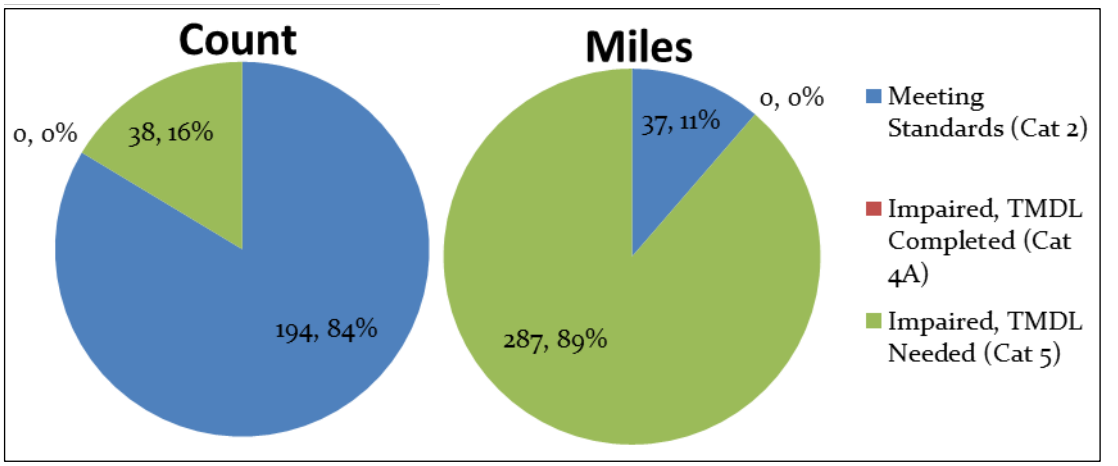

Figure 14. Proportion of assessed beaches and Great Lake shoreline that are meeting standards or impaired.

but low mileage for Category 2 waters. The remaining 38 waters were not supporting at least one designated use (Figure 14). TMDLs have not been developed for beaches or Great Lakes shoreline waters.

Rivers and Streams

Of the 2,898 assessed river and stream segments 2,068 (71%) were found to be supporting all assessed designated uses (Category 2). Similarly, of the miles assessed 64% were in Category 2. Of the remaining 830 waters that were not supporting at least one designated use, 712 still require TMDLs (Category 5) and 118 are addressed by EPA-approved TMDL studies (Category 4). The majority of impaired river and stream miles still require a TMDL (Figure 15).

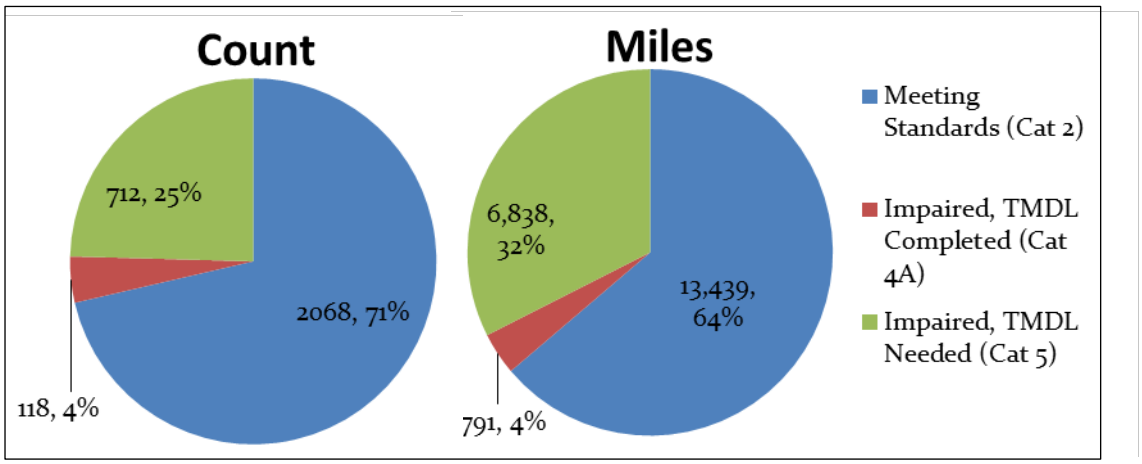

Figure 15. Proportion of assessed rivers and streams that are meeting standards or impaired.

Restoration of Wisconsin's Waters

Section 303(d) of the CWA requires delegated states to determine on a biennial basis whether waterbodies are impaired (not meeting designated uses or water quality criteria). One of the underlying goals of the CWA is to restore all impaired waters so they meet applicable water quality standards. One of the key tools to meet this goal is the development of a TMDL.

A TMDL is developed after consideration of all sources of pollution to an impaired waterbody and is stated as the amount of pollutant that the waterbody can assimilate and not exceed water quality standards. TMDL pollutant loads are determined in consideration of in-water targets that must be met for the waterbody to respond favorably. Targets may be based on promulgated numeric water quality criteria or may be based on narrative criteria developed in consideration of local data and/or nearby reference sites.

Once targets are set for the waterbody, the TMDL is established by allocating the allowable load between the point sources (WLA) and the nonpoint sources (LA) with some amount of the total

load set aside as a margin of safety (MOS). Thus, three components make up the TMDL: WLA + LA + MOS.

- The wasteload allocation (WLA) is the total allowable pollutant load from all point sources (e.g. municipal, industrial, CAFOs, MS4 stormwater). Reserve capacity may either be built into the WLA or be a separate component of the total loading capacity to allow for future growth in the watershed.
- The load allocation (LA) is the allowable pollutant load from nonpoint sources (agricultural, CAFO off-site landspreading, residential runoff, etc.). Natural sources (e.g., runoff from non-disturbed areas) are typically covered under the load allocation, and whenever possible nonpoint source loads and natural background loads should be distinguished.
- The margin of safety (MOS) accounts for uncertainty in modeling and calculating WLAs and LAs.

Once the TMDL is developed and approved, federal and state regulations then require implementation of TMDLs to meet water quality standards where there are implementation mechanisms in place and supported by law. For point source discharges, WLAs delineated in the TMDL need to be expressed in Wisconsin Pollutant Discharge Elimination System (WPDES) permits. Nonpoint source implementation is an adaptive process, requiring the collaboration of diverse stakeholders and the prioritization and targeting of available programmatic, regulatory, financial, and technical resources.

TMDLs in Development

Wisconsin River Basin

Several reservoir lakes and tributaries in the Wisconsin River Basin are impaired as a result of excessive nutrient loading. As a result, a comprehensive study of the Wisconsin River Basin (WRB) has been initiated by the WDNR that will culminate in the development of a plan to improve the water quality of the river, its impoundments and tributaries. The water quality improvement study and plan will be undertaken in the form of development and implementation of a TMDL.

The Wisconsin River TMDL study area spans Wisconsin's central corridor from the river's in Vilas County to Lake Wisconsin in Columbia County, covering 9,156 mi2 – approximately 15 percent of the state. The project area also encompasses:

- More than 110 wastewater dischargers
- 2nd & 5th largest inland lakes in Wisconsin
- 4 reaches impaired for suspended solids
- 16 reaches impaired for phosphorus
- 85 Cities and Villages

- 25 major tributaries
- 21 Counties

The Wisconsin River Basin TMDL is currently being drafted and is expected to be completed in 2017.

Upper Fox and Wolf River Basins

The Upper Fox River (UFR) Basin and the Wolf River (WR) Basin are two separate basins that converge within a series of pool lakes in Winnebago County before finally flowing collectively into Lake Winnebago. All of the surface water drainage to Lake Winnebago is contained within these two basins. Lake Winnebago outlets into the Lower Fox River Basin where it eventually flows into Green Bay. A TMDL has been developed for the Lower Fox River and Lower Green Bay Area of Concern (AOC) for phosphorus and total suspended solids.

The Upper Fox River and Wolf River Basins are important environmental and economic resources for the state and the local community. People have long used the Fox River and Wolf Rivers for transportation, commerce, energy, food, and recreation. However, the waters located within the Upper Fox and Wolf River Basins are impaired due to excess phosphorus and total suspended solids (TSS). To restore waters within the Fox and Wolf Basins, TMDLs will be developed for total phosphorus and TSS. The TMDL will identify the sources of the pollutants and the reductions necessary to address water quality impairments. In addition, addressing water quality in the Upper Fox and Wolf basins may be necessary in restoring water quality in the Lower Fox basin.

The Upper Fox and Wolf River Basins TMDLs are currently being drafted and are slated for completion in calendar year 2018.

Milwaukee River Basin

The Milwaukee Metropolitan Sewerage District (MMSD) is developing TMDLs as a third party on behalf of the WDNR for the Menomonee River, Kinnickinnic River, and Milwaukee River Watersheds, and for the Milwaukee Harbor Estuary. The pollutant causes of impairment that are being addressed by the TMDLs are fecal coliform bacteria, phosphorus, and sediment.

The Milwaukee River Basin TMDLs are currently being drafted and are slated for completion in calendar year 2017.