North Dakota 2020-2022 Integrated Section 305(b) Water Quality Assessment Report and Section 303(d) List of Waters Needing Total Maximum Daily Loads

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CONTENTS

LIST OF TABLES

LIST OF FIGURES

PART I. EXECUTIVE SUMMARY

The Clean Water Act (CWA) contains several sections which require states to report on the quality of their waters. Section 305(b) (State Water Quality Assessment Report) requires a comprehensive biennial report; and Section 303(d) requires, from time to time, a list of a state's water quality-limited waters needing total maximum daily loads (TMDLs). The primary purpose of the Section 305(b) State Water Quality Assessment Report is to assess and report on the extent to which beneficial uses of the state's rivers, streams, lakes, reservoirs and wetlands are met. Section 305(b) of the Clean Water Act requires states to submit this assessment report every two years; the information presented in this report is for the reporting period of 2020-2022. The Section 305(b) report is a summary report that presents information on use impairment and the causes and sources of impaired or threatened uses for the state as a whole. While the Section 305(b) report is considered a summary report, Section 303(d) and its accompanying regulations (CFR Part 130 Section 7) require each state to list individual waterbodies (i.e., lakes, reservoirs, rivers, streams and wetlands) which are considered water quality limited and which require load allocations, waste load allocations and TMDLs. This list has become known as the "TMDL list" or "Section 303(d) list."

The North Dakota Department of Environmental Quality (hereafter referred to as the department) currently recognizes 337 public lakes and reservoirs. Of the 337 public lakes and reservoirs recognized as public waters and included in ATTAINS, only 201 lakes and reservoirs totaling 617,136.6 acres are specifically listed in the state's water quality standards as classified lakes and therefore are assigned designated beneficial uses. The remaining 136 lakes and reservoirs, while included in the state's estimate of total lake acres, are not considered classified waters and therefore were not assessed for this report. By default, these waterbodies are assigned the Class 4 fisheries classification.

Of the 337 public lakes and reservoirs included in ATTAINS, there are 151 manmade reservoirs and 186 are natural lakes. All lakes and reservoirs included in this assessment are considered significantly publicly owned. Based on assessment information in ATTAINS, the 151 reservoirs have an aerial surface of 469,427 acres. Reservoirs comprise about 63 percent of North Dakota's total lake/reservoir surface acres. Of these, 409,662 acres or 55 percent of the state's entire lake and reservoir acres are contained within the two mainstem Missouri River reservoirs (Lake Sakakawea and Lake Oahe). The remaining 151 reservoirs share 59,765 acres, with an average surface area of 404 acres. The 186 natural lakes in North Dakota cover 278,602 acres, with approximately 102,384 acres or 37 percent attributed to Devils Lake. The remaining 162 lakes average 952 acres.

For purposes of Section 305(b) reporting and Section 303(d) listing, EPA encouraged states to submit an integrated report and to follow its integrated reporting guidance, including EPA's 2006 IR guidance, which is supplemented by EPA's 2008, 2010, 2012, 2014, 2016, and 2018 IR guidance memos (https://www.epa.gov/tmdl/integrated-reporting-guidance-under-cwa-sections-303d-305b-and-314). Key to integrated reporting is an assessment of all of the state's waters and placement of those waters into one of five categories. The categories represent varying levels of water quality standards attainment, ranging from Category 1, where all of a waterbody's designated uses are met, to Category 5, where a pollutant impairs a waterbody and a TMDL is required.

The beneficial use designated as aquatic life is fully supporting for 1,599 miles of the rivers and streams assessed for this report, while another 2,114 miles of rivers and stream are assessed as fully supporting but threatened for aquatic life use. In other words, if water quality trends continue, these rivers and streams may not fully support its use for aquatic life in the future. The remaining 1,711 miles of rivers and streams assessed for this report were assessed as not supporting aquatic life use.

NPS pollution (e.g., siltation/sedimentation and stream habitat loss or degradation) was the primary cause of aquatic life use impairment. Other forms of pollution causing impairment are trace element contamination, flow alteration and oxygen depletion. Organic enrichment creates conditions in the stream that cause dissolved oxygen (DO) to be depleted. Rivers and streams impaired by siltation/sedimentation, organic enrichment, eutrophication due to excess nutrients and habitat alteration also will result in a degradation of the biological community.

Recreation use was assessed on 7,957 miles of rivers and streams in the state. Recreation use was fully supporting; fully supporting, but threatened; and not supporting on 1,364 miles, 3,257 miles and 3,336 miles, respectively. E. coli or fecal coliform bacteria data collected from monitoring stations across the state were the primary indicators of recreation use attainment. For this reason, pathogens (as reflected by E. coli and fecal coliform bacteria) are the primary cause of recreation use impairment in North Dakota. Other factors affecting the use of the state's rivers and streams for recreation would be eutrophication from excessive nutrient loading, resulting in nuisance algae and plant growth. The primary sources of E. coli and fecal coliform bacteria contamination are animal feeding operations, riparian area grazing and failing or poorly designed septic systems.

Drinking water supply use is classified for 5,171 miles of rivers and streams in the state. Of the 536 miles assessed for this report, 126 miles were assessed as threatened for drinking water supply use.

A total of 4,139 miles of rivers and streams were identified as capable of supporting a sport fishery from which fish could be used for consumption. Based on the EPA fish tissue of 0.3 micrograms (µg) methyl-mercury/gram of fish tissue, only the Red River of the North was assessed as not supporting fish consumption. While there are many potential sources of methyl-mercury (both anthropogenic and natural), to date there have been no specific causes or sources identified for the mercury present in North Dakota fish.

A total of 201 lakes and reservoirs, representing 617,136 surface acres, are specifically listed in the state water quality standards as classified lakes and reservoirs. In some cases, the only beneficial uses assessed for lakes and reservoirs were agriculture and industrial uses. In other cases, all designated uses were assessed. There were also 95 lakes and reservoirs which were included in ATTAINS, but were not assessed. The non-classified lakes represent 131,186.8 acres or only 17.5 percent of the total lake and reservoir acres in the state. One-hundred-forty-one (141) lakes and reservoirs, representing 596,008 acres, were assessed as fully supporting aquatic life use; in other words, they are considered capable of supporting and maintaining a balanced community of aquatic organisms. An additional 28 lakes and reservoirs representing 7,790 acres were assessed as fully supporting, but threatened. A threatened assessment means that if water quality and/or watershed trends continue, it is unlikely these lakes will continue to support aquatic life use. The lakes and reservoirs will begin to experience more frequent algal blooms and fish kills. They will display a shift in trophic status from a mesotrophic or eutrophic condition to a hypereutrophic condition. Only seven (7) lakes, totaling 856 acres, were assessed as not supporting aquatic life use.

One of the primary causes of aquatic life impairment to lakes and reservoirs is low dissolved oxygen (DO) in the water column. Low DO in lakes can occur in summer (summer kills) but usually occurs in the winter under ice-cover conditions. When fish kills occur, low DO-tolerant fish species (e.g., carp, bullhead, white suckers) will be favored, resulting in a lake dominated by these rough fish species. Pollutants which stimulate the production of organic matter, such as plants and algae, can also cause aquatic life impairment. Two secondary pollutant causes are excessive nutrient loading and siltation.

Major sources of nutrient loading to the state's lakes and reservoirs are erosion and runoff from cropland; runoff from animal feeding operations (e.g., concentrated livestock feeding and wintering operations); and hydrologic modifications. Hydrologic modifications, such as wetland drainage, channelization and ditching, increase the runoff and delivery rates to lakes and reservoirs, in effect increasing the size of a lake's watershed.

Recreation use (e.g., swimming, waterskiing, boating, sailing, sunbathing) was assessed for 176 lakes and reservoirs in the state totaling 603,722 acres. Of this total, nine (9) lakes, representing 8,629 acres, were assessed as not supporting use for recreation. The primary cause of use impairment is excessive nutrient loading, which results in nuisance algal blooms and noxious aquatic plant growth.

One-hundred-twenty-one (131) lakes and reservoirs totaling 570,973 acres were assessed as fully supporting recreation use. An additional 36 lakes and reservoirs totaling 24,120 acres were assessed as fully supporting, but threatened. Nutrient loading is also linked to the negative water quality trends these lakes are experiencing. If left unchecked, these lakes will degrade to the point where frequent algal blooms and/or excessive weed growth will negatively affect recreation.

One-hundred and ninety-nine (199) classified lakes and reservoirs, representing 614,926 acres, were assigned the use for fish consumption. One (1) lake, Lake George located in Kidder County, is a class 5 lake which is defined as "not capable of supporting a fishery due to high salinity." Of the 199 lakes and reservoirs entered into ATTAINS and assigned a use for fish consumption, only Devils Lake, Lake Sakakawea, Lake Oahe, Lake Tschida, and Nelson Lake had sufficient methyl-mercury fish tissue data and fish population survey data necessary to calculate average concentrations and to assess fish consumption use. Based on these data and the EPA recommended fish tissue criterion for methylmercury of 0.3 µg/g, Lake Sakakawea, Devils Lake, and Lake Tschida were assessed as not supporting fish consumption use, while Lake Oahe and Nelson Lake were assessed as fully supporting fish consumption use. The remaining 194 lakes and reservoirs that support a sport fishery were not assessed for this report. Potential sources of mercury include natural sources and atmospheric deposition.

One-hundred and ninety-nine (199) lakes and reservoirs, representing 614,926 acres were assigned the use for municipal drinking water supply. Of these, 5 reservoirs (Lake Sakakawea, Lake Ashtabula, Homme Dam, Bisbee Dam and Mt. Carmel Reservoir) are currently used either directly or indirectly as municipal drinking water supplies, while two others (Patterson Lake and Renwick Dam) serve as back-up water supplies in the event the primary water supplies should fail. Homme Dam, Mt. Carmel Reservoir and Lake Sakakawea were assessed as fully supporting drinking water supply use. Municipal drinking water supply use was not assessed for Lakes Ashtabula, Bisbee Dam, Patterson Lake, Renwick Dam or for the other 192 classified lakes and reservoirs which are assigned a drinking water supply use.

Under requirements of the CWA, the EPA must periodically report on the condition of the nation's water resources by summarizing water quality information provided by the states. However, approaches to collecting and assessing water quality data vary from state to state, making it difficult to consistently compare the information across states, on a nationwide basis, or over time. In addition, most state assessment approaches result in reporting on a fraction of their river and stream miles and lake acres.

In response to the need for more consistent methods for monitoring and assessing the condition of the nation's waters and to improve on the extent of waters assessed in each state and across the nation, the EPA, states, tribes, academics and other federal agencies began collaborating on the development and implementation of a series of statistically based surveys called the National Aquatic Resource Surveys (NARS). The purposes of the NARS are to answer questions such as:

What percent of waters support healthy ecosystems and recreation?
What are the most common water quality problems?
Is water quality improving or getting worse?
Are investments in improving water quality focused appropriately?

In North Dakota, the department has participated in the National River and Streams Survey (NRSA) in 2008-2009, 2013-2014, and 2018-2019 the National Lakes Assessment (NLA) in 2007, 2012, and 2017 and the National Wetlands Condition Assessment in 2011 and 2016. For each of these surveys, the department conducted and intensification of the NARS survey design in order to obtain statistically reliable estimates of ecological condition for rivers and streams, lakes and reservoirs, and wetlands in the state.

Overall, biological indicators reported for rivers and streams based on the 2008-2009 NRSA and state intensification project provided relatively low estimates of good condition. According to the macroinvertebrate indicator, 24.5 percent of perennial rivers and streams are in good condition and 44.8 percent are considered to be in poor condition. Also, the fish index revealed that 32.9 percent of waterbodies are in good condition and 33.9 percent are in poor condition.
Chemical stressors assessed for rivers and streams also provided low estimates of good condition. Based on total phosphorus, 23 percent of waterbodies are in good condition and 69.3 percent are considered to be poor while total nitrogen estimates reveal that 6.7 percent of waters are good and 57.3 percent are in poor condition. Based on salinity, 23.2 percent of waterbodies are in good condition and 27.1 percent are in poor condition.
Physical stressors measured for rivers and streams were similar to chemical stressors in that they also provided low estimates of good condition for perennial rivers and streams in the state. Based on the bed sediment stressor, 41.9 percent of streams are in good condition and 24.5 percent are in poor condition. In-stream cover estimates reveal that 30.6 percent of streams are in good condition and 27.9 percent are in poor condition. Riparian vegetation condition estimates reveal that 20.1 percent of waterbodies are in good condition while 54.8 percent are considered to be in poor condition.

Based on the 2012 NLA and state intensification project, the biological communities, benthic macroinvertebrates and zooplankton, within North Dakota lakes, were in relatively good condition throughout the state. However, North Dakota's lakes are in relatively poor condition for nutrients. This finding is not surprising, however, and is consistent with other department monitoring indicating elevated nutrients levels in lakes throughout the state.

Despite increased nutrients noted throughout the state, plant and algal growth indicators showed most lakes were in good to fair condition, though a significant number of lakes were assessed as being at high risk (i. e., poor condition) for cyanobacteria blooms. Increased densities of cyanobacteria can lead to oxygen deprivation at lower depths and are associated with common toxins (e.g., anatoxins, microcystins). Though mostly at low levels, microcystin was detected in approximately 60 percent of North Dakota lakes, and at higher levels, these toxins can cause significant harm to wildlife, livestock, and humans. It should be noted that these blooms can be relatively short-lived and toxins can disappear from the system relatively fast.

Littoral vegetative cover remained in relatively good health during the 2012 assessment. Increased in-lake cover was directly correlated to an increased zooplankton MMI score. Further, plant cover in shallow, littoral areas can provide refugia for small fish, amphibians, and macroinvertebrates. Additionally, submerged vegetation can be an important food source for waterfowl, an important game resource throughout the State, particularly within lakes and wetlands in the prairie pothole region.

Section 303(d) of the CWA and its accompanying regulations require each state to list waterbodies (i.e., lakes, reservoirs, rivers, streams and wetlands) which are considered water quality limited and require load allocations, waste load allocations and TMDLs. This list has become known as the “TMDL list” or “Section 303(d) list.” A waterbody is considered water quality limited when it is known that its water quality does not meet applicable standards or is not expected to meet applicable standards. Waterbodies can be water quality limited due to point source pollution, NPS pollution or both.

In considering whether or not applicable water quality standards are being met, the state should not only consider the narrative and numeric criteria set forth in the standards but also the classified uses defined for the waterbody and whether the use or uses are fully supported or not supported due to any pollutant source or cause. Where a waterbody is water quality limited, the state is required to determine in a reasonable time frame the reduction in pollutant loading necessary for that waterbody to meet water quality standards, including its beneficial uses. The process by which the pollutant-loading capacity of a waterbody is determined and the load is allocated to point and nonpoint sources is called a total maximum daily load (TMDL). While the term “total maximum daily load” implies that loading capacity is determined on a daily time scale, TMDLs can range from meeting an instantaneous concentration (i.e., an acute standard) to computing an acceptable annual phosphorus load for a lake or reservoir.

To accomplish the TMDL Program’s prioritization goal of systematically prioritizing and reporting on priority watersheds or waters for restoration and protection and to facilitate State strategic planning to achieve water quality protection and improvement, the WMP develops a prioritization strategy for TMDL development. The “North Dakota Total Maximum Daily Load Prioritization Strategy” represents the Vision 1 (2012-2022) planning period and is included in Appendix A. This TMDL Prioritization Strategy describes a two-phased approach for prioritizing impaired waters for TMDL development and watershed planning. Specifically, the TMDL prioritization strategy is used to identify 1) a list of priority waters targeted for TMDL development or restoration approaches in the next two years (near term); and 2) a list of priority waters scheduled for likely TMDL development or advanced restoration approaches through 2022 (long term). For purposes of TMDL listing, both near term (next two years) and long term (through 2022) TMDL waterbodies are considered “high” priority for TMDL development or advanced restoration approaches. The WMP is currently developing a TMDL prioritization strategy for the Vision 2 planning period (2022-2032) and will include the updated strategy in the next (2024) Integrated Report.

As a compliment to each state’s TMDL program, EPA has developed a new national water quality program performance measure in order to track and measure progress in meeting the prioritization goal as described in the new TMDL Program. This measure, termed WQ-27, is defined as the "extent of priority areas identified by each State that are addressed by EPA-approved TMDLs or advanced restoration approaches for impaired waters that will achieve water quality standards (i.e., advanced restoration plans).

The 2020-2022 TMDL list is represented by 230 AUs (33 lakes and reservoirs[1] and 197 river and stream segments) and 359 individual waterbody/pollutant combinations. For purposes of TMDL development, each waterbody/pollutant combination requires a TMDL or advanced restoration plan. Of the 359 individual waterbody/pollutant combinations listed in 2020-2022, 188 waterbody/pollutant combinations are further identified as Category 5D. These waterbodies have been targeted under the Vision 1 (2012-2022) planning period for additional monitoring to verify the current use impairment assessments and pollutant causes.

The 2020-2022 Section 303(d) TMDL list for North Dakota has targeted 41 waterbody/pollutant combinations as "High" priority. These "High" priority waterbody/pollutant combinations represent 11 percent of all "High" and "Low" priority Category 5 waterbody/pollutant combinations on the list. These "High" priority waterbody/pollutant combinations are AUs targeted under the Vision 1 (2012-2022) planning period for TMDL or advanced restoration plan development. For the remaining 318 low priority waterbody/pollutant combinations which are in need of additional monitoring and/or TMDLs, the Department will be working with EPA to develop a method of prioritizing waterbodies for TMDL development. The WMP will reevaluate remaining Vision 1 TMDL priorities during the Vision 2 bridge period (2022-2024) and update "High" and "Low" priority water bodies for the next (2024) Integrated Report.

[1]Lake Sakakawea is described by two assessment units. These include ND-10110101-001-L_00 and ND-10110205-001-L_00, which includes the Little Missouri Bay portion of the reservoir.

PART II. INTRODUCTION

The Clean Water Act (CWA) requires states to report on the quality of their waters. Section 305(b) (*State Water Quality Assessment Report*) requires a comprehensive biennial report, and Section 303(d) requires a list of a state's water quality-limited waters needing total maximum daily loads (TMDLs), due April 1 of every even-numbered year. In guidance provided to the states by EPA dated July 29, 2005 (US EPA, 2005), EPA suggested that states combine these two reports into one integrated report. The following is a summary of the requirements of each reporting section.

II.A. Section 305(b) Water Quality Assessment Report

The primary purpose of this *State Water Quality Assessment Report* is to assess and report on the extent to which beneficial uses of the state's rivers, streams, lakes, reservoirs, and wetlands are met. Section 305(b) of the Clean Water Act requires states to submit this assessment report every two years. The information presented in this report is for the reporting period of 2018-2020. The Section 305(b) report is a summary report that presents information on use impairment and the causes and sources of impaired or threatened uses for the state.

This report is not a trends report, nor should the data or information in this report be used to assess water quality trends. Factors which complicate and prohibit comparisons between reporting years include changes in the number of sites, the quality of data upon which assessment information is based and changes to the estimated river and stream miles and lake surface area, which can fluctuate during dry/wet cyclical periods in North Dakota.

II.B. Section 303(d) TMDL List of Water Quality-limited Waters

While the Section 305(b) report is considered a summary report, Section 303(d), and its accompanying regulations (CFR Part 130 Section 7) require each state to list individual waterbodies (i.e., lakes, reservoirs, rivers, streams, and wetlands) which are considered water quality limited and which require load allocations, waste load allocations and TMDLs. This list has become known as the "TMDL list" or "Section 303(d) list (303(d) list for short)."

A waterbody is considered water quality limited when it is known that its water quality does not or is not expected to meet applicable water quality standards. Waterbodies can be water quality limited due to point sources of pollution, nonpoint sources (NPS) of pollution, or both.

For consideration of whether applicable water quality standards are being met, the state should not only consider the narrative and numeric criteria set forth in the standards to protect specific uses, but also the classified uses defined for the waterbody and whether the use or uses are fully supported or not supported due to any pollutant source or cause. Therefore, a waterbody could be considered water quality limited when it can be demonstrated that a beneficial use (e.g., aquatic life or recreation) is impaired, even when there are no demonstrated exceedances of either the narrative or numeric criteria. In cases where there is use impairment and no exceedance of the numeric standard, the state should provide information as to the cause of the impairment. Where the specific pollutant (e.g., copper or phosphorus) is unknown, a general cause category (e.g., metals or nutrients) should be included with the waterbody listing.

Section 303(d) of the CWA and accompanying EPA regulations and policy only require impaired and threatened waterbodies to be listed and TMDLs developed when the source of impairment is a pollutant. Pollution, by federal and state definition, is "any man-made or man-induced alteration of the chemical, physical, biological and radiological integrity of water." Based on the definition of a pollutant provided in Section 502(6) of the CWA and in 40 CFR 130.2(d), pollutants would include temperature, ammonia, chlorine, organic compounds, pesticides, trace elements, nutrients, biochemical oxygen demand (BOD), sediment and pathogens. Waterbodies impaired by habitat and flow alteration and the introduction of exotic species would not be included in the Section 303(d) TMDL list, as these impairment categories would be considered pollution and not pollutants.

Where a waterbody is water quality limited, the state is required to determine, in a reasonable timeframe, the reduction in pollutant loading necessary for that waterbody to meet water quality standards, including its beneficial uses. The process by which the pollutant loading capacity of a waterbody is determined and the load is allocated to point and nonpoint sources, is called a total maximum daily load (TMDL). While the term "total maximum daily load" implies that loading capacity is determined on a daily time scale, TMDLs can range from meeting an instantaneous concentration (i.e., an acute standard) to computing an acceptable annual phosphorus load for a lake or reservoir.

This Section 303(d) list includes waterbodies not meeting water quality standards, waterbodies needing TMDLs and waterbodies which have been removed from the 2018 list. Reasons for removing a waterbody from the 2018 list include: (1) a TMDL was completed for the waterbody/pollutant combination; (2) the applicable water quality standard is now attained and/or the original basis for the listing was incorrect; (3) the applicable water quality standard is now attained due to a change in the water quality standard and/or assessment methodology; (4) the applicable water quality standard is now attained due to restoration activities; or (5) sufficient data and/or information is lacking to determine water quality status and/or the original basis for listing was incorrect.

PART III. BACKGROUND

III.B. Total Waters

The North Dakota Department of Environmental Quality (hereafter referred to as the department) currently recognizes 337 public lakes and reservoirs. Of the 337 lakes and reservoirs recognized as public waters and included in ATTAINS, only 201 lakes and reservoirs totaling 622,381.6 acres are specifically listed in the state's water quality standards as classified lakes and therefore are assigned designated beneficial uses (Table III-1). The remaining 110 lakes and reservoirs, while included in the state's estimate of total lake acres, are not considered classified waters and therefore were not assessed for this report. By default, these waterbodies are assigned the Class 4 fisheries classification.

Table III-1. Atlas

Topic	Value
State Population[1]	774,948
State Surface Area (Sq. Miles)	70,704
Total Miles of Rivers and Streams[2]	56,829.9
Total Miles of Rivers and Streams by Stream Class[3]	
Class I, IA and II Streams	6,050.7
Class III Streams	50,778.7
Total Miles of Rivers and Streams by Basin	
Souris River	3,927.1
Red River (including Devils Lake)	12,240.9
Upper Missouri (Lake Sakakawea)	14,381.5
Lower Missouri (Lake Oahe)	23,236.1
James River	3,044.3
Border Miles of Shared Rivers and Streams[4]	430.6
Total Number of Lakes and Reservoirs[5]	337
Number of Natural Lakes	186
Number of Manmade Reservoirs	151
Total Acres of Lakes and Reservoirs	748,323.3
Acres of Natural Lakes	278,896.0
Acres of Manmade Reservoirs	469,427.3
Total Acres of Lakes and Reservoirs by Lake Class[7]	
Class 1	410,213.9
Class 2	160,085.3
Class 3	41,128.9
Class 4	3,498.1
Class 4-Not Listed[8]	131,186.8
Class 5	2,210.3
Acres of Freshwater Wetlands[9]	3,206,820

[1] Based on 2015 U.S. Census Bureau Estimates

[2] Total miles are based on rivers and streams in ATTAINS and reach indexed to the 1:100,000 scale National Hydrography Dataset (NHD).

[3] Stream classes are defined in the *Standards of Quality for Waters of the State* (NDDEQ, 2019). In general, Classes I, IA and II streams are perennial, while Class III streams are intermittent or ephemeral.

[4] Includes the Bois de Sioux River and the Red River of the North

[5] Number includes only the lakes and reservoirs which are publicly owned and are in ATTAINS.

[6] Estimates based on surface acreage at full pool elevation.

[7] Lake and reservoir classes are defined in the *Standards of Quality for Waters of the State* (NDDEQ, 2019). Acreage estimates for each lake class are based on lakes and reservoirs specifically listed in the state water quality standards. Lakes not specifically listed in the state water quality standards are Class 4 by default.

[8] Not Listed in Standards of Water Quality as the classification naturally changes with the wet and dry cycles and is reported as Non-Classed Lake or Impoundment in ATTAINS.

[9] Estimate derived from the statistical analysis of the US Fish and Wildlife Service's 2005 Status and Trends plots in North Dakota used in the state intensification of 2011 National Wetland Condition Assessment in North Dakota (see Part V.C. Wetlands Assessment).

In this report, the state has been divided into five basins: Red River (including Devils Lake), Souris River, Upper Missouri River (Lake Sakakawea), Lower Missouri River (Lake Oahe) and James River (Figure III-1). The atlas provided in Table III-1 shows an estimate of total river and stream miles by basin.

Of the 337 public lakes and reservoirs included in ATTAINS, 151 are manmade reservoirs and 186 are natural lakes. All lakes and reservoirs included in this assessment are considered significantly publicly owned. Based on assessment information in ATTAINS, the 151 reservoirs have an aerial surface of 469,427.3 acres. Reservoirs comprise about 65 percent of North Dakota's total lake/reservoir surface acres. Of these, 409,662 acres or 56 percent of the state's entire lake and reservoir acres are contained within the two mainstem Missouri River reservoirs (Lake Sakakawea and Lake Oahe). The remaining 146 reservoirs share 58,899 acres, with an average surface area of 453 acres (Figure 2 and Figure III-4).

The 186 natural lakes in North Dakota cover 255,555 acres, with approximately 102,384 acres or 40 percent attributed to Devils Lake. The remaining 162 lakes average 924.74 acres, with approximately 40 percent being smaller than 250 acres.

There are 56,827.8 miles of rivers and streams in the state. Estimates of river stream miles in the state are based on river and stream waterbodies in ATTAINS and are reach indexed to a modified version of the 1:100,000 National Hydrography Dataset (NHD plus). These include ephemeral, intermittent, and perennial rivers and streams. The estimate of river and stream miles for this report reflects a decrease of 246.65 miles from what was reported in 2018. This decrease is due to a change in the estimated size of several rivers and streams (Figure III-3 and Figure III-5).

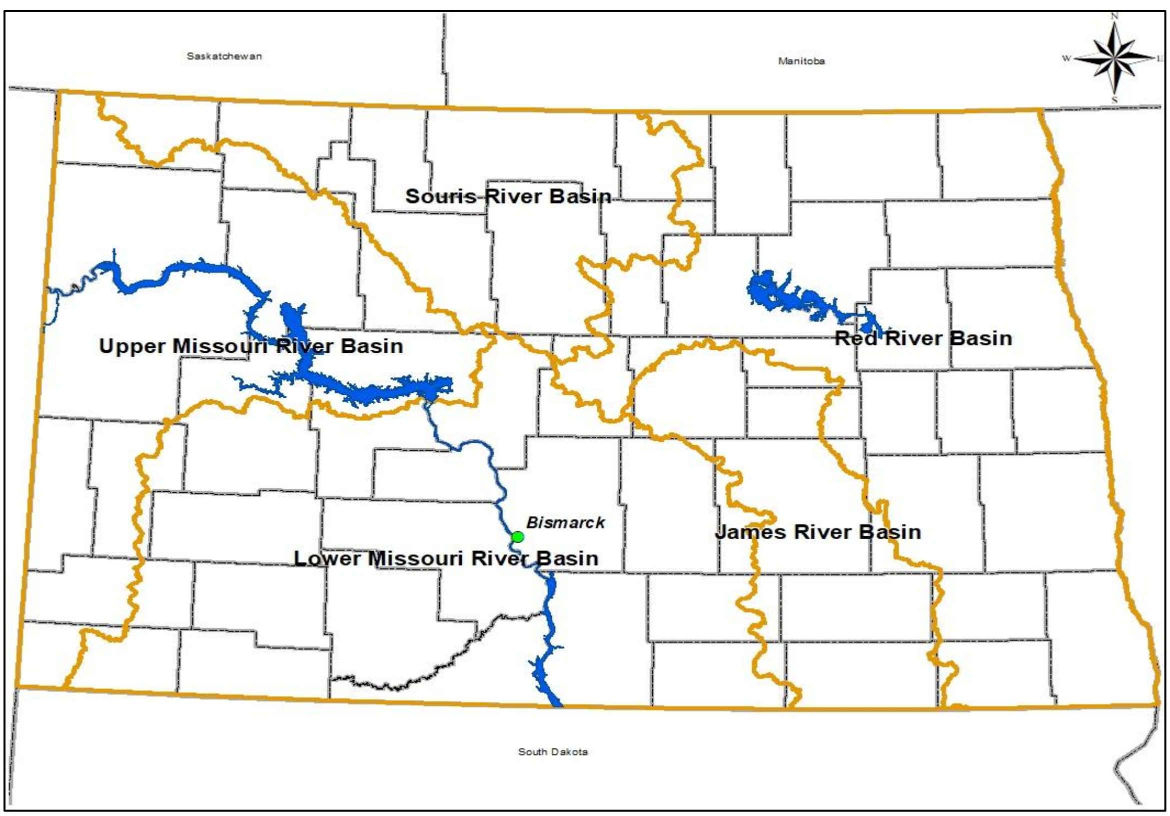

Figure III-1. The Five Major Hydrologic Basins of North Dakota.

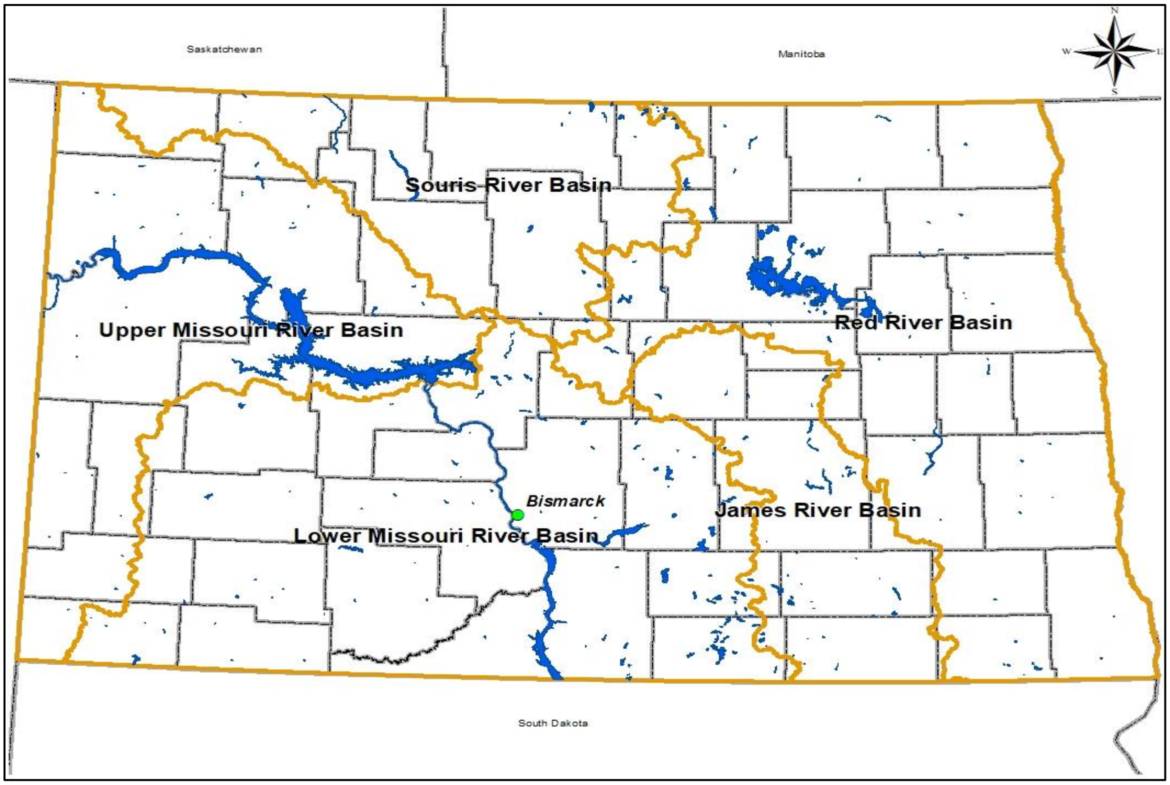

Figure III-2. North Dakota Lakes and Reservoirs.

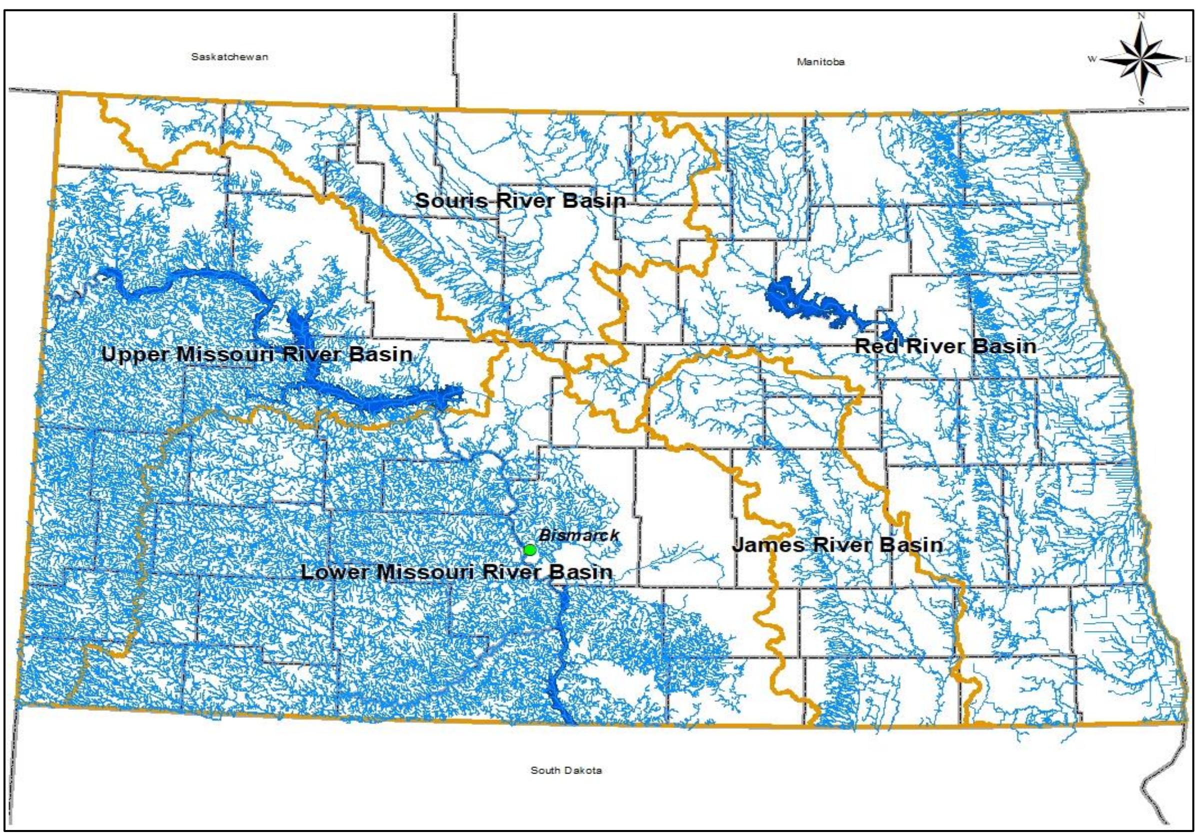

Figure III-3. North Dakota Reach Indexed Rivers and Streams.

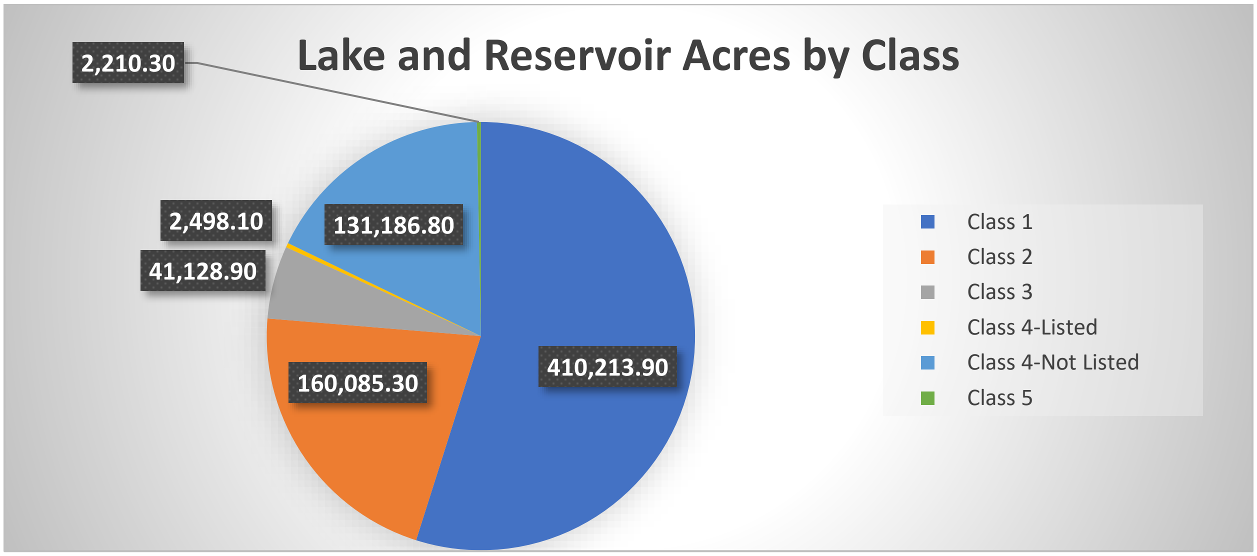

Figure III-4. North Dakota Lake and Reservoir Acreage by Class.

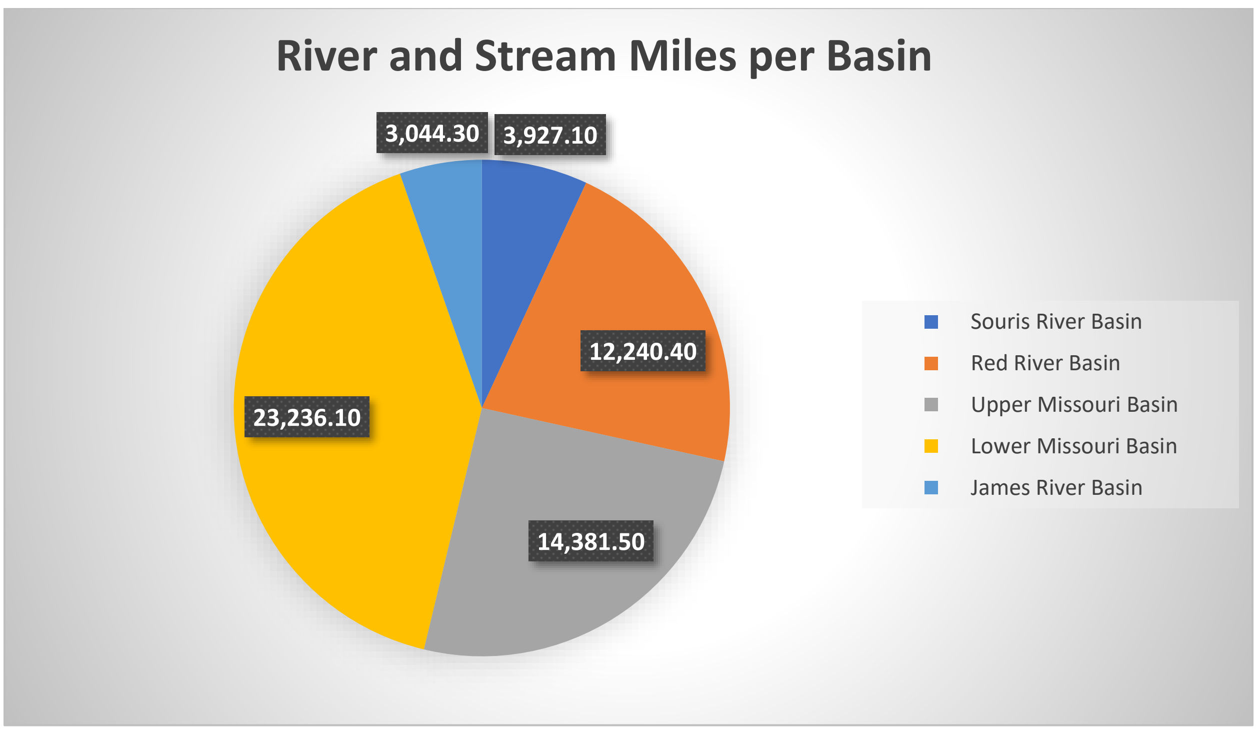

Figure III-5. North Dakota River and Stream Miles per Basin.

III.C. Water Pollution Control Program

III.C.1. Water Quality Standards Program

State water quality standards are the underpinning to the state policy of protecting, maintaining, and improving the quality of the state waters for the beneficial uses of human health, public and private water supplies, propagation of wildlife, fish, other aquatic life, domestic use, agricultural, industrial, and recreation. The standards protect the beneficial uses by classifying waters by use, propagates criteria and antidegradation policies to protect them, and enforces their adherence. Classification is based on beneficial use. Criteria is narrative and numeric, biological, physical, and chemical. Antidegradation protects current conditions for future generations. Enforcement makes the standards more than good advice.

The standards are periodically reviewed and updated to reflects the most current law and science. The period between review may not exceed three years. Known as the triennial review, emphasis is placed on ensuring the standard is populated with criteria that best protects the state defined beneficial use. When state specific data is not available, the criteria should be as or more conservative than the Clean Water Act (CWA) section 304(a).

A triennial review was completed and promulgated on July 1, 2021, and approved by the US EPA [exception of Hg] on November 1, 2021. The next triennial review is scheduled to begin in 2022.

The latest triennial review updated/revised:

- Correct spelling and improve grammar throughout the standards.
- Updated the ammonia criterion to reflect CWA, section 304(a) criteria Recommendations for the protection of aquatic life.
- Removed the Site-Specific ammonia criterion for the Red River of the North beginning at 12th avenue north bridge in Fargo and continuing north approximately 32 miles.
- Updated pH for Class I and IA streams to reflect the CWA section 304(a) criterion for the protection of aquatic life.
- Added selenium fish flesh criteria to reflect the CWA section 304(a) criteria for the protection of aquatic life.
- Updated the chronic aquatic life mercury criteria to reflects the CWA section 304(a) criteria for the protection of aquatic life.
- Added language to the discharge of waste or pollutant reporting and action requirements to reflect the law.
- Updated Step 1 for implementing mixing zone procedures during critical low-flow conditions.
- Updated language in the review process for category 3 waters.

III.C.2. Point Source Control Program

The department regulates all releases of wastewater from point sources into waters of the state. Point source pollution is defined simply as pollution coming from a specific source, like the end of a pipe. The regulation of all point source discharges is the responsibility of the department's Division of Water Quality. The North Dakota Pollutant Discharge Elimination System (NDPDES) Program requires all point source dischargers (municipal and industrial) to obtain a permit. NDPDES permits use technology-based and water quality-based limits for effluent discharges.

Environmental regulations implemented during the last 30 years have resulted in a significant reduction in pollution from major point sources (e.g., municipal and industrial wastewater treatment facilities). There are approximately 400 facilities (25 percent industrial and 75 percent municipal) that are permitted for discharges of treated wastewater.

Since 1992, permits have been required for stormwater discharges associated with construction and industrial facilities. Permitting stormwater discharges from industrial sites, construction sites and larger municipalities are a major portion of the NDPDES program. The department has issued four separate general permits for stormwater discharges. The general permits outline requirements for stormwater discharges from construction activities, industrial activities, mining operations, and municipal separate storm sewer systems (MS4's).

The department implements the stormwater regulations to the maximum extent possible. There are approximately 430 facilities covered under general permits for stormwater discharges from industrial activities. Included in these general permits are requirements for monitoring and sampling of stormwater discharges. All discharge data is evaluated and used to update the standard pollution prevention practices that are currently used in the state. These facilities must implement pollution prevention plans which are intended to improve the quality of stormwater discharges.

There are approximately 1890 facilities covered for construction stormwater in the state. Several of the forms and guidance materials for the industrial and construction permit were revised or created to assist permit holders. A stormwater sampling guide was developed and posted on the department's website, as well as new stormwater pollution prevention plan templates for construction and industrial activity. The department continues to provide stormwater education, including an annual workshop on stormwater issues.

The department works with the regulated small MS4s (19) on issues relating to stormwater discharges. The focus of MS4 activity continues to be development/implementation of ordinances or other regulatory mechanisms for local construction site erosion and sediment control, and post construction controls. The department provides information on compliance assistance activities and training conducted for permitted small MS4s. The department has developed an audit/inspection process for Phase II MS4s to ensure that compliance is verified on an ongoing basis.

Many of the wastewater treatment systems in North Dakota consist of impoundments or lagoons. The availability of land and the low operation and maintenance costs are the main reasons for their use and acceptance in North Dakota. These wastewater stabilization pond systems discharge intermittently, and the discharges are short in duration. The average discharge duration is less than six days in length with the majority of the discharges occurring in the spring and fall. A facility discharging effluent is required to monitor the discharge for quality and quantity data. This information is submitted to the department in monthly, quarterly, or semi-annual reports which are tracked and monitored for compliance with the conditions outlined in the permit.

The overall quality of wastewater is commonly indicated by 5-day biochemical oxygen demand (BOD-5) and total suspended solids (TSS). Typically, high concentrations of BOD-5 and TSS indicate poor treatment system performance which can present an environmental concern. Effluent from many of the state's permitted facilities is discharged over land or through ditches or unnamed drainages before it reaches waters of the state.

Generally, development of Total Maximum Daily Loads (TMDLs) has not been required for point source discharges in North Dakota. TMDL development activity occurs mainly in rural watersheds dealing with nonpoint source pollution issues. There is internal coordination during the development of TMDLs and waste load allocation (WLA) requirements in NDPDES permits, and no formal tracking mechanism is required or necessary in the NDPDES Program at this time. For this reporting period, no permits have been modified or reissued to implement WLAs with approved TMDLs.

The NDPDES program received primacy for the Industrial Pretreatment Program on September 9, 2005. This program regulates the discharges from categorical industrial discharges to the local POTW. The cities of Grand Forks, Fargo, Bismarck, Mandan and West Fargo have approved pretreatment programs. The department continues to work closely with pretreatment personnel from permitted industries and municipalities on providing training and updates on issues associated with the pretreatment program.

All waters of the state shall be free from substances attributable to municipal, industrial, or other discharges in concentrations or combinations which are toxic or harmful to humans, animals, plants, or resident biota. This narrative water quality standard is enforced in part through appropriate whole effluent toxicity (WET) requirements in NDPDES permits. All major municipal/industrial permittees and select minors are required to monitor their discharges for WET. Municipalities and industries sample at an approved frequency for WET with results submitted for the department's review. Failure of WET tests can result in toxicity identification evaluations (TIEs) to determine the cause of the toxicity in the effluent. TIEs that have been completed in the state have resulted in major and minor improvements to wastewater treatment systems.

Rules and regulations of the Safe Drinking Water Act have resulted in the movement to membrane filtration water treatment plants in the state. As a result, the department has been very active in permitting these new membrane filtration water treatment plants. The discharge of wastewater generated in the production of drinking water is not regulated by national effluent limitations guidelines, which establish technology-based effluent limitations for various industries. In the absence of a federal standard, limitations may be determined using Best Professional Judgment (BPJ) to ensure reasonable control technologies are used to prevent potential harmful effects of the discharge. In addition, the department must consider and include limitations necessary to protect water quality standards applicable to the receiving waters. The challenge for the program is working with the facilities and their consultants on discharge requirements especially for low base-flow streams in the state of North Dakota. The department has a general permit for discharges from qualifying water treatment plants.

The department continues working on addressing noncompliance in the program. The main emphasis from EPA continues to be wet weather issues like stormwater and sanitary system overflows (SSO's). Routine inspections can result in informal and formal enforcement actions. Informal enforcement can be letters requesting additional information and/or requiring repairs to best management practices (BMPs). In addition, the department issues formal warning letters citing apparent non-compliance with permit rules and water quality statutes (LOAN letters). The department has implemented the use of an Expedited Settlement Agreement (ESA) used for non-compliance instances that can be readily addressed. For more severe non-compliance issues the department uses a Notice of Violation (NOVs) and Consent Agreements are issued through the Attorney General's office. The consent agreements can include both upfront and suspended penalties. For each case, the collected penalty exceeded any economic benefit of non-compliance.

Impacts to water from livestock operations are a concern in North Dakota. Currently, about 700 active livestock facilities have been permitted for approval to operate. Most of these are cattle, hog and dairy facilities that are part of a farmer's total farm operation. The department addresses all animal feeding operations impacting water quality through mechanisms or existing programs in the state. The department utilizes the North Dakota Pollutant Discharge Elimination System (NDPDES) rules (NDAC 33-16-01) and Control of Pollution from Animal Feeding Operations rules (NDAC 33-16-03.1) to permit livestock facilities in the state.

The department continues to permit animal feeding operations under the current state program (NDAC 33-16-03.1) which also includes large CAFOs. For all state-permitted CAFOs, permit facility data, permit event data and inspection data are entered into the state data base system. CAFO inspections are performed yearly, and information is provided to EPA on a regular basis.

The department provides educational materials to livestock producers and the public on the impacts that livestock manure has on waters of the state. The department also participates in presentations to producer groups as requested. The department works closely with the Natural Resources Conservation Service (NRCS) and NDSU Extension Service on livestock manure systems. The department coordinates with the North Dakota Department of Agriculture and the North Dakota Stockmen’s Association on assessing potential water quality impacts at livestock facilities. The department also meets with individual producers on-site to determine what impacts the facility may have on water quality and discuss ways to reduce water quality impacts.

The Operator Training Program is an important aspect of water quality protection. North Dakota regulations require a certified operator for municipalities with populations of greater than 500. The goal of the program is to conduct an inspection of each municipal treatment system at least once every three years. These inspections verify proper system operation and reaffirm to the operator the importance of proper operation in protecting the state's water resources. The department also conducts wastewater operator training and certification seminars. In addition to the seminars, the program provides individual training and assistance to facilities encountering treatment problems.

Contracts were awarded to seven health districts in the state to provide assistance in water pollution investigations. The contracts run through the state fiscal year (July 1 - June 30) and are for a two-year period. Activities associated with these contracts are water and wastewater inspections, odor readings at animal feeding operations, initial response to spills and releases to waters of the state and initial response to complaints on water quality issues.

The growth of industrial activity related to oil and gas production and exploration continues, which has impacted all parts of the program. In response, the department has issued a new general permit for package-type mechanical treatment plants. These plants are serving many of the crew housing facilities in the western part of the state. A large amount of the domestic wastewater generated is still hauled from sites, so the department also increased its oversight of septic system servicers, requiring record keeping and disposal.

III.C.3. Nonpoint Source (NPS) Pollution Management Program

State and local efforts to address NPS pollution impacts to the beneficial uses of water resources are primarily accomplished through the NPS Program. The NPS Program is a voluntary program, dependent on the formation of partnerships and coordination with nongovernmental organizations (NGOs) as well as local, state, and federal agencies. Through these coordinated efforts, numerous locally driven NPS pollution management projects (NPS projects) have been implemented. These local initiatives are the primary means by which the NPS Program is implementing the 2015 – 2020 NPS Pollution Management Program Plan (Management Plan). Over the long term, this coordination will enable the NPS Program to realize its vision to abate NPS pollution threats and impairments to the beneficial uses of waters of the state. To realize this vision, the mission of the NPS Program is to implement a voluntary, incentive-based program that restores and protects the chemical, physical, and biological integrity of waters where beneficial uses are threatened or impaired due to nonpoint sources of pollution.

Five goals are included in the Management Plan to provide direction for the implementation of the NPS Program and ensure continued progress toward the vision. These goals are focused on assessment, restoration, outreach, and partnerships. Specific program goals listed in the Management Plan are as follows:

> Goal 1: Expand the number and distribution of assessed waterbodies in the state to better define local and statewide needs for addressing the sources and causes of NPS pollution threatening or impairing waterbody beneficial uses.
>
> Goal 2: Through the local watershed projects, improve water quality trends and/or restore impaired beneficial uses of 5 waterbodies by 2025.
>
> Goal 3: Increase public awareness and understanding of the sources and causes of NPS pollution as well as the feasible and sustainable solutions for addressing NPS pollutants impairing the beneficial uses of waterbodies.
>
> Goals 4: Increase the capacity and ability of soil conservation districts and other resource managers to develop and implement comprehensive watershed-based projects to address local water quality priorities.
>
> Goal 5: Support the implementation of the components of the ND Nutrient Reduction Strategy for Surface Waters that are focused on evaluating and/or addressing nonpoint sources of nitrogen and phosphorus.

Annually, the NPS Program uses Section 319 funding to support 30-35 NPS projects that are designed to help progress toward one or more of the program goals. These projects can be grouped in one of four different categories that describe the basic focus of the projects. Descriptions for these project categories are as follows:

> <u>Development Phase Projects:</u> Development phase projects are the first step in determining NPS pollution management needs and solutions. The watershed scale assessment projects under this category are generally initiated by local groups or organizations in response to an observed water quality problem and/or other information on water quality conditions in a specific waterbody (e.g., lake water quality reports). Information and/or data collected through the development phase watershed assessment projects is used to: 1) determine the extent of beneficial use impairments associated with NPS pollution; 2) identify sources and causes of NPS pollution; 3) establish watershed NPS pollutant load reduction targets; 4) identify feasible solutions to achieve NPS pollutant load reduction goals; and 5) develop a Total Maximum Daily Load (TMDL). In addition to the watershed assessments, development phase projects may include projects focused on the developing assessment tools or the evaluation of new or emerging NPS pollutant sources and causes.
>
> <u>Watershed Projects</u>: Watershed projects are comprehensive and long-term projects implemented through the NPS Program. These projects are designed to address documented NPS pollution impacts identified through development/assessment projects or TMDL reports. The goal of the watershed projects is to restore or protect waterbodies where the beneficial uses are impaired or threatened due to NPS pollution. The goal is generally accomplished by 1) promoting voluntary adoption of BMPs; 2) providing financial and technical assistance to implement BMPs; 3) disseminating information on

the project and solutions to NPS pollution impacts; and 4) evaluating progress toward meeting NPS pollutant reduction goals. Local sponsors utilize many funding sources including the: NPS Program; USDA; North Dakota Outdoor Heritage Fund (OHF), and local contributions to support their watershed restoration efforts. Funds allocated to a watershed project are used to employ staff, cost-share BMPs, conduct I&E events, and monitor trends in the aquatic community, water quality and/or land use. Generally initiated as five-year projects, these can be extended another five or more years depending on progress; size of the watershed; and extent of beneficial use impairments associated with NPS pollution.

Support Projects: These are projects that support BMP implementation within other NPS project areas or address a specific NPS pollutant source. Support projects can be statewide in scope or targeted toward specific NPS projects, geographic areas or priority watersheds. Generally, support projects deliver a specific specialized service or provide financial and/or technical assistance to implement a specific type of BMP. Services provided by these projects may include the development of construction designs and/or planning and financial assistance to implement BMPs such as livestock manure management systems; wetland restorations and/or riparian buffers. Most support projects will be 5 or more years in length.

Information/Education Projects: The fourth type of NPS project is the information/education (I&E) project. As the name implies, projects in this category are those that are designed to educate the public on various NPS pollution issues. Educational projects, which can vary greatly in size, focus and target audience, are delivered statewide or locally. Some projects may only use demonstrations or workshops to reach the target audience while others combine several educational offerings to deliver a NPS pollution management message. The educational projects can be up to three years in length and extended an additional three years if adequate progress is demonstrated.

Section 319 funding continues to be the primary source of financial support for NPS projects across the state. Funding received during the Integrated Report reporting period include the 2014 – 2021 Section 319 Grants (Active Grants). Sixty-eight local and state sponsored projects have been supported by these Active Grants. Information on all the active and completed NPS projects is provided on the EPA Grants Reporting and Tracking System (GRTS) https://www.epa.gov/nps/grants-reporting-and-tracking-system-grts and the NPS Program webpage NPS Home (nd.gov). Cumulative Section 319 allocations and expenditures during the 2018 – 2021 reporting period are provided in Table III-2.

Table III-2. Project Category Allocations and Expenditures from 2018 - 2021 under the Fiscal Year 2014 - 2021 Section 319 Grants

Project Category	Cumulative 319 Allocation	Cumulative 319 Expenditures	Percent of Total 319 Expenditures
Development Phase	$1,173,583	$656,848	5.05%
Information/Education	$4,936,443	$2,616,392	20.1%
Support	$4,945,299	$3,075,602	23.6%
Watershed	$9,795,234	$4,766,251	36.6%
Total	$20,850,559	$11,115,093	

Delivery of the NPS Program is accomplished through five objectives addressing: Waterbody Prioritization; Resource Assessment; Project Assistance; Coordination; and Information & Education. Each objective has specific actions, planned outputs and milestones that describe the major activities to be completed during the Management Plan period. These objectives are as follows:

- Waterbody Prioritization **-** Provide direction for the delivery of financial and technical assistance to assess, restore or protect waterbodies impaired or threatened by NPS pollution

- Resource Assessment **-** Document beneficial use and water quality conditions of priority waterbodies and/or watersheds and identify the sources and causes of beneficial use impairments.

- Project Assistance **-** Coordinate with local partners to secure financial and technical resources to support the development and implementation of priority watershed assessments, educational programs, and watershed restoration or protection projects.

- Coordination **-** Maintain and expand partnerships at the state and local levels to diversify input for project development and implementation as well as to increase opportunities for securing and coordinating resources to more efficiently address NPS pollution impacts.

- Information and Education **-** Strengthen support for and participation in NPS pollution management projects by increasing public awareness and understanding of NPS pollution impacts and the solutions for restoring and protecting those water resources impaired or threatened by NPS pollution.

Each of the Management Plan objectives are supported by a set of action items that are scheduled to be implemented during the Management Plan period. The progress and status of each action item is described in the annual NPS Program reports. Annual program reports associated with 2021- 2025 Management Plan are provided on the NPS Program web page NPS Home (nd.gov).

Evaluation of NPS Program success is primarily based on data collected within the watershed project areas; documented progress toward individual project goals and objectives; and completion of measurable outputs identified in the Management Plan. The annual and final NPS project reports; EPA NPS Program measures (i.e., Type 1 & 2 Success Stories); and annual NPS Program reports are the primary means used to disseminate information on the progress of the NPS Program and supported projects.

For watershed-based projects, documentation of progress is accomplished through various monitoring approaches that are dependent on several factors. These factors include variables such as project size; goals; planned BMPs; pollutant types; sources and causes of NPS pollution; target audience; land use; location; and beneficial use impairments. The monitoring methods employed also vary and may include photo-monitoring, modeling, biological monitoring; water quality monitoring; and BMP tracking. The sampling and analysis plan (SAP) or quality assurance project plan (QAPP) for each project addresses these variables by describing data collection goals, locations, methods, schedules, and quality control measures. Upon completion of a watershed project, the data collected is used to develop a final water quality report. These reports are included in the larger project final report to document tends in water quality and/or biological conditions and describe progress toward the project's NPS pollutant reduction and beneficial use improvement goals.

Since delivery of the NPS Program is primarily accomplished through projects developed and implemented by program partners, the overall success of the NPS Program is directly linked to the success of the NPS projects supported by the program. Therefore, evaluation of NPS Program progress is based almost exclusively on the cumulative accomplishments of the statewide and local NPS projects. These accomplishments are described in the annual and final project reports and posted in the EPA's Grants Reporting and Tracking System (GRTS) https://www.epa.gov/nps/grants-reporting-and-tracking-system-grts.

From a program perspective, progress is evaluated by tracking the measurable outcomes identified in the 2021-2025 NPS Pollution Management Program Plan. These evaluations are conducted annually and summarized in the NPS Program reports posted on the NDDEQ website NPS Home (nd.gov) and in the GRTS. Specific program and water quality outcomes addressed in the annual reports and listed in the Management Plan are as follows:

NPS Program Delivery Outcomes

- Five new watershed-based projects addressing NPS pollution impairments.
- Seven assessed waterbodies with adequate data to develop TMDLs or advanced restorative plans as well as comprehensive watershed management plans
- 75% of the public has a basic understanding of water quality and nonpoint source pollution issues in the state.
- 80% of the SCDs actively involved in education or restoration projects focused on addressing water quality impairments associated with NPS pollution
- Four Watershed Planning Specialists available in the state to assist local resource managers with watershed planning and implementation. Options for locating the specialists across the state include the major river basins and SCD Areas.
- 80% of annual Section 319 Grant Award used for NPS project development and implementation

Water Quality Improvement/Protection Outcomes

- Two waterbodies with one or more restored beneficial uses
- Self-evaluation method for assessing environmental and economic benefits of farm or ranch operational changes implemented to improvement water quality.
- Estimated annual load reductions for nitrogen, phosphorus and sediments of 70,000 pounds, 35,000 pounds and 15,000 tons, respectively.
- Research data and reports that describe the relationship between stream/lake water quality and agricultural practices applied in the watershed to serve as a foundation for developing future watershed management projects.
- Assessments and/or restoration projects initiated on 4 lakes with beneficial uses impaired due to harmful algal blooms.
- Three waterbodies with improving trends in water quality and/or beneficial uses

Land use improvements are another important measure used in the project areas to document reductions in pollutant sources. This is accomplished by tracking the number, type, and locations of BMPs applied. Information on applied BMPs provides an immediate means for evaluating annual progress and estimating potential pollutant reductions over the long term. While the BMP information cannot replace the measurement of actual beneficial use improvements or load reductions, it does readily show how the sources and causes of NPS pollution impairments are being addressed in the project areas and across the state. Cumulatively, this same BMP data can also be used to evaluate maintenance of an “on-the-ground” emphasis to address priority NPS pollution issues. With approximately 70% of cumulative project expenditures associated with Support projects and Watershed projects focused on BMP implementation (Table III-2), it is apparent a significant portion of NPS project costs is directed toward the planning and implementation of projects that address NPS pollution sources and causes. The BMP implemented by these projects are diverse and can be grouped into one of eight different categories. Table III-3 indicates the total and percent expenditures per BMP category in 2018 through 2021.

Table III-3. Expenditures per BMP Category (2018-2021).

BMP Category	Total Expenditures	Percent of Expenditures
Cropland Management	$326,464	4.3%
Grazing Management	$2,311,660	30.3%
Livestock Manure Management System (Full Systems)	$3,548,647	46.5%
Livestock Manure Management System (Partial Systems)	$184,784	2.4%
Erosion Control/ Tree Plantings/ Riparian Area Management	$128,156	1.7%
Miscellaneous Practices *****	$1,126,266	14.8%
TOTAL	$7,625,977	

*****Ninety-three percent (94%) of the Miscellaneous costs were associated with septic system renovations.

As indicated in Table III-3, approximately 80% of the annual NPS Program BMP expenditures are associated with practices addressing livestock grazing and manure management. However, with increased emphasis on harmful algal blooms (HABs) under the current Management Plan, increased funding will likely be targeted toward cropland nutrient management in future years. While resources will continue to be directed toward livestock management issues, more technical and financial support from the NPS Program will directed toward cropland acres to; 1) expand the use of cover crops; 2) diversify crop rotations; 3) achieve more efficient nutrient use; and 4) improve soil health. This emphasis will be particularly evident for waterbodies in the eastern half of the state where nutrient (i.e., nitrogen and phosphorus) applications for crop production are more intensive. Cropland BMPs that will be promoted and implemented include no till; cover crops, precision nutrient management, diverse crop rotations; vegetative buffers, and grassed waterways. Conversion of nonproductive croplands to permanent vegetation will also be an important practice to eliminate unneeded nutrient, herbicide, and pesticide inputs on those acres.

Although there are many challenges in measuring short-term achievements of watershed projects, data collected in some areas is indicating water quality improvements in a relatively short period. The Upper Spring Creek watershed project is such a project.

Upper Spring Creek watershed is a 179,111-acre sub-watershed located within the Knife River, HUC-8 Watershed (Figure 111-5). The Upper Spring Creek watershed lies mostly in Dunn County in western North Dakota, with a small portion on the eastern edge extending into Mercer

County. A land use analysis showed that about 56 percent of these acres are native grassland. Cropland and tilled acres make up approximately 26 percent and the remaining 18 percent consists of tame/reseeded grass, light development, woodland areas, and water/wetland areas. Although there are no large, concentrated animal feeding operations (CAFOs) within the watershed, there are several small to medium livestock operations in the area.

A Total Maximum Daily Load (TMDL) report was finalized for the entire Spring Creek watershed in September 2011. Information provided in the TMDL report indicated recreational uses for several stream reaches in the watershed were "not supported" or "fully supporting but threatened" due to E. coli bacteria. The primary E. coli bacteria sources identified in the watershed included excess grazing in riparian areas; small and medium livestock winter feeding areas; and overgrazed pastures and native rangelands. To address the water quality degradation, improved livestock grazing, and manure management were recognized as the most cost-effective solutions for the watershed.

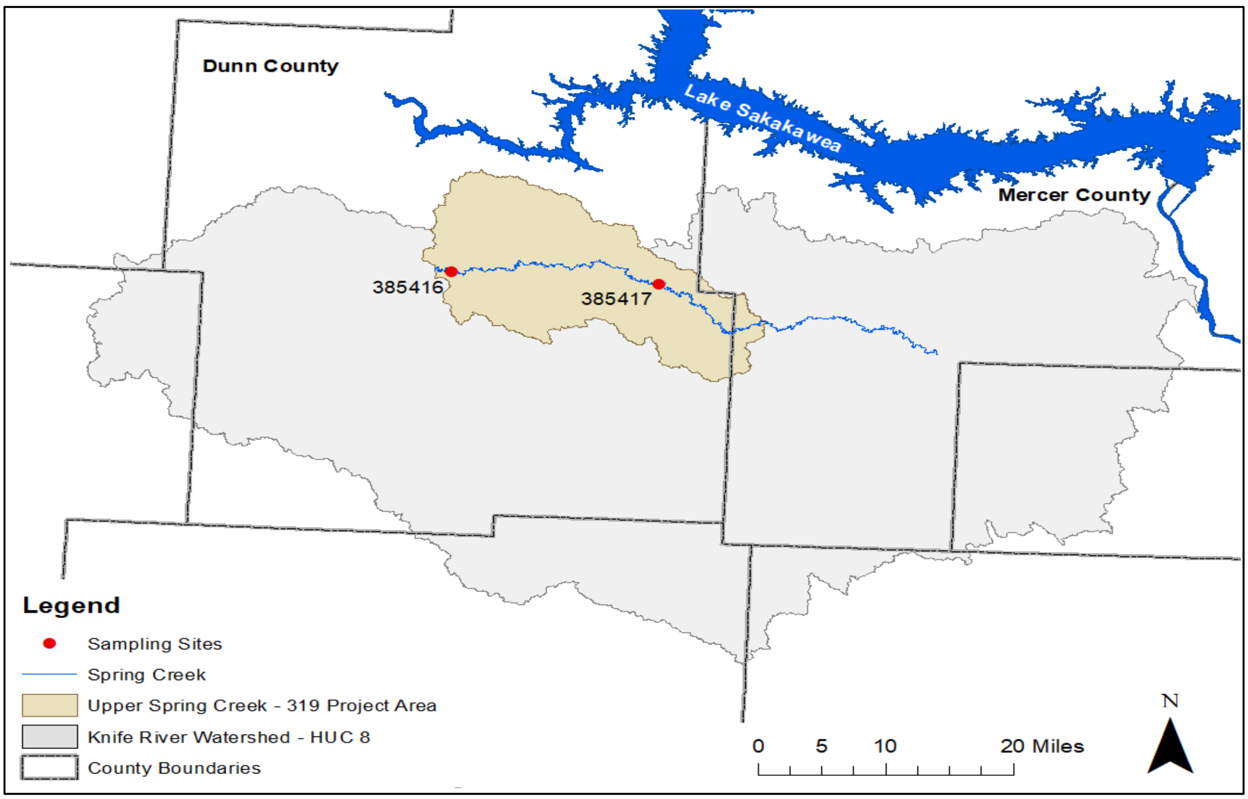

Figure III-6. Upper Spring Creek Watershed located in Dunn and Mercer Counties in Western North Dakota.

In 2011, the Mercer and Dunn County Soil Conservation Districts (SCDs) coordinated efforts to initiate the Spring Creek Watershed project. To evaluate progress, four stream sites were monitored for the duration of the Spring Creek Watershed project. Upon conclusion of the Spring Creek Watershed project in 2018, it was determined the upper reaches of Spring Creek were still impaired and additional BMPs were needed to improve water quality. A Section 319 funding proposal and project implementation plan (PIP) was developed for the Upper Spring Creek Watershed by Dunn County SCD in 2019. The additional Section 319 funding allowed the SCD to continue supporting BMP planning and implementation in the upper reaches of Spring Creek Watershed. To improve the overall condition of the watershed, the SCD employed staff to deliver conservation planning assistance and provided cost share assistance to ranchers implementing BMPs.

With the technical and financial assistance delivered by the SCD, BMPs were implemented on 67,447.6 acres. These practices included cover crops, fencing, pasture/hayland plantings, pipelines, trough/tank installation, well installation, and well decommissioning (Figures III-7 & III-8). Specific practices applied within the Upper Spring Creek watershed include:

- 860.3 acres of cover crops.
- 60,845.8 linear feet of fencing.
- 507.5 acres of pasture/hayland plantings
- 5,234 linear feet of pipelines.
- Four troughs/tanks installed.
- Four livestock well installed.
- One well decommissioned.

In addition to the practices planned and supported by the SCD, the project staff worked with the Bakken Working Lands Development Program to implement 94.8 acres of cover crops. Project staff also coordinated with the NRCS to enroll ranchers in the Environmental Quality Incentives Program (EQIP) to support the implementation of 43,830 feet of pipeline, 20 tanks, 36,609 feet of fence, 21,153 feet of trees, 1,397 acres of cover crop, and 199 acres of forage/biomass plantings.

Figure III-7. A tank installed by a producer funded through the 319 program.

Figure III-8. A cross fence installed by a producer funded through the 319 program.

As part of the PIP, a quality assurance project plan was developed to continue monitoring water quality at the two sites located in Upper Spring Creek watershed. Data was collected from these sites in 2019 – 2021. This data indicates improvements are being realized because of the BMPs implemented in the Upper Spring Creek watershed. Analyses show improving trends in annual (arithmetic) mean E. coli bacteria concentrations (Figures III-9 and III-10). This analysis is supported by the associated reductions in the percentage of samples exceeding the 409 CFU/mL threshold and 30-day geometric means (Tables II-4 and III-5). These trends suggest Phase I of the project has been very successful. Although the status of the waterbody remains "fully supporting, but threatened," the improving trends are expected to continue through Phase II of the project as more BMPs are implemented and educational efforts continue in the area. The second phase of the project is scheduled to be initiated in July 2022.

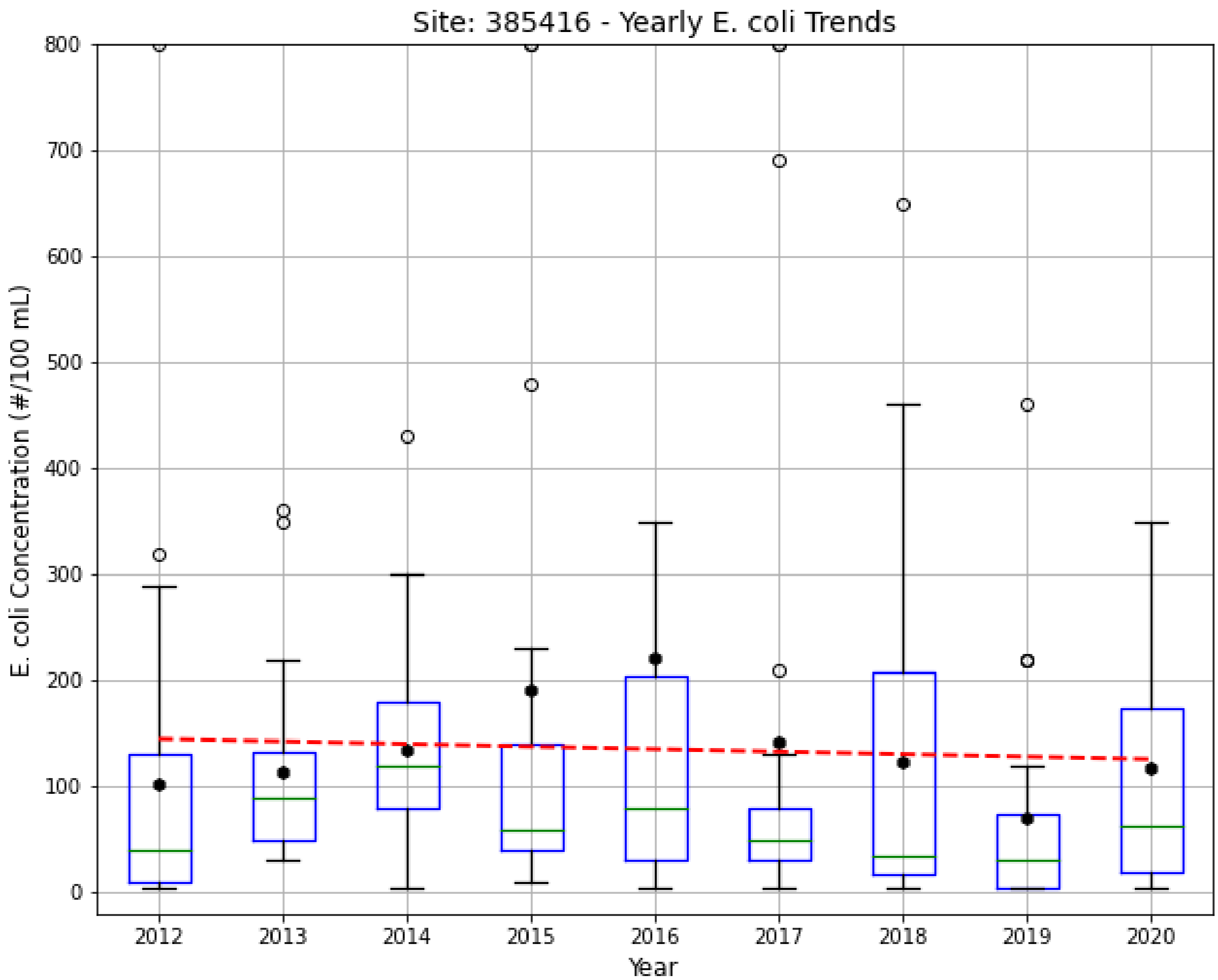

Figure III-9. The box plots depict the distribution of sample results for E. coli at monitoring station 385416 organized by sampling year.

Table III-4. Monitoring station 385416 – E. coli bacteria 30-day geometric mean, percent exceedance of 409 CFU and recreational support status

	May	June	July	August	September
Samples	39	47	44	46	41
Geo Mean (>126)	35	139	100	32	41
# > 409	1	7	2	1	2
% > 409	3%	15%	5%	2%	5%
Status*	FS	NS	FS	FS	FS

*FS – Fully Supporting; NS – Not Supporting

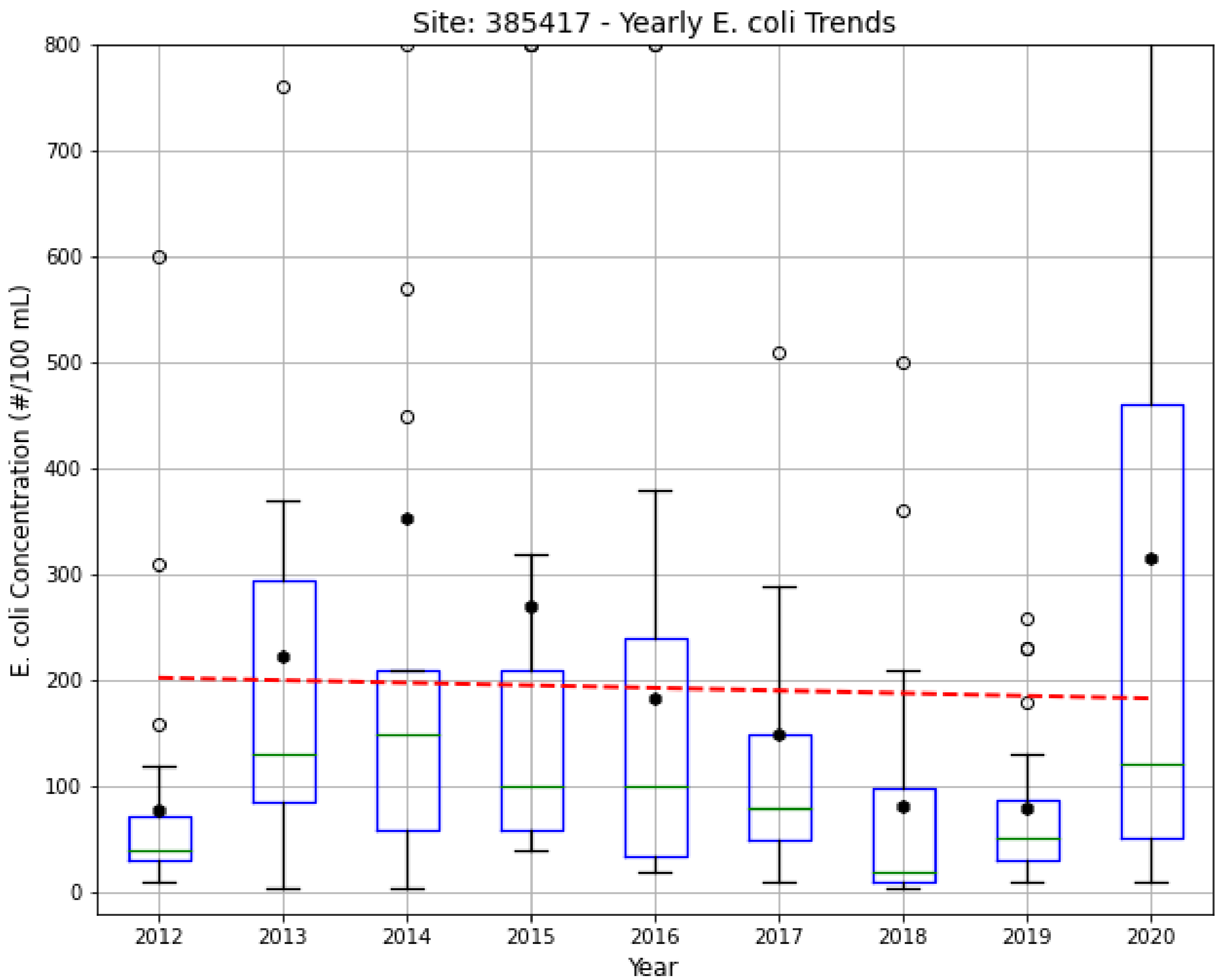

Figure III-10. The box plots depict the distribution of sample results for E. coli at monitoring station 385417 organized by sampling year.

Table III-5. Monitoring station 385417 – E. coli bacteria 30-day geometric mean, percent exceedance of 409 CFU and recreational support status.

	May	June	July	August	September
Samples	41	48	43	48	43
Geo Mean (>126)	106	119	101	64	52
# > 409	7	6	6	3	2
% > 409	17%	13%	14%	6%	5%
Status*	FST	FST	FST	FS	FS

*FS – Fully Supporting, FST – Fully Supporting but Threatened

PART IV. SURFACE WATER QUALITY MONITORING PROGRAM

IV.A. Monitoring Goals and Objectives

North Dakota's surface water quality monitoring program is detailed in a report entitled *North Dakota's Water Quality Monitoring Strategy for Surface Waters: 2008-2019* (NDDoH, 2014b). This document describes the department's strategy to monitor and assess its surface water resources, including rivers and streams, lakes and reservoirs and wetlands. This strategy fulfills requirements of Clean Water Act Section 106(e)(1) that requires the EPA, prior to awarding a Section 106 grant to a state, to determine that the state is monitoring the quality of its waters, compiling and analyzing data on the quality of its waters and including those data in its Section 305(b) report. An EPA guidance document entitled *Elements of a State Water Monitoring and Assessment Program* (US EPA, 2003) outlines 10 key elements of a state monitoring program necessary to meet the prerequisites of the CWA. The 10 key elements are:

- Monitoring Program Strategy.
- Monitoring Objectives.
- Monitoring Design.
- Core and Supplemental Water Quality Indicators.
- Quality Assurance.
- Data Management.
- Data Analysis/Assessment.
- Reporting.
- Programmatic Evaluation.
- General Support and Infrastructure Planning

The department's water quality monitoring goal for surface waters is ***"to develop and implement monitoring and assessment programs that will provide representative data of sufficient spatial coverage and of known precision and accuracy that will permit the assessment, restoration and protection of the quality of all the state's waters."*** In support of this goal and the water quality goals of the state and of the Clean Water Act, the department has established 10 monitoring and assessment objectives. The following objectives have been established to meet the goals of this strategy. They are:

- Provide data to develop, review and revise water quality standards.
- Assess water quality status and trends.
- Determine beneficial use support status.
- Identify impaired waters.
- Identify causes and sources of water quality impairments.
- Provide support for the implementation of new water management programs and for the modification of existing programs.
- Identify and characterize existing and emerging problems.
- Evaluate program effectiveness.
- Respond to complaints and emergencies.
- Identify and characterize reference conditions.

IV.B. Monitoring Programs, Projects and Studies

To meet the goals and objectives, the department has integrated several monitoring designs, both spatially and temporally. Monitoring includes fixed station sites, stratified random sites, rotating basin designs, statewide networks, chemical parameters and biological attributes. Monitoring is conducted by department staff, soil conservation districts, USGS, and private consultants. Current monitoring activities include the project or program purpose (objectives), monitoring design (selection of monitoring sites), selected parameters and the frequency of sample collection.

IV.B.1. Ambient Water Quality Monitoring Network for Rivers and Streams

In 2012, the USGS North Dakota Water Science Center completed an analysis of the state's ambient water quality monitoring network, including the department's fixed station ambient monitoring network and the ND State Water Commission's (SWC's) High/Low flow network. In addition to evaluating trends, providing loading estimates and providing a spatial comparison of sites, the report, entitled "Evaluation of Water-Quality Characteristics and Sampling Design for Streams in North Dakota, 1970-2008" (http://pubs.usgs.gov/sir/2012/5216/), provided recommendations for a revised water quality monitoring network for rivers and streams in the state. These recommendations were made to ensure adequate coverage, both spatially and temporally, which is necessary to estimate trends, estimate loads and provide for general water quality characterization in rivers and streams across the state.

Beginning on January 1, 2013, and based on the recommendations provided in the USGS report, the department, in cooperation with the USGS and the SWC, implemented a revised ambient water quality monitoring network for rivers and streams. This revised ambient water quality monitoring network consists of a set of core monitoring sites representing 3 levels of sampling intensification. The highest level of sites, design level 1, consist of a network of 32 basin integrator sites (Figure IV-1, Table IV-1). These sites are sampled 8 times per year, twice in April, once each in May, June, July, August, and October, and one time in the winter (January) under ice. The next level, design level 2, consists of 25 sites (Figure IV-1, Table IV-2). These sites are sampled 6 times per year, once each in April, May, June, August and October and once under ice during the winter (January). The lowest level of sites, design level 3, consists of 25 sites located across the state (Figure IV-1, Table IV-3). These sites are only be sampled 4 times per year, once each in April, June, August and October. Under the current design, the USGS samples all of the design level 2 sites (with the exception of the Red River at Harwood which is sampled by the department) and all the design level 3 sites.

At all level 1, 2 and 3 sites field measurements are taken for temperature, dissolved oxygen, pH and specific conductance. Sampling and analysis at all level 1, 2 and 3 sites consist of general chemistry, dissolved trace elements, and total and dissolved nutrients (Table IV-4). In addition to these water quality parameters, total organic carbon (TOC), dissolved organic carbon (DOC), total suspended solids (TSS), and E. coli bacteria are sampled and analyzed for at all level 1 sites (Table IV-4). E. coli bacteria are only be sampled during the recreation season (May-September). In addition to sampling for these analytes, the Red River at Fargo, the Red River at Grand Forks, and the Red River at Pembina are sampled for total suspended sediment. The analysis of the total suspended sediment samples is conducted by the USGS Iowa Sediment Laboratory. All chemical analysis of samples is performed by the department's Laboratory Services Division.

Through a cooperative agreement with the USGS, a "real-time water quality monitoring" was added to the Red River at Fargo (USGS site 05054000; NDDEQ site 385414) and Red River at Grand Forks (USGS site 05082500; NDDEQ site 384156) sites in September 2003 and May 2007, respectively. Real-time monitoring at these sites includes a continuous recording YSI Model 600 multi-probe sonde and datalogger that monitors field parameters (e.g., temperature, specific conductance, pH, dissolved oxygen and turbidity) continuously. Output from the sonde is transmitted via telemetry and the data posted "real-time" on the USGS North Dakota Water Science Center web site. As this data set has increased, regression relationships have been developed for select water quality variables (e.g., TSS, TDS, total phosphorus and total nitrogen) using the continuously recorded field parameters. These regression relationships have now been used to provide "real-time" concentration estimates of TSS, total phosphorus, total nitrogen and TDS that are posted on the USGS North Dakota Water Science Center web site (http://nd.water.usgs.gov).

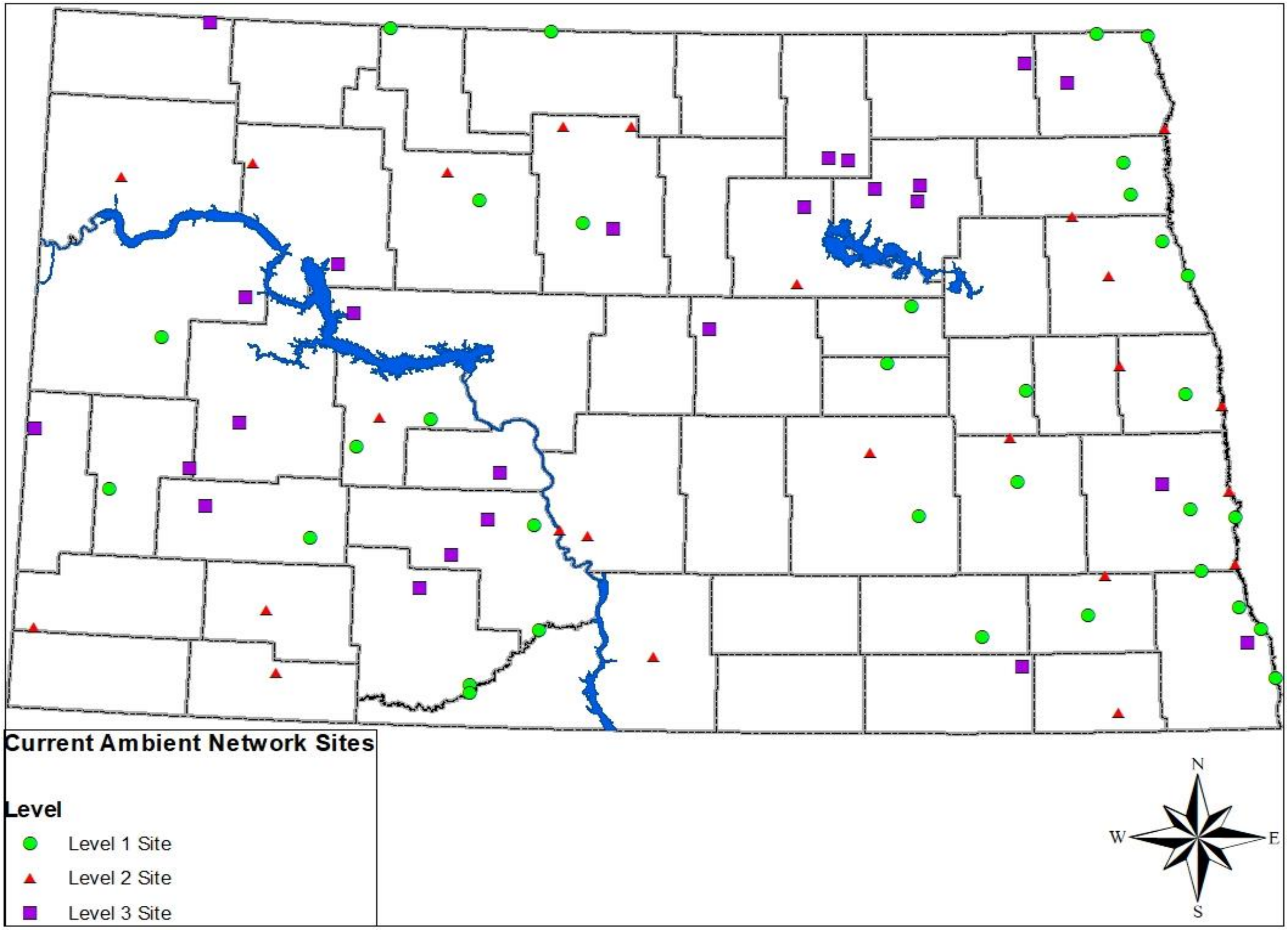

Figure IV-1. Ambient River and Stream Water Quality Monitoring Sites.

Table IV-1. Level 1 Ambient River and Stream Water Quality Monitoring Sites.

USGS Site ID	NDDEQ Site ID	Site Name	Latitude	Longitude	Design Level	Responsible Agency
05051300	385055	Bois de Sioux River nr Doran, MN	46.1522	-96.5789	1	NDDEQ
05051510	380083	Red River at Brushville, MN	46.3695	-96.6568	1	NDDEQ
05053000	380031	Wild Rice River nr Abercrombie, ND	46.4680	-96.7837	1	NDDEQ
05054000	385414	Red River at Fargo, ND[1]	46.8611	-96.7837	1	USGS-GF
05057000	380009	Sheyenne River nr Cooperstown, ND	47.4328	-98.0276	1	NDDEQ
05058000	380153	Sheyenne River below Baldhill Dam, ND	47.0339	-98.0837	1	NDDEQ
05058700	385168	Sheyenne River at Lisbon, ND	46.4469	-97.6793	1	NDDEQ
05059000	385001	Sheyenne River Kindred, ND	46.6316	-97.0006	1	NDDEQ
05060100	384155	Maple River b-l Mapleton, ND	46.9052	-97.0526	1	NDDEQ
05066500	380156	Goose River at Hillsboro, ND	47.4094	-97.0612	1	USGS-GF
05082500	384156	Red River at Grand Forks, ND[1]	47.9275	-97.0281	1	USGS-GF
05083000	380037	Turtle River at Manvel, ND	48.0786	-97.1845	1	USGS-GF
05085000	380039	Forest River at Minto, ND	48.2858	-97.3681	1	USGS-GF
05090000	380157	Park River at Grafton, ND	48.4247	-97.4120	1	USGS-GF
05100000	380158	Pembina River at Neche, ND	48.9897	-97.5570	1	USGS-GF
05102490	384157	Red River at Pembina, ND	48.9769	-97.2376	1	USGS-GF
05114000	380091	Souris River nr Sherwood	48.9900	-101.9582	1	USGS-Bis
05117500	380161	Souris River above Minot, ND	48.2458	-101.3713	1	USGS-Bis
05120000	380095	Souris River nr Verendrye, ND	48.1597	-100.7296	1	USGS-Bis
05124000	380090	Souris River nr Westhope, ND	48.9964	-100.9585	1	Env-Canada
06336000	380022	Little Missouri River at Medora, ND	46.9195	-103.5282	1	NDDEQ
06337000	380059	Little Missouri River nr Watford City, ND	47.5958	-103.2630	1	NDDEQ
06339500	384131	Knife River nr Golden Valley, ND	47.1545	-102.0599	1	NDDEQ
06340500	380087	Knife River at Hazen, ND	47.2853	-101.6221	1	NDDEQ
06345500	380160	Heart River nr Richardton, ND	46.7456	-102.3083	1	NDDEQ
06349000	380151	Heart River nr Mandan, ND	46.8339	-100.9746	1	NDDEQ
06351200	380105	Cannonball River nr Raleigh, ND	46.1269	-101.3332	1	NDDEQ
06353000	380077	Cedar Creek nr Raleigh, ND	46.0917	-101.3337	1	NDDEQ

06354000	380067	Cannonball River at Breien, ND	46.3761	-100.9344	1	NDDEQ
06468170	384130	James River nr Grace City, ND	47.5581	-98.8629	1	NDDEQ
06470000	380013	James River at Jamestown, ND	46.8897	-98.6817	1	NDDEQ
06470500	380012	James River at Lamoure, ND	46.3555	-98.3045	1	NDDEQ

[1]USGS Real-time water quality monitoring station.

Table IV-2. Level 2 Ambient River and Stream Water Quality Monitoring Sites.

USGS Site ID	NDDEQ Site ID	Site Name	Lat.	Long.	Design Level	Responsible Agency
05051522	NA	Red River at Hickson, ND	46.6597	-96.7959	2	USGS-GF
05051600	385573	Wild Rice River nr Rutland, ND	46.0222	-97.5115	2	USGS-GF
05054200	385040	Red River at Harwood, ND	46.9770	-96.8203	2	NDDEQ
05055300	385505	Sheyenne R above DL Outlet nr Flora, ND	47.9078	-99.4162	2	SWC
05056000	385345	Sheyenne River nr Warwick, ND	47.8056	-98.7162	2	USGS-GF
05057200	384126	Baldhill Creek near Dazey, ND	47.2292	-98.1248	2	USGS-GF
05059700	385351	Maple River near Enderlin, ND	46.6216	-97.5740	2	USGS-GF
05064500	NA	Red River at Halstad, MN	47.3519	-96.8437	2	USGS-GF
05065500	NA	Goose River nr Portland, ND	47.5389	-97.4556	2	USGS-GF
05082625	385370	Turtle River at State Park near Arvilla, ND	47.9319	-97.5145	2	USGS-GF
05084000	NA	Forest River near Fordville, ND	48.1972	-97.7306	2	USGS-GF
05092000	380004	Red River at Drayton, ND	48.5722	-97.1476	2	USGS-GF
05116500	380021	Des Lacs River at Foxholm, ND	48.3706	-101.5702	2	USGS-Bis
05123400	384132	Willow Creek nr Willow City, ND	48.5889	-100.4421	2	USGS-Bis
05123510	384133	Deep River nr Upham, ND	48.5842	-100.8626	2	USGS-Bis
06331000	380054	L Muddy River blw Cow Cr nr Williston, ND	48.2845	-103.5730	2	USGS-Bis
06332000	NA	White Earth River at White Earth, ND	48.3756	-102.7672	2	USGS-Bis
06335500	385031	Little Missouri at Marmath, ND	46.2978	-103.9175	2	USGS-Bis
06340000	380060	Spring Creek at Zap, ND	47.2861	-101.9257	2	USGS-Bis
06342500	380028	Missouri River at USGS-Bismarck, ND	46.8142	-100.8214	2	USGS-Bis
06349500	385053	Apple Creek nr Menoken, ND	46.7944	-100.6573	2	USGS-Bis
06350000	380025	Cannonball River at Regent, ND	46.4267	-102.5518	2	USGS-Bis
06352000	384182	Cedar Creek nr Haynes, ND	46.1542	-102.4740	2	USGS-Bis
06354580	384056	Beaver Creek blw Linton, ND	46.2686	-100.2518	2	USGS-Bis
06469400	380152	Pipestem Creek nr Pingree, ND	47.1675	-98.9690	2	USGS-Bis

Table IV-3. Level 3 Ambient River and Stream Water Quality Monitoring Sites.

USGS Site ID	NDDEQ Site ID	Site Name	Lat	Long	Design Level	Responsible Agency
05052500	385232	Antelope Creek atDwight, ND	46.3113	-96.7345	3	USGS-GF
05054500	380135	Sheyenne River above Harvey, ND	47.7028	-99.9490	3	USGS-Bis
05056060	385089	Mauvais Coulee Trib #3 nr Cando, ND	48.4575	-99.2243	3	USGS-GF
05056100	380207	Mauvais Coulee nr Cando	48.4481	-99.1026	3	USGS-GF
05056200	385092	Edmore Coulee nr Edmore	48.3367	-98.6604	3	USGS-GF
05056215	385093	Edmore Coulee Trib nr Webster	48.2664	-98.6809	3	USGS-GF
05056239	385091	Starkweather Coulee nr Webster, ND	48.3206	-98.9407	3	USGS-GF
05056340	380213	Little Coulee nr Leeds, ND	48.2433	-99.3729	3	USGS-GF
05060500	385302	Rush River at Amenia, ND	47.0166	-97.2143	3	USGS-GF
05099400	385287	Little South Pembina near Walhalla, ND	48.8653	-98.0059	3	USGS-GF
05101000	381279	Tongue River at Akra, ND	48.7783	-97.7468	3	USGS-GF
05113600	384135	Long Creek nr Noonan, ND	48.9811	-103.0766	3	USGS-Bis
05120500	384107	Wintering R. nr Karlsruhe, ND	48.1383	-100.5399	3	USGS-Bis
06332515	NA	Bear Den Creek nr Mandaree, ND	47.7872	-102.7685	3	USGS-Bis
06332523	NA	East Fork Shell Creek nr Parshall, ND	47.9486	-102.2149	3	USGS-Bis
06332770	NA	Deepwater Creek at Mouth nr Raub, ND	47.7378	-102.1077	3	USGS-Bis
06336600	385030	Beaver Creek nr Trotters, ND	47.1631	-103.9927	3	USGS-Bis
06339100	385054	Knife River at Manning, ND	47.2361	-102.7699	3	USGS-Bis
06342260	380103	Square Butte Creek below Center, ND	47.0569	-101.1935	3	USGS-Bis
06343000	NA	Heart River nr South Heart, ND	46.8656	-102.9485	3	USGS-Bis
06344600	NA	Green River nr New Hradec, ND	47.0278	-103.0532	3	USGS-Bis
06347000	385582	Antelope Creek nr Carson	46.5453	-101.6454	3	USGS-Bis
06347500	385078	Big Muddy Creek nr Almont, ND	46.6944	-101.4674	3	USGS-Bis
06348500	NA	Sweetbriar Creek nr Judson, ND	46.8517	-101.2532	3	USGS-Bis
06470800	384215	Bear Creek nr Oakes, ND	46.2252	-98.0718	3	USGS-Bis

Table IV-4. Ambient River and Stream Water Quality Monitoring Parameters.

Field Measurements	Laboratory Analysis			
	General Chemistry	**Trace Elements**	**Nutrients**	**Biological**
Temperature	Sodium[1,2]	Aluminum[1,2]	Ammonia (Total) [2]	E. coli[3]
pH	Magnesium[1,2]	Antimony[1,2]	Nitrate-nitrite (Total) [2]	
Dissolved Oxygen	Potassium[1,2]	Arsenic[1,2]	Total Kjeldahl Nitrogen[2]	
Specific Conductance	Calcium[1,2]	Barium[1,2]	Total Nitrogen[2]	
	Manganese[1,2]	Beryllium[1,2]	Total Phosphorus[2]	
	Iron[1,2]	Boron[1,2]	Total Organic Carbon[3]	
	Bromide[1,2]	Cadmium[1,2]	Ammonia (Dissolved) [2]	
	Chloride[1,2]			
	Fluoride[1,2]	Chromium [1,2]	Nitrate-nitrite (Dissolved) [2]	
	Sulfate[1,2]	Copper[1,2]	Total Kjeldahl Nitrogen (Dissolved) [2]	
	Carbonate[2]	Lead[1,2]	Total Nitrogen (Dissolved) [2]	
	Bicarbonate[2]	Nickel[1,2]	Total Phosphorus (Dissolved)[2]	
	Hydroxide[2]	Silica[1,2]	Dissolved Organic Carbon[3]	
	Alkalinity[2]	Silver[1,2]		
	Hardness[2]	Selenium[1,2]		
	Total Dissolved Solids[3]	Thallium[1,2]		
	Total Suspended Solids[1]	Zinc[1,2]		

[1]Analyzed as dissolved.
[2]Sampled and analyzed at level 1, 2 and 3 sites.
[3]Sampled and analyzed at level 1 sites.

IV.B.2. Ecoregion Reference Network Monitoring Program

The Ecoregion Reference Network Monitoring Program is used to support a variety of water quality management and biological monitoring and assessment activities by providing a network of biologically "least disturbed" reference sites within each of the states four major level 3 ecoregions (Lake Agassiz Plain, Northern Glaciated Plain, Northwestern Glaciated Plain, and Northwestern Great Plain) (Figure IV-2). Objectives of the Ecoregion Reference Network Monitoring Program include the development of biological indicators. Reference sites are also expected to support the development of nutrient criteria for rivers and streams and the refinement of existing clean sediment reference yields.

First introduced by EPA in the 1980's, the ecoregion concept assumes that waterbodies reflect the character of the land they drain, and that where sites are physically comparable, chemical and biological conditions should also be comparable. As such, reference sites located within a given ecoregion can serve as benchmarks for all other sites within the same ecoregion. Reference sites, therefore, become powerful tools when assessing or comparing results from both chemical and biological monitoring stations.

The goal of the Ecoregion Reference Network Monitoring Program is to establish a minimum set of 30 "reference sites" within each of the following level 3 ecoregions or ecoregion combinations: Lake Agassiz Plain (48), Northern Glaciated Plains (46), and combination Northwestern Glaciated Plains/Northwestern Great Plains (42/43). In addition to the 30 "reference sites" per ecoregion/ecoregion combination, the department will also select and sample 30 companion "highly disturbed" or "trashed" sites. These sites will be used as a basis of comparison when selecting and calibrating metrics used in IBIs.

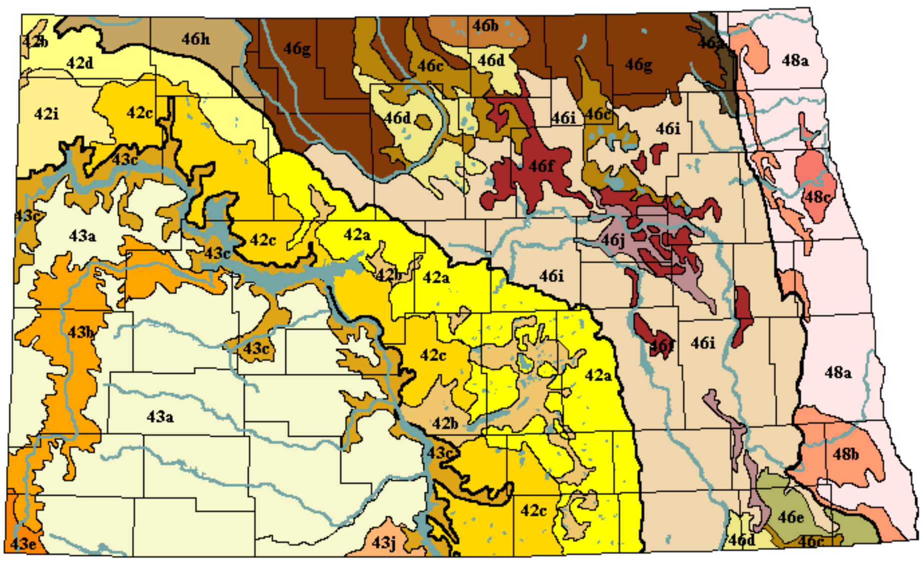

Figure IV-2. Map Depicting Ecoregions in North Dakota (Lake Agassiz Plain [48], Northern Glaciated Plain [46], Northwestern Glaciated Plain [42], Northwestern Great Plain [43]).

Reference sites and companion "trashed" sites are selected through a three step process, including: 1) landscape metric analysis using GIS; 2) site reconnaissance using digital orthoquads and aerial photos via GIS; and 3) site inspection and ground truthing.

During 2005, 2006, and 2007, as part of the Red River Biological Monitoring and Assessment Project, the department sampled 10 reference and 10 trashed sites in the Lake Agassiz Plain ecoregion and 10 reference and 10 trashed sites in the Red River basin portion of the Northern Glaciated Plains ecoregion. In 2008, another 10 reference and 10 trashed sites were sampled in the remaining portions of the Northern Glaciated Plains ecoregion. Reference site sampling continued in 2009 with 20 reference and 20 trashed sites sampled in the combined Northwestern Glaciated Plains/Northwestern Great Plains ecoregions and 5 reference and 5 trashed sites sampled in the Northern Glaciated Plains ecoregion. In 2010 and again in 2011, 10 reference and 10 trashed sites were sampled each year in the Lake Agassiz Plain and 5 reference and 5 trashed sites were sampled each year in the Northern Glaciated Plains ecoregion. The department's first round of reference site sampling concluded in 2012 with the sampling of 10 reference and 10 trashed sites sampled in the combined Northwestern Glaciated Plains/ Northwestern Great Plains ecoregions. With the conclusion of the first round of reference site sampling in 2012 and following sampling in 2013 and 2014 for the National Rivers and Streams Assessment, the department initiated a second round of reference sites sampling in the Lake Agassiz Plain again in 2015, the Northern Glaciated Plains in 2016, and the Northwestern Glaciated Plains/Northwestern Great Plains ecoregions in 2017.

IV.B.3. Lake Water Quality Assessment Program

IV.B.3.a. Historic Program

The department currently recognizes 337 lakes and reservoirs for water quality assessment purposes. Of this total, 146 are manmade reservoirs and 149 are natural lakes. All lakes and reservoirs included in this assessment are considered significantly publicly owned.

Reservoirs are defined as waterbodies formed as a result of dams or dugouts constructed on natural or manmade drainages. Natural lakes are waterbodies having natural lake basins. A natural lake can be enhanced with outlet control structures, diversions or dredging. Based on assessment information entered into ATTAINS, the 146 reservoirs have an aerial surface of 476,709.03 acres. Reservoirs comprise about 67 percent of North Dakota's total lake/reservoir surface acres. Of these, 411,498 acres or 58 percent of the state's entire lake and reservoir acres are contained within the two mainstem Missouri River reservoirs (Lake Sakakawea and Lake Oahe). The remaining 144 reservoirs share 65,211 acres, with an average surface area of 453 acres.

The 149 natural lakes in North Dakota cover 239,237 acres, with approximately 102,376 acres[1] or 43 percent attributed to Devils Lake. The remaining 151 lakes average 925 acres, with 40 percent being smaller than 250 acres.

Through a grant from the U.S. EPA Clean Lakes Program, the department initiated the Lake Water Quality Assessment (LWQA) Project from 1991-1996. During that time, the department completed sampling and analysis for 111 lakes and reservoirs in the state. The objective of the assessment project was to describe the general physical and chemical condition of the state's lakes and reservoirs, including trophic status.

The lakes and reservoirs targeted for assessment were chosen in conjunction with the North Dakota Game and Fish Department (NDGF). Criteria used during the selection process were geographic distribution, local and regional significance, fishing and recreational potential and relative trophic condition. Lakes without much historical monitoring information were given the highest priority.

The results from the LWQA Project were prepared in a functional atlas-type format. Each lake report discusses the general description of the waterbody, general water quality characteristics, plant and phytoplankton diversity, trophic status estimates and watershed condition.

From 1997-2000, LWQA Project activities were integrated into the department's rotating basin monitoring strategy. Lake Darling and the Upper Des Lacs Reservoir were sampled in 1997 as the department focused its monitoring activities in the Souris River Basin. Pipestem Dam and Jamestown Reservoir were sampled in 1998; Lake Sakakawea was sampled in 1999; and Bowman-Haley Reservoir, Patterson Lake and Lake Tschida were sampled in 2000.

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[1] The estimated surface area for Devils Lake is based on a lake elevation of 1446 mean sea level (msl), which is the elevation at which water overflows to Stump Lake.

IV.B.3.b. Current Program

As was stated previously the department recognizes 337 public lakes and reservoirs for assessment purposes. Of this total, many have no monitoring data, or so little monitoring data, that water quality cannot be assessed. These remaining lakes and reservoirs are the current target of lake water quality monitoring and assessment. Beginning in 2008 and extending through 2011, the department sampled approximately 15 lakes or reservoirs each year. Through this "Targeted Lake Water Quality Assessment Project", lakes were sampled twice during the summer growing season. Classified lakes and reservoirs in the state with little or no monitoring data were targeted for monitoring and assessment under this project. This initial 4-year project has resulted in water quality and trophic status assessments for a minimum of 58 lakes in the state. Information from these assessments has been published in a lake atlas format and posted on the department's web site. These assessments were also be used to assess beneficial use attainment status for Section 305(b) reporting and Section 303(d) listing.

Utilizing Supplemental Section 106 Water Quality Monitoring grant funding from EPA, the department continues to sample targeted lakes and reservoirs each year. Through this program 15 lakes were sampled in 2014, 16 lakes in 2015, 20 lakes in 2016, and 15 lakes in 2018. Since 2017 was a National Lakes Assessment year, no LWQA lakes were sampled in 2017.

IV.B.3.c. Devils Lake and Lake Sakakawea Monitoring

In addition to inclusion in the annual LWQA Project, Devils Lake and Lake Sakakawea have received special attention. Devils Lake has increased in elevation 26 feet since 1993. In response to questions about water quality changes resulting from these water level increases, the department initiated a comprehensive water quality monitoring program in 1993 for Devils Lake. Devils Lake is currently sampled four times per year, including once during the winter.

While Devils Lake has increased in elevation over the last 12 years, Lake Sakakawea's lake level has varied significantly since 2002. Of particular concern in North Dakota is the quality of Lake Sakakawea's cold water fishery when the lake is at low lake levels. Since 2002, the department and the NDGF have cooperated in a project to monitor the condition of the lake. Sampling consists of weekly DO/temperature profiles and water quality samples collected once each month at seven locations.

IV.B.3. National Aquatic Resource Surveys and State Intensification Projects

Under requirements of the federal Clean Water Act (CWA), the EPA must periodically report on the condition of the nation's water resources by summarizing water quality information provided by the states. However, approaches to collecting and assessing water quality data vary from state to state, making it difficult to consistently compare the information across states, on a nationwide basis, or over time. In addition, most state assessment approaches result in reporting on a fraction of their river and stream miles and lake acres.
In response to the need for more consistent methods for monitoring and assessing the condition of the nation's waters and to improve on the extent of waters assessed in each state and across the nation, the EPA, states, tribes, academics and other federal agencies began collaborating on the development and implementation of a series of statistically based surveys called the National Aquatic Resource Surveys (NARS). The purposes of the NARS are to answer questions such as:

- What percent of waters support healthy ecosystems and recreation?
- What are the most common water quality problems?

- Is water quality improving or getting worse?
- Are investments in improving water quality focused appropriately?

NARS is based on the work of EPA's Environmental Monitoring and Assessment Program (EMAP) and began with a series of regional pilot projects including the EMAP Western Pilot Project. The EMAP Western Pilot Project was the second regional pilot project within EMAP focusing on multiple resources. The first of these regional pilot projects focused on the mid-Atlantic region (Maryland, Delaware, Pennsylvania, Virginia and West Virginia). The EMAP Western Pilot Project was a five-year effort (2000-2004) targeted for the western conterminous United States. The pilot involved three EPA Regions (VIII, IX and X) and 12 states (North Dakota, South Dakota, Montana, Wyoming, Colorado, Utah, Arizona, Nevada, Idaho, California, Washington and Oregon). The purpose of the EMAP Western Pilot Project was to: (1) develop the monitoring tools (e.g., biological indicators, stream survey design methods and description[s] of reference condition) necessary to produce unbiased estimates of the ecological condition of rivers and streams that are applicable for the west; and (2) demonstrate those tools in assessments of ecological condition of rivers and streams across multiple geographic regions in the west.

With the success of the regional pilots and recognizing the need for a national assessment of rivers and streams, the EMAP Wadable Streams Assessment (WSA) was completed and published in 2006 marking the first nationally consistent, statistically valid study of the nation's wadeable streams. The WSA was then followed by the National Lakes Assessment (NLA) in 2007, the National Rivers and Streams Assessment (NRSA) in 2008 and 2009, the National Coastal Condition Assessment (NCCA) in 2010, and finally the National Wetland Condition Assessment (NWCA) in 2011. Collectively, each of these four aquatic resource assessments is referred to as NARS. NARS has completed its second round of aquatic resource assessments which are conducted on a five-year rotation and has started its third round of aquatic resource assessments with the NLA in 2017 and the NRSA in 2018 and 2019 (Table IV-5).

Table IV-5. Five-year Rotating Schedule of National Aquatic Resource Surveys.

Aquatic Resource Survey	Year																			
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**
NLA	■					■					■					■				
NRSA		■	■				■	■				■	■				■	■		
NCCA				■					■					■					■	
NWCA					■					■					■					■

<u>IV.B.3.a. National Lakes Assessment</u>

In 2007 and again in 2012, the EPA, in partnership with the department and other state agencies, initiated the National Lakes Assessment (NLA) to answer key environmental questions about the quality of the nation's lakes. Similar to other National Aquatic Resource Assessments, the NLA is intended to provide a snapshot of the condition of our nation's lakes on a broad geographic scale. Results from this assessment will allow water quality managers, the public, state agencies and others to say, with known statistical confidence, what proportion of the nation's lakes are in poor biological condition and identify key stressors affecting this resource. Data collected from the lakes are analyzed on both a regional and national scale. The information generated from this survey fills an important gap in meeting the requirements of the Clean Water Act. The goals of the NLA are to:

- Provide regional and national estimates of the current condition of lakes in good, fair and poor condition;
- Explore the relative importance of key stressors such as nutrients and pathogens and their extent across the population;
- Assess temporal trends in the condition of the nation's lakes and reservoirs and in the stressors that affect them; and
- Help build state and tribal capacity for lake monitoring and assessment.

To answer these questions and to achieve the goals of the program, each NLA focused on identifying and measuring relevant lake quality indicators in three basic categories: 1) ecological integrity; 2) trophic status; and 3) recreational condition. Data collected on stressors have been analyzed to explore associations between stressors and ecological condition.

In North Dakota, the department, working in cooperation with the USGS, conducted lake sampling at 38 lakes in 2007. Four of the state's 38 lakes were replicate sampled for a total of 42 lakes sampled in 2007.

In 2012 and 2017, the NLA was again implemented as a cooperative program with the states, tribes, and EPA. Forty (40) and 41 randomly selected lakes were sampled by the department in 2012 and 2017, respectively.

<u>IV.B.3.b. State Intensification of the National Lakes Assessment</u>

As stated earlier, 40 lake sites and two (2) revisits were targeted in North Dakota for the 2012 NLA.   In addition, the department completed sampling of an additional 10 sites which are part of a 50 site state intensification of the NLA. Two (2) intensification sites were sampled in 2012 at the same time the NLA sites were sampled. The remaining eight (8) intensification sites were sampled in 2013.

Based on the results of the 2012 NLA and state intensification, the department has completed a report summarizing the condition of lakes in North Dakota with known precision and accuracy (NDDoH 2015). Results from this report, including the statewide condition estimates, has also been entered into the ATTAINS web entry tool for State-scale Statistical Surveys. Results from the 2012 state intensification (i.e., statistical survey) are also reported in Section V of this report.

<u>IV.B.3.c. National Rivers and Streams Assessment</u>

In 2008 and 2009 and again in 2013 and 2014, the department participated in the EPA-sponsored National Rivers and Streams Assessment (NRSA). Unlike the other NARS assessments, the NRSA is 2-year study designed to be a probabilistic assessment of the condition of the nation's rivers and streams. The objectives of the NRSA are to:

- Assess the current condition of the nation's rivers and streams;
- Assess temporal trends in the condition of the nation's rivers and streams and in the stressors that affect them; and
- Help build state and tribal capacity for monitoring and assessment and promote collaboration across jurisdictional boundaries.

The goal of the NRSA is to address two key questions about the quality of the nation's rivers and streams:

- What percent of the nation's rivers and streams are in good, fair and poor condition for key indicators of water quality, ecological health and recreation?
- What is the relative importance of key stressors such as nutrients and pathogens?

The NRSA is designed to be completed during the index period of late May through September. Field crews collect a variety of measurements and samples from predetermined sampling reaches (located with an assigned set of coordinates) and from randomly selected stations along the sampling reach. The field crews also document the physical habitat conditions along the sampling reach.

IV.B.3.d. National Rivers and Streams Assessment and State Intensification Project

The NRSA design for 2008 and 2009 involved 61 randomly selected sites in North Dakota. The population of rivers and streams from which these sites were selected included small 3rd Strahler order streams as well as large, boatable rivers such as the Red River of the North and the Missouri River. Of the 61 sites, four (4) were on 3rd order, thirteen (13) were on 4th order, twenty (20) each on 5th and 6th order, one (1) on a 7th order, and three (3) on 8th or greater order streams. A report summarizing the results of the 2008/2009 NRSA and state intensification project has been completed. Results from this report, including the statewide condition estimates, has been entered into the ATTAINS web entry tool for State-scale Statistical Surveys. Results from the state intensification (i.e., statistical survey) are also reported in Section V of this report.

For the 2013 and 2014 NRSA EPA only 40 "base" sites were assigned to North Dakota. This limited number of sites necessitated the selection and sampling of an additional 10 intensification sites to bring the total sample size up to 50 sites statewide. Of the 40 "base" probability sites, three (3) were "non-wadable" sites located on the Red River which were sampled by the state of Minnesota. The remaining 37 NRSA "base" probability sites were located on North Dakota waters included 31 "wadable" sites and six (6) "non-wadable" sites.

All samples collected for the NRSA and state intensification project are being analyzed by EPA contract labs. Once the data analysis is completed and the data are entered into the department's database(s), department staff will again preparing a detailed report summarizing the condition of rivers and streams in North Dakota with known precision and accuracy. Once this report is complete, the statewide condition estimates will then be entered into the ATTAINS web entry tool for State-scale Statistical Surveys.

IV.B.3.e.National Wetland Condition Assessment and State Intensification Project

In July 2011, the department completed sampling as part of the EPA-sponsored National Wetland Condition Assessment (NWCA). The NWCA is a probabilistic assessment of the condition of the nation's wetlands and is designed to:

- Determine the ecological integrity of wetlands at regional and national scales;
- Build state and tribal capacity for monitoring and analyses;
- Promote collaboration across jurisdictional boundaries;
- Achieve a robust, statistically-valid set of wetland data; and
- Develop baseline information to evaluate progress.

The 2011 NWCA provides a baseline for wetland quality in the United States and builds on the success of the US Fish and Wildlife Service (US FWS) Wetland Status and Trends (S&T) Report. Just as the S&T Report characterizes wetland acreage by category across the country, the NWCA characterizes wetland conditions nationwide for many of the same wetland classes. When paired together, the two efforts provide the public and government agencies with comparable, national information on wetland quantity and quality. The data are intended to be an integrated evaluation of the cumulative effects of actions that either degrade wetlands or protect and restore their ecological condition.

In addition to the 11 sites selected and sampled in North Dakota as part of the NWCA, the department contracted with North Dakota State University's Center for Natural Resource and Agroecosystem Studies in an Intensification of the NWCA in North Dakota. The intensification project included an additional 42 randomly selected wetlands sites and two (2) reference wetland sites for a total wetland sample size of 55 wetlands located across the state. The major objectives of the intensification project are to: 1) assess the NWCA and intensification wetlands using the three tiered regional specific assessment methods developed for North Dakota; 2) develop models relating existing wetland assessment data from regional studies to ecosystem services; 3) compare the NWCA data/results to the regional specific methods data/results; 4) collect additional data that will aid in deriving ecosystem services and identify possible issues related to human health; and 5) calibrate/validate an ecosystem service correlation model to correspond with the data obtained from the national survey.

A final report summarizing the results of the NWCA intensification project was prepared by NDSU and submitted to EPA on March 11, 2014 and the results from the 2011 state intensification study (i.e., statistical survey) are summarized in Section V of this report.

In 2016, the department again participated in the NWCA. In addition to the 16 sites selected and sampled in North Dakota as part of the 2016 NWCA, the department contracted with North Dakota State University's Center for Natural Resource and Agroecosystem Studies in an Intensification of the NWCA in North Dakota. The intensification project included an additional 34 randomly selected wetlands sites for a total wetland sample size of 50 wetlands located across the state. The major objective of the intensification project is to assess the NWCA and intensification wetlands using the North Dakota Rapid Assessment Method developed by NDSU.

IV.B.4. Fish Tissue Contaminant Surveillance Program

IV.B.4.a. Program Background

The purpose of the Fish Tissue Surveillance Program is to protect human health by monitoring and assessing the levels of commonly found toxic compounds in fish from the state's lakes, reservoirs and rivers. The department has maintained an active fish tissue monitoring and contaminant surveillance program since 1990. As part of this program, individual fish tissue samples are collected from selected lakes, reservoirs and rivers throughout the state and analyzed for methyl-mercury. For example, in 2009, the department cooperated with the North Dakota Game and Fish Department's Fisheries Division in the collection and analysis of more than 300 fish tissue samples collected from Devils Lake, Lake Sakakawea, Lake Oahe, and Alkaline Lake.

These data are then used to issue periodic species-specific fish advisories for the state's rivers, lakes and reservoirs based on risk-based consumption levels. The approach compares the estimated average daily exposure dose for specific waterbodies and species to EPA's recommended reference dose (RfD) for methyl-mercury. Using these relationships, fish tissue data are interpreted by determining the consumption rate (e.g., two meals per week, one meal per week or one meal per month) that would likely pose a health threat to the general population and to sensitive populations (i.e., children and pregnant or breast-feeding women).

IV.B.5. NPS Pollution Management Program Monitoring

IV.B.5.a. Program Background

Since the reauthorization of the Clean Water Act in 1987, the North Dakota NPS Pollution Management Program has used Section 319 funding to support more than 90 local projects throughout the state. While the size, target audience and design of the projects have varied significantly, they all share the same basic objectives. These common objectives are to: (1) increase public awareness of NPS pollution issues; (2) reduce/prevent the delivery of NPS pollutants to waters of the state; and (3) disseminate information on effective solutions to NPS pollution where it is threatening or impairing uses.

State and local projects currently supported with Section 319 funding essentially include three different types of projects. These project types or categories are: (1) development phase projects; (2) educational projects; and (3) watershed projects. Although most projects clearly fit into one of these categories, there are also several projects which include components from all three categories. A portion of the Section 319 funds awarded to the state have also been used to assess major aquifers in the state as well as promote and implement practices that prevent groundwater contamination.

IV.B.5.b. NPS Development Phase Project Monitoring

Locally sponsored NPS assessment or TMDL development projects continue to be the primary means to determine watershed priorities and to prescribe specific management measures. These local assessments, commonly referred to as "development phase projects," provide the foundation for watershed implementation projects. The primary purposes of development phase projects are to identify beneficial use impairments or threats to specific waterbodies and to determine the extent to which those threats or impairments are due to NPS pollution.

Work activities during a development phase project generally involve an inventory of existing data and information and supplemental monitoring, as needed, to allow an accurate assessment of the watershed. Through these efforts, the local project sponsors are able to: (1) determine the extent to which beneficial uses are being impaired; (2) identify specific sources and causes of the impairments; (3) establish preliminary pollutant reduction goals or TMDL endpoints; and (4) identify practices or management measures needed to reduce the pollutant sources and restore or maintain the beneficial uses of the waterbody. Development phase projects are generally one to two years in length.

As is the case with TMDL development projects, responsibility for development and implementation of NPS assessment projects lies primarily with the department's Watershed Management Program. Regional TMDL development staff members are also responsible for coordinating NPS assessment projects. Technical support for assessment projects and overall program coordination are provided by Watershed Management Program staff located in Bismarck.

The goals, objectives, tasks and sampling procedures associated with each NPS assessment project are described in project-specific Quality Assurance Project Plans (QAPPs).

IV.B.5.c. NPS Watershed Implementation Project Monitoring

Watershed projects are the most comprehensive projects currently implemented through the NPS Pollution Management Program. These projects are typically long-term in nature (five to 10 years, depending on the size of the watershed and extent of NPS pollution impacts) and are designed to address documented NPS pollution impacts and beneficial use impairments within approved priority watersheds. Common objectives for a watershed project are to: (1) protect and/or restore impaired beneficial uses through the promotion and voluntary implementation of best management practices (BMPs) that reduce/prevent documented NPS pollution loadings; (2) disseminate information on local NPS pollution concerns and effective solutions; and (3) evaluate the effectiveness of implemented BMPs in meeting the NPS pollutant reduction goals of the project.

To evaluate the water quality improvement effects of BMPs that are implemented as part of a Section 319 NPS watershed restoration project, Watershed Management Program staff members assist local sponsors with the development and implementation of QAPPs specific to the pollutant reduction goals or TMDL endpoints described in the watershed restoration project implementation plan. Each QAPP developed for a watershed restoration project provides a detailed description of the monitoring goals, objectives, tasks and sampling procedures.

IV.B.6. Support Projects and Special Studies

Support projects and special studies are activities that are conducted on an as-needed basis to provide data or information to either answer a specific question or to provide program support.

Special studies provide immediate and in-depth investigations of specific water quality problems or emerging issues and usually involve practical research. In conducting practical research, the Watershed Management Program may rely on its own staff or may contract with the USGS, academia or private consultants.   Examples of special studies projects conducted by the department include:

- Studies to develop nutrient criteria for streams and lakes.
- Time of travel studies, dispersion and recreation studies in support of water quality model development.
- An assessment of water quality and biological impacts to streams impacted by brine water and oil spills in the Bakken region.

Support projects are activities conducted or supported by the department that result in products or tools that enhance overall program efficiency or lead to new assessment methods. Examples of support projects conducted or supported by the department include:

- Studies to evaluate or compare monitoring methods.
- The watershed and sub-watershed delineation and digitization project.

IV.B.7. Complaint and Fish Kill Investigations

IV.B.7.a. Complaint Investigations

The primary purpose for the investigation of complaints is to determine (1) whether or not an environmental or public health threat exists and (2) the need for corrective action where problems are found. Since customer service is a primary focus of the department, complaint response is a very high priority. When complaints are received by the department, they may be handled by department staff, including staff in other divisions of the Environmental Health Section, or forwarded to one of the local health districts located across the state. Once the complaint is routed to the appropriate state or local health district staff person, a field investigation is usually conducted. When problems are identified, voluntary correction is obtained in most cases. However, necessary enforcement action can be taken under the state water pollution laws (North Dakota Century Code 61-28) and regulations or under other applicable state or federal laws.

IV.B.7.b. Fish Kill Investigations

Fish mortalities can result from a variety of causes and sources, some natural in origin and some induced by man. It is recognized that response time is all-important in the initial phases of a fish kill investigation. Therefore, persons reporting a fish kill are encouraged to immediately? contact the department or the NDGF during normal working hours or Emergency Response through state radio. Once a fish kill is reported, staff members from the department's Watershed Management Program and/or NDGF are dispatched to investigate. The extent of a fish kill investigation is dependent on the numbers and kinds of fish involved and the resources available at the time for the investigation. Following a decision to investigate, the investigation should continue until a cause is determined or until all known potential causes have been ruled out.

IV.B.8. Harmful Algal Blooms (HABs) Surveillance Program

Algae are natural organisms in water that perform many functions that are vital for the health of aquatic ecosystems. When conditions are favorable, algae rapidly multiply "bloom" resulting in dense concentrations. When blooms are present, they potentially pose a substantial threat to human and ecological health. In addition to algae, there are microorganisms like cyanobacteria (blue-green algae) that can bloom. Cyanobacteria often bloom during hot weather when people, pets, and livestock are actively using lakes, ponds, wetlands, rivers, and streams. The blooms color the water green or blue-green and can cause foam, scum, or mats to appear on the surface. The organisms may also produce cyanotoxins. When present in water, cyanotoxins are dangerous for both people and animals.

Exposure from ingesting water affected by blue-green algae and cyanotoxins can cause illness in people and animals, and can result in death. There are no known antidotes for the cyanotoxins. People and animals that swallow water containing cyanotoxins can become sick with severe diarrhea and vomiting; numb lips; tingling fingers and toes; dizziness; or rashes, hives, or skin blisters. Children are at higher risk than adults for illness because their smaller size can allow them to get a relatively large dose of toxin.

Due to the significant health risks associated with blue-green algae blooms and cyanotoxins, the department has initiated a Harmful Algal Blooms (HABs) Surveillance Program. The HABs Surveillance Program was initiated in 2015 in response to a blue-green algae bloom on Homme Dam located near the town of Park River, ND in the northeastern part of the state. Since then an additional 22 advisories or warnings were issued for lakes and reservoirs in North Dakota.

The department's HABs response plan is detailed in Figure IV-3 and generally begins with notification by a local, state or federal agency or the public of an "algae bloom." While most reports are received by phone or by email, the department has developed a HABs reporting form that is available on the department's web site (https://www.deq.nd.gov/WQ/3_Watershed_Mgmt/8_HABs/HABsReporting).

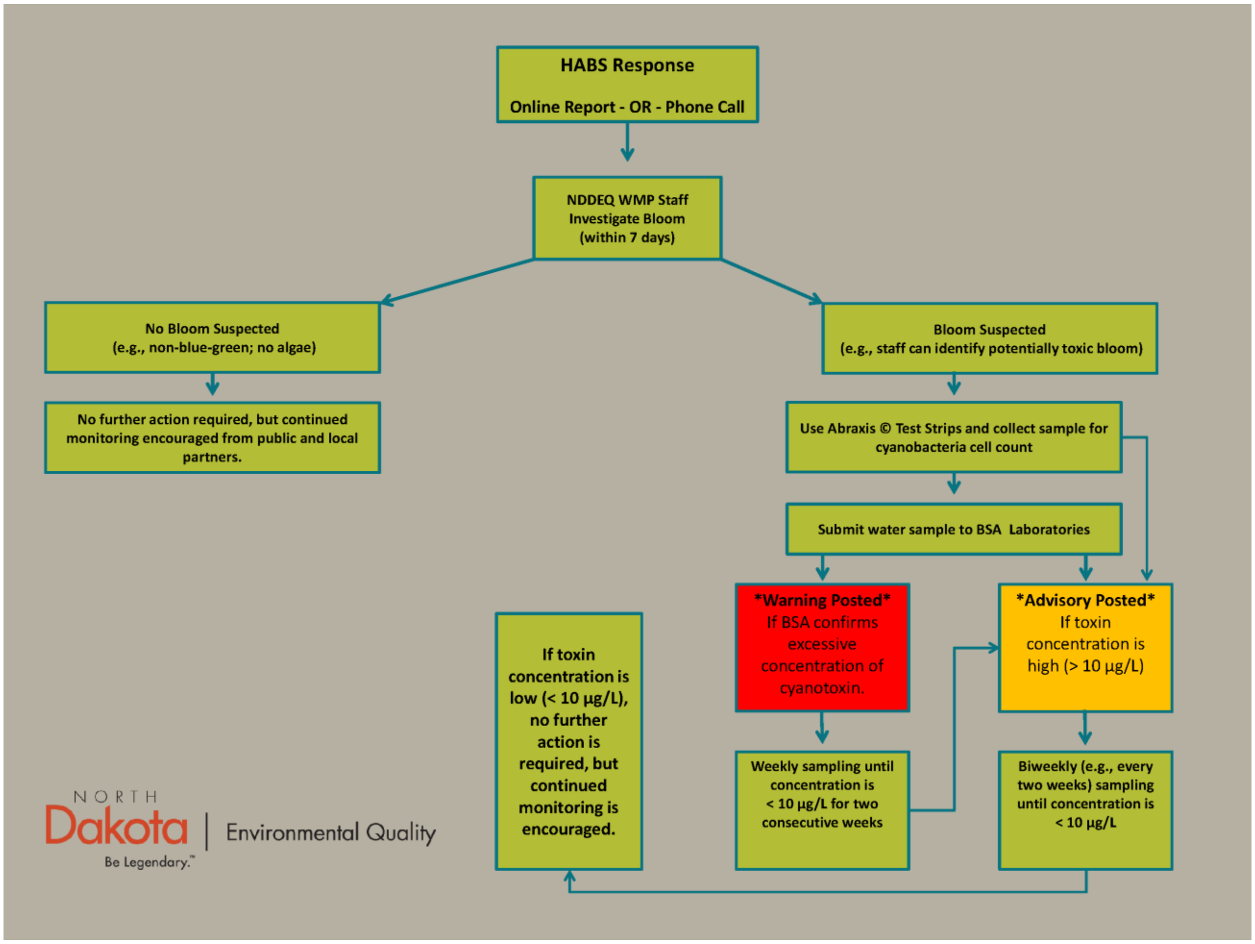


Figure IV-3. North Dakota Department of Environmental Quality Harmful Algal Blooms (HABs) Response Plan.

IV.B.9. Stream Flow

Stream flow data is critical to the analysis and interpretation of water quality data. Stream flow data are used to calculate critical flow conditions for TMDLs and NDPES permitting, to estimate pollutant loading and to interpret water quality results (e.g., load duration curve analysis). The USGS and agencies of the state of North Dakota have had cooperative agreements for the collection of stream flow records since 1903. During the 2013 water year (October 1, 2012 through September 30, 2013), the USGS cooperated with numerous state, federal and local agencies in the collection and reporting of stream flow data from 101 stream flow-gauging stations.

In addition to the extensive USGS stream flow gauging network, the department conducts flow monitoring at most water quality sites associated with NPS assessment and watershed implementation projects and TMDL development projects. This ensures that flow data is available for load calculations and other data analyses.

IV.B.10. Total Maximum Daily Load (TMDL) Program

The Total Maximum Daily Load (TMDL) Program is a subset of the Watershed Management Program. A TMDL is the amount of a pollutant a water body can handle and still meet the state water quality standard. The federal Clean Water Act requires states to develop TMDLs for water bodies not meeting water quality standards (also called "impaired waters") (40 CFR 130.7). TMDLs

Impaired waters are identified through statewide and local water quality monitoring and are included in the state "303d list" (also called "impaired waters list") as part of each Integrated Report. Once identified, the TMDL Program addresses impaired waters according to current 303d Vision goals and Prioritization Strategy.

The 2020-2022 Integrated Report represents the close of Vision 1, a 10-year (2012-2022) planning period for TMDL prioritization and development. Vision 1 was based on six main elements designed to guide states during the 10-year period: prioritization, assessment, protection, alternatives, engagement, and integration (https://www.epa.gov/tmdl/2013-vision-implementing-cwa-section-303d-impaired-waters-program-responsibilities).

A new 10-year Vision (Vision 2) began October 1, 2022 and includes a two-year bridge period to allow for state prioritization planning. At the time of this report, the TMDL Program is developing a Total Maximum Daily Load Prioritization Strategy ("TMDL Strategy") for Vision 2. Vision 2 includes updated goals and focus areas as designed by EPA (https://www.epa.gov/tmdl/Vision). Within the 10-year period, the TMDL Program will identify specific impaired water bodies to be addressed. These "TMDL commitments" will be based on Vision 2 goals, focus areas, and the TMDL Strategy, and will be submitted to EPA every two years. The final Vision 2 TMDL Strategy will be included in the 2024 Integrated Report.

IV.C. Coordination with Other Agencies

North Dakota has two rivers of international significance. The Souris River originates in the Canadian province of Saskatchewan, loops through North Dakota and returns to the province of Manitoba. The Red River of the North originates at the confluence of the Bois de Sioux and Ottertail Rivers at Wahpeton, North Dakota. The Red River flows north, forming the boundary between North Dakota and Minnesota before entering Manitoba. The department participates in two cross-border cooperative efforts to jointly manage and protect these rivers.

To ensure an ecosystems approach to transboundary water issues and to achieve greater operational efficiencies in the conduct of the International Joint Commission (IJC) has combined the ongoing responsibilities of the International Souris River Board of Control and the Souris River aspects of the International Souris-Red River Engineering Board into the International Souris River Board (ISRB). The ISRB operates under a directive from the IJC dated April 11, 2002. Part of the ISRB's mission is to assist the IJC in preventing and resolving disputes related to the transboundary waters of the Souris River basin.

The other international water quality effort in which the department is involved is the International Red River Watershed Board (as of August 4, 2021). Created by the International Joint Commission (IJC), the board monitors Red River water quality. The board also informs the IJC of trends and exceedances of water quality objectives, documents discharge and control measures, and water quality issues. Board activities are detailed in annual reports. The board is represented by 18 members, nine from the US and nine from Canada representing federal, state, and provincial government agencies.

The department monitors water quality in Devils Lake and distributes historical and current data to various federal and state agencies. Information and technical expertise is provided to sponsoring agencies that are planning mitigation measures for fluctuating lake levels.

The Red River Basin Commission (RRBC) was formed in 2002 to initiate a grass roots effort to address land and water issues in a basin-wide context. The RRBC was formed as a result of a merger between The Red River Basin Board, The International Coalition and the Red River Water Resources Council.

The RRBC is not intended to replace governmental agencies or local boards that have water management responsibilities in the basin. Rather, it was created to develop a comprehensive plan on a scale never before attempted. Another purpose of the RRBC is to foster the inter-jurisdictional coordination and communication needed to implement such a plan and to resolve disputes that inevitably will arise among varied interests during the planning process.

The RRBC is made up of a 41-member board of directors, comprised of mainly representatives of local government, including the cities, counties, rural municipalities, watershed boards, water resource districts and joint powers boards, as well as representation from First Nations, a water supply cooperative, a lake improvement association, and environmental groups.

IV.D. Cost/Benefit Assessment

Costs associated with municipal and point source pollution control are, and have been, extensive. Capital investments adding to, or constructing new, facilities are the largest expenditure.

From 2018-2020, approximately $166 million has been obligated from the Clean Water State Revolving Fund (CWSRF) for wastewater system improvements. However, monetary benefits are difficult to quantify. Qualitative benefits include the reduction of waste loads to receiving waters or elimination of public health threats such as malfunctioning drain field systems.

Federal, state, and local governments have also made significant investments in NPS pollution controls. Since 2018, the Section 319 NPS Pollution Control Program has provided more than $20.8 million in financial support to more than 61 state and local projects. In addition to the NPS investment in these watershed projects, project sponsors have provided $6.6 million in local match to these watershed projects. A variety of agricultural and other BMPs have been implemented through these watershed projects, with a total cost of approximately $5.9 million.

While the water quality benefits of these NPS program expenditures are substantial, measuring and documenting actual pollutant reductions through monitoring continues to be extremely challenging. One measure, EPA’s STEPL model and the Animal Feedlot Runoff Risk Index Worksheet are being used to estimate the nitrogen and phosphorus reductions associated with Section 319 cost shared BMPs. Using these models, the estimated annual nitrogen and phosphorus load reductions for BMPs from 2018-2020 Section 319 Grants are 253,545 pounds and 168,101 pounds, respectively. Examples of such BMPs include grassed waterways, grazing systems, manure management systems and septic system renovations.

PART V. SECTION 305(b) WATER QUALITY ASSESSMENT

V.A. Rivers and Streams Water Quality Assessment

The department reports on waters based on five categories (Table V-1). The five assessment categories are as follows:

- Category 1: All designated uses are met.
- Category 2: Some designated uses are met, but there is insufficient data to determine if remaining designated uses are met.
- Category 3: There is insufficient data to determine whether any designated uses are met.
- Category 4: Water is impaired or threatened, but a TMDL is not needed for one of three reasons: (a) a TMDL already has been approved for all pollutants causing impairment; (b) the state can demonstrate that "other pollutant control requirements required by local, state or federal authority" are expected to address all waterbody-pollutant combinations and attain all water quality standards in a reasonable period of time; or (c) the impairment or threat is not due to a pollutant.
- Category 5: The waterbody is impaired or threatened for at least one designated use, and a TMDL is needed.

In addition to these five broad categories, the department has identified a subset category 5 5R. Subcategory 5R are impaired waterbodies where a TMDL has not been developed, where the impairment is due solely to nonpoint sources, and where the impairment is currently being addressed through an "advanced restoration plan" approach (e.g., Section 319 watershed implementation project).

Table V-1 provides a summary of the number of river and stream AUs and the total miles of rivers and streams in each category that were assessed for this report.

Eight (8) AUs totaling 205.67 miles are assessed as Category 1. Category 1 waters are assessed as fully supporting. A total of 1230 AUs totaling 47,434.82 miles were assessed as Category 2. Category 2 waters have at least one designated use assessed as fully supporting, but the other uses are not assessed. In most cases, agriculture and industrial uses were assessed as fully supporting with the remaining aquatic life, recreation and/or municipal water supply uses not assessed. A total of 54 AUs were assessed as Category 4. Category 4 waters have at least one designated use assessed as impaired or threatened, and a TMDL is not required. Of these, 54 AUs, TMDLs have already been completed and approved by EPA (Category 4A) and 2 AUs do not need a TMDL because the cause of the impairment is not a pollutant (Category 4C). Typically, these are reaches where habitat degradation or flow alteration is impairing aquatic life use. A total of 194 AUs (6,023.48 miles) are assessed as category 5. Category 5 waters have at least one beneficial use impaired and a TMDL is required. A total of 9 AUs (362.45 miles) are assessed as category 5R. Category 5R waters have at least one beneficial use impaired and a restorative plan from a TMDL has been approved by EPA (Table V-2).

Table V-1. Assessment Category Summary for Rivers and Streams in North Dakota.

Category	Description	Number of AUs	Total Size (miles)
1	All uses met	8	205.67
2	Some uses met, others not assessed	1230	47,434.82
3	No uses assessed	0	0
4A	Some or all uses impaired or threatened, but a TMDL has been approved	54	2,777.22
4B	Some or all uses impaired or threatened, but other pollutant controls will result in water quality standard attainment	0	0
4C	Some or all uses impaired or threatened, but impairment is not due to a pollutant (i.e., flow modification)	2	37.85
5	Some or all uses impaired or threatened and a TMDL is required, includes category 5D	194	6,023.48
5R	Advanced Restoration Plan Accepted by EPA	9	362.45

Table V-2. River and Stream Assessment Units in Category 5R.

Assessment Unit	Assessment Unit Name	Assessment Unit Size (miles)
ND-09020204-023-S_00	Timber Coulee Watershed	36.07
ND-10130203-006-S_00	Antelope Creek	30.87
ND-10130203-033-S_00	Hailstone Creek	28.07
ND-10130203-034-S_00	Sims Creek	9.58
ND-10130203-055-S_00	Antelope Creek Watershed	130.23
ND-10130201-020-S_00	Goodman Creek	29.79
ND-10160001-006-S_00	James River	7.23
ND-09020205-006-S_00	Buffalo Creek	30.51
ND-10130203-041-S_00	Danzig Dam Watershed	60.09

The beneficial use aquatic life is assessed as fully supporting for 1,608.57 miles of the rivers and streams. Another 2,123.37 miles of rivers and streams are assessed as fully supporting but threatened. Fully Supporting but threatened assessment recognizes water quality trends towards not fully support the use for aquatic life in the future. The remaining 1,711.15 miles of rivers and streams assessed are not supporting aquatic life use (Table V-3).

Table V-3. Use Support Summary for Rivers and Streams in North Dakota (miles).

Use	Fully Supporting	Fully Supporting, but Threatened	Not Supporting	Not Assessed	Insufficient Information	Total Size
Aquatic Life	1,608.57	2,123.37	1,711.15	47,536.57	3,831.30	56,810.99
Fish Consumption	90.15	0	401.81	3,655.86	0	4147.82
Recreation	1,368.83	3,262.74	3,347.93	48,280.66	550.75	56,810.9
Drinking Water (Municipal and Domestic)	409.82	126.49	0	2,454.22	2,183.64	5,174.17
Agriculture	56,810.99	0	0	0	0	56,810.99
Industrial	56,810.99	0	0	0	0	56,810.99

Nonpoint source pollution (e.g., livestock waste, siltation/sedimentation and stream habitat loss or degradation) was the primary cause of aquatic life use impairment (Table V-3). Organic enrichment creates conditions in the stream that cause dissolved oxygen (DO) to be depleted. Rivers and streams impaired by siltation/sedimentation, organic enrichment, eutrophication due to excess nutrients and habitat alteration also will result in a degradation of the biological community. Other forms of pollution causing impairment are trace element contamination, flow alteration and oxygen depletion. Typically, species composition will shift from an aquatic community comprised of intolerant species (e.g., mayflies, caddisflies, stoneflies and darters) to an aquatic community dominated by tolerant species (e.g., midges, carp and bullheads).

The key sources of pollutants affecting aquatic life use are poor soil conservation and livestock management. Other sources linked to aquatic-life use impairment are point-source discharges, urban runoff, and hydrologic modifications (e.g., upstream impoundments, low-head dams, channelization, flow regulation and diversion, riparian vegetation removal and wetland drainage).

Table V-4. Impairment Summary for Rivers and Streams in North Dakota.

Impairment	Miles
Fecal coliform	3,481.21
E. Coli	3,755.64
Physical Substrate/Habitat Alterations	2,055.12
Biological Indicators	2,694.20
Sedimentation/Siltation	1,754.69
Oxygen Depletion	468.26
Mercury in Fish Tissue	401.82
Flow Alteration	299.06
Total Dissolved Solids/Sulfates	40.13
Nutrients	49.83

Recreation use was assessed on 7,979.5 miles of rivers and streams. Recreation use was fully supporting, fully supporting but threatened, and not supporting on 1,368.83 miles, 3,262.74 miles and 3,347.93 miles, respectively (Table V-3). E. coli or fecal coliform bacteria data collected from monitoring stations across the state are the indicators of recreation use attainment (see Part IV. B., Chapter 6. “Beneficial Use Assessment Methodology”). The primary sources of E. coli and fecal coliform bacteria contamination are wildlife, animal feeding operations, riparian grazing and failing or poorly designed septic systems. Other factors that can affect the use of the state's rivers and streams for recreation would be eutrophication from excessive nutrient loading, resulting in nuisance algae and plant growth.

Drinking water supply use is classified for 5,174.17 miles of rivers and streams. Of the 536.31 miles assessed for this report, 126.49 miles were assessed as threatened for drinking water supply use (Table V-3).

A total of 4,147.82 miles of rivers and streams are identified as capable of supporting an eatable sport fishery. Based on the US EPA's recommended fish tissue criterion of 0.3 µg methylmercury/gram of fish tissue there is a fish consumption advisory developed for state of North Dakota. In that advisory the Red River of the North and the Missouri River from Garrison Dam to Lake Oahe are the only two rivers specifically listed. The Red River of the North is assessed as not supporting fish consumption (401.81 miles) and the Missouri River below Garrison Dam as fully supporting (90.15 miles) (Table V-3).

V.A.1. State-wide Statistical Survey Results for Rivers and Streams

The department completed a state-wide statistical survey of rivers and streams in 2008 and 2009 as part of the EPA Sponsored National Rivers and Streams Assessment (NRSA). For a detailed summary of the 2008-2009 NRSA, including a description of the methods and results of the 2008-2009 NRSA the reader is referred to the report entitled "National Rivers and Streams Assessment 2008-2009 Technical Report" (US EPA, 2016a).   For a more detailed description of the state intensification project, including a complete summary of the results of the state intensification project the reader is referred to the report entitled "2008-2009 National Rivers and Streams Assessment in North Dakota" (NDDoH, 2015a). The following is a summary of some of the highlights from this report.

V.A.2. Sample Sites

The 2008 and 2009 NRSA and state intensification study covers all perennial rivers and streams. Perennial rivers and streams are defined as rivers and streams that flow throughout the year as a result of ground-water discharge or surface runoff. To identify the locations of perennial streams, the NRSA design team used the EPA-U.S. Geological Survey (USGS) National Hydrography Dataset Plus (NHD-Plus), a comprehensive set of digital spatial data on surface waters at the 1:100,000 scale. They also obtained information about stream order from the NHD-Plus. A total of 61 perennial stream sampling sites were selected and sampled in North Dakota for the 2008-2009 NRSA. The minimum number of sites necessary for the state intensification project was set at 50, therefore the sites selected for the NRSA in North Dakota was sufficient for the state level assessment. Perennial river and stream sites sampled in North Dakota included sites on small 3rd Strahler order streams as well as large, boatable waterbodies such as the Red River of the North and the Missouri River. Of the 61 sites sampled, four (4) were located on 3rd order streams, thirteen (13) were 4th order, twenty (20) in each of the 5th and 6th categories, one (1) 7th order, and three (3) sites were located on 8th order or greater rivers (Figure V-1).

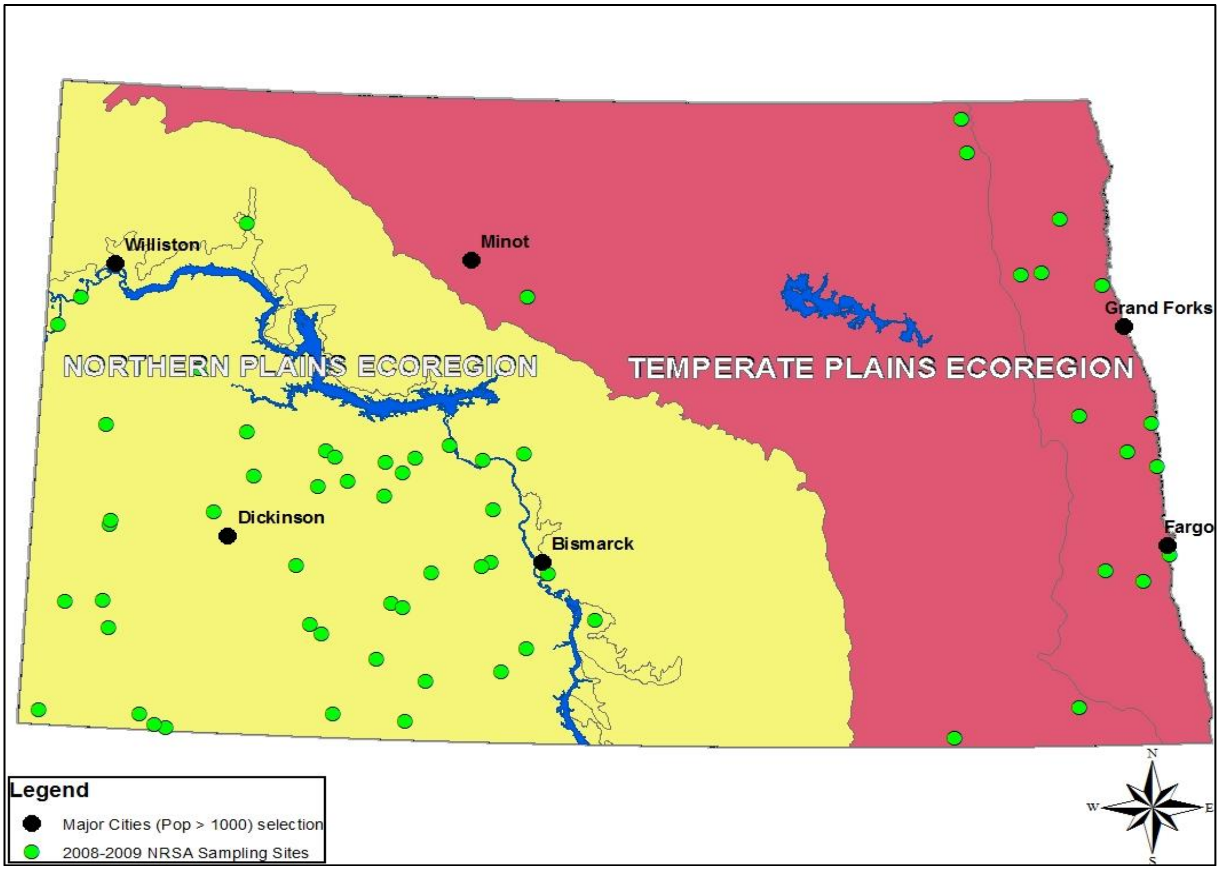


Figure V-1. Location of Sites Sampled in North Dakota for the 2008/2009 National Rivers and Streams Assessment and State Intensification Project.

To provide condition category (i.e., good, fair, poor) estimates using data collected from the random site selection process, results from each site are extrapolated as a representative sample for the area. Each sampling site carries a statistically generated 'weight' associated with it. Once thresholds are developed and condition categories are assigned to biological indicators as well as chemical/physical stressors, those site 'weights' are then summed by condition category. The sum of each category is then used to provide estimates for each condition category and expressed as a percentage of the overall target population, which for North Dakota is 5,152 miles (8,292 km).

The NRSA recognizes that there is natural variability in both the biological condition and the stressors that affect condition. To address this natural variability the NRSA synthesized the data and analyzed and reported the results at a regional scale, through nine ecologically and geographically unique areas, known as ecoregions (Omernik, 1987). North Dakota is represented by two of these ecoregions, the Temperate Plains ecoregion in the east and the Northern Plains ecoregion in the west (Figure V-1).

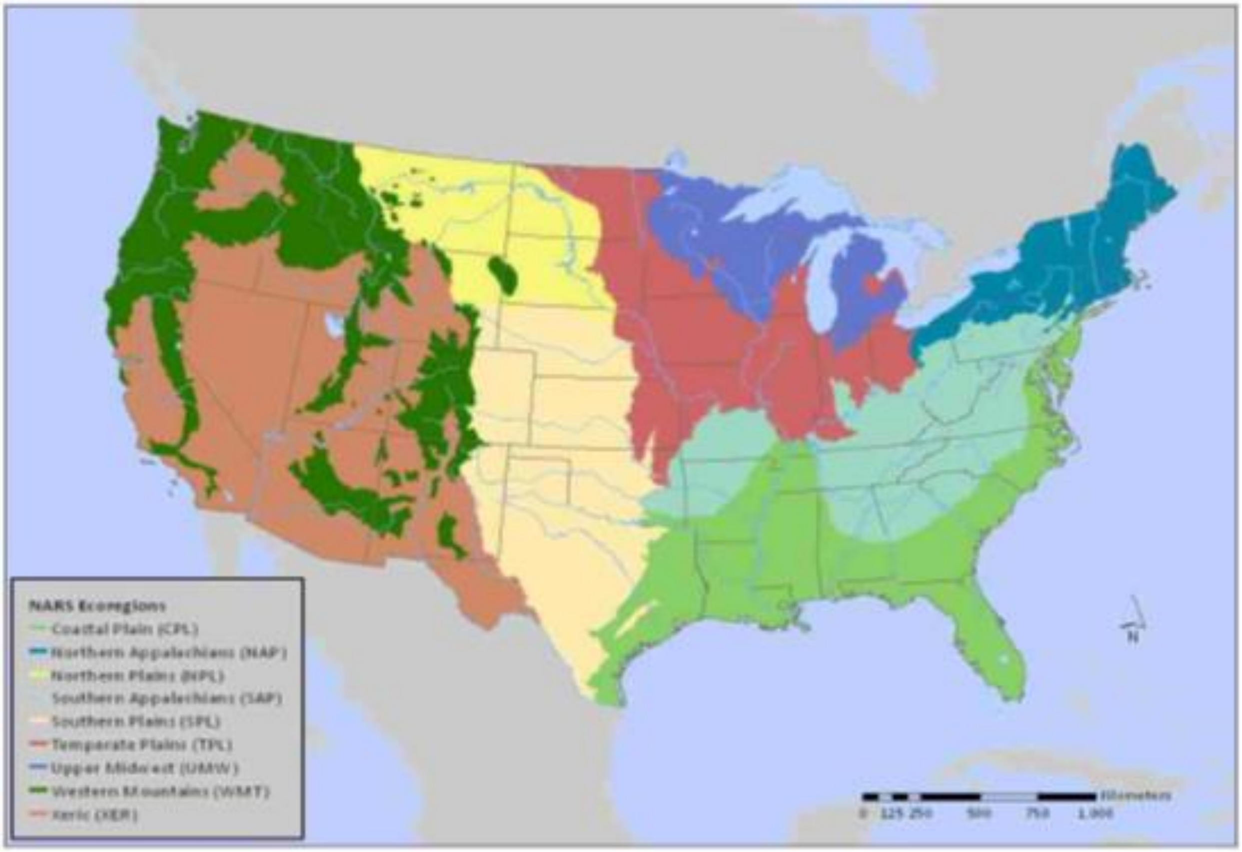


Figure V-2. Map Showing the Nine Major Ecoregions of the United States Used for National Aquatic Resource Surveys (NARS). Adapted from the 2008-2009 National Rivers and Streams Assessment report.

On a national scale, the Temperate Plains ecoregion includes portions of 11 states including; Illinois, Indiana, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota and Wisconsin (Figure V-2). This ecoregion covers approximately 342,200 square miles (US EPA, 2016a) and many of the streams and rivers are in the Mississippi River drainage. The Temperate Plains primarily consist of smooth plains interspersed with several small lakes and wetlands. Based on satellite images from the 2006 National Land Cover Dataset (NLCD), 69 percent of land is cultivated, 10 percent is forest and 9 percent is urban development (US EPA 2016a).

The Northern Plains ecoregion consists of portions of 5 states including; Nebraska, North Dakota, Montana, South Dakota and Wyoming (Figure V-2). This ecoregion covers approximately 205,084 square miles (US EPA, 2016a) and is a major component of the Missouri River watershed. The Northern Plains consist of open prairie and grasslands well suited for agriculture, primarily cattle grazing. Based on the 2006 NLCD, 68 percent of land is grass/shrubland, 23 percent is cultivated with only 3 percent being forested (US EPA, 2016a).

Of the 5,152 miles of rivers and streams assessed in the state, 2,093.7 miles (40.6 percent) are located in the Temperate Plains ecoregion and 3,058.3 miles (59.4 percent) are located in the Northern Plains ecoregion of North Dakota (Table V-5).

Table V-5. Estimate of Stream Length Assessed in North Dakota for the National Rivers and Streams Assessment and State Intensification Project.

Ecoregion	Num of Sites Sampled	Stream Length Assessed (miles)
Temperate Plains	16	2093.7
Northern Plains	45	3058.3
Total	61	5152.0

V.A.3. Biological Condition

Ecologists evaluate the biological condition of rivers and streams by analyzing key characteristics of the communities of organisms that live in them. These characteristics include the composition and relative abundance of related groups of organisms that represent a portion of the overall biological community. The NRSA focuses on two such key groups, known as *assemblages*: benthic macroinvertebrates (aquatic insects, crustacean, worms and mollusks that live at the bottom of rivers and streams) and fish. Periphyton (attached algae) were also sampled for the NRSA, but the results are currently not available. A separate index was developed for each biological community assemblage and ecoregion with condition categories (i.e., good, fair, poor) assigned to index scores. Each index was comprised of several attributes of the biological community, known as metrics. Examples of metrics used in each index included species richness, species composition, species diversity, functional feeding groups, habit niches and pollution tolerance/intolerance levels. All these aspects are combined into an overall score for the community, which is known as a multi-metric index (MMI).

V.A.3.a. Benthic Macroinvertebrate Condition

Based on the benthic macroinvertebrate MMI, 24.5 percent (1,264.8 miles) of assessed rivers and streams in the state were in good biological condition, 30.7 percent (1,579.6 miles) were in fair condition, and 44.8 percent (2,307.6 miles) were assessed to be in poor condition (Figure V-3).

Within the Temperate Plains ecoregion of North Dakota 33.2 percent (694.4 miles) of rivers and streams were in good condition, while 34.5 percent (723.3 miles) and 32.3 percent (675.9 miles) were in fair and poor condition, respectively. Within the Northern Plains ecoregion of North Dakota, 18.6 percent (570.3 miles) were in good condition, 28 percent (856.2 miles) were in fair condition and 53.4 percent (1,631.7 miles) were in poor condition based on the macroinvertebrate community index (Figure V-4).

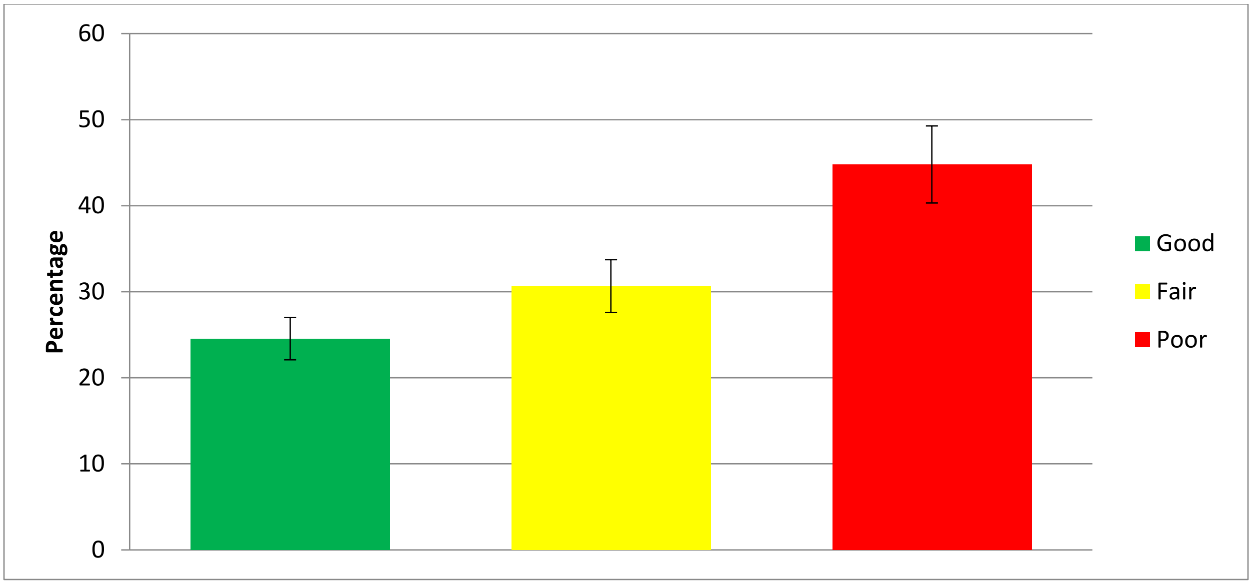


Figure V-3. Benthic Macroinvertebrate Condition Category Estimates for Perennial Rivers and Streams in North Dakota.

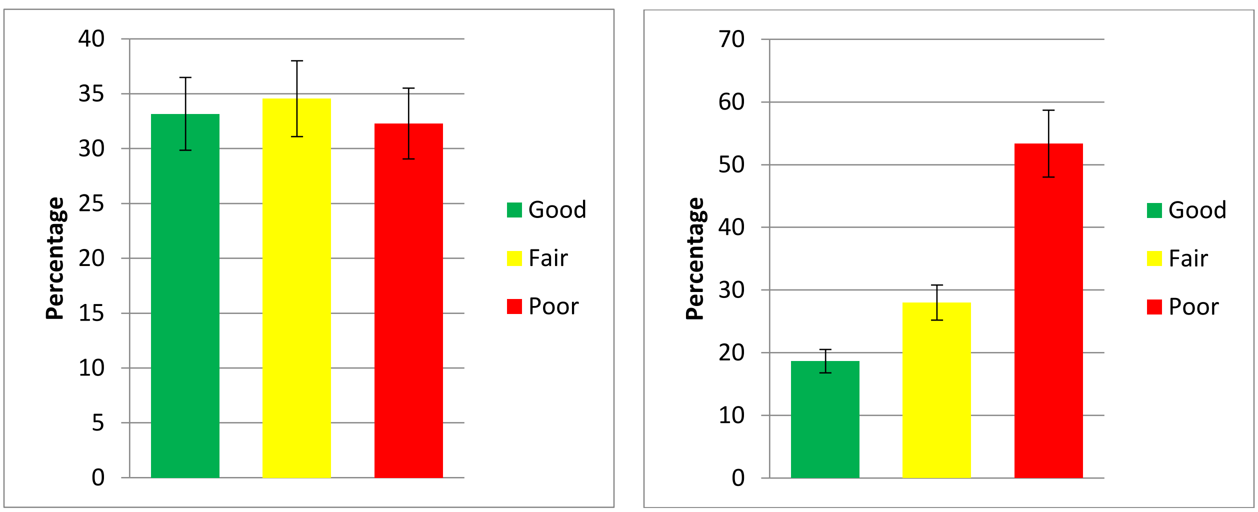


Figure V-4. Benthic Macroinvertebrate Condition Category Estimates for Perennial Rivers and Streams in the Temperate Plains (left) and Northern Plains (right) Ecoregions of North Dakota.

V.A.3.b. Fish Condition

The second indicator of biological condition was the fish community. Similar to the macroinvertebrate community index, metrics (attributes) of the fish community were combined into an overall score as an assessment of biological health. These index scores were then assigned condition categories (i.e., good, fair, poor) based on the index score. Unlike the macroinvertebrate community assessment where one index was developed for the Temperate Plains ecoregion and another was developed for the Northern Plains ecoregion, for the fish indicator one single index was developed for the entire state.
Overall, 32.9 percent (1,693.2 miles) of all assessed streams in the state were in good condition, 29.6 percent (1,525.0 miles) were in fair condition and 33.9 percent (1,744.5 miles) were assessed as being in poor condition regarding the fish community index (Figure V-5). In

addition, 3.7 percent (189.3 miles) of rivers and streams were not assessed for the fish indicator.

Within the Temperate Plains ecoregion, 36.5 percent (763.1 miles) of rivers and streams were assessed as in good condition, 9.7 percent (204.3 miles) were in fair condition and 53.8 percent (1,126.3 miles) were in poor condition regarding the fish indicator (Figure V-5). In the Northern Plains ecoregion, 30.4 percent (930.1 miles) were in good condition, 43.2 percent (1,320.7 miles) were in fair condition and 20.2 percent (618.2 miles) were in poor condition (Figure V-6). In the Northern Plains ecoregion, 6.2 percent (189.3 miles) of rivers and streams were not assessed for the fish indicator due to sampling permit restrictions and/or equipment failure.

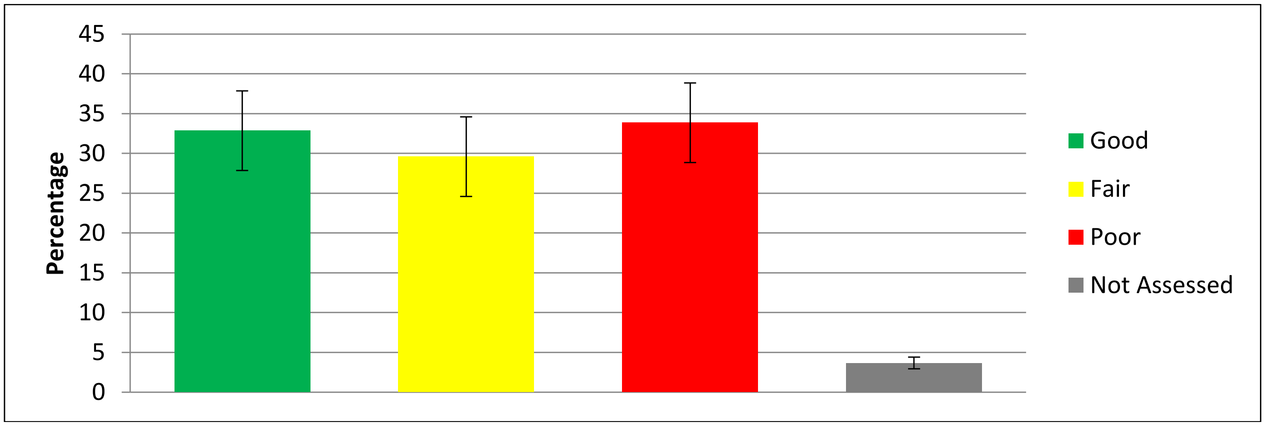


Figure V-5. Fish Condition Category Estimates for Perennial Rivers and Streams in North Dakota.

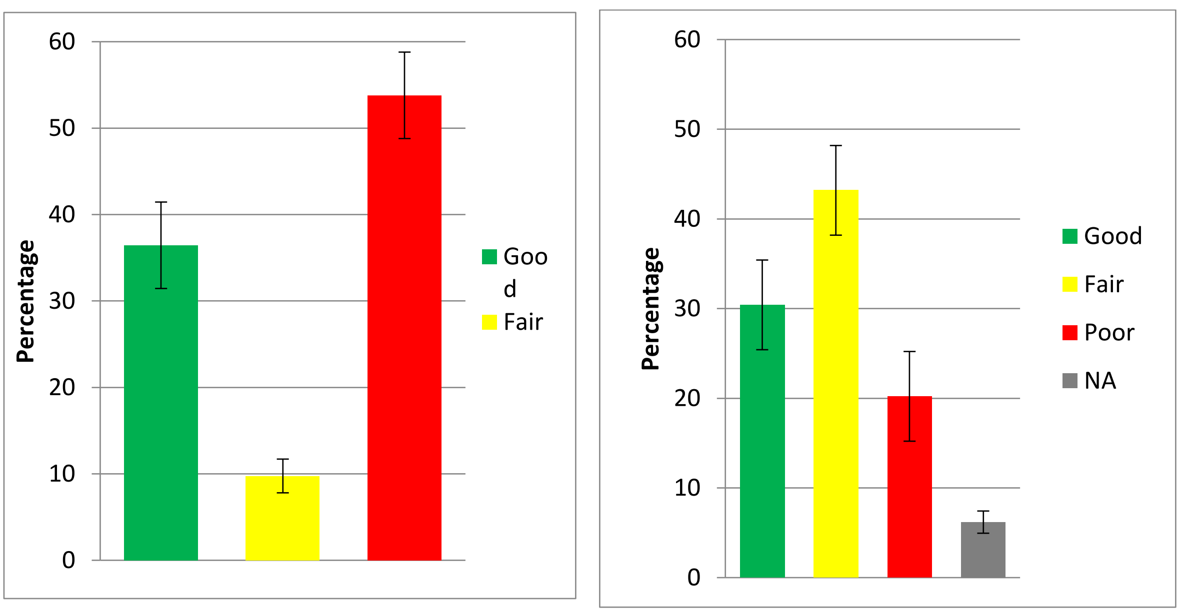


Figure V-6. Fish Condition Category Estimates for Perennial Rivers and Streams in the Temperate Plains (left) and Northern Plains (right) Ecoregions of North Dakota (Note– NA stands for Not Assessed).

V.A.4. Indicators of Stress

In the aquatic environment, a stressor is anything that could adversely affect the community of organisms living there. For the NRSA and state intensification study, specific chemical and physical stressor indicators were selected for sampling. These indicators of stress were not intended to be all-inclusive, and some important stressors were not included in the survey due to technical or cost constraints.

V.A.4.a. Chemical Stressors

Chemical stressors chosen for this assessment included salinity (expressed as specific conductance), total nitrogen, and total phosphorus. These stressors were chosen based on their significance in previous aquatic resource assessments (i.e., Wadable Streams Assessment).

It is estimated that 6.7 percent (343.1 miles) of rivers and streams in North Dakota were in good condition, 36 percent (1,859 miles) were fair, and 57.3 percent (2,799.6 miles) were in poor condition regarding total nitrogen (Figure V-7).

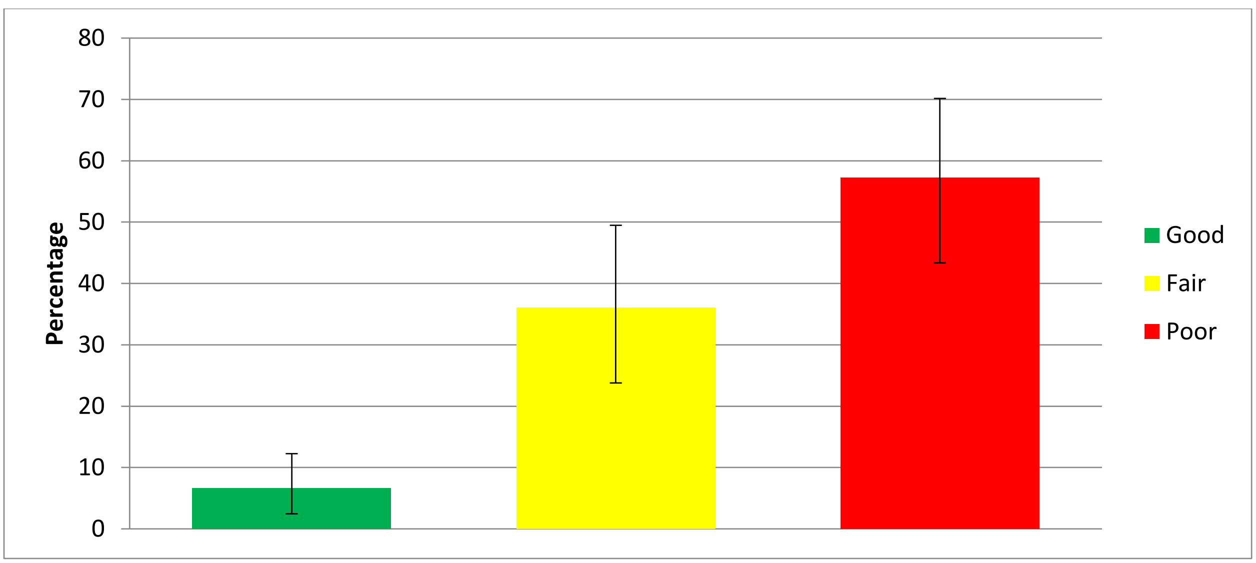


Figure V-7. Total Nitrogen Condition Category Estimates for Perennial Rivers and Streams in North Dakota.

Within the Temperate Plains ecoregion of North Dakota, no streams were assessed as in good condition, while 42.2 percent (884.2 miles) were in fair condition and 57.8 percent (1,209.4 miles) of rivers and streams were in poor condition. In the Northern Plains ecoregion, 11.2 percent (343.1 miles) of rivers and streams were in good condition, 31.9 percent (974.8 miles) were in fair condition and 56.9 percent (1740.4 miles) were in poor condition (Figure V-8).

As for total phosphorus, 23 percent (1,187.1 miles) of rivers and streams were in good condition, 7.7 percent (395.8 miles) were fair, and 69.3 percent (3,569.0 miles) were in poor condition (Figure V-9).

Within the Temperate Plains ecoregion, 1.4 percent (28.6 miles) of rivers and streams were in good condition, 0 percent were fair, and 98.6 percent (2,065.1 miles) were in poor condition. In the Northern Plains ecoregion, 37.9 percent (1,158.5 miles) of rivers and streams were in good condition, 12.9 percent (395.8 miles) were fair, and 49.2 percent (1,504.0 miles) were in poor condition with regard to total phosphorus (Figure V-10).

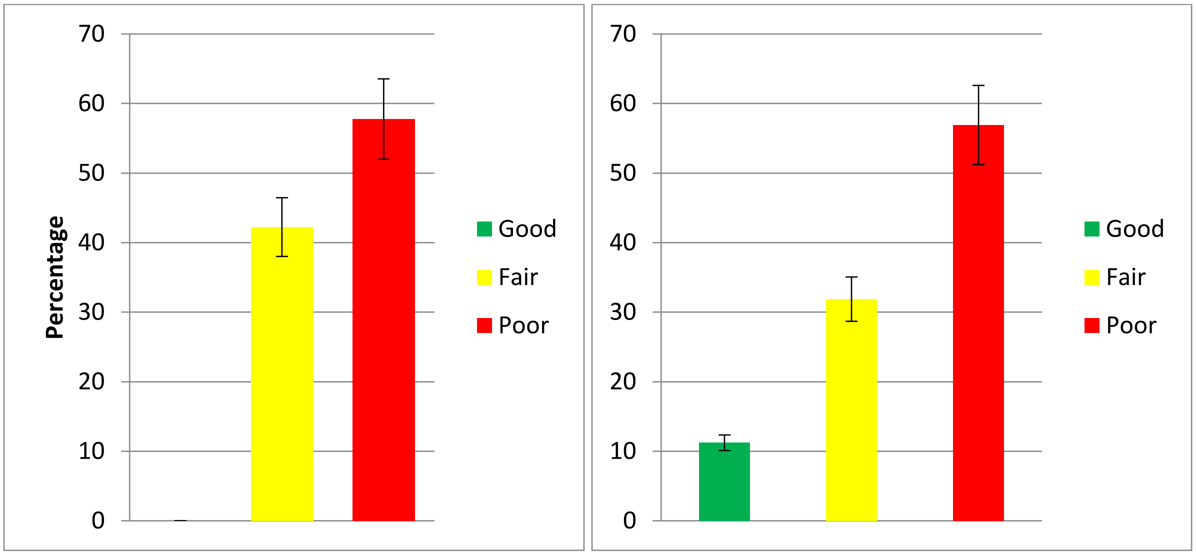


Figure V-8. Total Nitrogen Condition Category Estimates for Perennial Rivers and Streams in the Temperate Plains (left) and the Northern Plains (right) Ecoregions of North Dakota.

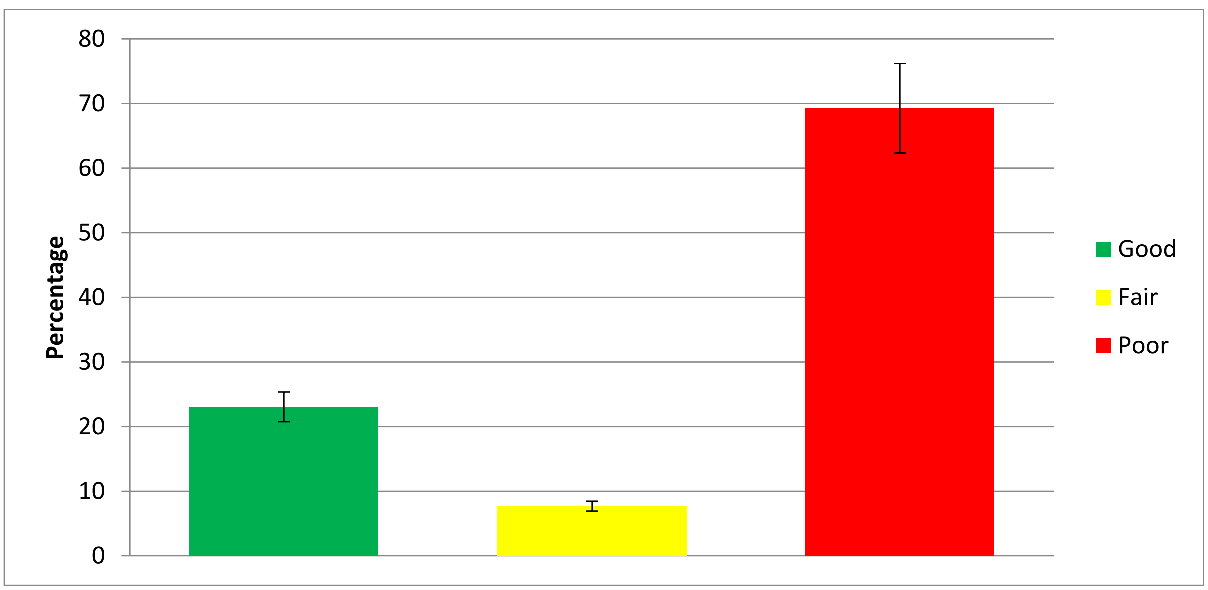
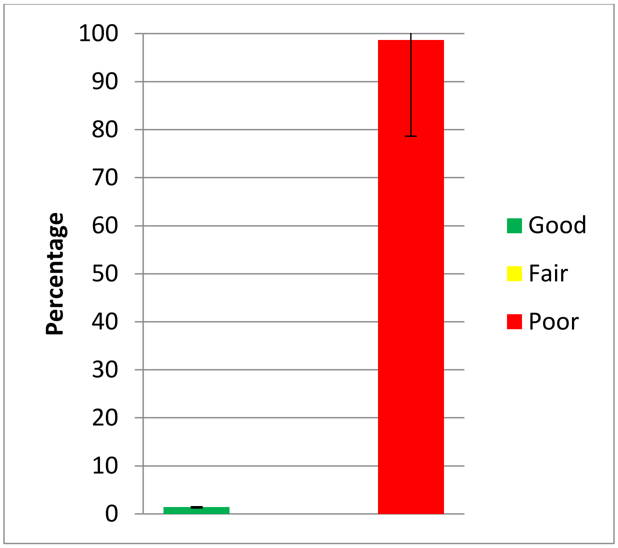


Figure V-9. Total Phosphorus Condition Category Estimates for Perennial Rivers and Streams in North Dakota.



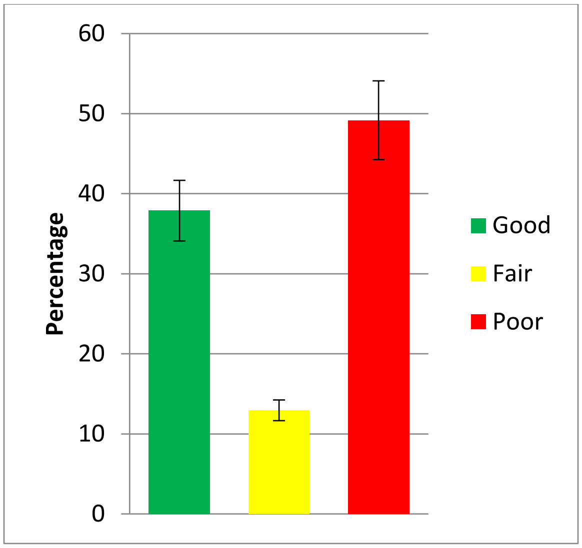


Figure V-10. Total Phosphorus Condition Category Estimates for Perennial Rivers and Streams in the Temperate Plains (left) and the Northern Plains (right) Ecoregions of North Dakota.

Salinity estimates reveal that 23.2 percent (1197.3 miles) of perennial rivers and streams were in good condition, 49.7 percent (2,559.6 miles) were fair and 27.1 percent (1,395.1 miles) were considered to be in poor condition (Figure V-11).

In the Temperate Plains ecoregion, 40.6 percent (849.7 miles) of rivers and streams were in good condition, 38 percent (794.7 miles) were fair and 21.4 percent (449.3 miles) were considered to be poor. In the Northern Plains ecoregion, 11.3 percent (347.6 miles) were in good condition, 57.7 percent (1,764.9 miles) were fair and 31 percent (945.8 miles) were in poor condition with regard to salinity (Figure V-12).

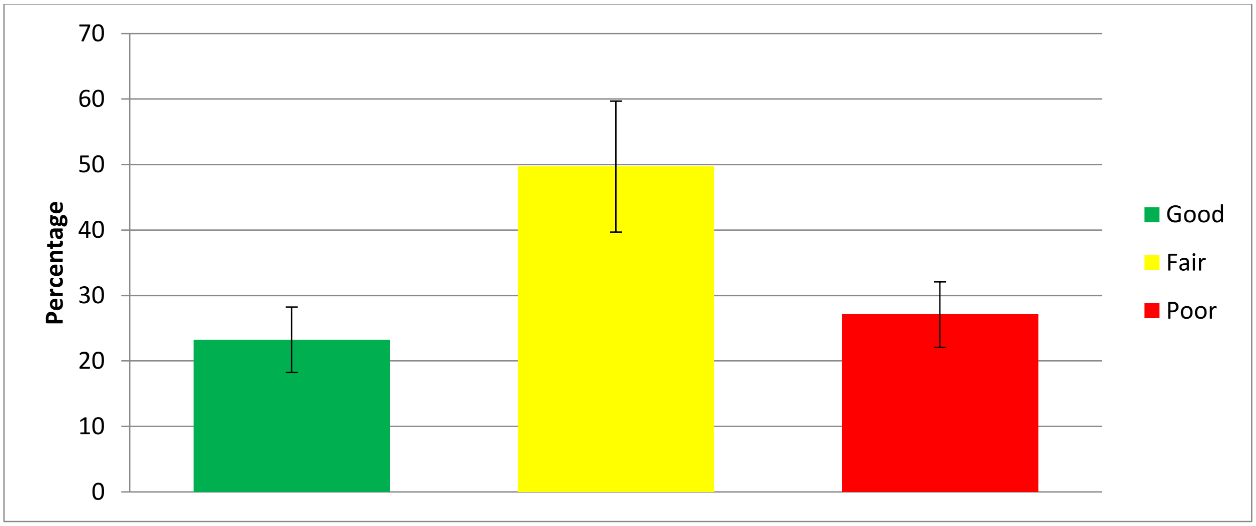


Figure V-11. Salinity Condition Category Estimates for Perennial Rivers and Streams in North Dakota.

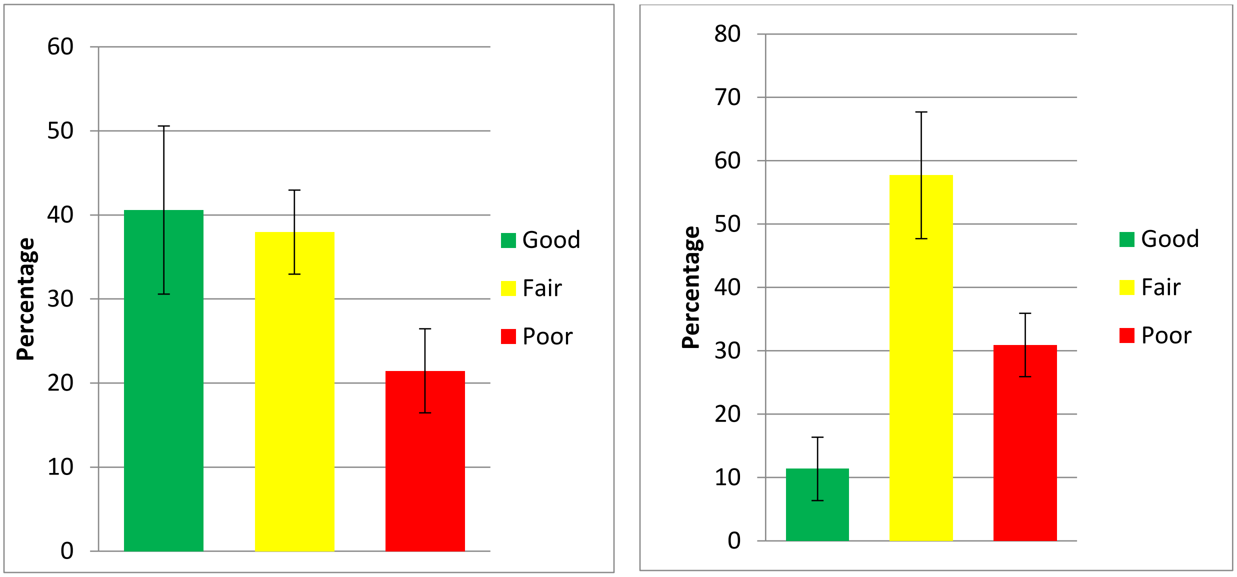


Figure V-12. Salinity Condition Category Estimates for Perennial Rivers and Streams in the Temperate Plains (left) and the Northern Plains (right) Ecoregions of North Dakota.

V.A.4.b. Physical Stressors

Physical stressors chosen for this assessment include excessive streambed sediment (bed sediment), in-stream cover and riparian vegetation condition. These stressors were chosen based on their relevance in previous ecological studies, thereby, providing a basis for comparisons.

Estimates for the entire state of North Dakota indicate that 41.9 percent (2,159.1 miles) of rivers and streams were in good condition, 31.9 percent (1,645.7 miles) were in fair condition and 24.5 percent (1,261 miles) were in poor condition for bed sediment condition (Figure V-13). The remaining 1.7 percent (86.2 miles) of perennial rivers and streams in the state were not assessed for bed sediment condition.

Within the Temperate Plains ecoregion, 55.3 percent (1,156.5 miles) of streams were in good condition, 38.9 percent (815.1 miles) were fair and 5.8 percent (122 miles) were in poor condition with regard to bed sediment. In the Northern Plains ecoregion, 32.8 percent (1,002.5 miles) of streams were in good condition, 27.2 percent (830.6 miles) were fair and 37.2 percent (1,139 miles) were in poor condition with regard to bed sediment (Figure V-14). The remaining 2.8 percent (86.2 miles) of rivers and streams in the Northern Plains ecoregion were not assessed.

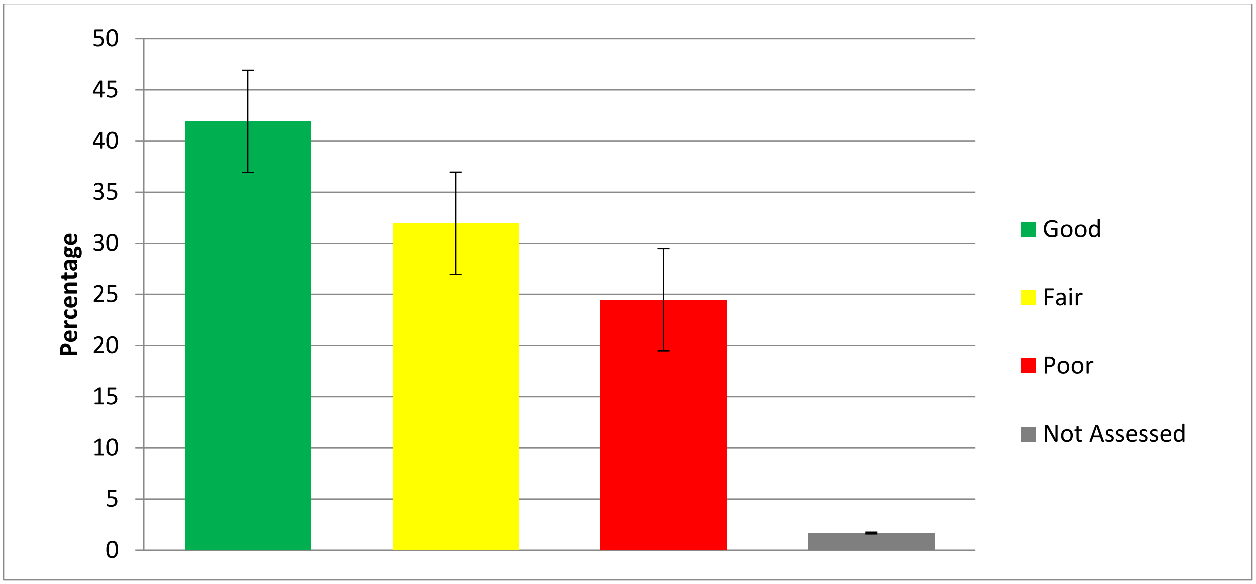


Figure V-13. Bed Sediment Condition Category Estimates for Perennial Rivers and Streams in North Dakota.

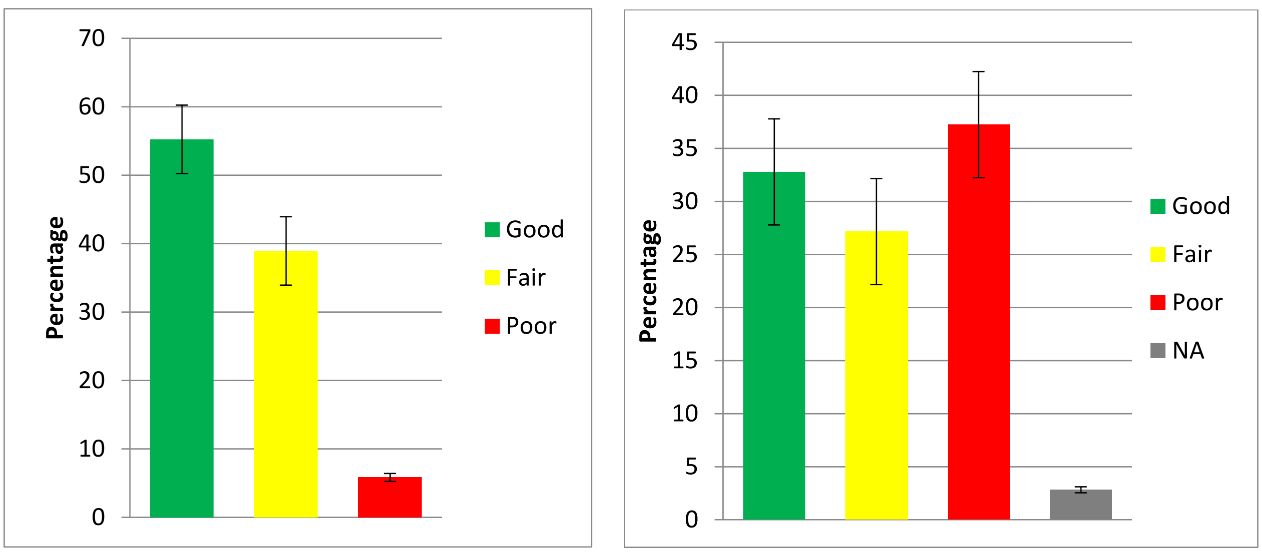


Figure V-14. Bed Sediment Condition Category Estimates for Perennial Rivers and Streams in the Temperate Plains (left) and Northern Plains (right) Ecoregions of North Dakota (Note– NA stands for Not Assessed).

Condition category estimates for the physical habitat stressor in-stream cover reveal that 30.6 percent (1,577.3 miles) of perennial rivers and streams were in good condition, 41.5 percent (2,136 miles) were fair, and 27.9 percent (1,438.8 miles) were in poor condition (Figure V-15). Within the Temperate Plains ecoregion, 51.6 percent (1,080.6 miles) of rivers and streams were in good condition and 48.4 percent (1,013.1 miles) were fair. There were no rivers and streams in the Temperate Plains ecoregion in North Dakota assessed to be in poor condition. In the Northern Plains ecoregion, 16.3 percent (496.7 miles) were in good condition, 36.7 percent (1,122.9 miles) were fair and 47 percent (1,438.8 miles) were considered to be in poor condition with regard to in-stream cover (Figure V-16).

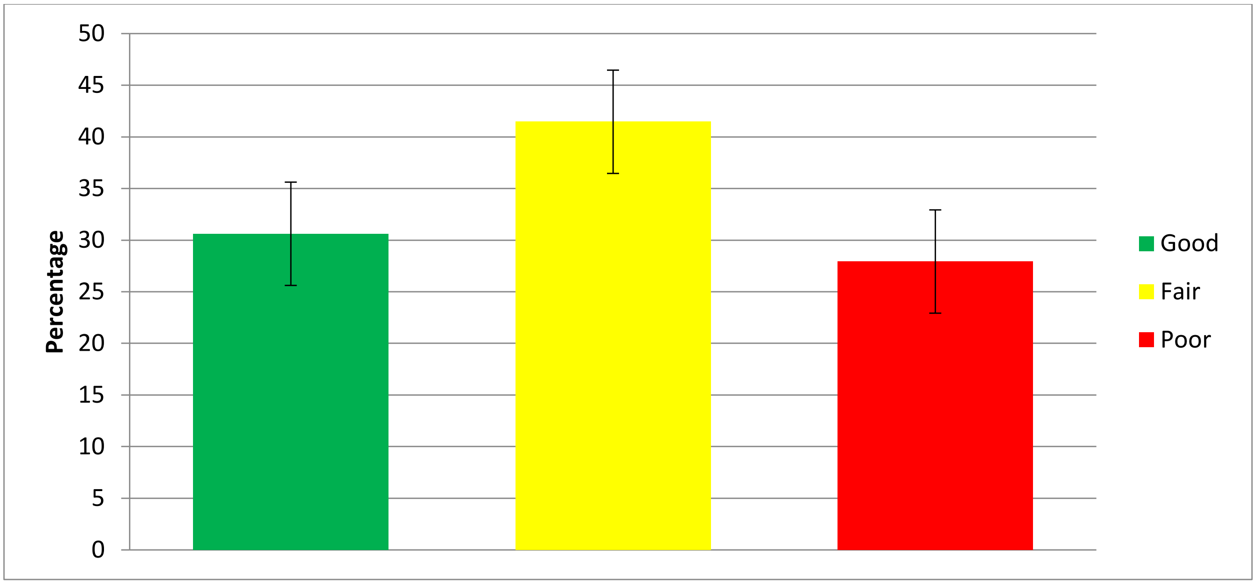
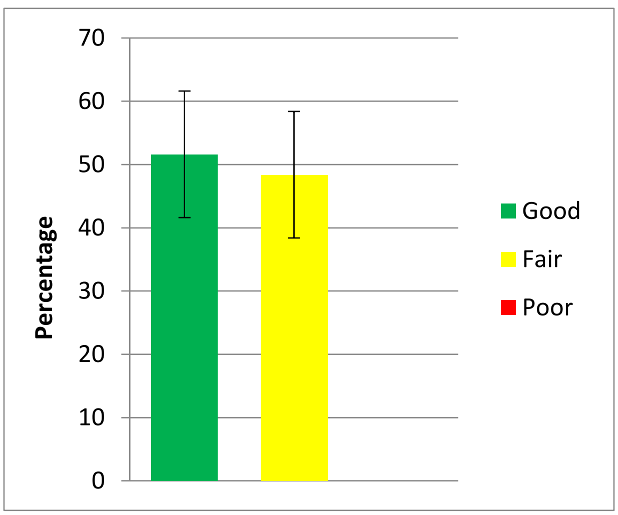


Figure V-15. In-stream Cover Condition Category Estimates for Perennial Rivers and Streams in North Dakota.



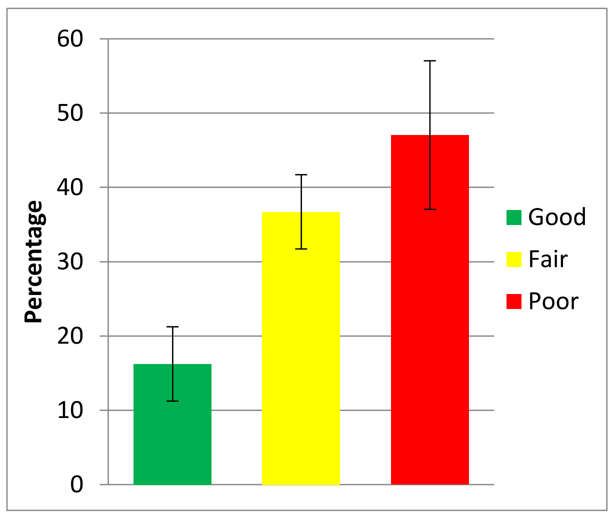


Figure V-16. In-stream Cover Condition Category Estimates for Perennial Rivers and Streams in the Temperate Plains (left) and Northern Plains (right) Ecoregions of North Dakota.

Finally, riparian vegetation condition estimates indicate that 20.1 percent (1,034.5 miles) were in good condition, 25.1 percent (1,295 miles) were fair and 54.8 percent (2,822.5 miles) of perennial rivers and streams in the state were in poor condition (Figure V-17).
Within the Temperate Plains ecoregion of North Dakota, 45.3 percent (948.3 miles) of rivers and streams were in good condition, 36.9 percent (771.7 miles) were fair, and 17.8 percent (373.7 miles) were in poor condition. However, in the Northern Plains ecoregion, only 2.8 percent (86.2 miles) were in good condition, 17.1 percent (523.3 miles) were fair and 80.1 percent (2,448.8 miles) were in poor condition with regard to the riparian vegetation condition estimate (Figure V-18).

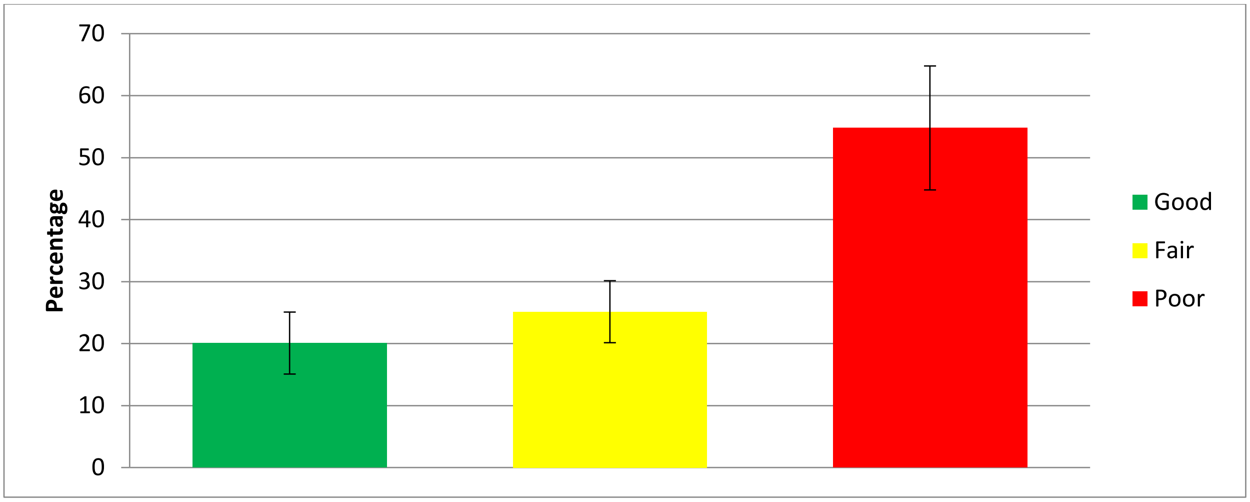


Figure V-17. Riparian Vegetation Condition Category Estimates for Perennial Rivers and Streams in North Dakota.

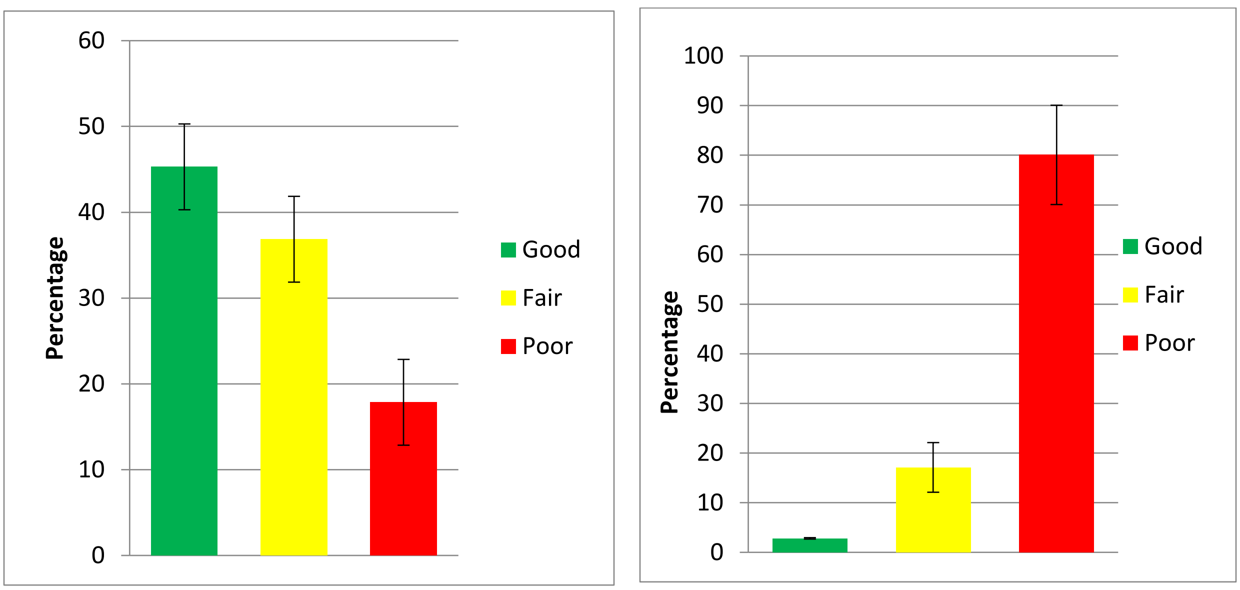


Figure V-18. Riparian Vegetation Condition Category Estimates for Perennial Rivers and Streams in the Temperate Plains (left) and Northern Plains (right) Ecoregions of North Dakota.

V.A.5. Human Health Considerations

To assess potential hazards to human health, two indicators were used for this assessment. The first is a pathogen indicator, enterococci bacteria, and the other is fish tissue mercury. Enterococci bacteria samples were collected from all 61 sites while fish tissue mercury samples were only collected from large, boatable rivers (Strahler 5th order and larger). Only one site on the Red River of the North near Perley Minnesota had a sample that exceeded the threshold of 300 µg Hg/g.

V.A.5.a. Pathogen Indicator

Enterococci are bacteria that live in the intestinal tracts of warm-blooded animals, including humans, and therefore indicate possible contamination of streams and rivers by fecal waste. Enterococci are typically not considered harmful to humans, but their presence in the environment indicates that other disease-causing agents such as viruses, bacteria and protozoa may also be present. Epidemiological studies conducted at beaches affected by human sources of fecal contamination have established a relationship between the density of enterococci in ambient waters and the elevated incidence of gastrointestinal illness in swimmers. Other potential health effects include diseases of the skin, eyes, ears, and respiratory tract.
Of the 61 sites sampled in North Dakota for enterococci bacteria, only six (6) sampling locations exceeded the human health threshold for enterococci bacteria of 130 colony forming units (cfu)/100 mL. This results in 90.3 percent (4,649.6 miles) of perennial rivers and streams assessed in good condition, while only 6.4 percent (330 miles) were in poor condition. An additional 3.3 percent (172.4 miles) of rivers and streams were not assessed for the enterococci indicator (Figure V-19).

Within the Temperate Plains ecoregion, 91.1 percent (1,906.8 miles) of rivers and streams were in good condition and only 8.9 percent (186.9 miles) were in poor condition regarding the pathogen indicator, enterococci. In the Northern Plains ecoregion, 89.7 percent (2,742.8 miles) of rivers and streams were in good condition while 4.7 percent (143.1 miles) were in poor condition (Figure V-20). The remaining 5.6 percent (172.4 miles) of rivers and streams in the Northern Plains ecoregion were not assessed.

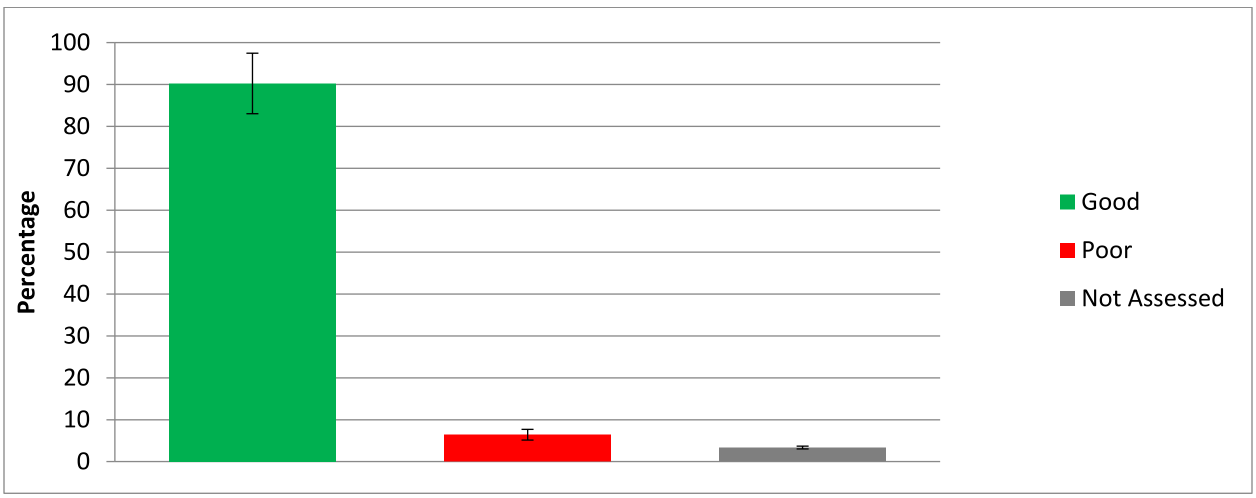


Figure V-19. Human Health Condition Category Estimates Based on Enterococci Bacteria for Perennial Rivers and Streams in North Dakota.

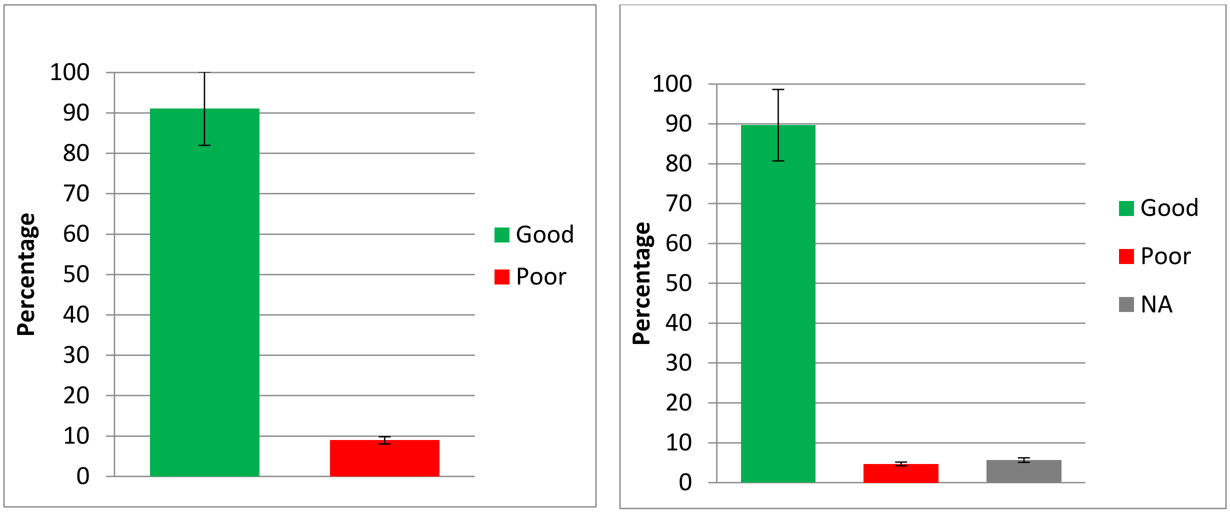


Figure V-20. Human Health Condition Category Estimates Based on Enterococci Bacteria for Perennial Rivers and Streams in the Temperate Plains (left) and Northern Plains (right) Ecoregions of North Dakota (Note– NA stands for Not Assessed).

V.A.6. Summary

Overall, biological indicators provided relatively low estimates of good condition. According to the macroinvertebrate indicator, 24.5 percent of perennial rivers and streams were in good condition and 44.8 percent were considered to be in poor condition. Also, the fish index revealed that 32.9 percent of waterbodies were in good condition and 33.9 percent were in poor condition.

Chemical stressors also provided low estimates of good condition. Based on total phosphorus, 23 percent of waterbodies were in good condition and 69.3 percent were considered to be poor while total nitrogen estimates reveal that 6.7 percent of waters were good and 57.3 percent were in poor condition. Based on salinity, 23.2 percent of waterbodies were in good condition and 27.1 percent were in poor condition.

Physical stressors were similar to chemical stressors in that they also provided low estimates of good condition for perennial rivers and streams in the state. Based on the bed sediment stressor, 41.9 percent of streams were in good condition and 24.5 percent were in poor condition. In-stream cover estimates reveal that 30.6 percent of streams were in good condition and 27.9 percent were in poor condition. Riparian vegetation condition estimates reveal that 20.1 percent of waterbodies were in good condition while 54.8 percent were considered to be in poor condition.

V.B. Lakes and Reservoirs Water Quality Assessment

Of the 337 public lakes, 201 are included in the state's water quality standards. One lake is Category 1 where all uses are attained. One-hundred-forty-eight (148) lakes and reservoirs are in Category 2, where at least one use is fully supporting (i.e., industrial and agricultural) but other uses were not assessed. Nineteen (19) lakes and reservoirs are Category 4A, where a TMDL has already been approved by EPA. Thirty-three (33) lakes and reservoirs are in Category 5, where at least one beneficial use is impaired and a TMDL is required (Figures VI-1 through VI-6).

Table V-6. Assessment Category Summary for Lakes and Reservoirs in North Dakota.

Category	Description	Number of AUs	Size (acres)
1	All uses met	1	2,210.3
2	Some uses met, others not assessed	148	137,890.25
3	No uses assessed	0	0
4A	Some or all uses impaired or threatened but a TMDL has been approved for all impaired uses	19	3,655.57
4B	Some or all uses impaired or threatened but other control measures will result in water quality standard attainment	0	0
4C	Some or all uses impaired or threatened but impairment is not due to a pollutant (i.e., flow alteration)	0	0
5	Some or all uses impaired or threatened and a TMDL is required	33	473,380.43

For this report, aquatic life is synonymous with biological integrity and ensures that a waterbody can support a healthy biological community (i.e., aquatic insects, fish, etc.). Regarding individual use support for lakes and reservoirs in North Dakota, 602,334.34 acres are fully supporting for aquatic life, 570,973.28 acres are fully supporting for recreation, and 617,136.55 acres are fully supporting for agricultural and industrial uses (Table V-7).

Table V-7. Individual Use Support Summary for Lakes and Reservoirs in North Dakota (acres).

Use	Not Supporting	Threatened	Insufficient Information	Not Assessed	Fully Supporting	Total
Aquatic Life	855.53	7,789.63	266.34	12,216.26	596,008.79	617,136.55
Fish Consumption	447,159.90	0	0	99,070.83	68,695.52	614,926.25
Recreation	8628.71	24,119.71	1442.14	11,972.71	570,973.28	617,136.55
Drinking Water	0	0	0	272,860.45	342,065.80	614,926.18
Agriculture	0	0	0	0	617,136.55	617,136.55
Industrial	0	0	0	0	617,136.55	617,136.55

The primary cause of aquatic life impairments in lakes and reservoirs is low dissolved oxygen, or oxygen depletion (Table V-8). Other pollutants that stimulate the production of organic matter include excess nutrients and siltation. Major sources of nutrient loads include cropland runoff and other nonpoint sources.

Table V-8. Impairment Summary for Lakes and Reservoirs in North Dakota.

Impairment	Acres
Nutrients	32,799.58
Oxygen Depletion	5,900.52
Sedimentation/Siltation	4,616.96
Turbidity	957.35
Total Dissolved Solids	40.69
Mercury in Fish Tissue	447,159.9

V.B.1. State-wide Statistical Survey Results for Lakes and Reservoirs

As described in Part IV.A. Chapter 2, Monitoring Programs, Projects and Studies, the department completed a state-wide statistical survey of lakes and reservoirs in 2012 as part of the EPA Sponsored National Lakes Assessment (NLA). For a detailed summary of the 2012 NLA, including a description of the study design and sampling methods the reader is referred to the US EPA National Lakes Assessment website at https://www.epa.gov/national-aquatic-resource-surveys/nla. For a more detailed description of the state intensification project, including a complete summary of the results of the state intensification project the reader is referred to the report entitled “Using the 2012 National Lakes Assessment to Describe the Condition of North Dakota’s Lakes (NDDoH, 2015b). The following is a summary of some of the highlights from this report.

V.B.2. Sample Sites

The 2012 NLA and state intensification project were a follow up to the 2007 NLA. For the 2007 NLA, lakes selected for the assessment were defined as a natural or man-made lake, pond, or reservoir that are at least 3.3 feet (1 meter) deep, have a surface area greater than 10 acres, and with a minimum of 0.25 acres of “open water” area (US EPA, 2009). For the 2012 NLA and state intensification project, the size of lakes selected for the assessment was reduced to 2.47 acres (1 hectare), less than a quarter of the size of lakes selected for the 2007 NLA. This new size criterion resulted in a target population of 159,652 lakes within the conterminous United States, and target population of 4,855 lakes within North Dakota. While the size criteria changed between 2007 and 2012, the depth criteria of at least 3.3 feet (1 meter) and a minimum open water area of 0.25 acres remained the same.

In North Dakota, 44 lakes were selected and sampled for the 2012 NLA. In addition to the lakes randomly selected and sampled for the 2012 NLA sampling, the department intensified the sample for a statistically acceptable sample size of 52 lakes (Figure V-21). NLA lakes were sampled between June and September of 2012, while the eight (8) randomly selected intensification lakes were sampled during August and September of 2013. Of the 52 total lakes sampled, 38 were sampled by the department, 12 by the United States Geological Survey (USGS), 1 by the Spirit Lake Nation, and 1 by the Turtle Mountain Band of Chippewa.

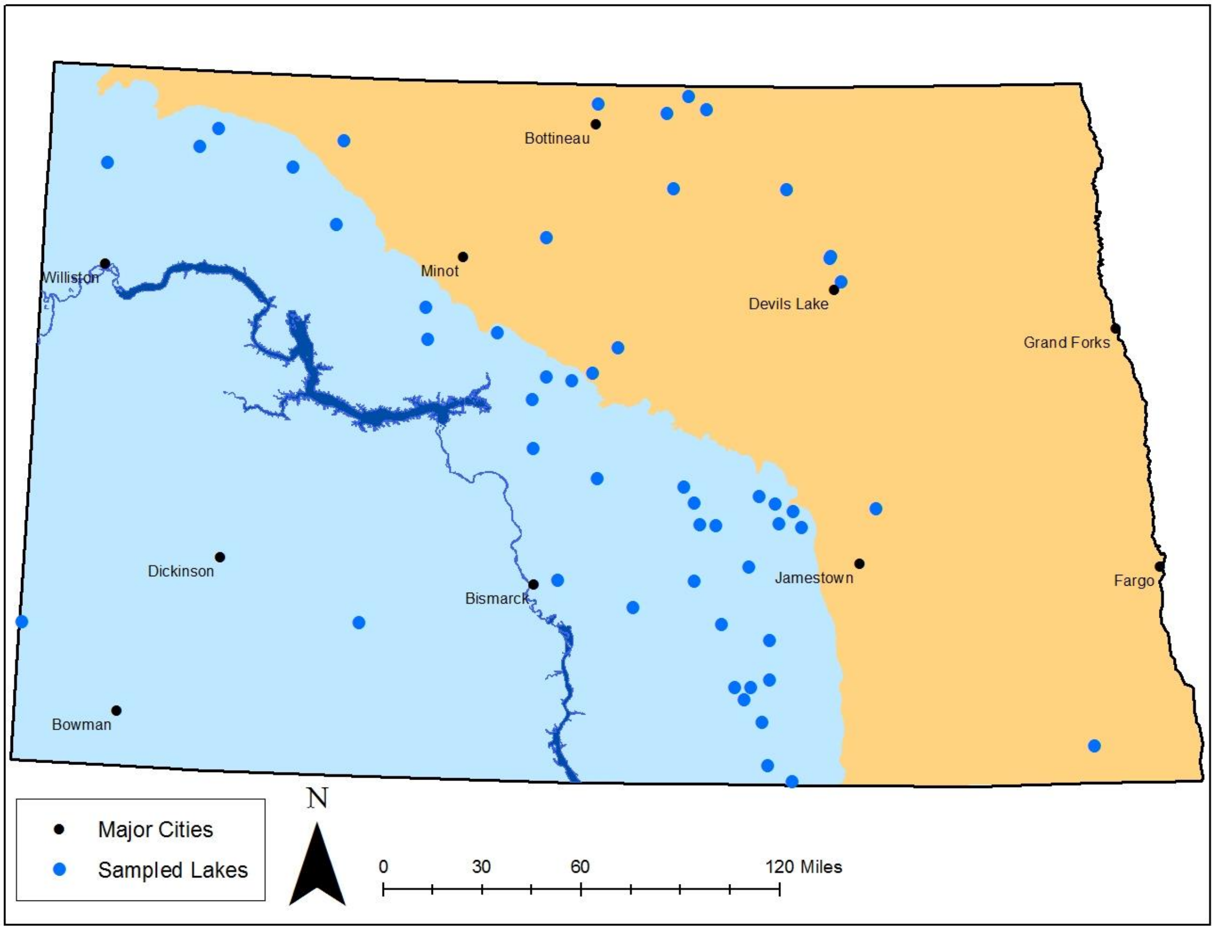


Figure V-21. Location of Lakes Sampled for the 2012 National Lakes Assessment and the State Intensification Project.

Following random lake selection by the EPA, North Dakota lakes were field-checked by staff with the department's WMP to ensure lakes were accessible for watercraft and that lakes fit the EPA's lake selection criteria. Additionally, where there was no public boat ramp, landowner permission was necessary to access the lake. Therefore, when accessibility was not possible due to any of the aforementioned reasons, "over-sample" lakes were selected to replace "target" lakes. "Over-sample" lakes were also field-checked to ensure suitability for inclusion in the study. As state previously North Dakota had an estimated 4,855 lakes within its target population for the 2012 NLA and state intensification. Following field-checking of these lakes, the target population was adjusted to fit the group of 52 lakes which were sampled. For 2012, 860 lakes (17.7 percent of the initial target population) were dropped from assessment. Reasons for dropping lakes from the assessment included: 1) lakes that were sampleable but were inaccessible due to barriers or safety concerns (244 lakes or 5 percent of the target population); or 2) lakes were sampleable but where access was denied (578 lakes or 11.9 percent of the target population). An additional 38 lakes (0.8 percent) were also excluded from the target population of 4,855 lakes due to a site evaluation error. Ultimately, the 52 lakes sampled within North Dakota as part of the 2012 and state intensification project were used to describe water quality condition of 3,995 lakes in the state. Further, lakes sampled represented a variety of lake sizes represented in the target population (Table V-9).

Table V-9. Distribution of Lakes by Size Range Sampled for the 2012 National Lakes Assessment and State Intensification Project.

Lake Size	Sample Size (n)	Percentage of Sample Population
< 50 acres	7	13.5
50 - < 100 acres	5	9.6
100 - < 200 acres	16	30.8
200 - < 500 acres	9	17.3
500 - < 1,000 acres	9	17.3
≥ 1,000 acres	6	11.5

V.B.3. Biological Condition

Ecologists can evaluate the biological condition of lakes in much the same way that biological condition can be evaluated for rivers and streams. For both aquatic resource types, biological condition can be evaluated by analyzing key characteristics of the communities of organisms that live in them. These characteristics include the composition and relative abundance of related groups of organisms that represent a portion of the overall biological community. While the NRSA focused on biological assemblages such as benthic macroinvertebrates and fish. The NLA focused on benthic macroinvertebrates and zooplankton. For each biological assemblage, benthic macroinvertebrates and zooplankton, a separate index was developed for each ecoregion with condition category (i.e., good, fair, poor) assigned to index scores. Each index was comprised of several attributes of the biological community, known as metrics. Examples of metrics used in each index included species richness, species composition, species diversity, functional feeding groups, habit niches and pollution tolerance/intolerance levels. All of these aspects are combined into an overall score for the community, which is known as a multi-metric index (MMI).

V.B.3.a. Benthic Macroinvertebrate Condition

Greater than 50 percent of North Dakota lakes (2,002 lakes) were in good condition based on the benthic macroinvertebrate MMI, compared to 13 percent (522 lakes) and 32.5 percent (1,297 lakes) of lakes in fair and poor condition, respectively (Figure V-22). Further, 4 percent of lakes (174 lakes) were not assessed (Figure V-22), a designation based on either there being no sample collected or fewer than 100 individuals counted in the sample.

V.B.3.b. Zooplankton Condition

With regard biological condition estimated based on the zooplankton MMI, most lakes in North Dakota were considered fair (55 percent; 2,195 lakes), with 15 percent of lakes (586 lakes) in good condition and 30 percent of lakes (1,214 lakes) in poor condition (Figure V-23).

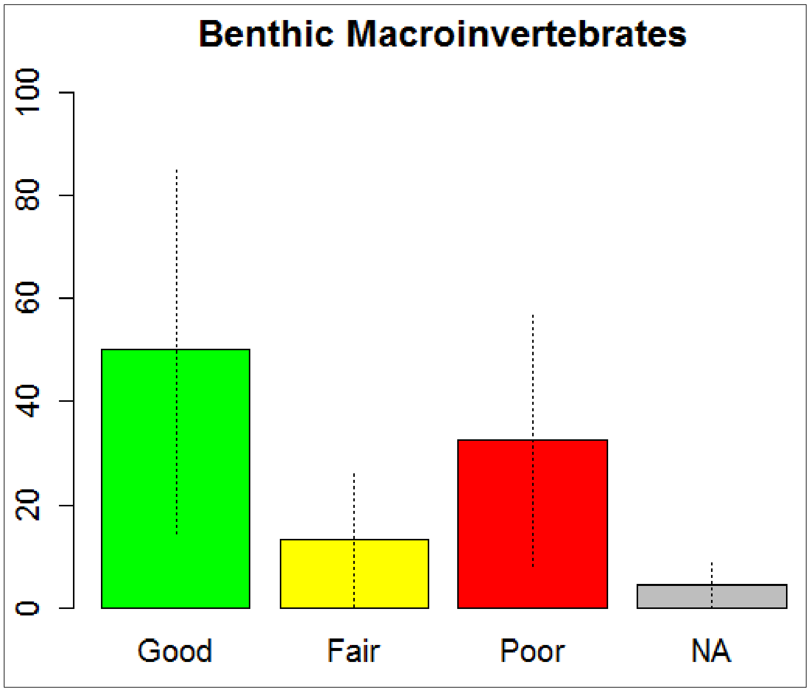


Figure V-22. Benthic Macroinvertebrate Condition Category Estimates for Lakes in North Dakota. (Lakes designated as Not Assessed (NA) were either not sampled for benthic macroinvertebrates or had fewer than 100 individuals counted.)

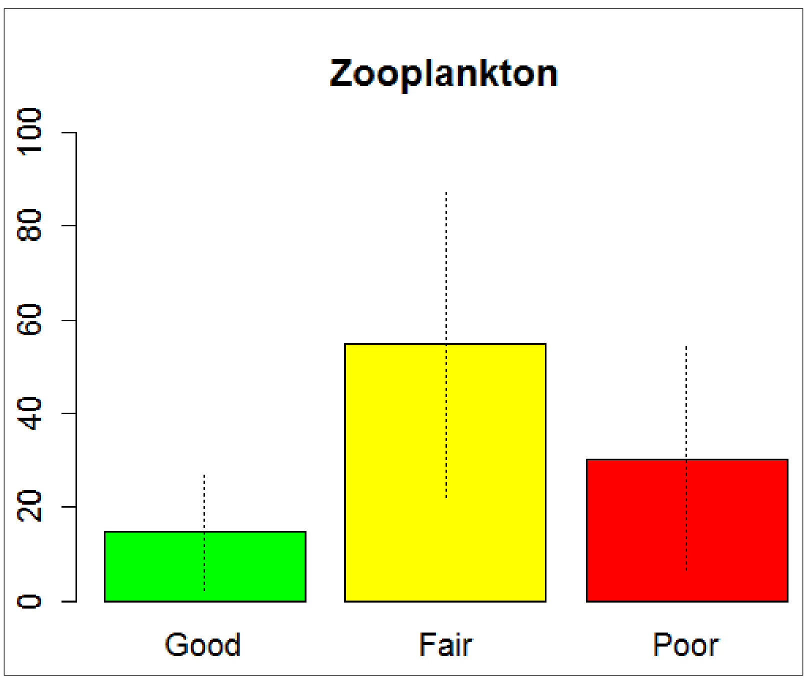


Figure V-23. Zooplankton Condition Category Estimates for Lakes in North Dakota.

V.B.4. Stressors to Lake Biota

In the aquatic environment, a stressor is anything (chemical, biological or physical) that could adversely affect the community of organisms living there. There are many external factors, both natural or otherwise, that can affect an aquatic organism's ability to thrive. Drought or rapid draw-down can be a stressor; contaminants (e.g., metals) can be a stressor; invasive species introductions can be a stressor, and human activity (e.g., shoreline development) can be a stressor. An important dimension of the NLA and state intensification study is to evaluate key chemical and physical stressors of lake quality that, when altered, have the potential to negatively impact a lake's biological community. For the 2012 NLA and state intensification study, specific chemical and physical stressor indicators were selected for sampling. These indicators of stress were not intended to be all-inclusive and some important stressors were not included in the survey due to technical or cost constraints.

V.B.4.a. Nutrients

Phosphorus and nitrogen are necessary nutrients required for all life. In appropriate amounts, these nutrients support the primary algal production necessary to support lake food webs. In many lakes, phosphorus is considered the "limiting nutrient," meaning that the available quantity of this nutrient controls the pace at which algae are produced in lakes. This also means that modest increases in available phosphorus can cause very rapid increases in algal growth. Some lakes are limited by nitrogen. In these lakes, modest increases in available nitrogen will yield the same effects. When excess nutrients from human activities enter lakes, cultural eutrophication is often the result. The culturally-accelerated eutrophication of lakes has a negative impact on everything from species diversity to lake aesthetics.

For the 2012 NLA and state intensification study, 53 percent of lakes assessed (2,113 lakes) were considered in fair condition for total nitrogen (TN), followed by 46 percent (1,828 lakes) in poor condition and only 1.4 percent (54 lakes) in good condition (Figure V-24). Further, 50.4 percent of lakes assessed in 2012 (2012 lakes) were considered in poor condition for total phosphorus (TP), followed by 41 percent (1622 lakes) in good condition and 9 percent (361 lakes) in fair condition (Figure V-25).

V.B.4.b. Dissolved Oxygen

Dissolved oxygen (DO) is considered one of the more important measurements of water quality and is a direct indicator of a lake's ability to support aquatic life. Aquatic organisms have different DO requirements for optimal growth and reproduction. Decreases in DO can occur during winter or summer when the available dissolved oxygen is consumed by aquatic plants, animals, and bacteria during respiration. While each organism has its own DO tolerance range, generally levels below 3 mg/L are of concern. Conditions below 1 mg/L are referred to as hypoxic and are often devoid of life.

For the 2012 NLA and state intensification project, DO assessment thresholds were established as good (≥ 5 mg/L), fair (≥3 mg/L to <5 mg/L), and poor (<3 mg/L). DO was relatively high throughout North Dakota lakes with greater than 99% (3,971 lakes) in good condition (Figure V-26).

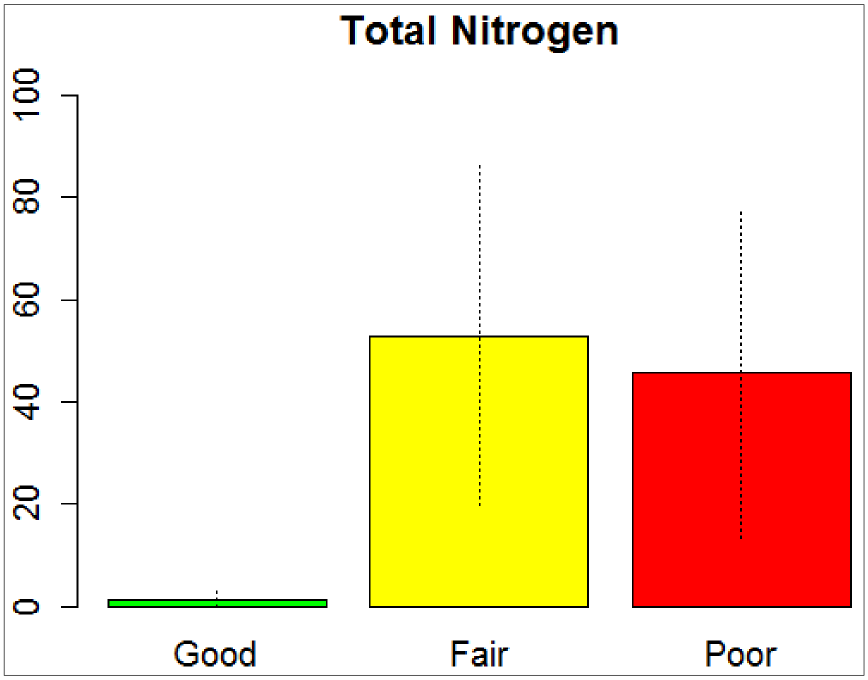


Figure V-24. Total Nitrogen Condition Category Estimates for Lakes in North Dakota.

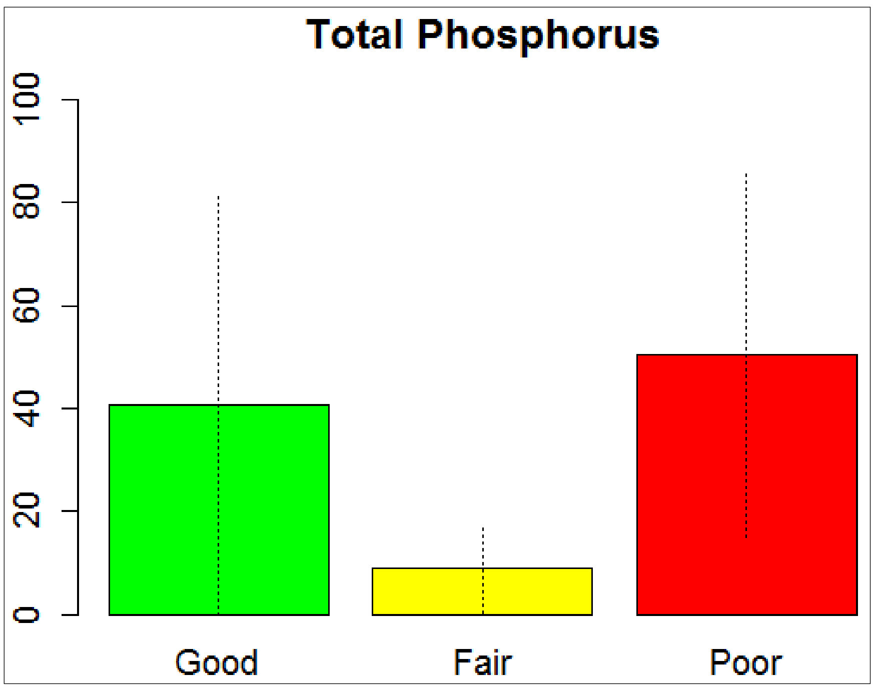


Figure V-25. Total Phosphorus Condition Category Estimates for Lakes in North Dakota.

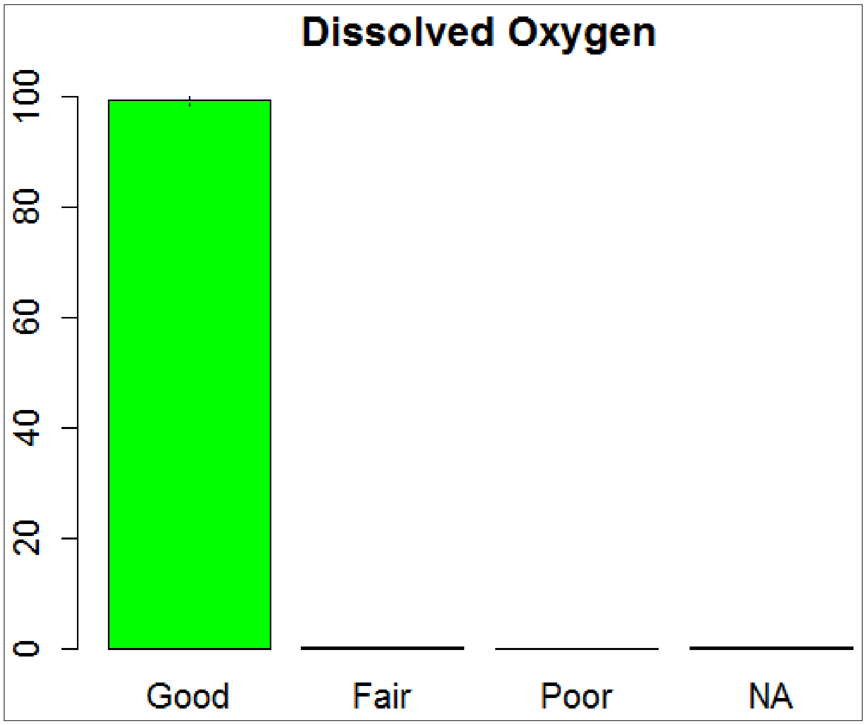


Figure V-26. Dissolved Oxygen Condition Category Estimates for Lakes in North Dakota. (Lakes designated as Not Assessed (NA) were not sampled for dissolved oxygen.)

V.B.4.c. Physical Habitat Condition

Physical habitat provides refuge for biological communities (e.g., benthic macroinvertebrates, zooplankton) from predators and direct sunlight. Three (3) indicators of lake physical habitat (littoral cover, riparian vegetation, and riparian disturbance) were measured and assessed for the 2012 NLA and state intensification project. Littoral cover in North Dakota lakes was in relatively good condition during the 2012 assessment, with nearly 60 percent of lakes (2,397 lakes) in good condition (Figure V-27). Similarly, riparian vegetation along lakes throughout the state was in relatively good condition for the 2012 survey, with greater than 50 percent of North Dakota lakes (2102 lakes) in good condition (Figure V-28). Thirty-nine (39) percent of North Dakota lakes (1548 lakes) were in good condition for riparian disturbance, though an equal number (1548 lakes) were in poor condition (Figure V-29).

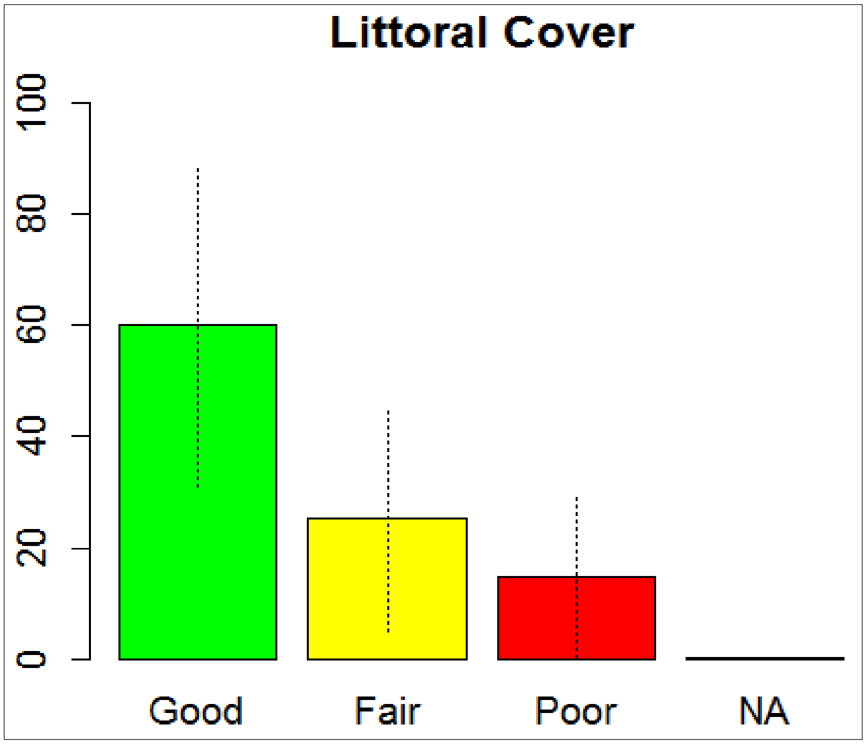


Figure V-27. Littoral Cover Condition Category Estimates for Lakes in North Dakota. (Lakes designated as Not Assessed (NA) were not assessed for littoral cover.)

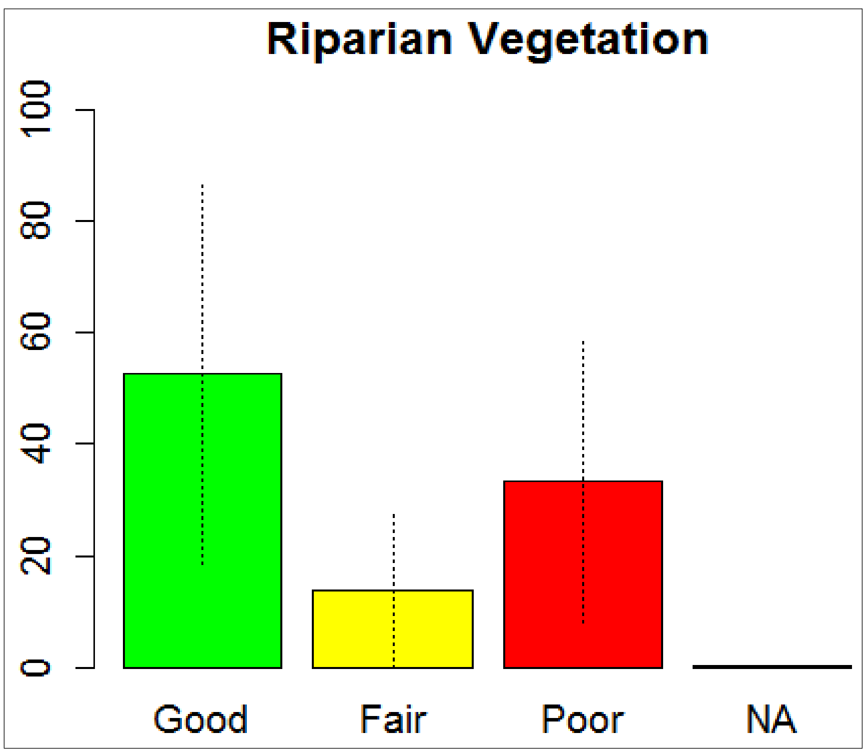


Figure V-28. Riparian Vegetation Condition Category Estimates for Lakes in North Dakota. (Lakes designated as Not Assessed (NA) were not assessed for riparian vegetation.)

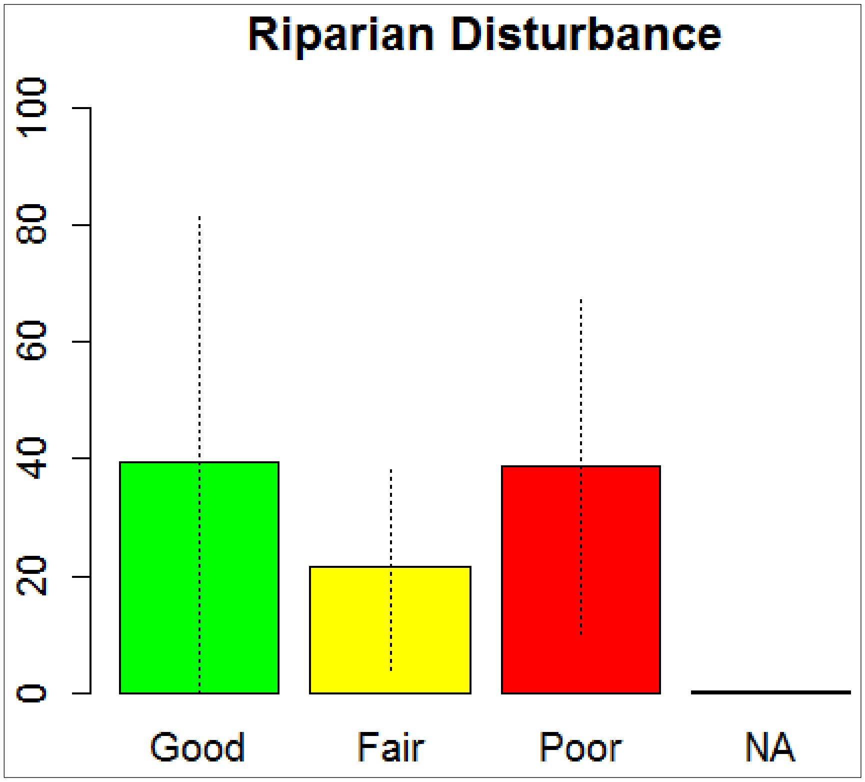


Figure V-29. Riparian Disturbance Condition Category Estimates for Lakes in North Dakota. (Lakes designated as Not Assessed (NA) were not assessed for riparian disturbance.)

V.B.5. Suitability for Recreation Use

Another perspective on lake condition considers the quality of a lake in terms of its suitability or safety for recreational use. Lakes are used for a wide variety of recreational opportunities that include swimming, waterskiing, fishing, boating, and many other activities. However, a number of microbial organisms, algal toxins, and other contaminants present in lakes can cause illness or otherwise make a lake unusable for recreation. The 2012 NLA and state intensification project assessed three indicators with respect to recreational condition: 1) microcystin, a type of algal toxin; 2) cyanobacteria, a type of algae that often produces algal toxins; and 3) chlorophyll-a, a measure of all algae present in the lake.

Phytoplankton or algae are the base of aquatic food webs. Excessive algal growth, however, can cause major ecological problems, such as hypoxia in lower depths or can cause harmful algal blooms that can produce toxins. When these toxins are caused by cyanobacteria (Also called blue-green algae) they are referred to as cyanotoxins. Cyanobacterial blooms can be unsightly, often resulting in floating layers of decaying, odiferous, gelatinous scum. While many varieties of cyanotoxin exist, microcystin, produced by Microcystis taxa, is currently believed to be the most common in lakes. Microcystin is a potent liver toxin, a known tumor promoter, and a possible human carcinogen. For all classifications presented hereafter in this suitability for recreational use, good is analogous to low risk, fair to moderate risk, and poor to high risk.

V.B.5.a. Chlorophyll-a

Based on measures of chlorophyll-α, 12.60 percent of North Dakota lakes (503 lakes) were considered to be low risk, while 73 percent (2935 lakes) of lakes were assessed as fair, and 14 percent (557 lakes) were poor (Figure V-30).

V.B.5.b. Cyanobacteria

Increased cyanobacteria (also known as blue-green algae) production can lead to an increased level of cyanotoxins in the water column, causing illness and/or death in wildlife, livestock, and humans. Nearly 30 percent of North Dakota lakes (1,198 lakes) were considered high risk for cyanobacteria densities which could cause health problems (i.e., poor condition), while only approximately 17 percent of lakes (693 lakes) were considered to be low risk (i.e., good condition) (Figure V-31). Fifty-two (52) percent of lakes assessed in 2012 (2,085 lakes) were considered at moderate risk for cyanobacteria blooms (i.e., fair condition).

V.B.5.c. Microcystin

Though not the only cyanotoxin group identified, microcystin is the most commonly identified in the United States and in North Dakota. Nearly 96 percent of North Dakota lakes (3,832 lakes) assessed in 2012 were considered low risk for microcystin exposure. Lakes with low risk either had measured microcystin concentrations that were less than 10 µg/L or results where the microcystin result was a non-detect. Roughly 4 percent of North Dakota lakes (144 lakes) were considered to be at high risk for microcystin. Lakes assessed to be at high risk (i.e., poor condition) had microcystin concentrations greater than or equal to 20 µg/L. Less than 1 percent of lakes (19 lakes) assessed in 2012 were at moderated risk (i.e., fair condition) for microcystin exposure. These were lakes where the measured microcystin concentrations were greater than or equal to 10 µg/L and less than 20 µg/L (Figure V-32).

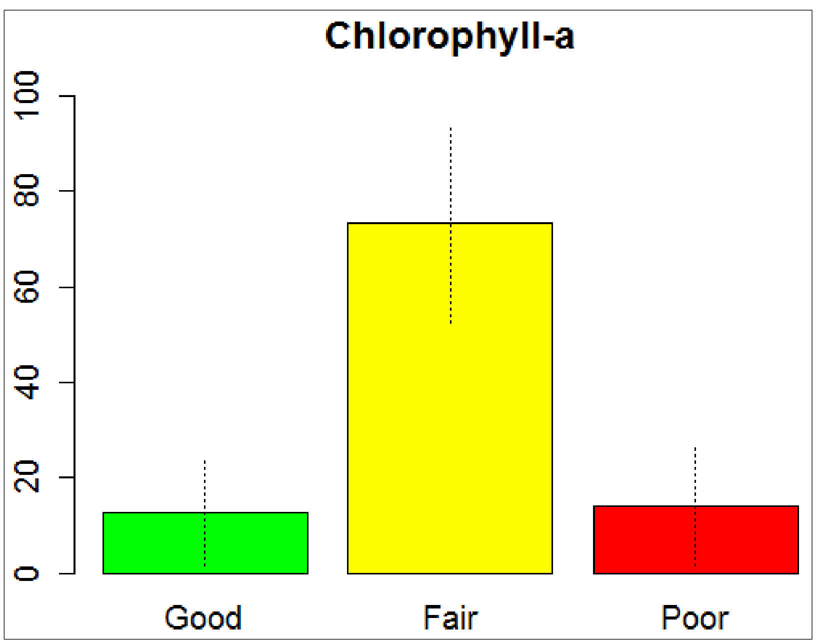


Figure V-30. Chlorophyll-a Condition Category Estimates for Lakes in North Dakota.

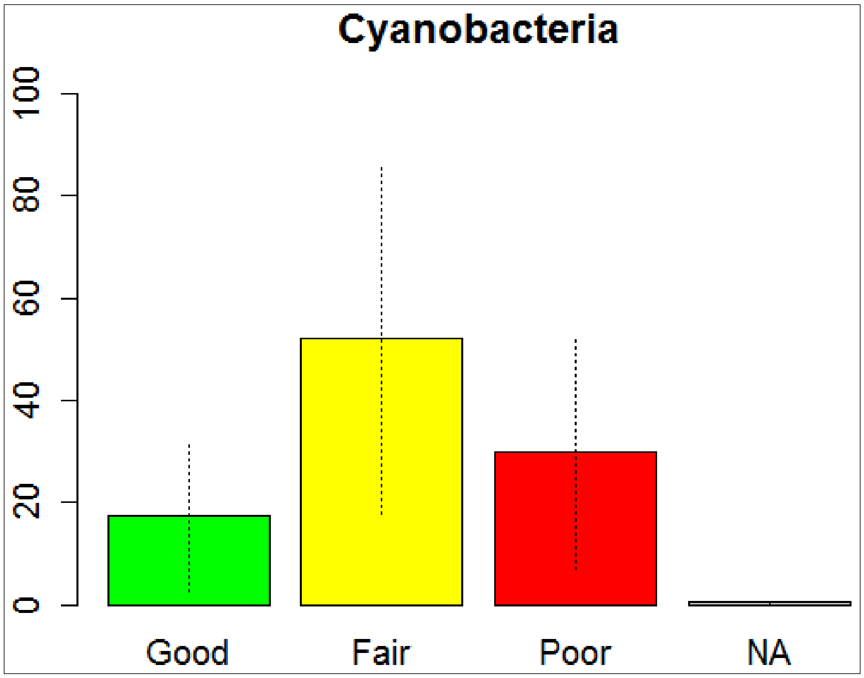


Figure V-31. Cyanobacteria Condition Category Estimates for Lakes in North Dakota. (Lakes designated as Not Assessed (NA) were not sampled for cyanobacteria.)

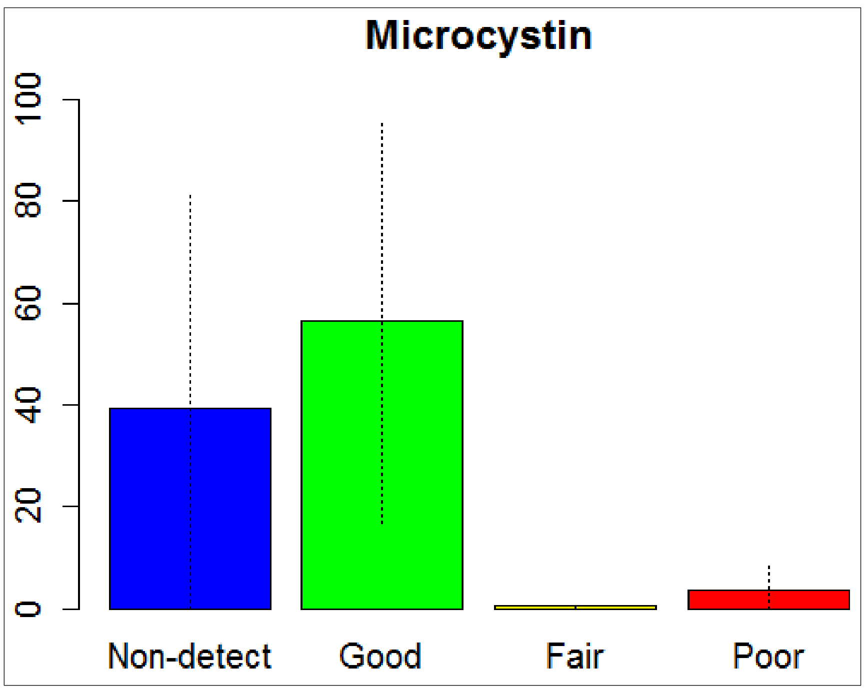


Figure V-32. Microcystin Condition Category Estimates for Lakes in North Dakota.

V.B.6. Summary

Biological communities, benthic macroinvertebrates and zooplankton, within North Dakota lakes, were in relatively good condition throughout the state. However, North Dakota's lakes are in relatively poor condition for nutrients. This finding is consistent with other department monitoring indicating elevated nutrient levels in lakes throughout the state.

Despite increased nutrients noted throughout the state, plant and algal growth indicators showed most lakes were in good to fair condition, though a significant number of lakes were assessed as being at high risk (ie., poor condition) for cyanobacteria blooms. Increased densities of cyanobacteria can lead to oxygen deprivation at lower depths and are associated with common toxins (e.g., anatoxins, microcystins). Though mostly at low levels, microcystin was detected in approximately 60 percent of North Dakota lakes, and at higher levels, these toxins can cause significant harm to wildlife, livestock, and humans. It should be noted that these blooms can be relatively short-lived and toxins can disappear from the system relatively fast.

Littoral vegetative cover remained in relatively good health during the 2012 assessment. Increased in-lake cover was directly correlated to an increased zooplankton MMI score. Further, plant cover in shallow, littoral areas can provide refugia for small fish, amphibians, and macroinvertebrates. Additionally, submerged vegetation can be an important food source for waterfowl, an important game resource throughout the State, particularly within lakes and wetlands in the prairie pothole region.

Tree growth is uncommon in North Dakota, but when present, can provide significant benefits for near-shore biological communities. Acknowledging that trees are not normally part of the plains, North Dakota lakes have relatively good riparian vegetation. Healthy, treed riparian buffers can provide a “filter” for increased nutrients, sediment inputs, and other non-point source pollutants. There were, conversely, a high number of lakes in poor condition for riparian disturbance. Protection of lake riparian buffers should be noted for benefits they provide to mitigate the effects of pollutant runoff, but additionally for the benefits provided to near-shore biological communities. Riparian areas of North Dakota lakes were co-dominated by grasslands, which are commonly used as nesting grounds for upland birds and waterfowl, as well as habitat for hundreds of game and non-game species. Further, this survey found an increasing amount of nutrients in lakes with greater amounts of farmland within the riparian buffers, a finding consistent elsewhere throughout the country. Thus, wetland loss and continual turning over of land can lead to increased nutrients being deposited in these lakes, with the potential consequence of increased eutrophication.

V.B.7. Public Health Concerns

Cyanobacteria, more commonly referred to as blue-green algae, are a photosynthetic bacteria which are ubiquitous throughout North Dakota lakes and reservoirs. Cyanobacteria can develop into dense growths, or blooms, referred to as harmful algal blooms (HABs). HABs can produce a variety of toxins which can affect the liver (i.e., hepatotoxins), the nervous system (i.e., neurotoxins) or the skin (i.e., dermatoxins).

Certain environmental conditions (e.g., warm water, sunlight, stagnant water, excess nutrients) can facilitate a bloom in lakes, particularly in nearshore or shallow areas. Some of these cyanobacteria produce the aforementioned toxins which are released when the cells are lysed (or ruptured) and the toxins are released into the water or inside the body. These toxins have been related to skin rashes or gastrointestinal issues with humans recreating in North Dakota lakes, while there have been multiple cases of death of livestock and pets. Additionally, HABs can:

- Block sunlight needed for other aquatic organisms
- Lead to high diel variability of dissolved oxygen concentrations
- Raise treatment cost for public water supply systems

The North Dakota DEQ issued 18 advisories or warnings in 2018 and 2019, 37 in 2020, and 21 in 2021, on a total of 49 lakes and reservoir (Table V-10). Some waterbodies are perpetual “offenders” and are on the advisory and/or warning list every year, including Bowman-Haley Reservoir, Patterson Lake and Sweetbriar Dam.

In 2021, the North Dakota DEQ published guidelines for advisories and warnings based on concentrations of microcystin, anatoxin-a and cylindrospermopsin (NDDEQ, 2021). Some or all of these will become implemented into the state’s water quality standards during the next triennial review.

Other examples of public health or aquatic life concerns include fishing advisories or bans, pollution-caused fish kills or abnormalities, known sediment contamination, discontinued use of drinking water supplies, closure of swimming areas or incidents of waterborne diseases.

Fish kills occur periodically in the lakes and rivers of the state. When they do occur, it is generally the result of low-water conditions, heavy snow cover or both, which result in low dissolved oxygen concentration. Because most fish kills occur in the winter, documenting their occurrence and extent is difficult. In most instances, the occurrence of fish kills is inferred through spring test netting by the North Dakota Game and Fish Department.

Table V-10. Lakes and reservoirs with harmful algal bloom warnings or advisories posted between 2018 and 2020.

Alkali Lake	Sargent	2020, 2021
Antelope Lake	Pierce	2018, 2020, 2021
Beaver Lake	Logan	2019
Blumhardt Lake	McIntosh	2019
Boom Lake	LaMoure	2021
Bowman-Haley Reservoir	Bowman	2018, 2019, 2020, 2021
Braddock Dam	Emmons	2018, 2020
Buffalo Lake	Pierce	2019, 2020
Buffalo Lodge Lake	McHenry	2021
Bylin Dam	Walsh	2021
Camels Hump Dam	Golden Valley	2018
Coal Mine Lake	Pierce	2018, 2020
Dead Colt Creek	Ransom	2020, 2021
Devils Lake	Ramsey	2019, 2020
Dry Lake	McIntosh	2018, 2019, 2020
Epping-Springbrook Dam	Williams	2020, 2021
Flood Lake	Lamoure	2019

Froelich Dam	Sioux	2019, 2020, 2021
Golden lake	Steele	2021
Green Lake	McIntosh	2018
Harmon Lake	Morton	2019, 2020
Harvey Reservoir	Wells	2018
Homme Dam	Walsh	2018, 2019, 2020
Hoffer Lake	Sheridan	2021
Jamestown Reservoir	Stutsman	2019, 2020, 2021
Lake Ashtabula	Barnes	2018
Lake Josephine	Kidder	2018
Lake Lamoure	Lamoure	2018, 2020
Lake Tschida	Grant	2018, 2020, 2021
Larson Lake	Hettinger	2019, 2020
Long Lake	Burleigh	2018, 2019, 2020
Mount Carmel Dam	Cavalier	2020
Patterson Lake	Stark	2018, 2019, 2020, 2021
Pheasant Lake	Dickey	2018
Pipestem Reservoir	Stutsman	2021
Renwick Dam	Pembina	2020
Rice Lake	Ward	2020
Reule Lake	Stutsman	2021
Sather Dam	McKenzie	2020
Schlecht-Thom Dam	Lamoure	2019
South Golden Lake	Steele	2020
Spiritwood Lake	Stutsman	2020
Stump Lake	Nelson	2019, 2020, 2021
Sweetbriar Dam	Morton	2018, 2019, 2020, 2021
Twin Lakes	Lamoure	2018
Whitman Dam	Nelson	2021
Wilson Dam	Dickey	2019
Wood Lake	Benson	2020
Woodhouse Lake	Kidder	2018

V.B.8 Public Participation

Public comments will be solicited on the draft 2020-2022 TMDL list through a public notice published in the Fargo Forum, Grand Forks Herald, Bismarck Tribune, Minot Daily News, Dickinson Press and Williston Daily Herald.

Comments will also be solicited via mail or email by contacting the South Dakota Department of Agriculture and Natural Resources, Minnesota Pollution Control Agency, Natural Resources Conservation Service, US Fish and Wildlife Service, US Forest Service, US Army Corp of Engineers, North Dakota Department of Water Resources, Red River Basin Commission, along with US EPA Region 8.

PART VI. SECTION 303(d) LIST OF WATER QUALITY LIMITED WATERS NEEDING TMDLs

The 2020-2022 TMDL list is represented by 359 waterbody/pollutant combinations and 229 assessment units (AUs) with 23 AUs in the James River basin, 63 AUs in the Missouri River basin, 123 AUs in the Red River basin and 20 AUs in the Souris River basin. Of those, 33 are lakes and 196 river and stream segments.

The following maps and tables include a comprehensive list of impaired waters in the James River Basin, Missouri River Basin, Red River of the North Basin, and Souris River Basins in North Dakota.

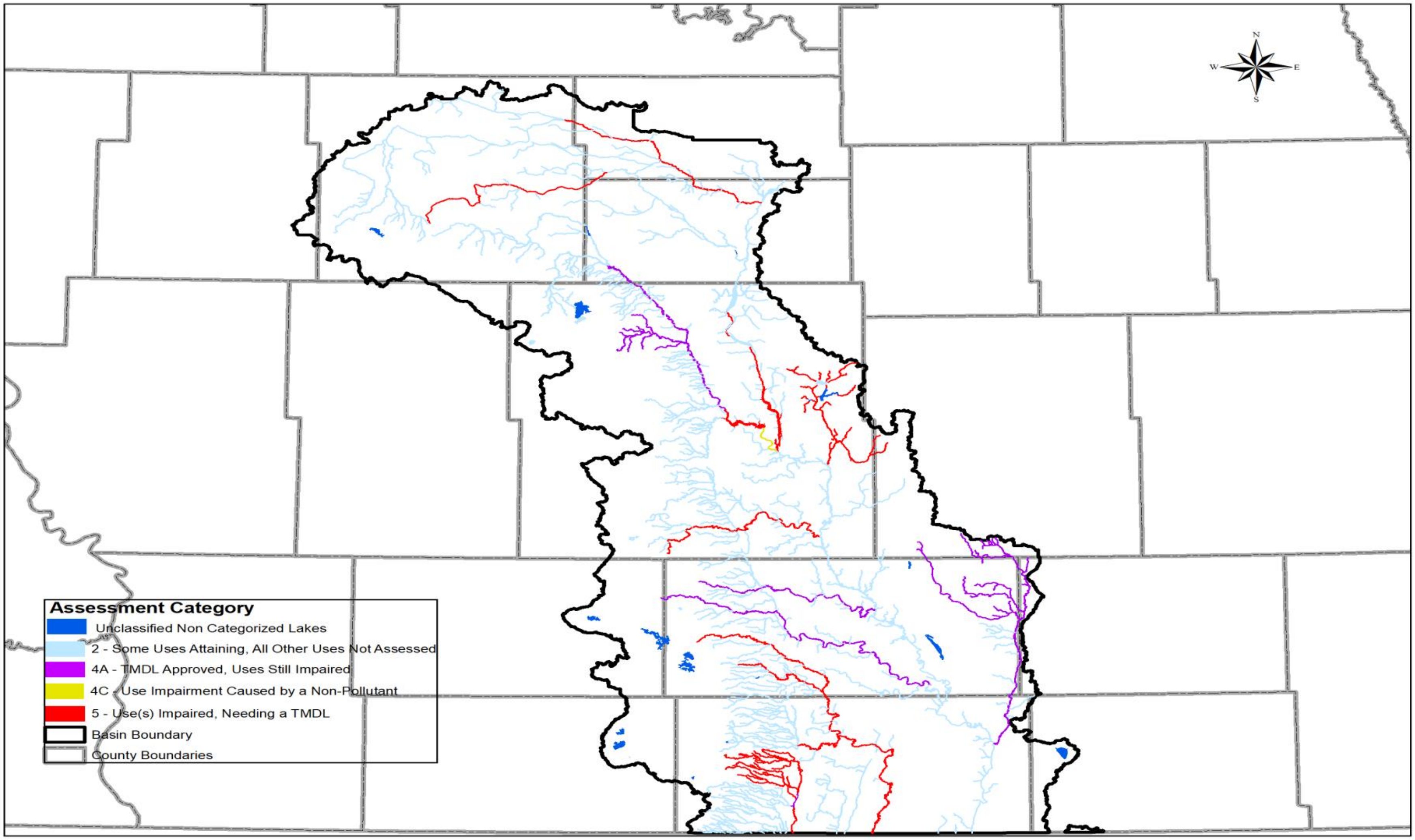


Figure VI-1. Graphical Depiction of 2020-2022 Section 303(d) Listed/Category 5 Waters in the James River Basin.

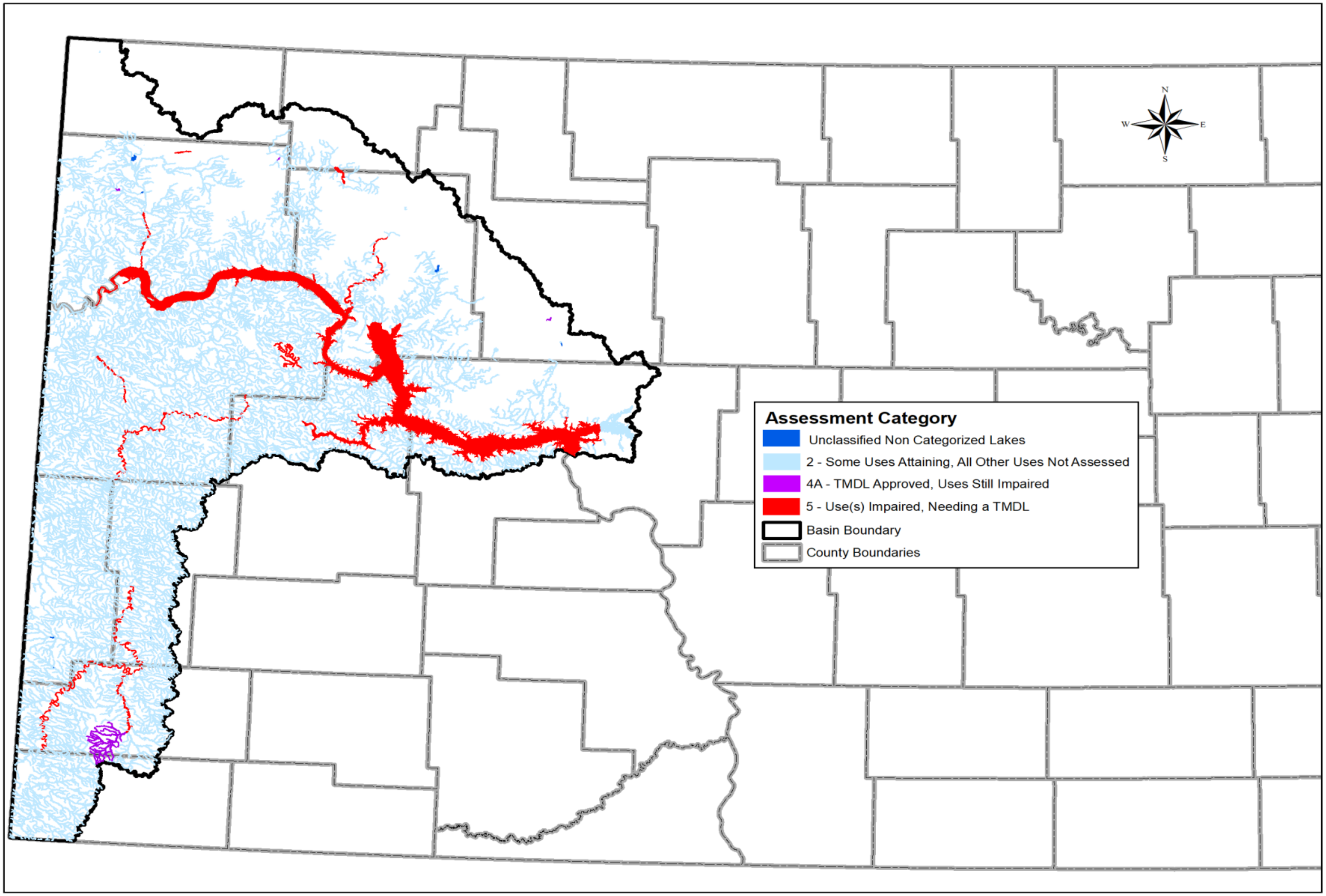


Figure VI-2. Graphical Depiction of 2020-2022 Section 303(d) Listed/Category 5 Waters in the Upper Missouri River Basin.

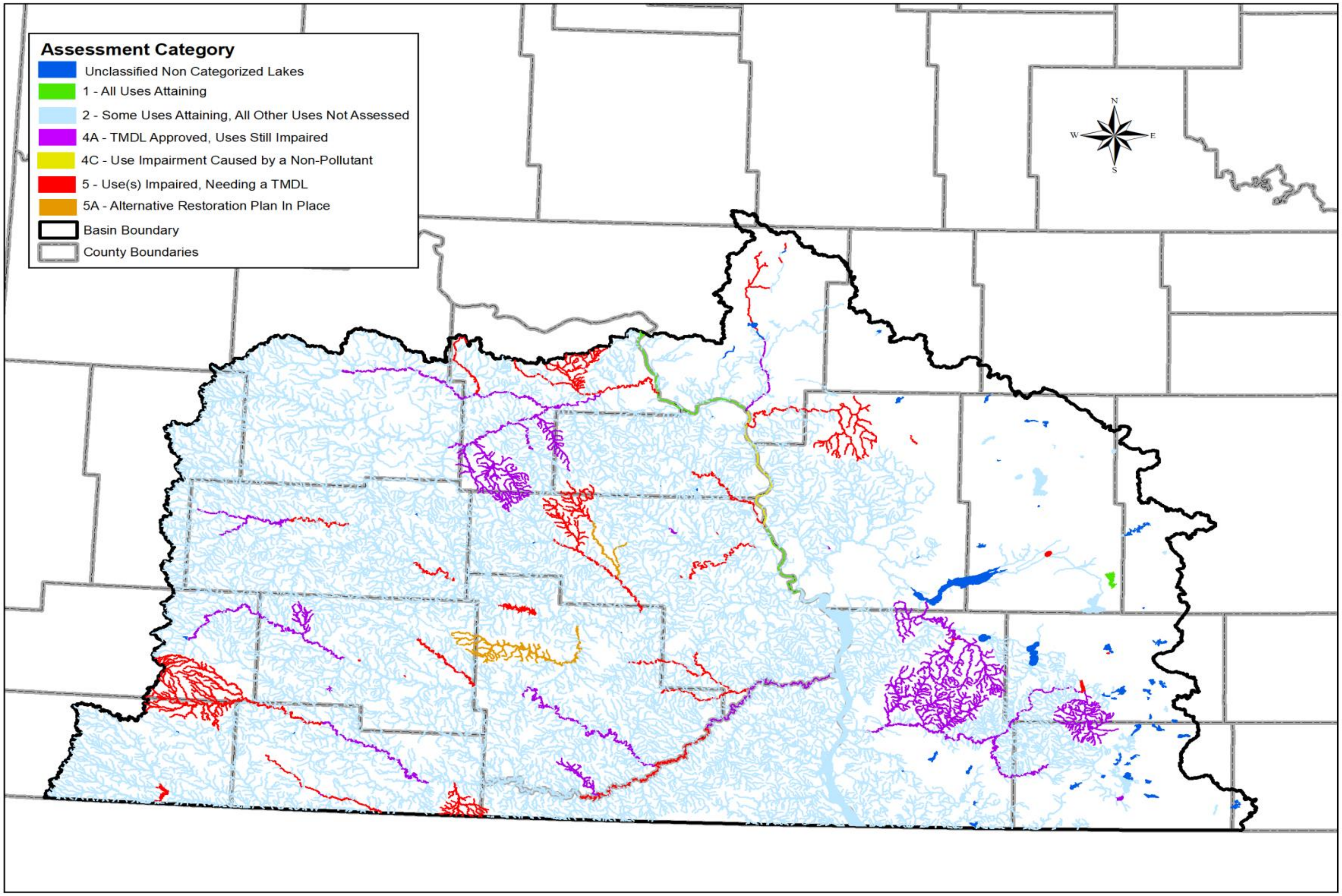


Figure VI-3. Graphical Depiction of 2020-2022 Section 303(d) Listed/Category 5 Waters in the Lower Missouri River Basin.

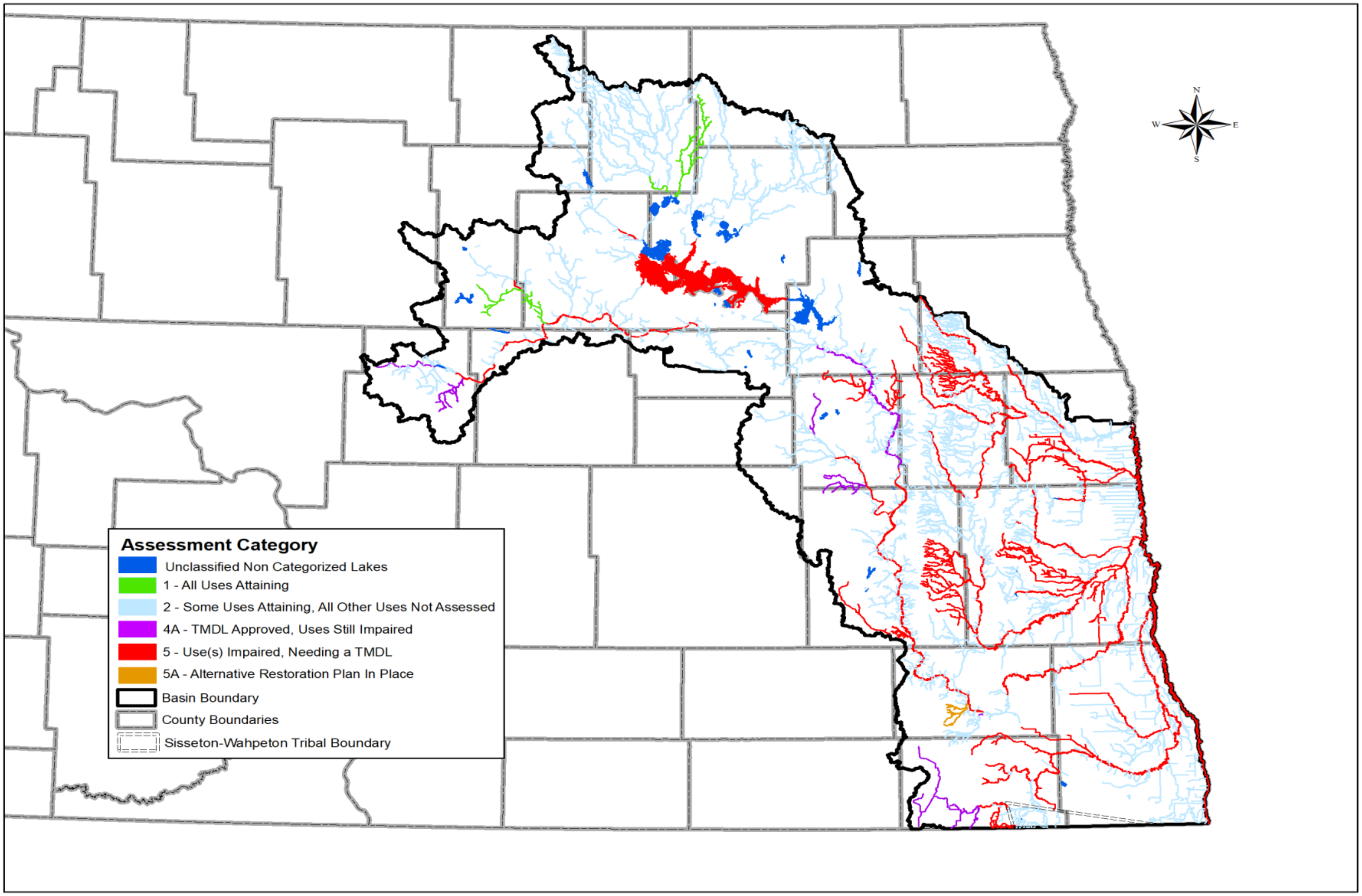


Figure VI-4. Graphical Depiction of 2020-2022 Section 303(d) Listed/Category 5 Waters in the Upper Red River Basin.

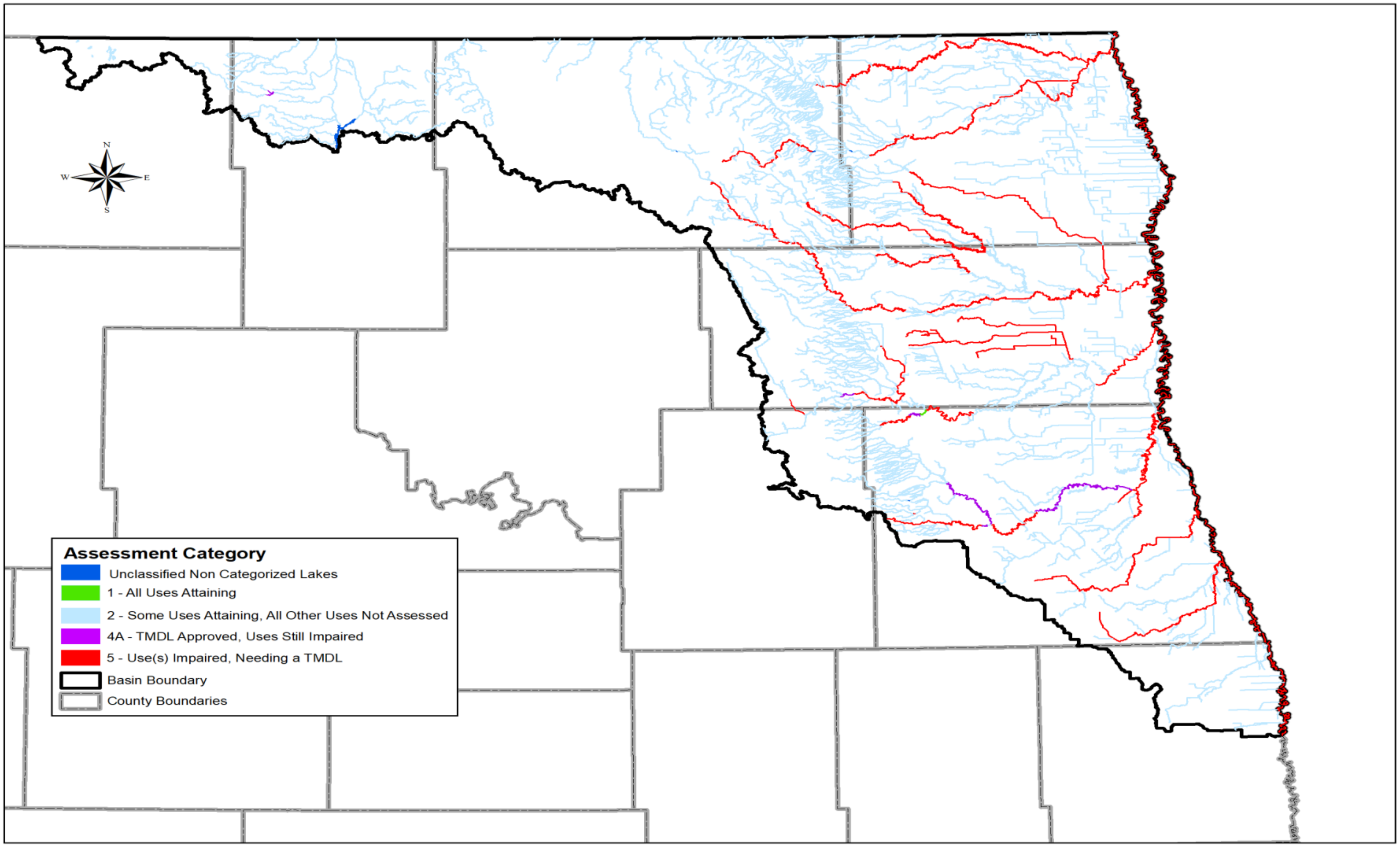


Figure VI-5. Graphical Depiction of 2020-2022 Section 303(d) Listed/Category 5 Waters in the Lower Red River Basin.

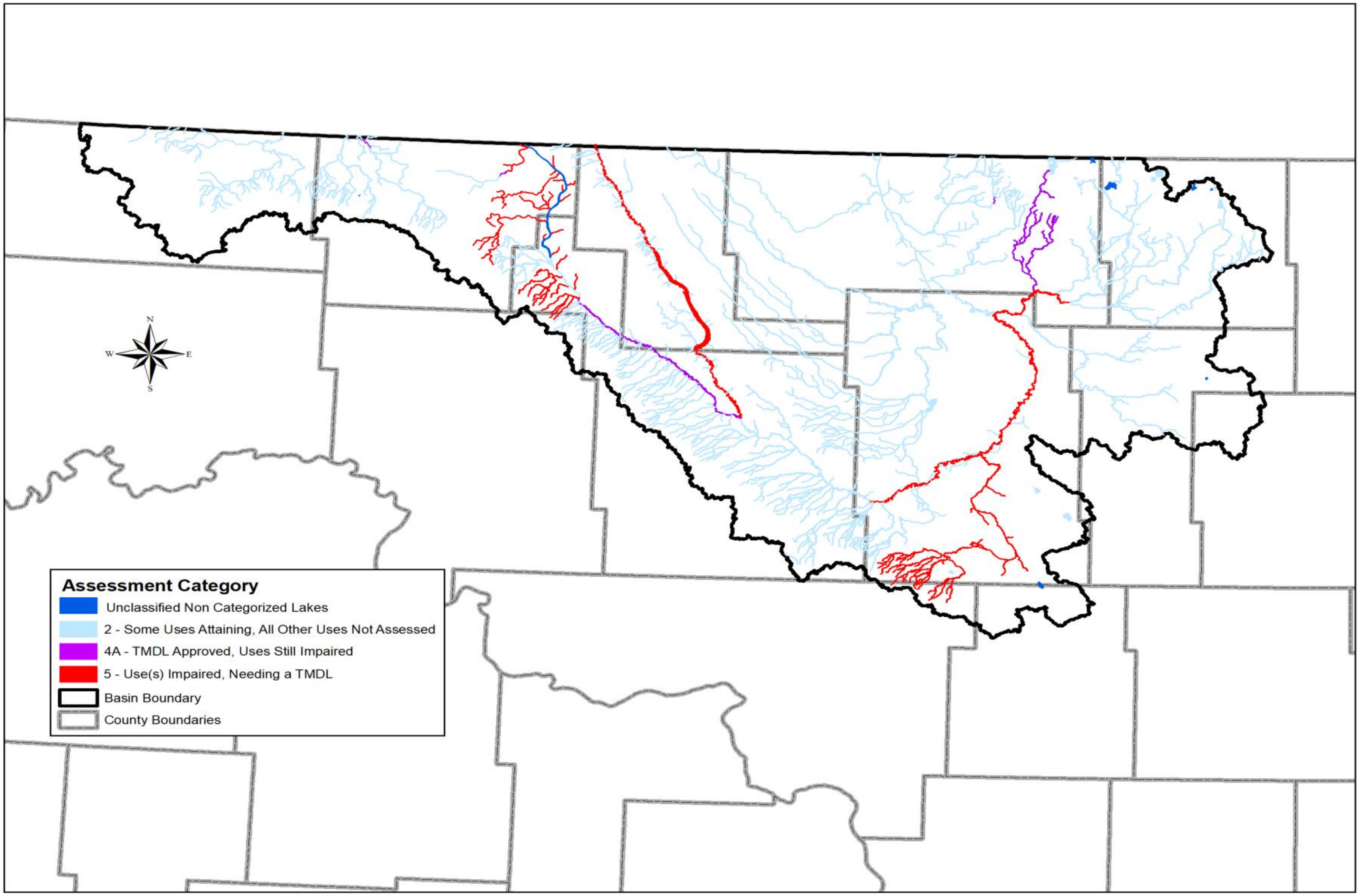


Figure VI-6. Graphical Depiction of 2020-2022 Section 303(d) Listed/Category 5 Waters in the Souris River Basin.

Table VI-1. 2020-2022 List of Section 303d Impaired Waters in the James River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-10160001-002-L_00	A large C.O.E. reservoir on the James River in Stutsman County, N.D.	2036.5 Acres	Low	No	Recreation	Nutrients
ND-10160001-002-S_00	James River downstream from Jamestown Reservoir to its confluence with Pipestem Creek, including one tributary.	5 Miles	Low	Yes	Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
ND-10160001-003-S_00	James River from Arrowwood Lake, downstream to Jim Lake, including Mud Lake.	5.2 Miles	Low	Yes	Fish and Other Aquatic Biota	Dissolved Oxygen
ND-10160001-013-S_00	James River from its confluence with Big Slough, downstream to its confluence with Rocky Run.	20.5 Miles	High	No	Recreation	Escherichia coli (E. coli)
ND-10160001-018-S_00	Rocky Run from its confluence with a tributary watershed west of Cathay, ND, downstream to its confluence with Rosefield Slough.	14.6 Miles	Low	Yes	Recreation	Fecal Coliform
ND-10160001-021-S_00	Rocky Run from its beginning, downstream to its confluence with a tributary watershed located west of Cathay, ND (ND-10160001-020-S_00).	24.3 Miles	Low	Yes	Recreation	Fecal Coliform
ND-10160001-023-S_00	James River from its confluence with Rocky Run, downstream to its confluence with Lake Juanita Outlet (ND-10160001-027-S_00).	21.6 Miles	High	No	Recreation	Escherichia coli (E. coli)
ND-10160002-001-L_00	A large C.O.E. reservoir on Pipestem Creek in Stutsman County, N.D. Size is based on a full pool status.	1932.7 Acres	Low	Yes	Recreation	Nutrients
ND-10160003-005-S_00	Beaver Creek from its confluence with Buffalo Creek, downstream to its confluence with the James River, situated in SE Stutsman County.	16 Miles	Low	No	Recreation	Escherichia coli (E. coli)

2020-2022 List of Section 303d Impaired Waters in the James River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-10160003-008-S_00	Buffalo Creek from its beginning, downstream to its confluence with Beaver Creek (ND-10160003-005-S_00).	28.9 Miles	Low	No	Recreation	Escherichia coli (E. coli)
ND-10160003-013-S_00	Seven Mile Coulee, including all tributaries. Located in Eastern Stutsman County.	83.9 Miles	Low	No	Recreation	Escherichia coli (E. coli)
ND-10160004-001-S_00	Elm River from Pheasant Lake, downstream to the ND/SD border and Elm Lake.	5.6 Miles	Low	Yes	Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-10160004-002-S_00	Maple River from its confluence with South Fork Maple River, downstream to the ND/SD border.	41.9 Miles	Low	Yes	Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-10160004-005-S_00	Elm River, downstream to Pheasant Lake. Located in Dickey County.	14.3 Miles	Low	Yes	Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-10160004-006-S_00	Upper Elm River, including all tributaries. Located in Dickey County.	15.2 Miles	Low	Yes	Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-10160004-007-S_00	Bristol Gulch, including all tributaries. Located in Dickey County.	44.5 Miles	Low	Yes	Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-10160004-008-S_00	Unnamed tributaries to the Elm River (ND-10160004-005-S_00). Located in Dickey County.	21.7 Miles	Low	Yes	Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-10160004-009-S_00	Unnamed tributary to Pheasant Lake. Located in Dickey County.	2.5 Miles	Low	Yes	Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-10160004-013-S_00	Maple River from its confluence with Maple Creek, downstream to its confluence with South Fork Maple River. Located in Dickey County.	16.1 Miles	Low	Yes	Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-10160004-015-S_00	South Fork Maple River from its confluence with three tributaries, downstream to its confluence with the Maple River. Located in Dickey County.	14.9 Miles	Low	Yes	Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-10160004-022-S_00	Maple Creek, downstream to its confluence with the Maple River. Located in Lamoure County.	34.4 Miles	Low	Yes	Fish and Other Aquatic Biota	Sedimentation/Siltation

2020-2022 List of Section 303d Impaired Waters in the James River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-10160004-026-S_00	Maple River from Schlect-Thom Dam, downstream to its confluence with Maple Creek. Located in Lamoure County.	20.5 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Sedimentation/Siltation

Table VI-2. 2020-2022 List of Section 303d Impaired Waters in the Missouri River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-10100004-008-S_00	Charbonneau Creek downstream to its confluence with West Branch Charbonneau Creek.	20.7 Miles	Low	No		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
					Fish and Other Aquatic Biota	Fish Bioassessments
ND-10110101-001-L_00	A 950 acre shallow natural lake in Mountrail and Burke Counties, North Dakota.	1640.6 Acres	Low	No		
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-10110101-009-L_00	A 253 acre reservoir in Mountrail County.	177.4 Acres	Low	Yes		
					Recreation	Nutrients
ND-10110101-021-L_00	A large reservoir along the Missouri River in McLean, Mercer, Dunn, Mountrail, McKenzie, and Williams County. Because it is located in a different hydrologic unit, Lake Sakakawea also includes the Little Missouri Bay assessment unit (ND-10110205-001-L_00)	318820.9 Acres	Low	No		
					Fish Consumption	Methylmercury
ND-10110101-056-S_00	Handy Water Creek, including all tributaries. Located in Eastern McKenzie County.	41.9 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
ND-10110101-080-S_00	Little Knife River from Stanley Reservoir, downstream to Lake Sakakawea. Located in Central Mountrail County.	44.6 Miles	Low	Yes		
					Recreation	Fecal Coliform
ND-10110102-001-L_00	A 227.7 acre, enhanced natural lake in Williams County, North Dakota.	607.7 Acres	Low	No		
					Recreation	Nutrients
ND-10110102-001-S_00	Little Muddy River from its confluence with East Fork Little Muddy River, downstream to Lake Sakakawea. Located in Central Williams County.	23.5 Miles	High	No		
					Recreation	Fecal Coliform
ND-10110203-001-S_00	Little Missouri River from its confluence with Little Beaver Creek downstream to its confluence with Deep Creek. Located in Slope County.	77.5 Miles	Low	No		
					Recreation	Escherichia coli (E. coli)
ND-10110203-003-S_00	Deep Creek from the confluences of East Branch Deep Creek and West Branch Deep Creek downstream to its confluence with the Little Missouri River. Located in Slope County.	43 Miles	Low	No		
					Fish and Other Aquatic Biota	Dissolved Oxygen

2020-2022 List of Section 303d Impaired Waters in the Missouri River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-10110203-025-S_00	Little Missouri River from its confluence with Deep Creek, downstream to its confluence with Andrew's Creek. Located in Billings and Slope Counties.	48.9 Miles	High	No	Recreation	Escherichia coli (E. coli)
ND-10110205-001-L_00	Little Missouri Bay from Lost Bridge to Lake Sakakawea.	22718.6 Acres	Low	No	Fish Consumption	Methylmercury
ND-10110205-001-S_00	Little Missouri River from its confluence with Beaver Creek downstream to highway 85. Located in McKenzie County.	58.5 Miles	High	No	Recreation	Escherichia coli (E. coli)
ND-10110205-033-S_00	Little Missouri River from Hwy 85 downstream to its confluence with Cherry Creek. Located in McKenzie and Dunn Counties.	21 Miles	High	No	Recreation	Escherichia coli (E. coli)
ND-10130101-001-S_00	Painted Woods Creek from its confluence with the New Johns Lake diversion downstream to Painted Woods Lake. Located in Mclean and Burleigh Counties.	34 Miles	Low	No	Recreation	Escherichia coli (E. coli)
ND-10130101-002-S_00	Square Butte Creek from its confluence with Otter Creek downstream to its confluence with the Missouri River. Located in Morton County.	2.8 Miles	Low	Yes	Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-10130101-009-S_00	Square Butte Creek from Nelson Lake downstream to its confluence with Otter Creek. Located in Oliver and Morton Counties.	38.5 Miles	Low	Yes	Fish and Other Aquatic Biota Recreation	Sedimentation/Siltation Fecal Coliform
ND-10130101-027-S_00	Painted Woods Creek upstream from its confluence with the New John's Lake diversion, including tributaries. Located in Burleigh County.	107.2 Miles	Low	No	Recreation	Escherichia coli (E. coli)
ND-10130101-035-S_00	Turtle Creek from Turtle Lake to Lake Ordway. Located in McLean County.	0.9 Miles	High	No	Recreation	Escherichia coli (E. coli)

2020-2022 List of Section 303d Impaired Waters in the Missouri River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-10130101-036-S_00	Upper Turtle Creek watershed above Turtle Lake including all tributaries and tributary from Crooked Lake, between Long Lake and Strawberry Lake, and tributary flowing into Camp Lake.	32.7 Miles	High	No		
					Recreation	Escherichia coli (E. coli)
ND-10130103-003-L_00	A 91.2 acre, hypereutrophic reservoir in Emmons County, North Dakota. Built in 1939 by the WPA for flood control, agriculture, and recreation. Braddock Dam has a 40,819 acre watershed of mostly cropland.	91.3 Acres	Low	No		
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-10130103-010-L_00	A 805.7 acre shallow prairie pothole lake located n Kidder County, North Dakota.	827.2 Acres	Low	No		
					Fish and Other Aquatic Biota	Dissolved Oxygen
					Fish and Other Aquatic Biota	Eutrophication, Nutrients
					Recreation	Eutrophication, Nutrients
ND-10130103-012-L_00	A 71.1 acre natural lake in Logan County, North Dakota.	82.3 Acres	Low	No		
					Recreation	Nutrients
ND-10130103-013-L_00	A 298.1 acre natural lake in Burleigh County, North Dakota.	298 Acres	Low	No		
					Fish and Other Aquatic Biota	Dissolved Oxygen
					Fish and Other Aquatic Biota	Nutrients
					Recreation	Nutrients
ND-10130104-001-L_00	A 953.1 acre, hypereutrophic, enhanced, natural lake on Beaver Creek in Logan County, North Dakota. Beaver Lake has a maximum depth of 7 feet and a mean depth of 5.6 feet. It's watershed covers 29,030 acres of fertile agricultural lands.	967.2 Acres	Low	Yes		
					Fish and Other Aquatic Biota	Dissolved Oxygen
					Fish and Other Aquatic Biota	Nutrients
					Fish and Other Aquatic Biota	Sedimentation/Siltation
					Recreation	Nutrients
ND-10130201-002-S_00	Knife River from its confluence with Antelope Creek downstream to its confluence with the Missouri River. Located in Mercer County.	24.2 Miles	High	No		
					Recreation	Escherichia coli (E. coli)

2020-2022 List of Section 303d Impaired Waters in the Missouri River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-10130201-014-S_00	Antelope Creek from its confluence with West Branch Antelope Creek Watershed (ND-10130201-017-S) downstream to its confluence with the Knife River. Located in Mercer County.	8.5 Miles	Low	Yes	Recreation	Fecal Coliform
ND-10130201-016-S_00	Antelope Creek upstream from the Antelope Creek West Branch confluence, including tributaries. Located in Mercer County.	82.1 Miles	Low	Yes	Recreation	Fecal Coliform
ND-10130201-017-S_00	Antelope Creek West Branch downstream to its confluence with Antelope Creek Watershed (ND-10130201-016-S). Located in Mercer County.	21.2 Miles	Low	Yes	Recreation	Fecal Coliform
ND-10130202-001-L_00	A 5018 acre Bureau of Reclamation dam located on the Heart River south of Glen Ullin in Grant County, North Dakota.	3235.8 Acres	Low	No	Fish Consumption	Methylmercury
					Recreation	Nutrients
ND-10130202-012-S_00	Heart River from its confluence with Plum Creek downstream to its confluence with Government Creek. Located in Stark County.	20 Miles	High	No	Recreation	Escherichia coli (E. coli)
ND-10130202-050-S_00	Heart River from Patterson Lake, downstream to its confluence with the Green River. Located in Stark County.	25.1 Miles	Low	Yes	Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
ND-10130203-002-L_00	A small hypereutrophic impoundment on a tributary to the Heart River in Morton County, N.D. It's watershed covers 4,170 acres of an even mix of grassed and cropped agricultural lands.	31.7 Acres	Low	No	Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-10130203-002-S_00	Big Muddy Creek from its confluence with Hailstone Creek downstream to its confluence with the Heart River. Located in Morton and Grant Counties.	22.1 Miles	Low	No	Recreation	Escherichia coli (E. coli)

2020-2022 List of Section 303d Impaired Waters in the Missouri River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-10130203-004-L_00	A 56.5 acre impoundment on Fish Creek, in Morton County, North Dakota.	51.9 Acres	Low	No		
					Fish and Other Aquatic Biota	Dissolved Oxygen
ND-10130203-007-L_00	A hypereutrophic impoundment on Hailstone Creek in Morton County, N.D. Built in the 1930's by the WPA, the dam is fed by a 25,200 acre watershed.	132.7 Acres	Low	No		
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-10130203-009-S_00	Heart River from its confluence with Fish Creek downstream to its confluence with Dead Heart Slough. Located in Morton County.	34.3 Miles	High	No		
					Recreation	Escherichia coli (E. coli)
ND-10130203-032-S_00	Big Muddy Creek from its confluence with Hay Marsh Creek downstream to its confluence with Hailstone Creek. Located in Morton County.	32.5 Miles	Low	No		
					Recreation	Escherichia coli (E. coli)
ND-10130203-046-S_00	Wilson Creek and tributaries located in Morton County.	62.6 Miles	Low	No		
					Recreation	Escherichia coli (E. coli)
ND-10130204-002-L_00	A 108.5 acre impoundment in Hettinger County, North Dakota.	87.5 Acres	Low	No		
					Fish and Other Aquatic Biota	Dissolved Oxygen
					Fish and Other Aquatic Biota	Nutrients
					Recreation	Nutrients
ND-10130204-005-L_00	A 35 acre impoundment on the north edge of Mott in Hettinger County, North Dakota.	37.6 Acres	Low	No		
					Fish and Other Aquatic Biota	Dissolved Oxygen
					Fish and Other Aquatic Biota	Nutrients
					Recreation	Nutrients
ND-10130204-014-S_00	Thirty Mile Creek from its confluence with Springs Creek downstream to its confluence with the Cannonball River. Located in Hettinger County.	40.8 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
					Recreation	Escherichia coli (E. coli)

2020-2022 List of Section 303d Impaired Waters in the Missouri River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-10130205-001-S_00	Cedar Creek from its confluence with Hay Creek, downstream to its confluence with the Cannonball River. Located on border of Grant and Sioux Counties.	41.1 Miles	Low	No	Recreation	Escherichia coli (E. coli)
ND-10130205-003-L_00	An impoundment at the confluence of the Cedar and North cedar Creeks. Cedar Lake was built in 1935 by the CCC for flood control and recreation.	219.7 Acres	Low	Yes	Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-10130205-021-S_00	Plum Creek, including all tributaries. Located in Adams County.	67.3 Miles	Low	Yes	Recreation	Fecal Coliform
ND-10130205-033-S_00	Cedar Creek from Cedar Lake, downstream to its confluence with Chanta Peta Creek. Located in Adams County.	44 Miles	Low	Yes	Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
ND-10130205-042-S_00	Cedar Creek from its confluence with South Fork Cedar Creek, downstream to Cedar Lake. Located in Slope and Bowman County.	31.8 Miles	Low	Yes	Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-10130205-043-S_00	North Fork Cedar Creek, including all tributaries. Located in Slope County.	14.8 Miles	Low	Yes	Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-10130205-044-S_00	Unnamed tributaries to Cedar Creek (ND-10130205-042-S_00). Located in Slope and Bowman counties.	84.7 Miles	Low	Yes	Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-10130205-045-S_00	South Fork Cedar Creek, including all tributaries. Located in Bowman County.	22.2 Miles	Low	Yes	Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-10130205-046-S_00	Cedar Creek upstream from its confluence with South Fork Cedar Creek, including all tributaries. Located in Bowman and Slope Counties.	50 Miles	Low	Yes	Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-10130205-047-S_00	North Cedar Creek, including all tributaries. Located in Slope County.	116.4 Miles	Low	Yes	Fish and Other Aquatic Biota	Sedimentation/Siltation
					Recreation	Fecal Coliform

2020-2022 List of Section 303d Impaired Waters in the Missouri River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-10130206-008-S_00	Dogtooth Creek from its confluence with Louse Creek downstream to its confluence with the Cannonball River. Located in Morton County.	6.5 Miles	Low	No	Recreation	Escherichia coli (E. coli)
ND-10130206-010-S_00	Dogtooth Creek from its confluence with a tributary near Raleigh, ND (ND-10130206-011-S) downstream to its confluence with Louse Creek. Located in Grant County.	30.6 Miles	Low	No	Recreation	Escherichia coli (E. coli)
ND-10130206-016-S_00	Louse Creek from its confluence with Chanta Peta Creek downstream to its confluence with Dogtooth Creek. Located in Grant County.	9.9 Miles	Low	No	Recreation	Escherichia coli (E. coli)
ND-10130206-018-S_00	Louse Creek from its confluence with Gap Creek downstream to its confluence with Chanta Peta Creek. Located in Morton and Grant County.	30.1 Miles	Low	No	Recreation	Escherichia coli (E. coli)
ND-10130206-022-S_00	Chanta Peta Creek from its confluence with East Fork Chanta Peta Creek downstream to its confluence with Louse Creek. Located in Morton County.	12.7 Miles	Low	No	Recreation	Escherichia coli (E. coli)
ND-10130206-027-S_00	Cannonball River from Cedar Creek, downstream to a tributary near Shields, ND.	24.7 Miles	Low	No	Recreation	Escherichia coli (E. coli)
ND-10130301-001-L_00	A 1,750 acre Us Army Corps of Engineers constructed reservoir located at the confluences of the Grand River, Alkali Creek and Spring Creek in Bowman County, North Dakota.	1814.4 Acres	Low	No	Recreation	Nutrients
ND-10130303-001-S_00	Flat Creek, downstream to Mirror Lake. Located in Adams County.	19.1 Miles	Low	Yes	Fish and Other Aquatic Biota	Nutrients
ND-10130303-003-S_00	Flat Creek from Mirror Lake downstream to the ND-SD border. Located in Adams County.	22.4 Miles	Low	Yes	Recreation	Fecal Coliform

Table VI-3. 2020-2022 List of Section 303d Impaired Waters in the Red River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-09020101-001-S_00	Bois De Sioux River from the ND-SD border, downstream to its confluence with the Rabbit River on MN side. Located in the SE corner of Richland County.	13.1 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09020101-002-S_00	Bois De Sioux River from its confluence with the Rabbit River (MN), downstream to its confluence with the Ottertail River. Located on the Eastern border of Richland County.	15.7 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
					Recreation	Escherichia coli (E. coli)
ND-09020104-001-S_00	Red River of the North from its confluence with the Ottertail River downstream to its confluence with the Whiskey Creek on the MN side. Located in Eastern Richland County.	26.9 Miles	Low	No		
					Fish Consumption	Methylmercury
					Recreation	Escherichia coli (E. coli)
ND-09020104-002-S_00	Red River of the North from its confluence with Whiskey Creek, downstream to its confluence with the Wild Rice River. Located in NE Richland and SE Cass Counties.	53.4 Miles	Low	No		
					Fish Consumption	Methylmercury
ND-09020104-003-S_00	Red River of the North, from its confluence with the Wild Rice River, downstream to the 12th Ave bridge in Fargo, ND (just upstream from Moorhead, MN waste water discharge). Eastern Cass County.	21.2 Miles	Low	No		
					Fish Consumption	Methylmercury
ND-09020104-004-S_00	Red River of the North, from the 12th Ave N. bridge in Fargo, ND downstream to its confluence with the Sheyenne River. Eastern Cass County.	20.6 Miles	Low	No		
					Fish Consumption	Methylmercury
ND-09020104-005-S_00	Red River of the North from its confluence with the Sheyenne River, downstream to its confluence with the Buffalo River on the MN side of the border. Located in NE Cass County.	12.5 Miles	Low	No		
					Fish Consumption	Methylmercury

2020-2022 List of Section 303d Impaired Waters in the Red River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-09020105-001-S_00	Wild Rice River from its confluence with the Colfax Watershed, downstream to its confluence with the Red River Of The North. Located in NE Richland and SE Cass Counties.	38.9 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09020105-002-L_00	A 36.8 acre excavated pond in Richland County.	40.7 Acres	Low	No		
					Fish and Other Aquatic Biota	Total Dissolved Solids (TDS)
ND-09020105-003-S_00	Wild Rice River from its confluence with a tributary about 3.6 miles NE of Great Bend, ND downstream to its confluence with the Colfax Watershed. Located in Eastern Richland County.	47.5 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
					Fish and Other Aquatic Biota	Dissolved Oxygen
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09020105-005-S_00	Antelope Creek, in Richland County, from its headwaters downstream to its confluence with the Wild Rice River.	53.2 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
					Recreation	Escherichia coli (E. coli)
ND-09020105-009-S_00	Wild Rice River from Elk Creek (ND-09020105-010-S_00), downstream to its confluence with a tributary 3.5 miles NE of Great Bend, ND (ND-09020105-008-S_00). Located in South Central Richland County.	54.7 Miles	Low	No		
					Fish and Other Aquatic Biota	Dissolved Oxygen
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09020105-010-S_00	Elk Creek, including all tributaries. Located in SE Ransom, NE Sargent, and West Central Richland Counties.	26.8 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
ND-09020105-012-S_00	Wild Rice River from its confluence with Shortfoot Creek (ND-09020105-016-S_00) downstream to its confluence with Elk Creek (ND-09020105-010-S_00).	48.8 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation

2020-2022 List of Section 303d Impaired Waters in the Red River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-09020105-014-S_00	Unnamed tributary to the Wild Rice River (ND-09020105-012-S_00) located near Milnor, ND in NE Sargent County.	38.7 Miles	Low	No		
					Fish and Other Aquatic Biota	Combination Benthic/Fishes Bioassessments
					Recreation	Escherichia coli (E. coli)
ND-09020105-016-S_00	Shortfoot Creek from its confluence with the Wild Rice River upstream to tribal boundary, including all tributaries.	18.1 Miles	High	No		
					Recreation	Escherichia coli (E. coli)
ND-09020105-017-S_00	Crooked Creek watershed to confluence with Wild Rice River (ND-09020105-015-S_00).	40.7 Miles	High	No		
					Recreation	Escherichia coli (E. coli)
ND-09020105-018-S_00	Wild Rice River from its confluence with the Silver Lake Diversion downstream to tribal boundary.	8.9 Miles	High	No		
					Recreation	Escherichia coli (E. coli)
ND-09020105-021-S_00	Unnamed tributaries to Sprague Lake from the ND-SD border including outflow from Sprague Lake downstream to Wild Rice River.	30.7 Miles	Low	No		
					Fish and Other Aquatic Biota	Selenium
ND-09020105-022-S_00	Wild Rice River from its confluence with Wild Rice Creek downstream to its confluence with the Silver Lake Diversion.	6.2 Miles	High	No		
					Recreation	Escherichia coli (E. coli)
ND-09020107-001-S_00	Red River of the North from its confluence with the Buffalo River downstream to its confluence with the Elm River.	29.3 Miles	Low	No		
					Fish Consumption	Methylmercury
ND-09020107-002-S_00	Elm River from its confluence with the North Branch Elm River downstream to its confluence with Red River Of The North.	7 Miles	Low	No		
					Fish and Other Aquatic Biota	Combination Benthic/Fishes Bioassessments
ND-09020107-004-S_00	Elm River from its confluence with the South Branch Elm River downstream to its confluence with the North Branch Elm River	12 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments

2020-2022 List of Section 303d Impaired Waters in the Red River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-09020107-006-S_00	Elm River from the dam NE of Galesburg, ND downstream to its confluence with the South Branch Elm River.	30.4 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09020107-007-S_00	Unnamed tributaries to the Elm River (ND-09020107-006-S_00).	21.5 Miles	Low	No		
					Fish and Other Aquatic Biota	Selenium
ND-09020107-008-S_00	Elm River from the dam NW of Galesburg, ND downstream to the dam NE of Galesburg.	20.9 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09020107-011-S_00	North Branch Elm River, downstream to its confluence with the Elm River.	32.9 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09020107-013-S_00	North Branch Elm River upstream from its confluence with Unnamed tributary	58.4 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
ND-09020107-014-S_00	Red River of the North from its confluence with the Elm River, downstream to its confluence with the Marsh River.	30.6 Miles	Low	No		
					Fish Consumption	Methylmercury
ND-09020107-017-S_00	South Branch Elm River from Hunter Dam downstream to its confluence with the Elm River.	16.3 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
ND-09020109-007-S_00	North Branch Goose River, downstream to its confluence with the Goose River.	36.9 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
ND-09020109-011-S_00	Goose River from its confluence with Beaver Creek, downstream to its confluence with the South Branch Goose River.	19.3 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09020109-013-S_00	South Branch Goose River from its confluence with the Middle Branch Goose River downstream to its confluence with the Goose River	9.5 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments

2020-2022 List of Section 303d Impaired Waters in the Red River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-09020109-015-S_00	South Branch Goose River downstream to its confluence with the Middle Branch Goose River.	43.1 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
					Recreation	Escherichia coli (E. coli)
ND-09020109-017-S_00	Middle Branch Goose River, from its confluence with a tributary watershed near Sherbrooke, ND (ND-09020109-019-S_00), downstream to its confluence with the South Branch Goose River.	17.9 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
ND-09020109-020-S_00	Middle Branch Goose River downstream to its confluence with tributary watershed near Sherbrooke, ND (ND-09020109-019-S).	35.2 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
					Fish and Other Aquatic Biota	Fish Bioassessments
ND-09020109-022-S_00	Goose River from its confluence with Spring Creek downstream to its confluence with Beaver Creek	30.7 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
ND-09020109-024-S_00	Beaver Creek from the Golden Lake Diversion, downstream to its confluence with the Goose	25.4 Miles	Low	Yes		
					Recreation	Fecal Coliform
ND-09020109-027-S_00	Beaver Creek, downstream to the Golden Lake diversion channel.	36.8 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
					Fish and Other Aquatic Biota	Fish Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
					Recreation	Fecal Coliform
ND-09020109-029-S_00	Spring Creek, including tributaries	126.2 Miles	Low	Yes		
					Recreation	Fecal Coliform
ND-09020109-034-S_00	Little Goose River from Little Goose River National Wildlife Refuge downstream to the Goose River.	32.3 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Fish Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09020201-006-L_00	Located on the border of Benson and Ramsey Counties.	102384.6 Acres	Low	No		
					Fish Consumption	Methylmercury

2020-2022 List of Section 303d Impaired Waters in the Red River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-09020201-039-S_00	Little Coulee from Lake Ibsen downstream to Silver Lake. Located in NE Benson County.	7.1 Miles	Low	No		
					Fish and Other Aquatic Biota	Dissolved Oxygen
ND-09020202-001-L_00	Warsing Dam is a narrow, quarter moon shaped, hypereutrophic, 53.4 acre impoundment within the Sheyenne River drainage. The contributing watershed covers 8,360 acres of predominantly agricultural lands. Warsing dam receives light to moderate use.	56.9 Acres	High	No		
					Fish and Other Aquatic Biota	Dissolved Oxygen
					Fish and Other Aquatic Biota	Eutrophication, Nutrients
					Fish and Other Aquatic Biota	Sedimentation/Siltation
					Recreation	Eutrophication, Nutrients
ND-09020202-001-S_00	Sheyenne River from its confluence with the Warsing Dam Watershed, downstream to the end of the hydrologic unit. Located along the Benson and Eddy County Line.	9.2 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09020202-003-L_00	Buffalo Lake is a 534 acre natural lake in Pierce County, North Dakota.	549.3 Acres	High	No		
					Fish and Other Aquatic Biota	Nutrients
					Recreation	Nutrients
ND-09020202-004-S_00	Sheyenne River from its confluence with Big Coulee (ND-09020202-007-S_00), downstream to its confluence with the Warsing Dam Watershed (ND-09020202-003-S).	40.6 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09020202-006-S_00	Sheyenne River from Harvey Dam, downstream to its confluence with Big Coulee (ND-09020202-007-S_00). Located near the Pierce, Benson and Wells County junction.	36.3 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09020202-012-S_00	Sheyenne River from Coal Mine Lake downstream to Harvey Dam. Located along the Sheridan and Wells County border.	19.4 Miles	Low	No		
					Fish and Other Aquatic Biota	Dissolved Oxygen

2020-2022 List of Section 303d Impaired Waters in the Red River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-09020203-001-L_00	Lake Ashtabula is a large impoundment on the main stem of the Sheyenne River. It is a U.S. Army Corps of Engineers multipurpose reservoir built for flood protection, recreation and irrigation. Size is based off of the 1:24k NHD Layer.	5144.9 Acres	High	No	Recreation	Nutrients
ND-09020203-002-S_00	Baldhill Creek from tributary watershed (ND-09020203-005-S_00) downstream to Lake Ashtabula. Located in Griggs and Barnes County.	30.2 Miles	Low	Yes	Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
ND-09020203-005-L_00	Carlson-Tande Reservoir is a small impoundment in NE Griggs County, North Dakota.	15.2 Acres	Low	Yes	Fish and Other Aquatic Biota	Dissolved Oxygen
					Fish and Other Aquatic Biota	Nutrients
					Recreation	Nutrients
ND-09020203-007-L_00	McVille Dam is a 36.7 acre reservoir located on McVille Coulee on the east side of the town McVille ND, in southern Nelson County.	30 Acres	Low	No	Fish and Other Aquatic Biota	Dissolved Oxygen
					Fish and Other Aquatic Biota	Nutrients
					Fish and Other Aquatic Biota	Sedimentation/Siltation
					Recreation	Nutrients
ND-09020203-012-S_00	Pickerel Lake Creek, including all tributaries. Located in NE Griggs County.	36.5 Miles	Low	Yes	Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
					Recreation	Escherichia coli (E. coli)
ND-09020203-013-S_00	Unnamed tributary watershed to the Sheyenne River (ND-09020203-001-S). Located in northern Griggs County.	38.1 Miles	Low	Yes	Recreation	Escherichia coli (E. coli)
ND-09020204-001-S_00	Sheyenne River, from its confluence with an unnamed tributary watershed (ND-09020204-014-S), downstream to its confluence with the Maple River. Located in SE Cass County.	28 Miles	Low	Yes	Recreation	Fecal Coliform
ND-09020204-003-L_00	Located in NW Cass County. See attached document on Assessment dialog.	124.7 Acres	Low	No	Fish and Other Aquatic Biota	Sedimentation/Siltation

2020-2022 List of Section 303d Impaired Waters in the Red River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-09020204-003-S_00	Sheyenne River from its confluence with the Maple River, downstream to its confluence with the Red River Of The North. Located in Eastern Cass County.	19.4 Miles	Low	Yes		
					Recreation	Fecal Coliform
ND-09020204-004-S_00	Rush River from its confluence with an unnamed tributary watershed (ND-09020204-012-S) located 2.83 miles to the SE of Amenia ND, downstream to its confluence with the Sheyenne River.	16.4 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09020204-007-S_00	Rush River downstream to an unnamed tributary watershed (ND-09020204-012-S_00) roughly 2.83 miles to the SE of Amenia ND. Located in north central Cass County.	42.4 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
					Fish and Other Aquatic Biota	Fish Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
					Recreation	Escherichia coli (E. coli)
ND-09020204-015-S_00	Sheyenne River, from its confluence with tributary watershed (ND-09020204-016-S_00), downstream to tributary ND-09020204-014-S_00. Located along the Richland and Cass County	28.6 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
					Recreation	Escherichia coli (E. coli)
ND-09020204-017-S_00	Sheyenne River from unnamed tributary (ND-09020204-018-S_00), downstream to unnamed tributary watershed (ND-09020204-016-S_00). Located in northern Ransom and Richland County.	57.2 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
					Fish and Other Aquatic Biota	Fish Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09020204-022-S_00	Sheyenne River from tributary near Lisbon (ND-09020204-0024-S_00), downstream to its confluence with Dead Colt Creek (ND-09020204-021-S_00). Located in central Ransom County.	11.6 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Fish Bioassessments
					Recreation	Escherichia coli (E. coli)

2020-2022 List of Section 303d Impaired Waters in the Red River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-09020204-025-S_00	Sheyenne River, from its confluence with a tributary near Highway 46 (ND-09020204-026-S_00) downstream to its confluence with a tributary near Lisbon, ND (ND-09020204-024-S_00).	46.6 Miles	High	No		
					Recreation	Fecal Coliform
ND-09020204-027-S_00	Sheyenne River, from its confluence with a tributary watershed below Valley City (ND-09020204-028-S_00), downstream to its confluence with a tributary near Highway 46 (ND-09020204-026-S_00). Located in south central Barnes County.	34.2 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09020204-031-S_00	Spring Creek, upstream from Clausen Springs Dam, including all tributaries. Located in southern Barnes County.	26.9 Miles	Low	No		
					Fish and Other Aquatic Biota	Dissolved Oxygen
					Recreation	Escherichia coli (E. col
ND-09020204-032-S_00	Spring Creek from its confluence with the Sheyenne River, upstream to Clausen Springs Dam, including all tributaries. Located in south central Barnes County.	21.8 Miles	Medium	No		
					Recreation	Escherichia coli (E. coli)
ND-09020204-034-S_00	Sheyenne River from its confluence with a tributary above Valley City, near railroad bridge, (ND-09020204-038-S_00) downstream to its confluence with a tributary below Valley City (ND-09020204-028-S_00). Located in Central Barnes County.	13.3 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09020204-040-S_00	Sheyenne River from Lake Ashtabula downstream to its confluence with a tributary above Valley City, near rail road bridge (ND-09020204-038-S_00). Located in Central Barnes County.	13.7 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09020205-001-S_00	Maple River from its confluence with Buffalo Creek downstream to its confluence with the Sheyenne River. Located in Eastern Cass County.	28.7 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation

2020-2022 List of Section 303d Impaired Waters in the Red River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-09020205-002-S_00	Unnamed tributary watershed to the Maple River (ND-09020205-001-S_00). Located in SE Cass County.	51.1 Miles	Low	No		
					Fish and Other Aquatic Biota	Combination Benthic/Fishes Bioassessments
ND-09020205-003-S_00	Swan Creek from its confluence with the Maple River upstream to the Casselton Reservoir, including all tributaries. Located in Central Cass County.	53.1 Miles	High	No		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
					Recreation	Escherichia coli (E. coli)
ND-09020205-004-S_00	Swan Creek, upstream from the Casselton Reservoir, including all tributaries. Located in Central Cass County.	83.5 Miles	Low	No		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
ND-09020205-006-S_00	Buffalo Creek from Embden Dam, downstream to the Maple River. Located in S.C. Cass County.	30.5 Miles	Low	No		
					Fish and Other Aquatic Biota	Combination Benthic/Fishes Bioassessments
ND-09020205-010-S_00	Maple River, from its confluence with a tributary near Leonard, ND (ND-09020205-011-S_00) downstream to its confluence with Buffalo Creek. Located in south central Cass County.	47.9 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
					Fish and Other Aquatic Biota	Fish Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09020205-012-S_00	Maple River from its confluence with the South Branch Maple River downstream to its confluence with a tributary near Leonard, ND. Located in SW Cass County.	29.9 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Fish Bioassessments
ND-09020205-015-S_00	Maple River from its confluence with a tributary watershed near Buffalo, ND (ND-09020205-019-S_00) downstream to its confluence with the South Branch Maple River. Located in western Cass County.	40.5 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
					Fish and Other Aquatic Biota	Dissolved Oxygen
					Fish and Other Aquatic Biota	Fish Bioassessments
ND-09020205-017-S_00	Unnamed tributary watershed to the Maple River (ND-09020205-015-S_00). Located in S.E. Barnes County.	55.8 Miles	High	No		
					Recreation	Escherichia coli (E. coli)

2020-2022 List of Section 303d Impaired Waters in the Red River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-09020205-018-S_00	Unnamed tributary watershed to the Maple River (ND-09020205-015-S_00). Located in Eastern Barnes County.	160.6 Miles	High	No		
					Recreation	Escherichia coli (E. coli)
ND-09020205-024-S_00	Maple River downstream to its confluence with a tributary near the Steele, Cass, and Barnes County Line (ND-09020205-023-S_00).	31.5 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Dissolved Oxygen
					Fish and Other Aquatic Biota	Fish Bioassessments
ND-09020301-001-S_00	Red River of the North, from its confluence with the Marsh River (Mn), downstream to its confluence with the Sand Hill River (Mn). Located in Eastern Trail County.	21.2 Miles	Low	No		
					Fish Consumption	Methylmercury
ND-09020301-002-S_00	English Coulee from its confluence with a tributary upstream from Grand Forks, ND downstream to its confluence with the Red River Of The North (Lower Reach).	9 Miles	Low	No		
					Fish and Other Aquatic Biota	Dissolved Oxygen
					Fish and Other Aquatic Biota	Sedimentation/Siltation
					Fish and Other Aquatic Biota	Selenium
					Fish and Other Aquatic Biota	Total Dissolved Solids (TDS)
					Recreation	Escherichia coli (E. coli)
					Recreation	Sedimentation/Siltation
ND-09020301-005-S_00	English Coulee from its confluence with a major control structure, downstream to its confluence with a tributary that is upstream from Grand Forks, ND (Middle Reach).	12.9 Miles	Low	No		
					Fish and Other Aquatic Biota	Dissolved Oxygen
					Fish and Other Aquatic Biota	Selenium
					Fish and Other Aquatic Biota	Total Dissolved Solids (TDS)
					Recreation	Escherichia coli (E. coli)
ND-09020301-006-S_00	English Coulee from its headwaters, downstream to a major control structure.	18.3 Miles	Low	No		
					Fish and Other Aquatic Biota	Dissolved Oxygen
					Fish and Other Aquatic Biota	Selenium
					Fish and Other Aquatic Biota	Total Dissolved Solids (TDS)
					Recreation	Escherichia coli (E. coli)

2020-2022 List of Section 303d Impaired Waters in the Red River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-09020301-007-S_00	Red River of the North from its confluence with the Sand Hill River (Mn), downstream to its confluence with Cole Creek.	31.1 Miles	Low	No	Fish Consumption	Methylmercury
ND-09020301-010-S_00	Red River of the North from its confluence with Cole Creek, downstream to its confluence with the Red Lake River.	8 Miles	Low	No	Fish Consumption	Methylmercury
ND-09020301-011-S_00	Cole Creek, including tributaries	36.2 Miles	Low	Yes	Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
ND-09020301-014-S_00	Red River of the North from its confluence with the Red Lake River, downstream to its confluence with English Coulee.	3.8 Miles	Low	No	Fish Consumption	Methylmercury
ND-09020306-001-S_00	Red River of the North from its confluence with English Coulee, downstream to the confluence with Grand Marais Creek (Mn).	8.8 Miles	Low	No	Fish Consumption	Methylmercury
ND-09020306-003-S_00	Red River of the North from its confluence with Grand Marais Creek (Mn), downstream to its confluence with the Turtle River.	12.4 Miles	Low	No	Fish Consumption	Methylmercury
ND-09020306-004-S_00	Red River of the North from its confluence with the Turtle River, downstream to its confluence with the Forest River.	31.5 Miles	Low	No	Fish Consumption	Methylmercury
ND-09020306-005-S_00	Red River of the North from its confluence with the Forest River, downstream to its confluence with the Park River.	21.6 Miles	Low	No	Fish Consumption	Methylmercury

2020-2022 List of Section 303d Impaired Waters in the Red River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-09020307-001-S_00	Turtle River from its confluence with Salt Water Coulee, downstream to its confluence with the Red River Of The North.	30.4 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
					Fish and Other Aquatic Biota	Selenium
					Municipal and Domestic	Arsenic
					Municipal and Domestic	Chloride
					Municipal and Domestic	Selenium
					Municipal and Domestic	Sulfate
ND-09020307-004-L_00	Kolding Dam is a 9.8 acre impoundment in Grand Forks County, North Dakota.	10 Acres	Low	No		
					Fish and Other Aquatic Biota	Dissolved Oxygen
					Fish and Other Aquatic Biota	Nutrients
					Recreation	Nutrients
ND-09020307-006-S_00	Turtle River from its confluence with Kelly Slough, downstream to its confluence with Salt Water Coulee.	0.6 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Sedimentation/Siltation
					Fish and Other Aquatic Biota	Selenium
ND-09020307-007-S_00	Salt Water Coulee from its confluence with Fresh Water Coulee downstream to its confluence with the Turtle River.	6.4 Miles	Low	No		
					Fish and Other Aquatic Biota	Cadmium
					Fish and Other Aquatic Biota	Selenium
ND-09020307-016-S_00	Kelly Slough from the control structure at Kelly Slough National Wildlife Refuge downstream to its confluence with the Turtle River	2.7 Miles	Low	No		
					Fish and Other Aquatic Biota	Cadmium
					Fish and Other Aquatic Biota	Selenium
ND-09020307-021-S_00	Turtle River from its confluence with South Branch Turtle River downstream to its confluence with a tributary NE oF Turtle River State Park.	13.7 Miles	Low	No		
					Municipal and Domestic	Sulfate
ND-09020307-024-S_00	South Branch Turtle River downstream to Larimore Dam.	18.2 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
					Fish and Other Aquatic Biota	Selenium

2020-2022 List of Section 303d Impaired Waters in the Red River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-09020308-001-S_00	Forest River from Lake Ardoch, downstream to its confluence with the Red River Of The North.	16.1 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
					Fish and Other Aquatic Biota	Fish Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09020308-002-L_00	A 143 acre, flood control impoundment on the Middle Branch of the Forest River in Nelson County.	149.7 Acres	Low	Yes		
					Recreation	Nutrients
ND-09020308-009-S_00	Unnamed tributary watershed to the Forest River (ND-09020308-007-S)	64.1 Miles	Low	No		
					Fish and Other Aquatic Biota	Selenium
ND-09020308-015-S_00	Forest River from its confluence with South Branch Forest River, downstream to its confluence with a tributary near Highway 18.	13 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
					Fish and Other Aquatic Biota	Fish Bioassessments
					Fish and Other Aquatic Biota	Selenium
ND-09020308-017-S_00	South Branch Forest River from its confluence with Unnamed tributary watershed (ND-09020308-018-S) downstream to Fordville Dam.	8 Miles	High	No		
					Recreation	Escherichia coli (E. coli)
ND-09020308-023-S_00	Middle Branch Forest River from Matecjek Dam, downstream to its confluence with North Branch Forest River.	8.7 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
					Fish and Other Aquatic Biota	Fish Bioassessments
ND-09020308-029-S_00	North Branch Forest River from its confluence with tributary near Highway 32 (ND-09020308-033-S) downstream to its confluence with Middle Branch Forest River	12.3 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
ND-09020310-001-L_00	Homme Dam is a 194 acre impoundment on the Park River in Walsh County, North Dakota.	184.5 Acres	Low	Yes		
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09020310-001-S_00	Park River from its confluence with Salt Lake Outlet (ND-09020310-009-S_00), downstream to its confluence with the Red River Of The North.	11.6 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
					Fish and Other Aquatic Biota	Selenium

2020-2022 List of Section 303d Impaired Waters in the Red River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-09020310-003-S_00	Willow Creek from Dam NE of Mountain, ND downstream to Salt Lake.	39.6 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
ND-09020310-010-S_00	Park River from its confluence with a tributary east of Grafton, ND (ND-09020310-012-S_00), downstream to its confluence with the outlet from Salt Lake (ND-09020310-009-S_00).	14.4 Miles	Low	No		
					Fish and Other Aquatic Biota	Selenium
ND-09020310-013-S_00	Park River from the confluence of the South Branch Park River and the Middle Branch Park River, downstream to its confluence with a tributary east of Grafton, ND (ND-09020310-012-S_00).	6 Miles	Low	No		
					Fish and Other Aquatic Biota	Selenium
ND-09020310-014-S_00	South Branch Park River from its confluence with A tributary (ND-09020310-015-S) downstream to its confluence with the Middle Branch Park River	2.3 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
ND-09020310-016-S_00	South Branch Park River from its confluence with A tributary near Park River, ND (ND-09020310-018-S) downstream to its confluence with a tributary (ND-09020310-015-S)	20.3 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
ND-09020310-020-S_00	South Branch Park River from its confluence with a tributary watershed near Adams, ND (ND-09020310-022-S_00), downstream to Homme Dam.	16.7 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
					Fish and Other Aquatic Biota	Fish Bioassessments
ND-09020310-023-S_00	South Branch Park River downstream to A tributary watershed near Adams, ND (ND-09020310-022-S).	33.4 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
ND-09020310-029-S_00	Middle Branch Park River from a tributary near Highway 32, downstream to tributary near Highway 18.	25.5 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
ND-09020310-037-S_00	North Branch Park River from its confluence with a tributary near Highway 32 downstream to its confluence with Cart Creek.	27.6 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments

2020-2022 List of Section 303d Impaired Waters in the Red River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-09020310-039-S_00	North Branch Park River from a tributary watershed (ND-09020310-043-S_00) near Milton, ND downstream to its confluence with a tributary near Highway 32.	15.7 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
					Fish and Other Aquatic Biota	Fish Bioassessments
ND-09020310-044-S_00	Cart Creek from its confluence with A tributary 2 miles east of Mountain, ND downstream to its confluence with North Branch Park River	33.5 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
					Fish and Other Aquatic Biota	Fish Bioassessments
ND-09020311-001-S_00	Red River of the North from its confluence with the Park River, downstream to its confluence with a small tributary north of Drayton, ND.	19.1 Miles	Low	No		
					Fish Consumption	Methylmercury
ND-09020311-003-S_00	Red River of the North from its confluence with a small tributary north of Drayton, ND downstream to its confluence with Two Rivers.	29.3 Miles	Low	No		
					Fish Consumption	Methylmercury
ND-09020311-005-S_00	Red River of the North from its confluence with Two Rivers, downstream to its confluence with the Pembina River.	17.6 Miles	Low	No		
					Fish Consumption	Methylmercury
ND-09020311-007-S_00	Red River of the North from its confluence with the Pembina River, downstream to the US/Canada border.	2.9 Miles	Low	No		
					Fish Consumption	Methylmercury
ND-09020316-001-S_00	Pembina River from its confluence with the Tongue River downstream to its confluence with the Red River of the North.	8.6 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Cadmium
					Fish and Other Aquatic Biota	Copper
					Fish and Other Aquatic Biota	Lead
					Fish and Other Aquatic Biota	Selenium
					Municipal and Domestic	Arsenic
					Municipal and Domestic	Lead
					Recreation	Fecal Coliform

2020-2022 List of Section 303d Impaired Waters in the Red River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-09020316-002-L_00	Renwick Dam is a 220 acre impoundment on the Tongue River in Pembina County, N.D. It is home to the Icelandic State Park.	180.4 Acres	Low	Yes		
					Fish and Other Aquatic Biota	Sedimentation/Siltation
					Recreation	Nutrients
ND-09020316-002-S_00	Tongue River from its confluence with Big Slough downstream to its confluence with the Pembina River.	11.5 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
ND-09020316-006-S_00	Tongue River from its confluence with a tributary N.E. of Cavalier, ND downstream to its confluence with Big Slough. Currently this ID also includes the portion known as the Tongue River Cuttoff.	22.8 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09020316-009-S_00	Tongue River from Renwick Dam, downstream to a tributary N.E. of Cavalier, ND.	14.6 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Sedimentation/Siltation
					Fish and Other Aquatic Biota	Selenium
ND-09020316-011-S_00	Tongue River from Herzog Dam watershed downstream to Renwick Dam.	8.1 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
ND-09020316-019-S_00	Tongue River downstream to Senator Young Dam.	19.6 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
ND-09020316-021-S_00	Pembina River from its confluence with a tributary west of Neche, ND downstream to its confluence with the Tongue River.	28.5 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Cadmium
					Fish and Other Aquatic Biota	Copper
					Fish and Other Aquatic Biota	Lead
					Fish and Other Aquatic Biota	Sedimentation/Siltation
					Fish and Other Aquatic Biota	Selenium
					Municipal and Domestic	Arsenic
					Municipal and Domestic	Cadmium
					Municipal and Domestic	Lead
					Recreation	Escherichia coli (E. coli)

2020-2022 List of Section 303d Impaired Waters in the Red River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-09020316-023-S_00	Pembina River from its confluence with a tributary N.E. of Walhalla, ND downstream to its confluence with a tributary west of Neche, ND.	32.2 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments
					Fish and Other Aquatic Biota	Fish Bioassessments
					Municipal and Domestic	Arsenic
					Municipal and Domestic	Cadmium
					Municipal and Domestic	Lead
ND-09020316-025-S_00	Pembina River from its confluence with Little South Pembina River, downstream to its confluence with a tributary N.E. of Walhalla, ND.	13.1 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Fish Bioassessments
					Fish and Other Aquatic Biota	Selenium
					Municipal and Domestic	Arsenic
					Municipal and Domestic	Cadmium
					Municipal and Domestic	Lead

Table VI-4. 2020-2022 List of Section 303d Impaired Waters in the Souris River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-09010002-012-S_00	Unnamed tributaries to the Middle and Lower Des Lacs Lakes (Reach ID: ND-09010002-003-S_00). Located in NW Ward County.	76.5 Miles	Low	No		
					Fish and Other Aquatic Biota	Selenium
ND-09010002-014-S_00	Stoney Creek, including all tributaries. Located in Burke and Ward Counties.	43.2 Miles	Low	No		
					Fish and Other Aquatic Biota	Dissolved Oxygen
ND-09010002-016-S_00	Stoney Run, from Upper Des Lacs Lake, upstream to Northgate Dam, including all tributaries. Located in NE Burke County.	10.2 Miles	Low	No		
					Fish and Other Aquatic Biota	Dissolved Oxygen
ND-09010002-017-S_00	Unnamed tributaries to Upper Des Lacs Reservoir (ND-09010002-003-L). Located in Burke and Ward Counties.	52 Miles	Low	No		
					Fish and Other Aquatic Biota	Dissolved Oxygen
ND-09010003-001-S_00	Souris River from its confluence with Oak Creek downstream to its confluence with the Wintering River. Located in McHenry County.	52 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09010003-003-S_00	Wintering River, including all tributaries. Located in SW McHenry and NE McLean counties.	217 Miles	High	No		
					Recreation	Escherichia coli (E. coli)
ND-09010003-005-S_00	Souris River from its confluence with the Wintering River downstream to its confluence with Willow Creek. Located in NE McHenry County.	74.9 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09010004-001-S_00	Willow Creek from its confluence with Ox Creek downstream to its confluence with the Souris	38.7 Miles	High	No		
					Recreation	Escherichia coli (E. coli)
					Recreation	Fecal Coliform
ND-09010008-001-L_00	Lake Darling is a large impoundment on the Souris River between the Canadian border and Minot, North Dakota. Created as a waterfowl refuge by the USFWS and named after the famed wildlife biologist.	8698 Acres	Low	No		
					Recreation	Nutrients

2020-2022 List of Section 303d Impaired Waters in the Souris River Basin of North Dakota

Assessment Unit (AU) ID	AU Description	AU Size	TMDL Priority	5D	Designated Use	Impairment
ND-09010008-001-S_00	Souris River from the N.D./Saskatchewan border downstream to Lake Darling.	43.9 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Sedimentation/Siltation
ND-09010008-003-S_00	Souris River from Lake Darling downstream to its confluence with the Des Lacs River. Located in Northern Ward County.	33.2 Miles	Low	Yes		
					Fish and Other Aquatic Biota	Benthic Macroinvertebrates Bioassessments

Table VI-5. 2018 Section 303d List of Impaired Waters Which Have Been De-Listed for 2020-2022.

Assessment Unit (AU) ID	AU Description	AU Size	Impaired Use	Pollutant	De-Listing Rationale
ND-09010003-001-S_00	Souris River from its confluence with Oak Creek downstream to its confluence with the Wintering River. Located in McHenry County.	52 Miles			
			Fish and Other Aquatic Biota	Dissolved Oxygen	Applicable WQS attained based on new data. Based on 90 dissolved oxygen measurements taken on the assessment unit (site 380095 and 05120000) between 2010 and 2020, the standard is no longer exceeded.
ND-09020105-001-S_00	Wild Rice River from its confluence with the Colfax Watershed, downstream to its confluence with the Red River Of The North. Located in NE Richland and SE Cass Counties.	38.9 Miles			
			Fish and Other Aquatic Biota	Dissolved Oxygen	Applicable WQS attained based on new data. Based on 115 dissolved oxygen measurements taken on the assessment unit (site 385233 and 05053500) between 2010 and 2020, the standard is no longer exceeded.
ND-09020109-024-S_00	Beaver Creek from the Golden Lake Diversion, downstream to its confluence with the Goose River.	25.4 Miles			
			Fish and Other Aquatic Biota	Fish Bioassessments	Based on fish and macroinvertebrate IBI scores and chemical and physical monitoring data collected between 2010 and 2020 (site 551418), the assessment unit is fully supporting aquatic life use.
ND-09020307-019-S_00	Turtle River from its confluence with a tributary NE of Turtle River State Park, downstream to its confluence with Kelly Slough.	25.3 Miles			
			Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments	Based on fish and macroinvertebrate IBI scores and chemical and physical monitoring data collected between 2010 and 2020 (551590), the assessment unit is fully supporting aquatic life use.
ND-09020316-009-S_00	Tongue River from Renwick Dam, downstream to a tributary N.E. of Cavalier, ND.	14.6 Miles			
			Fish and Other Aquatic Biota	Combined Biota/Habitat Bioassessments	Based on fish and macroinvertebrate IBI scores and chemical and physical monitoring data collected between 2010 and 2020 (551569), the assessment unit is fully supporting aquatic life use.
ND-10130101-002-L_00	A 223 acre glacial lake in McLean County North Dakota.	223.1 Acres			
			Fish and Other Aquatic Biota	Nutrients	Based on the 2018 Lake Water Quality Assessment (LWQA)

					data, nutrients are no longer exceeding narrative criteria.
			Fish and Other Aquatic Biota	Dissolved Oxygen	Based on the 2018 Lake Water Quality Assessment (LWQA) data, the dissolved oxygen standard is no longer exceeded.
ND-10130101-003-L_00	Crooked Lake is a natural, glacial lake located in McLean County, North Dakota.	626.8 Acres			
			Fish and Other Aquatic Biota	Nutrients	Based on the 2018 Lake Water Quality Assessment (LWQA) data, nutrients are no longer exceeding narrative criteria.
			Fish and Other Aquatic Biota	Dissolved Oxygen	Based on the 2018 Lake Water Quality Assessment (LWQA) data, the dissolved oxygen standard is no longer exceeded.
ND-10130103-002-S_00	Long Lake Creek and unnamed tributaries located in Emmons and Burleigh Counties.	226.7 Miles			
			Recreation	Escherichia coli (E. coli)	TMDL approved by EPA on 5-22-2019. Action ID R8-ND-2019-1
ND-10130103-004-S_00	West Branch Long Lake Creek upstream from Braddock Dam, including tributaries. Located in Emmons County.	85.2 Miles			
			Recreation	Escherichia coli (E. coli)	TMDL approved by EPA on 5-22-2019, Action ID R8-ND-2019-1
ND-10130106-003-L_00	A large hypereutrophic, enhanced, natural lake in McIntosh County, N.D. Lake Hoskin's watershed covers 25,000 acres of agricultural lands.	555.1 Acres			
			Fish and Other Aquatic Biota	Dissolved Oxygen	Based on the 2019 Lake Water Quality Assessment (LWQA) data, the dissolved oxygen standard is no longer exceeded.

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PART VII. Appendix A: Water Quality Assessment Methodology for North Dakota's Surface Waters

Water Quality Assessment Methodology for North Dakota's Surface Waters

Revised
January 2022

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Water Quality Assessment Methodology
for North Dakota’s Surface Waters

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Table of Contents **Page**

List of Tables **Page**

List of Figures

Appendices

I. INTRODUCTION

A. Background

The federal Clean Water Act (CWA) provides the regulatory context and mandate for state water quality monitoring and assessment programs. The North Dakota Department of Environmental Quality (NDDEQ) has been designated as the state water pollution control agency for purposes of the federal CWA and, as such, is authorized to take all actions necessary or appropriate to secure for the state all benefits of the CWA and similar federal acts (NDCC 61-28-04). State law establishes policy to protect, maintain, and improve the quality of waters of state, while the overall goal of the federal CWA is to “restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.”

Various sections in the CWA require states to conduct specific activities to monitor, assess, and protect their waters. These activities include:

- Develop and adopt water quality standards designed to protect designated beneficial uses (Section 303);

- Establish and maintain monitoring programs to collect and analyze water quality data (Section 106). Reporting on the status of waters and the degree to which designated beneficial uses are supported (Section 305[b]);

- Identify and prioritize waters that are not meeting water quality standards (Section 303[d]);

- Assess the status and trends of water quality in lakes and identifying and classifying lakes according to trophic condition (Section 314); and

- Identify waters impaired due to nonpoint sources of pollution as well as identifying those sources and causes of nonpoint source pollution (Section 319).

B. North Dakota’s Surface Water Resources

The NDDEQ currently recognizes 337 public lakes and reservoirs. Of the 337 public lakes and reservoirs recognized as public waters and included in the ATTAINS database (see section III. ATTAINS), only 201 lakes and reservoirs totaling 610,250.9 acres that are specifically listed in the state’s water quality standards as classified lakes and therefore are assigned designated beneficial uses.

Of the 337 public lakes and reservoirs included in ATTAINS, there are 151 manmade reservoirs and 186 natural lakes. All lakes and reservoirs included in this assessment methodology are considered significantly publicly owned. Based on surface area estimates entered into ATTAINS for each reservoir, the 151 reservoirs have an aerial surface of 468,561.8 acres. Reservoirs comprise about 65 percent of North Dakota's total lake/reservoir surface acres. Of these, 409,662 acres or 56 percent of the state’s entire lake and reservoir acres are contained within the two mainstem Missouri River reservoirs (Lake Sakakawea and Lake Oahe). The remaining 146 reservoirs share 58,899 acres, with an average surface area of 453 acres.
The 186 natural lakes in North Dakota cover 255,555 acres, with approximately 102,384 acres or 40 percent attributed to Devils Lake. The remaining 162 lakes average 924.74 acres, with approximately 40 percent being smaller than 250 acres.

There are 56,827.8 miles of rivers and streams in the state. Estimates of river stream miles in the state are based on river and stream waterbodies entered into the ATTAINS database that are reach indexed to a modified version of the 1:100,000 National Hydrography Dataset (NHD plus) and include ephemeral, intermittent and perennial rivers and streams.

One of the most significant water resource types in the state are wetlands. There are an estimated 3.2 million acres of wetlands in the state. The majority of these wetlands are temporary, seasonal, semi-permanent and permanent depressional wetlands located in what is commonly called the Prairie Pothole Region.

C. Purpose and Scope

Water quality standards provide the fundamental benchmarks by which the quality of all surface waters are measured. It is the water quality standards that are used to determine impairment. As a general policy, the assessment procedures described in this methodology are consistent with the NDDEQ's interpretation of the state's water quality standards.

For purposes of Section 305(b) reporting and Section 303(d) listing, the US Environmental Protection Agency (EPA) encourages states to submit an integrated report (IR) and to follow its integrated reporting guidance, including EPA's 2006 IR guidance, which is supplemented by EPA's 2008, 2010, 2012, 2014, 2016 and 2018 IR guidance memos (http://www.epa.gov/tmdl/integrated-reporting-guidance). Key to integrated reporting is an assessment of all of the state's waters and placement of those waters into one of five assessment categories. The categories represent varying levels of water quality standards attainment, ranging from Category 1, where all of a waterbody's designated uses are fully supporting, to Category 5, where a pollutant impairs a waterbody and a TMDL is required (Table 1). These category determinations are based on consideration of all existing and readily available data and information consistent with the state's water quality assessment methodology.

The purpose of this document is to describe the assessment methodology used in the state's biennial integrated report. This information, which is summarized by specific lake, reservoir, river reach or sub-watershed, is integrated as beneficial use assessments that are entered into a water quality assessment "accounting"/database management system developed by EPA. This system, which provides a standard format for water quality assessment and reporting, is termed the Assessment Total Maximum Daily Load Tracking and Implementation System (ATTAINS).

Table 1. Assessment Categories for the Integrated Report

Assessment Category	Assessment Category Description
Category 1	All the waterbody's designated uses have been assessed and are fully supporting.
Category 2	Some of the waterbody's designated uses are fully supporting, but there is insufficient data to determine if remaining designated uses are fully supporting.
Category 3	Insufficient data to determine whether any of the waterbody's designated uses are met.
Category 4	At least one of the waterbody's beneficial uses is not supported or has been assessed as fully supporting, but threatened, but a TMDL is not needed. This category has been further sub-categorized as: • 4A - waterbodies that are impaired or threatened, but TMDLs needed to restore beneficial uses have been approved or established by EPA; • 4B - waterbodies that are impaired or threatened, but do not require TMDLs because the state can demonstrate that "other pollution control requirements (e.g., BMPs) required by local, state or federal authority" (see 40 CFR 130.7[b][1][iii]) are expected to address all waterbody-pollutant combinations and attain all water quality standards in a reasonable period; and • 4C - waterbodies that are impaired or threatened, but the impairment is not due to a pollutant.
Category 5	At least one of the waterbody's beneficial uses is not supported or has been assessed as fully supporting, but threatened, and a TMDL is needed. • 5R – optional subcategory 5 (restorative). Waterbodies listed on the 303d list with an EPA accepted Advanced Restoration Plan to achieve water quality standards. • 5D – waterbodies currently listed on the Section 303(d) list but are targeted for additional monitoring and assessment during the next two to four years. **Note:** This also includes waterbodies which are assessed as impaired based on biological data alone and for which there are no known pollutant causes of the impairment. These impaired waterbodies will be target for additional stressor identification monitoring and assessment.

II. WATER QUALITY STANDARDS

A. Background

As stated previously, water quality standards are the fundamental benchmarks by which the quality of all of the state's surface waters are assessed. It is the state's water quality standards that are ultimately used to determine beneficial use impairment status.

Water quality standards were first adopted into North Dakota administrative code beginning in the late 1960's. "Water quality standards" is a term which is used in both a broad and narrow sense. In its broadest sense, water quality standards include all the provisions and requirements in water quality rules and regulations, including minimum wastewater treatment requirements and effluent limits for point source dischargers. In the narrower sense, water quality standards define the specific uses we make of waters of the state and set forth specific criteria, both numeric and narrative, that define acceptable conditions for the protection of these uses, including antidegradation provisions (Appendix A). The term "water quality standards" is used in the narrower sense throughout this document.

Water quality reporting requirements under Sections 305(b) and 303(d) of the CWA require states to assess the extent to which their lakes, reservoirs, rivers, and streams are meeting water quality standards applicable to their waters, including beneficial uses as defined in their state water quality standards. In addition to beneficial uses, applicable water quality standards also include narrative and numeric standards and antidegradation policies and procedures. While Section 305(b) requires states and tribes to provide only a statewide water quality summary, Section 303(d) takes this reporting a step further by requiring states to identify and list the individual waterbodies that are not meeting applicable water quality standards and to develop TMDLs for those waters. Both Section 305(b) reporting and Section 303(d) listing accomplish this assessment by determining whether a waterbody is supporting its designated beneficial uses.

B. Beneficial Use Designation

The protected beneficial uses of the state's surface waters are defined in the *Standards of Quality for Waters of the State* (North Dakota Water Quality Standards). The state's water quality standards provide for four stream classes (I, IA, II, and III) and five lake classes (1-5). While considered "waters of the state" and protected under the state's narrative standards, the state's water quality standards do not define beneficial uses for wetlands.

All classified lakes, reservoirs, rivers, and streams in the state are protected for aquatic life and recreation. Protection for aquatic life means surface waters are suitable for the propagation and support of fish and other aquatic biota, including aquatic macroinvertebrates, and that these waters will not adversely affect wildlife in the area. Protection of all surface waters, except wetlands, for recreation means waters should be suitable for direct body contact activities such as bathing and swimming and for secondary contact activities such as boating, fishing, and wading.

Class I, IA, and II rivers and streams and all classified lakes and reservoirs are designated for use as municipal and drinking water supplies. Specifically, these waters shall be suitable for use as a source of water for drinking and culinary purposes after treatment to a level approved by the NDDEQ.

While not specifically identified in state water quality standards, fish consumption is protected through both narrative and numeric human health criteria specified in the state's water quality standards (North Dakota Water Quality Standards). The state's narrative water quality standards provide that surface waters shall be "free from materials attributable to municipal, industrial, or other discharges or agricultural practices" which will "render any undesirable taste to fish flesh or, in any way, make fish inedible." In addition, the state's statewide fish consumption advisory applies to all waters known to provide a sport fishery.

Other beneficial uses identified in the state's water quality standards are agriculture (e.g., stock watering and irrigation) and industrial (e.g., washing and cooling). These uses apply to all classified rivers, streams, lakes, and reservoirs.

Four beneficial uses (aquatic life, recreation, drinking water, and fish consumption) are typically assessed for purposes of Section 305(b) reporting and Section 303(d) listing. All waterbodies included in the assessment database (ATTAINS) and, therefore, all stream classes (I, IA, II, and III) and all lake classes (1-5) are assigned aquatic life and recreation beneficial uses. All Class I, IA, and II rivers and streams and all classified lakes and reservoirs are assigned the drinking water beneficial use. Fish consumption use is assumed to apply to all Class I, IA, and II rivers and streams, to those Class III streams known to provide a sport fishery, and to all Class 1 through 4 lakes and reservoirs.

C. Numeric Water Quality Standards

A numeric water quality standard is considered a safe concentration of a pollutant in water, associated with a specific beneficial use. Numeric standards are associated with all use classes. Ideally, if the numeric standard is not exceeded, the use will be protected. However, nature is very complex and variable, and the NDDEQ may use a variety of assessment tools (e.g., chemical and biological monitoring) to fully assess beneficial uses. With few exceptions, protection for aquatic life and/or drinking water uses will also provide protection for less sensitive uses (e.g., agriculture and industrial uses). For some pollutants, numeric standards may be applicable to more than one use and may be more stringent for one use than another. For example, the drinking water standard for selenium is 50 µg/L, while the chronic aquatic life standard is 5 µg/L.

As is the case for most states, the state of North Dakota's numeric standards for toxic pollutants are based on the EPA's aquatic life criteria. The EPA develops and publishes these criteria as required by Section 304(a) of the CWA. Most numeric standards have two parts, a chronic value and an acute value. The chronic standard is the highest concentration of a toxicant to which organisms can be exposed indefinitely with no harmful effects, including growth and reproduction. The acute standard protects aquatic organisms from potential lethal effects of a short-term "spike" in the concentration of the toxicant.

In the development of aquatic life criteria and associated standards, the EPA and the NDDEQ have addressed some of the many toxicological, water chemistry, and practical realities that affect a toxicant's impact on aquatic biota. For example, pollutant concentrations and flow volumes vary in effluents and in receiving streams over time, aquatic organisms generally can tolerate higher concentrations of toxicants for shorter periods of time, and the sensitivity of aquatic organisms to toxicants often varies over their lifespan. EPA's approach for expressing water quality standards addresses varying toxicant concentrations, length of an averaging period for the standard, and the number of acceptable exceedances over time. These concepts are highly relevant to the interpretation of water quality standards and the assessment of waterbodies based on available data. In the development and implementation of numeric water quality standards, these concepts are referred to as:

- Magnitude;
- Duration; and
- Frequency.

Magnitude refers to the concentration of a given pollutant and is represented by the numeric standard. For example, the chronic and acute standards for copper are 14.0 and 9.3 µg/L, respectively. This is the "magnitude" of copper that, if not exceeded in water, will protect aquatic biota from chronic and acute effects.

Duration refers to the period of time the measured concentration of a toxicant can be averaged and still provide the desired level of protection to the aquatic community. In the context of toxicity to aquatic organisms, it would be unrealistic to consider a standard as an instantaneous maximum concentration never to be exceeded. On the other hand, toxicant concentrations averaged over too long a time could be under-protective, if it allowed exceedingly high lethal concentrations to be masked by the average. In general, EPA recommends a 4-day averaging period for chronic standards and a 1-hour averaging period for acute standards.

Frequency refers to the number of times a standard may be exceeded over a prescribed time period and still provide adequate protection. EPA guidance and state water quality standards specify that the numeric standards, both chronic and acute, should not be exceeded more than once in three years. The three-year time frame is based on studies of the time it takes for aquatic communities to recover from a major disturbance.

D. Narrative Water Quality Standards

A narrative water quality standard is a statement(s) that prohibits unacceptable conditions from occurring in or upon surface waters, such as floating debris, oil, scum, garbage, cans, trash, or any unwanted or discarded material. Narrative standards also prohibit the discharge of pollutants, which alone or in combination with other substances, can 1) cause a public health hazard or injury to the environment; 2) impair existing or reasonable beneficial uses of surface waters; or 3) directly or indirectly cause concentrations of pollutants to exceed applicable standards. Narrative standards are often referred to as "free froms" because they help keep surface waters free from very fundamental and basic forms of water pollution (e.g., sediment and nutrients).

The association between narrative standards and beneficial use impairment is less well defined than it is for numeric standards. Because narrative standards are not quantitative, the determination that one has been exceeded typically requires a "weight-of-evidence" approach to the assessment showing a consistent pattern of water quality standards violations. The narrative standards relevant to this guidance document are found in state water quality standards Section 33-16-02.1-08. These standards protect surface waters and aquatic biota from:

- Eutrophication (particularly lakes and reservoirs);

- Impairment of the biological community (exemplified by the Index of Biotic Integrity); and

- Impairment of fish for human consumption.

E. Antidegradation Policies and Procedures

In addition to numeric and narrative standards and the beneficial uses they protect, a third element of water quality standards is antidegradation. The fundamental concept of antidegradation is the protection of waterbodies whose water quality is currently better than applicable standards. Antidegradation policies and procedures are in place to maintain high quality water resources and prevent them from being degraded down to the level of water quality standards.

State water quality standards has established three categories or tiers of antidegradation protection (Appendix A). Category 1 is a very high level of protection and automatically applies to all Class I and IA rivers and streams, all Class 1, 2, and 3 lakes and reservoirs, and wetlands that are functioning at their optimal level. Category 1 may also apply to some Class II and III rivers and streams, but only if it can be demonstrated that there is remaining pollutant assimilative capacity, and both aquatic life and recreation uses are currently being supported. Category 2 antidegradation protection applies to Class 4 and 5 lakes and reservoirs and to Class II and III rivers and streams not meeting the criteria for Category 1. Category 3 is the highest level of protection and is reserved for Outstanding State Resource Waters. Waterbodies may only be designated Category 3 after they have been determined to have exceptional value for present and prospective future use for public water supplies, propagation of fish or aquatic biota, wildlife, recreational purposes, or agricultural, industrial, or other legitimate beneficial uses.

III. ATTAINS DATABASE

With an estimated 56,827.8 miles of rivers and streams and 724,117 acres of lakes and reservoirs in the state, it is impractical to adequately assess each mile of stream or every acre of lake. However, the NDDEQ believes it is important to: 1) accurately assess those waters for which beneficial use assessment information is available; and 2) account for those stream miles and lake acres that are not assessed or for which there are insufficient data to conduct an assessment. As a result, the NDDEQ has adopted the Assessment and Total Maximum Daily Load Tracking and Implementation System (ATTAINS) database to manage water quality assessment information for the state's rivers, streams, lakes, and reservoirs. Developed by EPA, ATTAINS is a web based "accounting"/database management system that provides a standard format for water quality assessment information. It includes a web interface for adding and editing assessment data. Assessment data, as compared to raw monitoring data, describes the overall health or condition of the waterbody by describing beneficial use impairment(s) and, for those waterbodies where beneficial uses are impaired or threatened, the causes of pollution affecting the beneficial use. ATTAINS also allows the user to track and report on TMDL-listed waters, including their development and approval status and de-listing rationale.

For the 2022 Integrated Reporting cycle, there are 1,805 discreet assessment units (AUs) entered into the ATTAINS database for North Dakota which represent 56,827.8 miles of rivers and streams (1495 AUs) and 337 lakes and reservoirs (310 AUs) (Note: Lake Sakakawea is represented by two assessment units in ATTAINS, one for the main reservoirs and one for the Little Missouri Bay segment of the reservoir.). While each lake or reservoir is an individual AU in ATTAINS, river and stream AUs may be represented by a single stream reach or by multiple stream reaches representing a catchment or sub-watershed. Within ATTAINS, designated uses are defined for each AU (i.e., river or stream reach and lake or reservoir) based on the state's water quality standards. Each AU is then assessed individually, based on the availability of sufficient and credible chemical, physical and/or biological data. To delineate and define AUs used in ATTAINS, the NDDEQ follows a general set of guidelines:

1. Each AU is within the eight-digit USGS hydrologic unit.

2. Each river and stream AU is composed of stream reaches of the same water quality standards classification (I, IA, II or III).

3. To the extent practical, each AU is within a contiguous Level IV ecoregion.

4. Mainstem perennial rivers are delineated as separate AUs. Where these rivers join with another major river or stream within the eight-digit hydrologic unit, the river was further delineated into two or more AUs.

5. Tributary rivers and streams, which are named on USGS 1:100,000 scale planimetric maps or the National Hydrography Dataset (NHD), are delineated as separate AUs. These AUs may be further delineated, based on stream order or water quality standards classification.

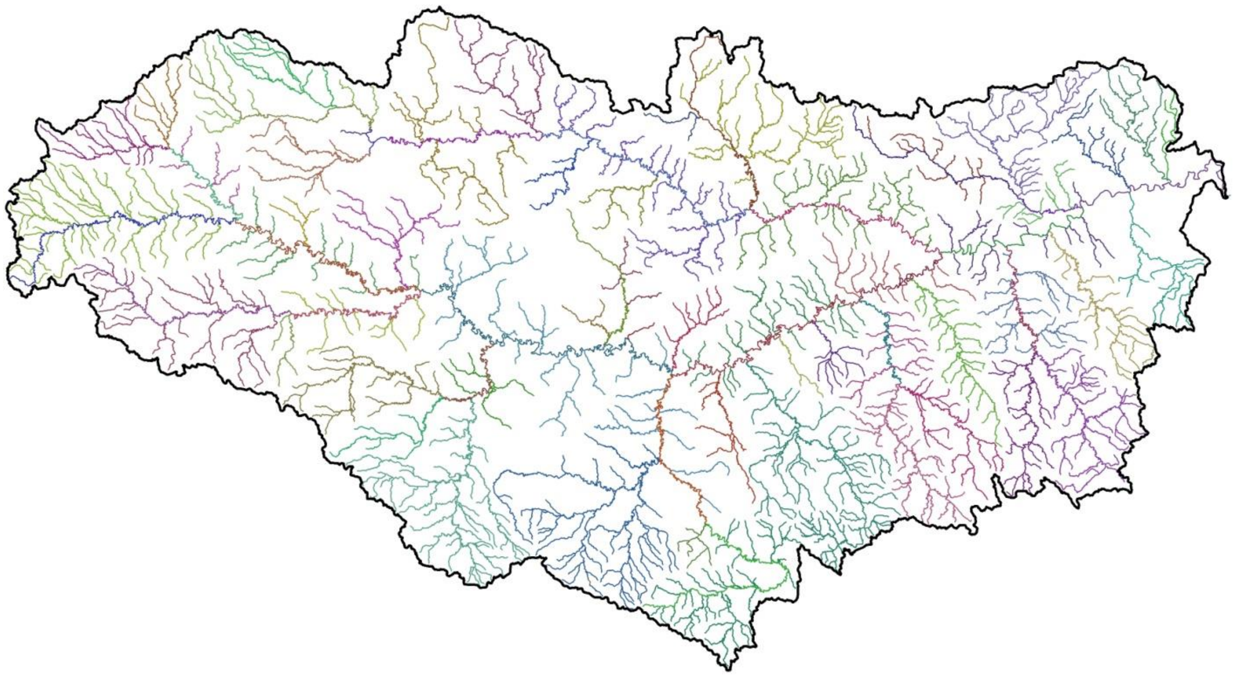
6. Unnamed ephemeral tributaries to a delineated AU are consolidated into one unique AU. This is done primarily for accounting purposes so that all tributary stream reaches identified in the NHD are included in ATTAINS.

7. Stream reaches, which are identified in the NHD and on USGS 1:24,000 scale maps and which do not form either an indirect or direct hydrologic connection with a perennial stream or classified lake, are not included in ATTAINS. This would include small drainages that originate and flow into closed basin lakes or wetlands. (Note: These delineation criteria do not apply to tributaries to Devils Lake)

ATTAINS provides an efficient accounting and data management system. It also allows for the graphical presentation of water quality assessment information by linking assessments contained in ATTAINS to the NHD file through “reach indexing” and geographic information systems (GIS). To facilitate the GIS data link, the NDDEQ has “reach-indexed” each AU in ATTAINS to the NHD file. The product of this process is a GIS coverage that can be used to graphically display water quality assessment data entered in ATTAINS. An example can be seen in Figure 1, which depicts each of the reach-indexed AUs delineated in the Knife River Sub-basin (10130201).

Assessments completed and entered in ATTAINS also form the basis for the state’s Section 319 Nonpoint Source (NPS) Assessment Report and Management Plan. Because of the way the NDDEQ’s Watershed Management Program is structured, there is complete integration of the state’s Section 305(b) Water Quality Assessment Report, the Section 303(d) TMDL List and the Section 319 NPS Assessment Report and Management Plan.

Figure 1. Map of Reach-Indexed Assessment Units Delineated in the Knife River Sub-



basin (10130201).

IV. SUFFICIENT AND CREDIBLE DATA REQUIREMENTS AND OVERWHELMING EVIDENCE

A. Sufficient and Credible Data Requirements

For water quality assessments, including those done for purposes of Section 305(b) assessment and reporting and 303(d) listing, the NDDEQ will use only what it considers to be sufficient and credible data. Sufficient and credible data are chemical, physical, and biological data that, at a minimum, meet the following criteria:

- Data collection and analysis followed known and documented quality assurance/quality control procedures. This would include citizens or volunteer monitoring data or data submitted by third parties.

- Water column chemical, biological or fish tissue data are 10 years old or less for rivers and streams and lakes and reservoirs, unless there is adequate justification to use older data (e.g., land use, watershed, or climatic conditions have not changed). Years of record are based on the USGS water year. Water years are from October 1 in one year through September 30 of the following year. It should be noted that it is preferable to split the year in the fall when hydrologic conditions are stable, rather than to use calendar years. Data for all 10 years of the period are not required to make an assessment.

- There is a minimum of 10 chemical samples collected in the 10-year period for rivers and streams. The 10 samples may range from one sample collected in each of 10 years or 10 samples collected all in one year.
- There should be a minimum of two samples collected from lakes or reservoirs during the growing season, April-November. The samples may consist of two samples collected the

same year or samples collected in separate years.

- A minimum of five E. coli samples are collected during any 30-day consecutive period (e.g., calendar month) from May through September. The five samples per month may consist of five samples collected during the month in the same year or five samples collected during the same calendar month, but pooled across multiple years (e.g., two samples collected in May 2012, two samples collected in May 2013 and one sample collected in May 2017).

- For all chemical criteria that are expressed as a 30-day arithmetic average (e.g., chloride, sulfate, radium 226 and 228, and boron) a minimum of four daily samples must be collected during any consecutive 30-day period. Samples collected during the same day shall be averaged and treated as one daily sample.

- A minimum of two biological samples (fish and/or macroinvertebrate) are necessary in the most recent 10-year period per assessment unit. Samples may be collected from multiple sites within the assessment stream reach, multiple samples collected within the same year, or individual samples collected during multiple years. Samples may consist of a minimum of two fish samples, two macroinvertebrate samples, or one fish and one macroinvertebrate sample. Samples should be collected from sites considered to be representative of the AU. At a minimum one site should be located at the downstream end of the assessed stream reach.

- The mean methyl-mercury concentration is estimated from a minimum of 3 composite samples (preferred) or 9 individual fish samples representative of the filet. When composite samples are used, each composite sample should consist of a minimum of three individual fish per composite with the smallest fish in the composite no less than 75% of the largest fish by length. Each composite sample should also be representative of a distinct age class of the target fish species in the waterbody. In other words, if three composite samples are collected, one composite should represent small fish, one representing medium sized fish and one representing large fish in the population.

- If individual fish samples are collected, then a minimum of 9 fish samples should be used to estimate the mean methyl-mercury concentration. The same criteria used to collect a composite sample should be used for individual fish samples where fish should be representative of at least three size classes and a minimum of three fish should be collected per size class (3 size classes times 3 fish per size class equals 9 fish). In cases where individual fish samples are used, then the number of fish per size class should be equal.

B. Overwhelming Evidence

There are situations where a single set of data is all that is needed to make a use support determination. For example, a single set of water chemistry data may be sufficient to establish that a waterbody is not supporting aquatic life use. In such situations where a single data set irrefutably proves that impairment exists, an impairment determination may be based on this "overwhelming evidence."

A number of factors are evaluated when making a determination as to whether data can be used as a basis for an "overwhelming evidence" assessment. Factors include the technical soundness of the methods used to collect the data and the spatial and temporal coverage of the data as it relates to the waterbody being assessed. Data quality and data currency (i.e., how old are the data) are also factors which are considered.

Data cannot be overwhelming evidence unless the methods used for collection and analysis meets the most stringent standards for reliability and validity. The person evaluating the data must be certain that the data are representative of actual current waterbody conditions. The data must be representative of the spatial extent of the waterbody and of relevant temporal patterns. Data more than three or four years old should not be used as overwhelming evidence unless there is a strong basis for concluding that conditions have not changed since the data were collected.

V. BENEFICIAL USE ASSESSMENT METHODOLOGY

A. Aquatic Life Use Assessment Methodology for Rivers and Streams

The following is a description of the assessment methodology or decision criteria used to assess aquatic life and recreation uses where they are assigned to rivers and streams in the state. The methodologies used to assess drinking water and fish consumption uses are the same for both rivers and lakes and are provided in separate sections of this document.

All water quality assessments entered into ATTAINS for Section 305(b) reporting and Section 303(d) TMDL listing are based on "sufficient and credible" monitoring data. Physical and chemical monitoring data used for these assessments includes conventional pollutant (e.g., dissolved oxygen, pH, temperature, ammonia, fecal coliform bacteria, and E. coli bacteria) and toxic pollutant (e.g., trace elements and pesticides) data collected for the most recent 10-year period. Biological monitoring data used for assessment includes fish and macroinvertebrate data collected by the NDDEQ during the last 10 years (i.e., 2008-2017), EPA National River and Stream Assessment data collected in 2013 and 2014.

As stated previously, use impairment for the state's rivers and streams is assessed for aquatic life and recreation. The following is the beneficial use decision criteria utilized for these assessments.

The NDDEQ uses both chemical and biological data when assessing aquatic life use support for the state's rivers and streams. In some cases, both chemical data and biological data are used to make an assessment determination for an AU. Where both data are available, the NDDEQ uses a weight-of-evidence approach in making an assessment decision. For example, if there are chemical data that do not show an aquatic life use impairment, but there are sufficient and credible biological data to show an impairment to the aquatic community, then the use-support decision will be to list the river or stream AU as "not supporting."

1. Chemical Assessment Criteria

In general, aquatic life use determinations utilizing chemical data are based on the number of exceedances of the current *Standards of Quality for Waters of the State* ((North Dakota Water Quality Standards) for DO, pH, and temperature and on the number of exceedances of the acute or chronic standards for ammonia, aluminum, arsenic, cadmium, copper, cyanide, lead, nickel, selenium, silver, zinc, and chromium. The acute and chronic water quality standards for trace metals are expressed as total recoverable metals and not as dissolved metals. However, where dissolved metals data are available, use support assessments are made by applying the dissolved metals data to the water quality standards expressed as the total recoverable fraction. Further, for acute and chronic criteria that are hardness dependent (i.e., cadmium, copper, chromium (III), lead, nickel, silver, and zinc), where hardness of the sample is greater than 400 mg/L, the hardness value used in the criteria calculation will be capped at 400 mg/L.

The following are the use support decision criteria that the NDDEQ uses to assess aquatic life use based on chemical data:

- *Fully Supporting:*

  For the conventional pollutants DO, pH, and temperature, the standards of 5 mg/L (daily minimum) for DO, 7.0 to 9.0 (Class I and IA streams and all lakes) and 6.0 to 9.0 (Class II and III streams) for pH and 29.4 °C (85 °F) (maximum) for temperature are not exceeded in the AU. Consistent with state water quality standards (Appendix A), if the DO or pH standard is exceeded, but in 10 percent or less of the samples and there is no record of lethality to aquatic biota, then the AU is also assessed as "fully supporting".

  For ammonia and other toxic pollutants (e.g., trace elements and organics), aquatic life is assessed as "fully supporting" if the acute or chronic standard is not exceeded during any consecutive three-year period.

- *Fully Supporting but Threatened*:

  For DO and pH, one or more standards were exceeded in greater than 10 percent to 25 percent of the measurements taken during the 10-year assessment period. The temperature standard is exceeded, but in 10 percent or less of the measurements taken during the 10-year assessment period.

  For ammonia and other toxic pollutants, the acute or chronic standard was exceeded once or twice during any consecutive three-year period during the 10-year assessment period.

- *Not Supporting*:

  For DO and pH, one or more standards were exceeded in greater than 25 percent of the measurements taken during the 10-year assessment period. The temperature standard is exceeded in greater than 10 percent of the measurements taken during the 10-year assessment period.

  For ammonia and other toxic pollutants, the acute or chronic standard was exceeded three or more times during any consecutive three-year period during the 10-year assessment period.

2. Biological Assessment Criteria

Aquatic-life use, or biological integrity, can be defined as “the ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity and functional organization comparable to that of the natural habitats of the region.” (Karr, 1981) When the aquatic community (e.g., fish and macroinvertebrates) is similar to that of “least disturbed” habitats in the region, termed “reference condition,” aquatic life use can be assessed as fully supporting. When the aquatic community deviates significantly from reference condition, it is assessed as not supporting aquatic life use.

While chemical data provides an indirect assessment of aquatic life use impairment, direct measures of the biological community are believed to be a more accurate assessment of aquatic-life use or biological integrity. The state water quality standards ((North Dakota Water Quality Standards) describe a narrative biological goal that “the biological condition of surface waters shall be similar to that of sites or waterbodies determined by the NDDEQ to be regional reference sites.” This narrative standard also states that it is the intent of the state, in adopting this narrative goal, “to provide an additional assessment method that can be used to identify impaired surface waters.”

IBI Development

The NDDEQ began a stream biological monitoring and assessment program in 1993. In order to interpret these biological data and to develop a biological assessment methodology, the NDDEQ has adopted the “multi-metric” index of biological integrity (IBI) approach to assess biological integrity or aquatic-life use support for rivers and streams. The multi-metric index approach assumes that various measures of the biological community (e.g., species richness, species composition, trophic structure, and individual health) respond to human-induced stressors (e.g., pollutant loadings or habitat alterations). Each measure of the biological community, termed a “metric,” is evaluated and scored on a scale of 0-100. The higher the score, the better the biological condition and, presumably, the lower the pollutant or habitat impact.

Final metrics which go into each IBI are selected after a large set of candidate metrics go through a series of data reduction steps. First, each of the candidate metrics are evaluated using histograms, to ensure each has an adequate range of data. The second step includes a “signal to noise analysis” to evaluate the variation of each metric. Values of less than 1 are eliminated from further consideration. The third step involves tests for responsiveness, including subjecting candidate metrics to the Mann-Whitney U Test and evaluating box plots used to distinguish metric scores from “reference” and “disturbed” sites. A Mann-Whitney U Test is a nonparametric test that evaluates the difference between the medians of two independent data sets (i.e., reference and disturbed sites). Metrics with $p > 0.20$ are eliminated due to a lack of response. Metrics with p values less than 0.20 are retained for further evaluation and subjected to box plot analysis. If the box plots for the metric does not distinguish between reference and disturbed, that metric is eliminated. Finally, a correlation matrix is completed using all remaining metrics that are not eliminated due to low responsiveness or other poor predictive characteristics. When metric pairs are highly correlated ($r>0.80$) one of the pair is eliminated to reduce redundancy within the final set of metrics.

Once the final metrics are determined for an IBI, raw metric values are transformed into standardized metric scores. All metric scores are computed using the following equations developed by Minns et al. (1994) that standardizes metrics on a scale of 0 to 100.

Metrics that decrease with impairment:

$$Ms = (M_R/M_{MAX}) \times 100$$

Metrics that increase with impairment:

$$Ms = (M_{MAX} - M_R) / (M_{MAX} - M_{MIN}) \times 100;$$

Where Ms = standardized metric value;
M_R = the raw metric value;
M_{MAX} = the maximum value; and
M_{MIN} = the minimum metric value.

Maximum (M_{MAX}) and minimum (M_{MIN}) values for each metric are set at the 95th and 5th percentiles, respectively, of the entire data set. The overall IBI score is then calculated as the mean of all standardized metric scores.

To date, the NDDEQ has developed final multi-metric IBIs for fish in the Lake Agassiz Plain ecoregion and macroinvertebrates in the Lake Agassiz Plain (48) and Northern Glaciated Plain (46) level III ecoregions (Figure 2).

A revised fish IBI for the Lake Agassiz Plain ecoregion was published in a report entitled *Fish Index of Biotic Integrity for Wadable Streams in the Lake Agassiz Plain (48) Ecoregion* (NDDoH, 2011a). This IBI is based on 7 metrics (Table 2).

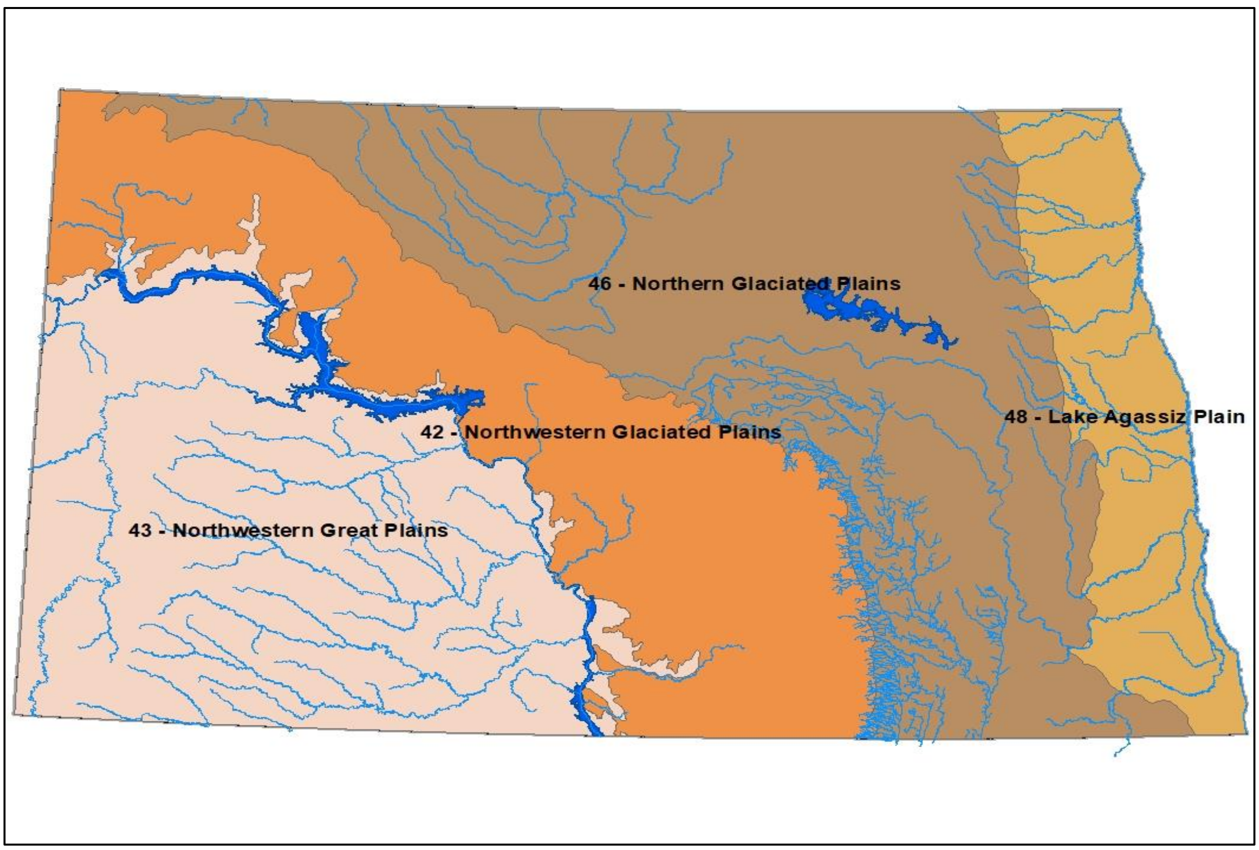


Figure 2. Map Depicting Ecoregions in North Dakota (Lake Agassiz Plain [48], Northern Glaciated Plain [46], Northwestern Glaciated Plain [42], Northwestern Great Plain [43]).

Table 2. Lake Agassiz Plain (48) Ecoregion Fish IBI Metrics.

Final Metric	Category	Response to Perturbation
CPUE (Fish/Minute)	Abundance	Decrease
Percent Dominant Taxon	Composition	Increase
Percent Generalist, Omnivore Individuals	Trophic	Increase
Percent Insectivore Biomass	Trophic	Decrease
Percent Lithophilic Individuals	Reproductive	Decrease
Percent Minnow and Darter Taxa	Richness	Decrease
Total Taxa	Richness	Decrease

The macroinvertebrate IBI which was developed for the Lake Agassiz Plain (48) ecoregion was published in a report entitled *Macroinvertebrate Index of Biotic Integrity for the Lake Agassiz Plain Ecoregion (48) of North Dakota* (NDDoH, 2011b). The macroinvertebrate IBI for the Lake Agassiz Plain ecoregion is based on 7 metrics (Table 3). The macroinvertebrate IBI which was developed for the Northern Glaciated Plain (46) ecoregion was published in the report entitled *Macroinvertebrate Index of Biotic Integrity for the Northern Glaciated Plain Ecoregion (46) of North Dakota* (NDDoH, 2010). The macroinvertebrate IBI for the Northern Glaciated Plain ecoregion is based on 6 metrics (Table 4).

Table 3. Lake Agassiz Plain (48) Ecoregion Macroinvertebrate IBI Metrics.

Final Metric	Category	Response to Perturbation
Diptera Taxa	Richness	Decrease
Hilsenhoff Biotic Index	Tolerance	Increase
Percent EPT	Composition	Decrease
Scraper Taxa	Trophic	Decrease
Shannon Weiner Index	Composition	Decrease
Sprawler Taxa	Habit	Decrease
Total Taxa	Richness	Decrease

Table 4. Northern Glaciated Plain (46) Ecoregion Macroinvertebrate IBI Metrics.

Final Metric	Category	Response to Perturbation
Percent EPT	Composition	Decrease
Percent Non-Insect Individuals	Composition	Increase
Percent Univoltine Individuals	Life Cycle/Composition	Decrease
Tolerant Taxa	Tolerance	Increase
Hilsenhoff Biotic Index (HBI)	Tolerance	Increase
Swimmer Taxa	Habit	Increase

Beneficial Use Assessment Scoring Thresholds

In order to assess biological condition or aquatic life support of rivers and streams, we need to be able to compare what we are measuring to some estimate that would be expected to be good biological condition or fully supporting aquatic life use for the river or stream. This is also referred to as the river or stream's "biological potential." Setting reasonable expectations for a biological indicator, like an IBI, is one of the greatest challenges to making an assessment of biological condition. Is it appropriate to take a historical perspective, and try to compare current conditions to some estimate of pre-Columbian conditions, or to pre-industrial conditions, or to some other point in history? Or is it acceptable to assume that some level of anthropogenic disturbance is a given, and simply use the best of today's conditions as the measuring stick against which everything else is assessed? The answers to all these questions relate to the concept of "reference condition" (Bailey et al. 2004, Stoddard et al. 2006).

Due to the difficulty of estimating historical conditions for most biological indicators, the Department has adopted the "least-disturbed condition" as the operational definition of reference condition. "Least-disturbed condition" is found in conjunction with the best available physical, chemical and biological habitat conditions for a given area or region (e.g., ecoregion) given the current state of the landscape. "Reference" or "least-disturbed" condition is described by evaluating data collected at sites selected based on a set of explicit criteria defining what is "best" or "least-disturbed" by human activities. These criteria vary from ecoregion to ecoregion in the state, and are developed iteratively with the goal of identifying a set of sites which are influenced the least by human activities. The Department's procedure for selecting reference sites is described in Appendix B.

Once a set of "reference sites" are selected for a given ecoregion in the state, they are sampled using the same methods employed at sites used to develop the IBI or where assessments are conducted. The range of conditions (e.g., habitat variables, chemical concentrations, or IBI scores) found at these "reference sites" describes a distribution of values, and extremes of this distribution are used to set thresholds to distinguish sites that are in good condition from those that are clearly not. One common approach, and the one used by the Department, is to examine the range or statistical distribution of IBI scores for a set of reference sites within an ecoregion (Barbour et al. 1999), and, depending on the reference site sample size, to use the 5^{th} or 10^{th} percentile of this distribution to separate the most disturbed (i.e., poor biological condition) sites from moderately disturbed (i.e., fair biological condition) sites. Similarly, the 25^{th} or 50^{th} percentile of the distribution is used to distinguish between moderately disturbed sites and those in "least-disturbed condition." Details on how these thresholds were set for each multi-metric IBI developed by the Department are available in each of the three IBI reports referenced above, while the IBI scoring thresholds for each biological condition class and use support category are provided in Tables 5, 6 and 7.

Table 5. Scoring Thresholds by Biological Condition Class and Aquatic Life Use Support Category for the Lake Agassiz Plain Ecoregion Fish IBI.

IBI Score	Biological Condition Class	Aquatic Life Use Support
≥71	Good	Fully Supporting
<71 and ≥48	Fair	Fully Supporting, but Threatened
<48	Poor	Not Supporting

Table 6. Scoring Thresholds by Biological Condition Class and Aquatic Life Use Support Category for the Lake Agassiz Plain Ecoregion Macroinvertebrate IBI.

IBI Score	Biological Condition Class	Aquatic Life Use Support
≥76	Good	Fully Supporting
<76 and ≥45	Fair	Fully Supporting, but Threatened
<45	Poor	Not Supporting

Table 7. Scoring Thresholds by Biological Condition Class and Aquatic Life Use Support Category for the Northern Glaciated Plain Ecoregion Macroinvertebrate IBI.

IBI Score	Biological Condition Class	Aquatic Life Use Support
≥66	Good	Fully Supporting
<66 and ≥40	Fair	Fully Supporting, but Threatened
<40	Poor	Not Supporting

Aquatic Life Use Support Assessment

Site and Data Requirements

For Section 305(b) assessment and Section 303(d) listing purposes, use assessments based on biological data should ideally be done at the Assessment Unit (AU) scale. The number of sites and samples necessary to conduct an assessment depends on the spatial and temporal variability inherent to the AU. For AUs that are represented by a relatively small, homogeneous stream reach, one site located on the AU may be sufficient. For larger more complex AUs, multiple sample sites with multiple samples collected over time may be necessary. When the number of sites located within an AU is limited, it may be necessary to split the AU into smaller segments and then to assess the smaller AU segment represented by the site. In general, best professional judgment should be used to determine the adequacy of sites and samples when making a use support decision for an AU based on biological data, but as a rule of thumb one should follow these general guidelines.

1. Sites should be located within the AU such that each site represents a homogeneous reach within the AU.

2. At least one site should be located near the downstream end of the assessed stream reach.

3. Additional sites should be located a minimum of 2.5 miles (4 km) apart or where there are significant changes in the hydrology or geomorphology of the stream, or where there is a significant change in landuse adjacent to the stream.

4. When the AU consists of a mainstem segment and tributaries, sites should be located on the mainstem above and below the tributaries as well as on the tributary stream(s).

While it may be possible to conduct an assessment based on one site located within the AU, a minimum of two samples are required to conduct an assessment. Samples should be collected within the last 10 years and may consist of two or more samples collected at one site or one sample collected each at two or more sites. For assessment purposes, a sample consists of one biological assemblage sampled at one point in time. Therefore, two samples may be represented by two biological assemblages (e.g., fish and macroinvertebrates) sampled at the same time or the same biological assemblage sampled at the same site twice. When the same biological assemblage is sampled at the same site, samples should be collected at least 30 days apart.

Using the appropriate biological condition and aquatic life use support scoring thresholds for the biological assemblage and ecoregion, an aquatic life use support assessment is made for each sample collected within the AU. Using each sample aquatic life use support assessment, an overall assessment of the AU is made using the following use support decision criteria:

- *Fully Supporting*:

  Use support assessments for all samples are fully supporting.

- *Fully Supporting, but Threatened*:

  Use support assessment for all samples are fully supporting, but threatened; or

  Use support assessment for at least one sample is fully supporting, and use support assessments for all other samples are not supporting.

- *Not Supporting*:

  Use support assessments for all samples are not supporting.

Section 303(d) Listing Criteria

When biological data results in an aquatic life use support decision that the AU is either fully supporting, but threatened or not supporting and if there are no other chemical or habitat data which can be used to list a pollutant cause, then the AU should be listed on the 303(d) list as category 5D (Table 1), but with the condition that it will be targeted for further stressor identification monitoring and assessment. Only after a stressor identification is completed will the AU be targeted for TMDL development.

Other Biological Assessment Data

The NDDEQ recognizes that there may be biological data that are available for waterbodies in the state that meet the sufficient and credible data requirements. Where these data are available the NDDEQ encourages the use of this information to make aquatic life use support decisions. While it is not possible to assess these sites or waterbodies as fully supporting, sites that are exemplified by low taxa richness, presence of pollutant tolerant taxa and/or low density, can be assessed as not supporting aquatic life use.

B. Recreation Use Assessment Methodology for Rivers, Streams, Lakes and Reservoirs

Recreation use is any activity that relies on water for sport or enjoyment. Recreation use includes primary contact activities such as swimming and bathing and secondary contact activities such as boating, fishing, and wading. Recreation use in rivers, streams, lakes and reservoirs is considered fully supporting when there is little or no risk of illness through either primary or secondary contact with the water. The state's recreation use support assessment methodology for rivers, streams, lakes, and reservoirs is based on the state's numeric water quality standards for E. coli bacteria (126 organisms/100mL).

For each assessment based on E. coli data, the following criteria are used:

- Assessment Criterion 1: For each assessment unit, the geometric mean of samples collected during any 30-day consecutive period (e.g., calendar month) from May 1 through September 30 does not exceed a density of 126 organisms per 100 mL. A minimum of five samples collected during a 30-day consecutive period (e.g., calendar month) is required to compute the geometric mean. If necessary, samples may be pooled by calendar month across years.

- Assessment Criterion 2: For each assessment unit, less than 10 percent of samples collected during any 30-day consecutive period (e.g., calendar month) from May 1 through September 30 exceed a density of 409 organisms per 100 ml. A minimum of ten samples collected during a 30-day consecutive period is required to compute the percent of samples exceeding the criteria. If necessary, samples may be pooled by calendar month across years.

  The two criteria are then applied using the following use support decision criteria:

  - Fully Supporting: Both criteria 1 and 2 are met.
  - Fully Supporting but Threatened: Criterion 1 is met, but 2 is not.
  - Not Supporting: Criterion 1 is not met. Criteria 2 may or may not be met.

C. Aquatic Life and Recreation Use Assessment Methodology for Lakes and Reservoirs

The following is a description of the assessment methodology or decision criteria used to assess aquatic life and recreation uses for lakes and reservoirs. The primary indicators used to assess aquatic life and recreation uses for lakes and reservoirs in the state are measures of trophic condition. In addition, the presence of Harmful Algal Blooms are also used to assess recreation use. The methodology used to assess the drinking water, fish consumption, agricultural, and industrial uses is the same for both rivers and lakes and is provided in a separate section of the document.

1. Aquatic Life and Recreation Use Assessment Using Trophic Condition Indicators

The state's narrative water quality standards (North Dakota Water Quality Standards) form the basis for aquatic life and recreation use assessment for Section 305(b) reporting and the Section 303(d) TMDL list. State water quality standards contain narrative criteria that require lakes and reservoirs to be "free from" substances "which are toxic or harmful to humans, animals, plants, or resident aquatic biota" or are "in sufficient amounts to be unsightly or deleterious." Narrative standards also prohibit the "discharge of pollutants" (e.g., organic enrichment, nutrients, or sediment), "which alone or in combination with other substances, shall impair existing or reasonable beneficial uses of the receiving waters."

Trophic status indicators are used by the NDDEQ as the primary means to assess whether a lake or reservoir is meeting the narrative standards. Trophic status is a measure of the productivity of a lake or reservoir and is directly related to the level of nutrients (i.e., phosphorus and nitrogen) entering the lake or reservoir from its watershed and/or from the internal recycling of nutrients. Highly productive lakes, termed "hypereutrophic," contain excessive phosphorus and are characterized by large growths of weeds, cyanobacteria (i.e., blue-green algal) blooms, low transparency, and low dissolved oxygen (DO) concentrations. These lakes experience frequent fish kills and are generally characterized as having excessive rough fish populations (carp, bullhead, and sucker) and poor sport fisheries. Due to the frequent algal blooms and excessive weed growth, these lakes are also undesirable for recreational uses such as swimming and boating.

Mesotrophic and eutrophic lakes, on the other hand, have lower phosphorus concentrations, low to moderate levels of algae and aquatic plant growth, high transparency, and adequate DO concentrations throughout the year. Mesotrophic lakes do not experience algal blooms, while eutrophic lakes may occasionally experience algal blooms of short duration, typically a few days to a week.

Due to the relationship between trophic status indicators and the aquatic community (as reflected by the fishery) or between trophic status indicators and the frequency of algal blooms, trophic status becomes an effective indicator of aquatic life and recreation use support in lakes and reservoirs. For purposes of this assessment methodology, it is assumed that hypereutrophic lakes do not fully support a sustainable sport fishery and are limited in recreational uses, whereas mesotrophic lakes fully support both aquatic life and recreation use. Eutrophic lakes may be assessed as fully supporting, fully supporting but threatened, or not supporting their uses for aquatic life or recreation.

Eutrophic lakes are further assessed based on 1) the lake or reservoir's water quality standards fishery classification; 2) information provided by North Dakota Game and Fish Department Fisheries Division staff, local water resource managers and the public; 3) the knowledge of land use in the lake's watershed; and/or 4) the relative degree of eutrophication. For example, a eutrophic lake, which has a well-balanced sport fishery and experiences infrequent algal blooms, is assessed as fully supporting with respect to aquatic life and recreation use. A eutrophic lake, which experiences periodic algal blooms and limited swimming use, would be assessed as not supporting recreation use. A lake fully supporting its aquatic life and/or recreation use, but for which monitoring has shown a decline in its trophic status (i.e., increasing phosphorus concentrations over time), would be assessed as fully supporting, but threatened.

It is recognized that this assessment procedure ignores the fact that, through natural succession, some lakes and reservoirs may display naturally high phosphorus concentrations and experience high productivity. While natural succession or eutrophication can cause high phosphorus concentrations, research suggests that these lakes are typically eutrophic and that lakes classified as hypereutrophic are reflecting external nutrient loading in excess of that occurring naturally.

Since trophic status indicators specific to North Dakota waters have not been developed, Carlson's trophic status index (TSI) (Carlson, 1977) has been chosen to assess the trophic status of lakes or reservoirs. To create a numerical TSI value, Carlson's TSI uses a mathematical relationship based on three indicators: 1) Secchi Disk Transparency in meters (m); 2) surface total phosphorus concentration expressed as µg/ L; and 3) chlorophyll-a concentration expressed as µg/L.

This numerical value, ranging from 0-100, corresponds to a trophic condition with increasing values indicating a more eutrophic (degraded) condition. Carlson's TSI estimates are calculated using the following equations and is also depicted graphically in Figure 3.

- Trophic status based on Secchi Disk Transparency (TSIS):
  $TSIS = 60 - 14.41 \ln (SD)$
  Where SD = Secchi disk transparency in meters.

- Trophic status based on total phosphorus (TSIP):
  $TSIP = 14.20 \ln (TP) + 4.15$
  Where TP = Total phosphorus concentration in $\mu g\ L^{-1}$.

- Trophic status based on chlorophyll-a (TSIC):

$$TSIC = 9.81 \ln(TC) + 30.60$$
Where TC = Chlorophyll-a concentrations in $\mu g\ L^{-1}$.

In general, of the three indicators, it is believed that chlorophyll-a is the best indicator of trophic status, since it is a direct measure of lake productivity. Secchi disk transparency should be used next, followed by phosphorus concentration. In theory, for a given lake or reservoir, the measures of chlorophyll-a, Secchi disk transparency, and phosphorus concentration are all interrelated and should yield similar trophic status index values. This, however, is usually not the case. Many lakes and reservoirs in the state are shallow and windswept causing non-algal turbidity to limit light penetration. This situation may result in a lake having a high phosphorus concentration, low Secchi disk transparency, and low chlorophyll-a concentration. In other instances, other micronutrients may be limiting algal growth even though excessive phosphorus is present.

When conducting an aquatic life and recreation use assessment for a lake or reservoir, the average trophic status index score should be calculated for each indicator. When the trophic status index scores for each indicator (chlorophyll-a, Secchi disk transparency, and phosphorus concentration) each result in a different trophic status assessment then the assessment should be based first on chlorophyll-a, followed by Secchi disk transparency. Only when there are not adequate chlorophyll-a and/or Secchi disk transparency data available to make an assessment should phosphorus concentration data be used.

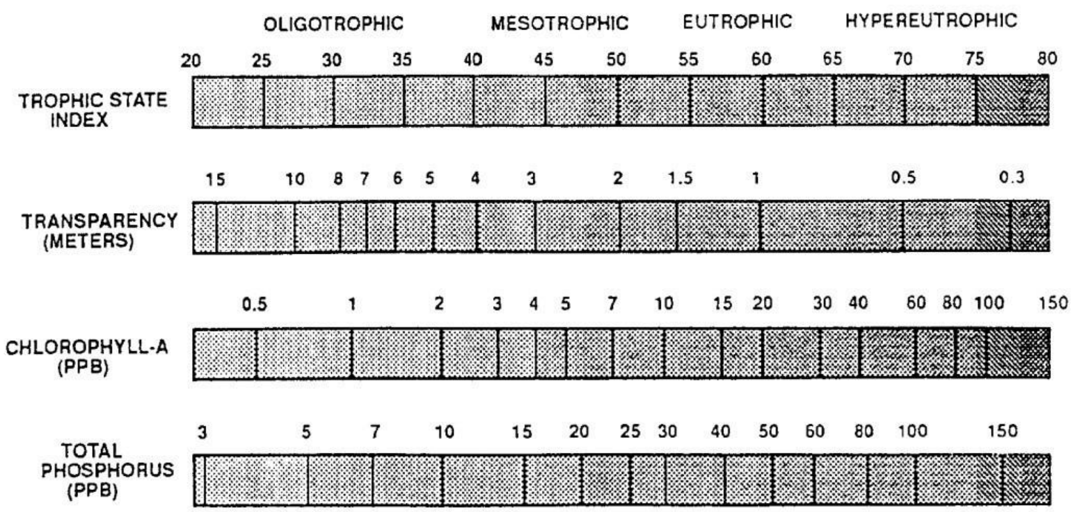


Figure 3. A Graphic Representation of Carlson's TSI.

2. Lake and Reservoir Use Assessment Using Harmful Algal Bloom Advisories and Warnings

Harmful Algal Blooms (HABs) are caused by the excessive growth of cyanobacteria (i.e., blue-green algae). Some species of cyanobacteria (e.g., Anabaena sp., Aphanizomenon sp., and Microcystis sp.) can produce cyanotoxins that are harmful to people and animals.

Beginning in 2016, and to date, the NDDEQ conducted a HABs surveillance and advisory program for lakes and reservoirs in the state. Typically, the NDDEQ, would receive a report of a potential cyanobacteria bloom by phone, email or through the NDDEQ web site (https://deq.nd.gov/WQ/3_Watershed_Mgmt/8_HABS/Habs.aspx). Following the report, NDDEQ personnel investigated the lake to confirm the presence a bloom. If a bloom was confirmed, then testing was done in the field for microcystin using Abraxis® test strips. If the test strips confirmed the presence of cyanotoxin, then samples were collected from the lake, usually along the shoreline near a boat ramp, swimming beach or other public access area, and sent to a laboratory for analysis. If the laboratory microcystin concentration exceeded the NDDEQ's threshold for recreation risk of 10 µg/L (ppb) in one or more samples collected from the lake, an advisory or warning was posted. In most cases, an advisory was posted which recommended that only those areas of the lake where the bloom was concentrated be avoided (e.g., swimming beach). In a few cases, when the bloom extended throughout the lake and microcystin concentrations exceeded 2,000 ppb, was a warning posted. Warnings that were posted recommended the entire lake be avoided. Following the posting, the NDDEQ continued to sample the lake weekly (warning) or bi-weekly (advisory) until the bloom diminished, and low toxin was detected. At that time the advisory or warning posting was removed.

As a water quality assessment tool, HABs postings will be flagged in ATTAINS as lakes or reservoirs where additional water quality monitoring is needed to verify a use impairment. These lakes and reservoirs will be targeted for intensive monitoring and trophic status assessment through the NDDEQ's Lake Water Quality Assessment Program (LWQA). Final recreation and aquatic life use assessment determinations will be made based on the lake or reservoir's trophic status condition using the LWQA data (see previous section).

D. Drinking Water Supply Use Assessment Methodology for Rivers, Lakes, and Reservoirs

Drinking water is defined as "waters that are suitable for use as a source of water supply for drinking and culinary purposes, after treatment to a level approved by the NDDEQ" (Appendix A). All Class I, IA, and II rivers and streams, with the exception of the Sheyenne River from its headwaters to 0.1 mile downstream from Baldhill Dam, and all lakes and reservoirs classified in the state water quality standards, with the exception of Lake George in Kidder County, are assigned the drinking water supply beneficial use. While most lakes and reservoirs are assigned this use, few currently are used as a drinking water supply. Lake Sakakawea is the current drinking water supply for the Southwest Water Pipeline and the cities of Garrison, Parshall, Pick City, and Riverdale.

Drinking water use is assessed by comparing ambient water quality data to the state water quality standards (Tables 1 and 2 in North Dakota Water Quality Standards). Ambient water chemistry data are compared to the water quality standards for chloride, sulfate, and nitrate (Table 8) and to the human health standards for Class I, IA, and II rivers and streams (see Table 2 in North Dakota Water Quality Standards). Drinking water supply is not a designated use for Class III rivers and streams or for the Sheyenne River from its headwaters to 0.1 mile downstream from Baldhill Dam. The human health standard for Class I, IA, and II rivers and streams considers two means of exposure: 1) ingestion of contaminated aquatic organisms; and 2) ingestion of contaminated drinking water.

Drinking water use is also protected through the state's narrative water quality standards. To paraphrase, narrative standards provide language that waters of the state shall be free from materials that produce a color or odor, or other conditions to such a degree as to create a nuisance. Further, state narrative standards provide language that waters of the state shall be "free from substances….in concentrations or combinations which are toxic or harmful to **humans**, animals, plants, or resident biota." There shall also be "no discharge of pollutants, which …..shall cause a public health hazard or injury to environmental resources."

Table 8. State Water Quality Standards for Chloride, Sulfate, and Nitrate (Appendix A).

Stream Classification	Water Quality Standards (mg/L)		
	Chloride[1]	Sulfate[1]	Nitrate[2]
Class I	100	250	10
Class IA	175	450[3]	10
Class II	250	450	10

[1]Expressed as a 30-day arithmetic average based on a minimum of four daily samples collected during the 30-day period.
[2]The water quality standard for nitrite of 1 mg/L shall also not be exceeded.
[3] The site specific sulfate standard for the Sheyenne River from its headwaters to 0.1 mile downstream from Baldhill Dam is 750 mg/L.

In order to make beneficial use determinations for drinking water, the following decision criteria are used:

- *Fully Supporting:*

  Based on Numeric Standards: No exceedances of the water quality standard for nitrate, one or fewer exceedances of the 30-day average standards for chloride or sulfate, and no exceedances of any of the human health standards.

  Based on Narrative Standards: No drinking water complaints on record in the last two years.

- *Fully Supporting but Threatened:*

  Based on Numeric Standards: The fully supporting, but threatened use assessment designation is not applied to the drinking water use. Waters are either assessed as fully supporting or not supporting based on chemical data applied to the numeric standards.

  Based on Narrative Criteria: No impairment based on the numeric criteria, but a declining trend in water quality over time suggests a measurable increase in the cost to treat water for drinking water supply may occur if the trend continues.

- *Not Supporting*:

  Based on Numeric Criteria: One or more exceedances of the water quality standard for nitrate, two or more exceedances of the 30-day average criteria for chloride or sulfate, or one or more exceedances of any of the human health standards.

  Based on Narrative Criteria: Knowledge of taste and odor problems or increased treatment costs have been associated with pollutants.

E. Fish Consumption Use Assessment Methodology for Rivers, Lakes and Reservoirs

As stated previously, the state's narrative water quality standards provide that surface waters shall be "free from materials attributable to municipal, industrial, or other discharges or agricultural practices" which will "render any undesirable taste to fish flesh or, in any way, make fish inedible." Fish consumption use is assumed to apply to all Class I, IA, and II rivers and streams, to those Class III streams known to provide a sport fishery and to all Class 1 through 4 lakes and reservoirs.

The beneficial use assessment methodology for fish consumption is based on the U.S. Environmental Protection Agency's (EPA) recommended methylmercury fish tissue criterion of 0.3 µg/g (EPA, 2001), and is consistent with the state's fish advisory guidelines for the general population. The EPA recommended mercury criterion is based on a reference dose (based on noncancer human health effects) of 0.0001 mg methylemercury/kg body weight-day minus the relative source contribution which is estimated to be 2.7×10^{-5} mg methylmercury/kg body weight-day. The EPA criterion assumes an average human body weight default value of 70 kg (154 pounds) for adults and an average meal size of 0.0175 kg (6 ounces).

The Department's assessment methodology for fish consumption is also based on the US EPA's "Guidance for Implementing the January 2001 Methylymercury Water Quality Criterion, Final" (EPA, 2009) and "Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories", volume 1 (EPA, 2000). Based on these two guidance documents, a waterbody is assessed for fish consumption use using the mean concentration of at least one piscivorous game fish species (e.g., walleye, sauger, northern pike, catfish, largemouth bass, or small mouth bass) found in the waterbody. The mean methylemercury concentration is estimated from a minimum of 3 composite samples (preferred) or 9 individual fish samples representative of the filet. When composite samples are used, each composite sample should consist of a minimum of three individual fish per composite with the smallest fish in the composite no less than 75% of the largest fish by length. Each composite sample should also be representative of a distinct age class of the target fish species in the waterbody. In other words, if three composite samples are collected, one composite should represent small fish, one representing medium sized fish and one representing large fish in the population.

If individual fish samples are collected, then a minimum of 9 fish samples should be used to estimate the mean methylmercury concentration. The same criteria used to collect a composite sample should be used for individual fish samples where fish should be representative of at least three size classes and a minimum of three fish should be collected per size class (3 size classes times 3 fish per size class equals 9 fish). In cases where individual fish samples are used, then the number of fish per size class should be equal.

EPA recommends using the t-test to determine whether the mean methylmercury concentration in fish tissue samples in a waterbody exceeds the criterion with statistical significance. The t-statistic is used to test the null hypothesis that the mean concentration of methylmercury in fish is equal to or less than the fish tissue criterion of 0.3 µg/g. The alternate hypothesis is that the mean concentration of methylmercury in fish is greater than the criterion. Where the null hypothesis is true the result is an assessment where fish consumption is "fully supporting." Where the null hypothesis is rejected in favor of the alternative hypothesis, then fish consumption use is assessed as "not supporting." For purposes of the state's assessment methodology, the 0.05 significance level ($p \leq 0.05$) has been selected. This means there is a 5% chance of rejecting the null hypothesis when it is really true (Type I error).

The t-test (t_c) is calculated from the sample mean (z) and variance (s^2) from the sample data as:

$t_c = (z-c) / s$

Where,

t_c = test statistic;

z = mean methylmercury concentration;

c = methylmercury criterion; and

s = standard deviation of the mean.

The null hypothesis of no difference is rejected in favor of the alternative hypothesis of exceedance if:

$t_c > t_{\alpha,n-1}$

Where, $t_{\alpha,n-1}$ is the tabulated value of the Student-t distribution corresponding to the level of significance α=0.05 and n-1 degrees of freedom (n=sample size) (Table 9).

Table 9. One-sided Student-t Distribution Values for α=0.05 and n-1 Degrees of Freedom.

	n-1 degrees of freedom									
	2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Student-t value	2.920	2.353	2.132	2.015	1.943	1.895	1.860	1.833	1.812	1.796

Fish Consumption Use Assessment Example

A sample of nine individual walleye representing three size classes (three fish per class) were collected from Jensen Lake and analyzed for mercury. The mercury samples were collected as dorsal plugs and are assumed to represent the concentration of mercury in the filet of each fish.

Size Class	Length (inches)	Mercury Concentration (µg/g)
Small	12	0.23
	12.5	0.24
	13.6	0.27
Medium	16.5	0.33
	17.1	0.36
	18.0	0.38
Large	23	0.45
	23.5	0.46
	24.2	0.47

The mean concentration (z) for the nine samples (n=9) is 0.35 with a variance (s^2) equal to 0.008828. Based on this mean and variance the test statistic is calculated as:

$$t_c = (z\text{-}c) / s$$

$$t_c = (0.35\text{-}0.3)/0.09396$$

$$t_c = 0.532$$

The null hypothesis of no difference between the mean and the criterion is accepted if $t_c > t_{\alpha,n-1,}$ where α=0.05 and n-1=8. Since $t_c = 0.532$ is not greater than $t_{\alpha,n-1} = 1.860$ (Table 1) then the null hypothesis is rejected in favor of the alternative hypothesis that the mean methylmercury concentration is greater than the criterion and fish consumption use for Jensen Lake is assessed as not supporting.

F. Agricultural Use Assessment Methodology for Rivers, Lakes and Reservoirs

Agricultural uses are defined in the state water quality standards as “ waters suitable for irrigation, stock watering, and other agricultural uses, but not suitable for use as a source of domestic supply for the farm unless satisfactory treatment is provided.” While not specifically stated in state water quality standards, the numeric standards for pH (6.0-9.0), boron (750 µg/L as a 30-day average), sodium (less than 50% of cation based on mEq/L), and radium (5 pCi/L as a 30-day average) are intended for the protection of agricultural uses. Further, state water quality standards provide for the protection of agricultural uses by providing language that waters of the state shall be “free from substances….in concentrations or combinations which are toxic or harmful to humans, **animals, plants**, or resident biota.”
In order to make beneficial use determinations for agricultural uses, the following decision criteria are used:

- *Fully Supporting:*

  Based on Numeric Standards: Ten percent or less of the samples exceed the water quality standard for pH or sodium and one or fewer exceedances of the 30-day average criteria for boron or radium.

  Based on Narrative Standards: Water supply supports normal crop and livestock production.

- *Fully Supporting but Threatened:*

  Based on Numeric Standards: The fully supporting, but threatened use assessment designation is not applied to agricultural use. Waters are either assessed as fully supporting or not supporting based on chemical data applied to the numeric standards.

  Based on Narrative Standards: No impairment based on the numeric criteria, but a declining trend in water quality over time suggests a measurable decrease in crop and/or livestock production may occur if the trend continues.

- *Not Supporting*:

  Based on Numeric Standards: Greater than 10 percent of samples are exceeded for the water quality standard for pH or sodium, or two or more exceedances of the 30-day average criteria for boron or radium.

  Based on Narrative Standards: At least one pollutant has been demonstrated to cause a measurable decrease in crop or livestock production.

G. Industrial Use Assessment Methodology for Rivers, Lakes and Reservoirs

Industrial uses are defined in the state water quality standards as “waters suitable for industrial purposes, including food processing, after treatment.” While there are no specific numeric criteria in the state’s water quality standards intended to protect industrial uses, it is assumed that if the state’s narrative standards are met, or if other numeric water quality standards are met, the beneficial uses for industry will also be met.

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Standard Operating Procedure for the Selection of Reference and Disturbed Sites for Biological Monitoring in North Dakota

STANDARD OPERATING PROCEDURE
FOR THE SELECTION OF REFERENCE AND DISTURBED
SITES FOR BIOLOGICAL MONITORING IN NORTH DAKOTA

Summary

The North Dakota Department of Environmental Quality (NDDEQ) utilizes reference (least impaired) and disturbed (most impaired) physical conditions to provide an estimate of natural and human induced variability in biological community structure and in stream habitat quality. Sites are also used to develop threshold values and compile Indices of Biological Integrity (IBI). When selecting reference or disturbed conditions the NDDEQ Watershed Management Program (WMP) must account for natural and climatic variability across the state of North Dakota. To account for environmental variability in North Dakota, the state's total land area was separated into four regions by US Geological Survey Level III Ecoregions and each area was evaluated individually.

The first step in site selection involves a remote sensing component which utilizes an ESRI ArcView Geographic Information System (GIS), ArcView extensions and various GIS data layers. The Analytical Tool Interface for Landscape Assessments (ATtILA) extension allows users to calculate many common landscape metrics including: landscape characteristics, riparian characteristics, human stressors and physical characteristics. Grouped metrics are used to estimate anthropogenic stressors in a 1000 meter (m) circular buffer around distinct sampling points located on perennial flowing waters of the state. Ultimately a final site score is calculated based on the varying metric scores in the buffer. The most disturbed points are classified with the highest scores while the least disturbed points receive the lowest scores. The highest scoring disturbed sites and lowest scoring reference sites then move to the second evaluation step.

The second screening step is to evaluate each site individually by using additional GIS layers. Sites are plotted and examined for landscape attributes which may result in the site not being suitable for sample collection (e.g. water was too deep). Layers used in screening step two include but are not limited to: roads; aerial photos; public and private land ownership; township, range and section grids; county boundaries; and dam structures. The remaining viable sampling locations are then evaluated with another level of screening.

The third screening step involves site reconnaissance, also known as 'ground truthing'. During this step, WMP personnel visit sites to evaluate reference or disturbed using best professional judgment. Some important features to consider while 'ground truthing' are stream geomorphology, stream habitat alterations (e.g. dams, rip-rap), land use in or adjacent to the riparian zone, and other human influences at or near site locations.

Software and Data Layers/Sources

___ ArcView 3.X (ArcView version 3.2a or higher recommended)

Extensions:

___ ArcView 3.X Spatial Analyst Extension
___ Analytical Tool Interface for Landscape Assessments (ATtILA2004v1.0) Extension (EPA)
___ Buffer Theme Builder Extension
___ Display Points Lat/Long Extension
___ Divided line by adding points evenly Extension
___ Grid & Theme Projector version 2 Extension
___ XTools Extension (9/15/03)

Datasets and Layers:

___ Ecoregion GIS Layer (USGS)
___ National Agriculture Imagery Program (NAIP) 2005 Aerial Photography (NRCS) or Digital Orthophoto Quarter Quadrangles (DOQQ) (USGS)
___ National Elevation Dataset (NED) (USGS)
___ National Hydrography Dataset (NHD) (USGS)
___ National Land Cover Data (NLCD) (USGS)
___ North Dakota Public Land Ownership Layer
___ State and County Roads GIS Layer (North Dakota GIS Hub)
___ Township, Range and Section Grid

Procedures

Step 1: Remote Sensing

1. Create a new ArcView 3.X GIS project. Set the map coordinate system to *Universal Transverse Mercator* (UTM) zone 14N (North). Set map coordinate units to decimal degrees. Set map distance units to meters.

2. Select stream reaches in the NHD shapefile that fall inside the target watershed or study area. Create a new shapefile with the selected features. Perennial streams should be selected using the following F_CODEs in the NHD attribute table: 33400, 33600, 46003, 46006, and 55800.

3. Use the *Divide Line by Adding Points Evenly* extension to add points along the NHD shapefile features at intervals of 2000 meters.

4. Make sure the map coordinate system is set to UTM zone 14N. Next use the *Display Points Lat & Long Extension* to add Latitude and Longitude coordinates for each point to the shapefile's attribute table.

5. Use the *Buffer Theme Builder*'s "Create Buffer Theme" button to produce a shapefile of 1000 meter buffers around each potential sampling site in the point shapefile created in step 3.

6. Create a slope grid in percent from a statewide NED grid. Use the map calculator in spatial analyst and the function *[grid].slope (zFactor, percentRise)* to derive slopes

where *zFactor* is the conversion factor if x, y, and z are in different units and *percentRise* equals true for percent slope and false for degree slope.

7. With the new Buffer Theme selected as the reporting unit, select and calculate the desired metrics in each of the four groups: landscape characteristics, riparian characteristics, human stressors and physical characteristics. Metric scores result from the evaluation of the NLCD grid, a roads layer, precipitation, and population density. Metrics should be chosen for their sensitivity. The most sensitive metrics will have the most variability in scores and will make site characteristic differentiation simpler.

8. Once the most sensitive metrics are chosen, use ATtILA to calculate an index score for each assessment unit. Scores are based on a summation of quantile rankings. The number of quantiles is user-defined.

9. Select the assessment units with the lowest and highest index scores, which are a measure of human disturbance. Lowest scores will be the least disturbed reference assessment units or “best available” sites in the study population and the highest scores will be the most disturbed sites.

Step 2: Digital Media Screening

10. Use aerial photography, GIS layers and best professional judgment to evaluate land uses within the selected assessment units. This screening step is mainly used to exclude best available sites with obvious landuse and waterbody characteristics that may disrupt or prohibit sample collection.

Characteristics of Concern

Reference Sites

- Animal feeding operations near the waterbody
- Heavily grazed or degraded riparian area
- Debris or trash in the water body riparian area
- Stream banks with large areas of mass wasting

Reference and Disturbed Sites

- Areas with significant human alteration (e.g. concrete channels)
- Dam structures creating deep pools

GIS Layers used:

- National Agriculture Imagery Program (NAIP) 2005 Aerial Photography (NRCS) or Digital Orthophoto Quarter Quadrangles (DOQQ) (USGS)
- Federal and State Highways, County Roads and Township Roads
- Designated Public Lands and Township, Range, and Sections Grids
- Dam Structures Point Features

Step 3: Landowner Verification and Site Visitation

11. Before a site visit is scheduled, it is advisable to research the identity of the person(s) or group(s) that own land adjacent to or around a potential monitoring location. The inquiry into the property ownership may prove more useful than waiting to contact local residents during an initial site visit and reduce the time expended to obtain permission to access the site. If the land is determined to be held publicly, an effort should be made to contact any and all renters (e.g., producers renting North Dakota State Land Department School Sections).

12. Once permission to access a site is obtained, a site visit should be scheduled. When first arriving at a site it is important to observe any property ownership signage or placards declaring "No Trespassing" or that hazardous conditions are present. If permission to access has been granted, proceed to the site coordinates.

13. Upon reaching the site coordinates, begin to verify the Level 2 assessment screening of GIS layers and aerial photography. Characteristics of the site location that should be examined include but are not limited to; landuse(s) in and around the stream, stream geomorphology, water depth and obstructions to the flow of water. The site investigator should keep a log of notes pertaining to site characteristics and comment on any features present in aerial photos, county maps, or landowner atlases that could be used during future sampling visits.

    A useful tool for examining stream conditions is the Rapid Geomorphic Assessment (RGA) which was developed by the United States Department of Agriculture. The RGA method classifies stream channel stability and the habitat quality of riparian areas and may be used calculate a general stream and habitat score to classify potential Reference and Disturbed sampling locations. The RGA form and instructions for its completion can be found on the following pages.

RAPID GEOMORPHIC ASSESSMENT (RGA) FORM CHANNEL STABILITY & HABITAT RANKING SCHEME

Station Name: ____

Station Description: ____

Date: ____________ Time: ________ Slope: _______% Pattern: meander/ straight/ braided

Crew: ______________________ Pictures (circle): u/s, d/s, x-sec, LB, RB

1. Primary bed material

Bedrock	Boulder/Cobble	Gravel	Sand	Silt/Clay
0	1	2	3	4

2. Bed/bank protection

Yes	No	(with)	1 bank	2 banks
0	1		2	3

3. Degree of incision (relative elev. of "normal" low water if floodplain/terrace is 100%)

0-10%	11-25%	26-50%	51-75%	76-100%
4	3	2	1	0

4. Degree of constriction (relative decrease in top-bank width from up to downstream)

0-10%	11-25%	26-50%	51-75%	76-100%
0	1	2	3	4

5. Streambank erosion (dominant process each bank)

	None	Fluvial	Mass Wasting (failures)
Inside or left	0	1	2
Outside or right	0	1	2

6. Streambank instability (percent of each bank failing)

	0-10%	11-25%	26-50%	51-75%	76-100%
Inside or left	0	0.5	1	1.5	2
Outside or right	0	0.5	1	1.5	2

7. Established riparian vegetative cover (woody or stabilizing perennial grasses each bank)

	0-10%	11-25%	26-50%	51-75%	76-100%
Inside or left	2	1.5	1	0.5	0
Outside or right	2	1.5	1	0.5	0

8. Occurrence of bank accretion (percent of each bank with fluvial deposition)

	0-10%	11-25%	26-50%	51-75%	76-100%
Inside or left	2	1.5	1	0.5	0
Outside or right	2	1.5	1	0.5	0

9. Sum of All Values [ ]

Instructions for Completion of a Rapid Geomorphic Assessment Form

Define a representative reach 6-20 channel widths long.

1. Primary bed material

Bedrock	The parent material that underlies all other material. In some cases this becomes exposed at the surface. Bedrock can be identified as large slabs of rock, parts of which may be covered by other surficial material.
Boulder/Cobble	All rocks greater than 64 mm median diameter.
Gravel	All particles with a median diameter between 64.0 — 2.00 mm
Sand	All Particles with a median diameter between 2.00 — 0.063 mm
Silt-Clay	All fine particles with a median diameter of less than 0.063 mm

2. Bed/bank protection

Yes	Mark if the channel bed is artificially protected, such as rip rap or concrete.
No	Mark if the channel bed is not artificially protected and is composed of natural material.
Protection	
1 Bank	Mark if one bank is artificially protected, such as with rip rap or concrete.
2 Banks	Mark if two banks are artificially protected.

3. Degree of incision (Relative elevation of "normal" low water; floodplain/terrace @ 100%)

Calculated by measuring water depth at deepest point across channel, divided by bank height from bank top to bank base (where slope breaks to become channel bed). This ratio is given as a percentage and the appropriate category marked.

4. Degree of constriction (Relative decrease in top-bank width from up to downstream)

Often found where obstructions or artificial protection are present within the channel. Taking the reach length into consideration, channel width at the upstream and downstream parts of the reach is measured and the relative difference calculated.

5. Stream bank erosion (Each bank)

The dominant form of bank erosion is marked separately for each bank, left and right, facing in a downstream direction.

If the reach is a meandering reach, the banks are viewed in terms of 'Inside, Outside' as opposed to 'Left, Right' (appropriate for questions *5-8)*. Inside bank, being the inner bank of the meander, if the stream bends to the left as you face downstream, this would be the left bank. Outside bank, being the outer bank, on your right as you face downstream in a stream meandering left.

None	No erosion
Fluvial	Fluvial processes, such as undercutting of the bank toe, cause erosion.

Mass Wasting Mass movement of large amounts of material from the bank is the method of bank erosion. Mass Wasting is characterized by high, steep banks with shear bank faces. Debris at the bank toe appears to have fallen from higher up in the bank face. Includes, rotational slip failures and block failures.

6. Stream bank instability (Percent of each bank failing)

If the bank exhibits mass wasting, mark percentage of bank with failures over the length of the reach. If more than 50% failures are marked, the dominant process is mass wasting (see question *5).*

7. Established riparian woody-vegetative cover (Each bank)

Riparian woody-vegetative cover represents most permanent vegetation that grows on the stream banks. Distinguished by its woody stem, this includes trees and bushes but does not include grasses. Grasses grow and die annually with the summer and thus do not provide any form of bank protection during winter months whilst permanent vegetation does.

8. Occurrence of bank accretion (Percent of each bank with fluvial deposition)

The percentage of the reach length with fluvial deposition of material (often sand, also includes fines and gravels) is marked.

9. Sum of All Values

Sum all category values for question one through eight. Lower aggregate scores indicate more stable geomorphology and improved habitat. Higher scores indicate unstable geomorphology and decreased habitat.

PART VIII. Appendix B: North Dakota TMDL Prioritization Strategy

North Dakota Total Maximum Daily Load Prioritization Strategy

Final
January 2017

North Dakota Department of Environmental Quality
Division of Water Quality
Watershed Management Program

Background and Purpose

A Total Maximum Daily Load (TMDL) is a pollution budget and includes a calculation of the maximum amount of a pollutant that can occur in a waterbody and allocates the necessary reductions to one or more pollutant sources. A TMDL serves as a planning tool and potential starting point for restoration or protection activities with the ultimate goal of attaining or maintaining water quality standards. In North Dakota, the North Dakota Department of Environmental Quality, Division of Water Quality's Watershed Management Program (WMP) is responsible for the development, implementation and delivery of several water quality programs, including the TMDL Program. There are two components to the TMDL Program, both which are required under Section 303(d) of the Clean Water Act and its accompanying regulations (CFR Part 130 Section 7).

Part one of the program requires each state to identify individual waterbodies (i.e., river, streams, lakes and reservoirs) which are considered water quality limited and which require load allocations, waste load allocations and TMDLs. For North Dakota, this list of impaired waters is prepared and submitted to EPA every two years in the form of the "Integrated Section 305(b) Water Quality Assessment Report and the Section 303(d) List of Impaired Waters Needing Total Maximum Daily Loads (TMDLs)" (aka the Integrated Report).

Following the development of its list of impaired waters needing TMDLs, the second part of the program involves the development of TMDLs for waters on the list. Prior to this strategy, TMDL development pace, or the number of TMDLs to be completed each year, was determined during each two year Integrated Reporting cycle with annual updates. Under the old prioritization system TMDL development priorities were determined by two main factors: 1) availability of data to complete the TMDL; and 2) public interest to implement the recommendations of the TMDL in the form of a Section 319 Nonpoint Source Project Implementation Plan or similar watershed management plan.

Historically, TMDL priorities and the pace of TMDL development for many states was driven by lawsuits and settlement agreements that dictated how many TMDLs a state was required to complete and how long the state had to complete their TMDLs. As the TMDL settlement agreements for many states were nearing completion, EPA began collaborating with the states and the Association of Clean Water Administrators (ACWA) to develop a new national vision and goals for the Section 303(d) TMDL program. The TMDL Program "Vision" and goals were finalized in 2013 (http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/programvision.cfm). The following is the vision statement for the TMDL Program.

"The Clean Water Act Section 303(d) Program provides for effective integration of implementation efforts to restore and protect the nation's aquatic resources, where the nation's waters are assessed, restoration and protection objectives are systematically prioritized, and Total Maximum Daily Loads and advanced restorative approaches are adaptively implemented to achieve water quality goals with the collaboration of States, Federal agencies, tribes, stakeholders, and the public."

Implementation of the vision is organized around goals for the following six vision elements:

“Prioritization” For the 2016 integrated reporting cycle and beyond, States review, systematically prioritize, and report priority watersheds or waters for restoration and protection in their biennial integrated reports to facilitate State strategic planning for achieving water quality goals.

“Assessment” By 2020, States identify the extent of healthy and CWA Section 303(d) impaired waters in each State’s priority watersheds or waters through site-specific assessments.

“Protection” For the 2016 reporting cycle and beyond, in addition to the traditional TMDL development priorities and schedules for waters in need of restoration, States identify protection planning priorities and approaches along with schedules to help prevent impairments in healthy waters, in a manner consistent with each State’s systematic prioritization.

“Restorative” By 2018, States use restorative approaches, in addition to TMDLs, that incorporate adaptive management and are tailored to specific circumstances where such approaches are better suited to implement priority watershed or water actions that achieve the water quality goals of each State, including identifying and reducing nonpoint sources of pollution.

“Engagement” By 2014, EPA and the States actively engage the public and other stakeholders to improve and protect water quality, as demonstrated by documented, inclusive, transparent, and consistent communication; requesting and sharing feedback on proposed approaches; and enhanced understanding of program objectives.

“Integration” By 2016, EPA and the States identify and coordinate implementation of key point source and nonpoint source control actions that foster effective integration across CWA programs, other statutory programs (e.g., CERCLA, RCRA, SDWA, CAA), and the water quality efforts of other Federal departments and agencies (e.g., Agriculture, Interior, Commerce) to achieve the water quality goals of each state.

Describing a process and plan for prioritizing North Dakota’s impaired waters for TMDL development is fundamental to meeting the TMDL vision prioritization goal and is the purpose of this document. This North Dakota TMDL prioritization strategy describes the WMP’s approach for prioritizing TMDL development for federal fiscal years 2016-2022.

PRIORITIZATION STRATEGY AND PERFORMANCE MEASURE

Prioritization is defined as the systematic ranking in order of importance. We live in a world of limited resources - limited in terms of time, manpower and money. Prioritization is therefore, necessary to wisely allocate our limited resources where they can do the most good. With respect to TMDL development and watershed planning, the WMP does not have sufficient technical or financial resources to address all the impaired waterbodies and watersheds identified on the State’s TMDL list immediately. For this reason it is necessary to develop an efficient and effective method to identify and target priority waterbodies and watersheds within the State where TMDLs and watershed plans are needed the most and where the implementation of these TMDLs and watershed plans are likely to be the most successful in improving water quality and restoring and protecting beneficial uses.

To accomplish the TMDL Program's prioritization goal of systematically prioritizing and reporting on priority watersheds or waters for restoration and protection and to facilitate State strategic planning to achieve water quality protection and improvement, the WMP has developed a two-phased strategy for prioritizing impaired waters for TMDL development and watershed planning.

In order to track and measure progress in meeting the prioritization goal, EPA has developed a new national water quality program performance measure termed WQ-27. WQ-27 is defined as the "extent of priority areas identified by each State that are addressed by EPA-approved TMDLs or advanced restoration approaches for impaired waters that will achieve water quality standards. These areas may also include protection approaches for unimpaired waters to maintain water quality standards."

Since progress in meeting the WQ-27 measure is based on the State's list of priority impaired waters, a primary objective of TMDL prioritization strategy is to support the national program measure that will be used to set the baseline for achieving progress in meeting the measure. Specifically, the TMDL prioritization strategy will be used to identify:

- A list of priority waters targeted for TMDL development or restorative approaches in the next two years (near term); and
- A list of priority waters scheduled for likely TMDL development or restorative approaches over the through 2022 (long term).

Additionally, this strategy provides the strategic rationale for the State in setting these near term and long term TMDL development and watershed planning priorities.

In developing its list of near term and long term TMDL development and watershed planning priorities, the WMP will use the list of impaired waters as provided in the 2014 Integrated Report (http://www.ndhealth.gov/WQ/SW/Z7_Publications/IntegratedReports/2014_North_Dakota_Integrated_Report_Final_20150428.pdf).

As stated earlier, TMDL prioritization will be implemented in two phases, the first of which has been completed and is discussed below as Phase 1. Phase 2, also discussed below, will be completed as WMP's Basin Water Quality Management Framework is implemented.

Phase 1 Prioritization

Prioritization completed under Phase 1 was a review of the Section 303(d) list of impaired waters needing TMDLs included in the 2014 Integrated Report. The purpose of the review was two-fold. One, to identify as low priority, waterbodies and/or waterbody-pollutant combinations listings which had insufficient data for immediate TMDL development, where there was uncertainty regarding the basis for the impairment listing, or where the TMDL was beyond the technical and financial ability of the WMP; and two, to identify as high priority (near term and long term), impaired waterbodies and/or waterbody/pollutant combinations where there are currently sufficient data available for TMDL development, where there is strong local support for a TMDL development project, and/or where the WMP has the technical resources and capability to develop the TMDL.

The new TMDL vision also affords States the opportunity to address their priority impaired waters through Advanced Restorative Plans rather than through TMDL development. By definition, TMDLs are a plan that simply describes a pollutant load reduction necessary to meet water quality standards. There is no requirement in a TMDL to implement BMPs or other conservation practices that will result in water quality improvement. Advanced Restorative Plans are thought of as a new way of doing water quality business whereby the development of a full blown TMDL is suspended while a plan is implemented that addresses the impairments in a watershed.

The TMDL prioritization strategy recognizes Advanced Restorative Plans as a practical alternative to TMDLs for many waterbody impairments. Since implementation is a requirement of Advanced Restorative Plans, they have the opportunity to resolve many water quality impairments in the State. The North Dakota TMDL Prioritization Strategy, therefore, also recognizes impaired waters listings as high priority where the waterbody impairment(s) are due exclusively to nonpoint sources and where there is a Section 319 Nonpoint Source Project Implementation Plan (PIP) in place that could address the listed impairment(s). In these cases, the Section 319 Nonpoint Source PIPs will have many of the components of a TMDL, such as a pollutant reduction target, a load allocation, and the identification of sources causing the impairment. In many cases, multiple waterbody/pollutant combinations were identified and prioritized in watersheds which can be addressed by a single Section 319 Nonpoint Source PIP. In these cases the Section 319 Nonpoint Source PIP will be revised to address all of the waterbody/pollutant combinations in the watershed and the sources causing the impairment(s).

While there are a number of impaired waterbodies identified as low priority for both near and long term TMDL development, they may be high priority for other WMP programs (e.g., education and outreach, monitoring and assessment, water quality standards).

Priorities identified for immediate TMDL development are also based on the impairment as it relates to State water quality standards. E. coli has a numeric water quality standard and is given high priority for TMDL development where data are available.

Phase 1 Results-High Priority Selection

The 2014 Section 303(d) list of impaired waters needing TMDLs is represented by 217 individual waterbodies (assessment units) which includes 27 lakes and reservoirs and 189 river and stream segments. This results in 340 individual waterbody/pollutant combinations which are identified as needing a TMDL. From this list of impaired waters, the Phase 1 prioritization identified 67 waterbody/pollutant listings as long term high priorities for TMDL or advanced restorative plan development by 2022. Of these, and as a part of the Phase 1 prioritization, 34 waterbody/pollutant combinations were further prioritized and targeted for near term TMDL or advanced restorative plan development in the next two year timeframe.

As illustrated in Figure 1, of the 67 pollutant/waterbody combinations identified as high priority in Phase 1 most are E. coli bacteria listings for rivers and stream segments (52), followed by lake/reservoir nutrient/dissolved oxygen/sediment listings (14), and one (1) river and stream bioassessments (including benthic macroinvertebrates and fish). It should also be noted that many of the waterbody/pollutant combination categories targeted for TMDL development in the next two-year cycle (near term) are similar to those identified for long term TMDL development (Figure 2).

It should be noted that in the case of the high priority lake/reservoir sediment listings and river and with the stream bioassessment listing, these impairment listings will be addressed through advance restorative plans where a Section 319 Nonpoint Source PIP is already in place to address other nonpoint sources causes (e.g., nutrients, E. coli bacteria). In these cases, the PIP will be amended to address the additional impairment causes and their sources.

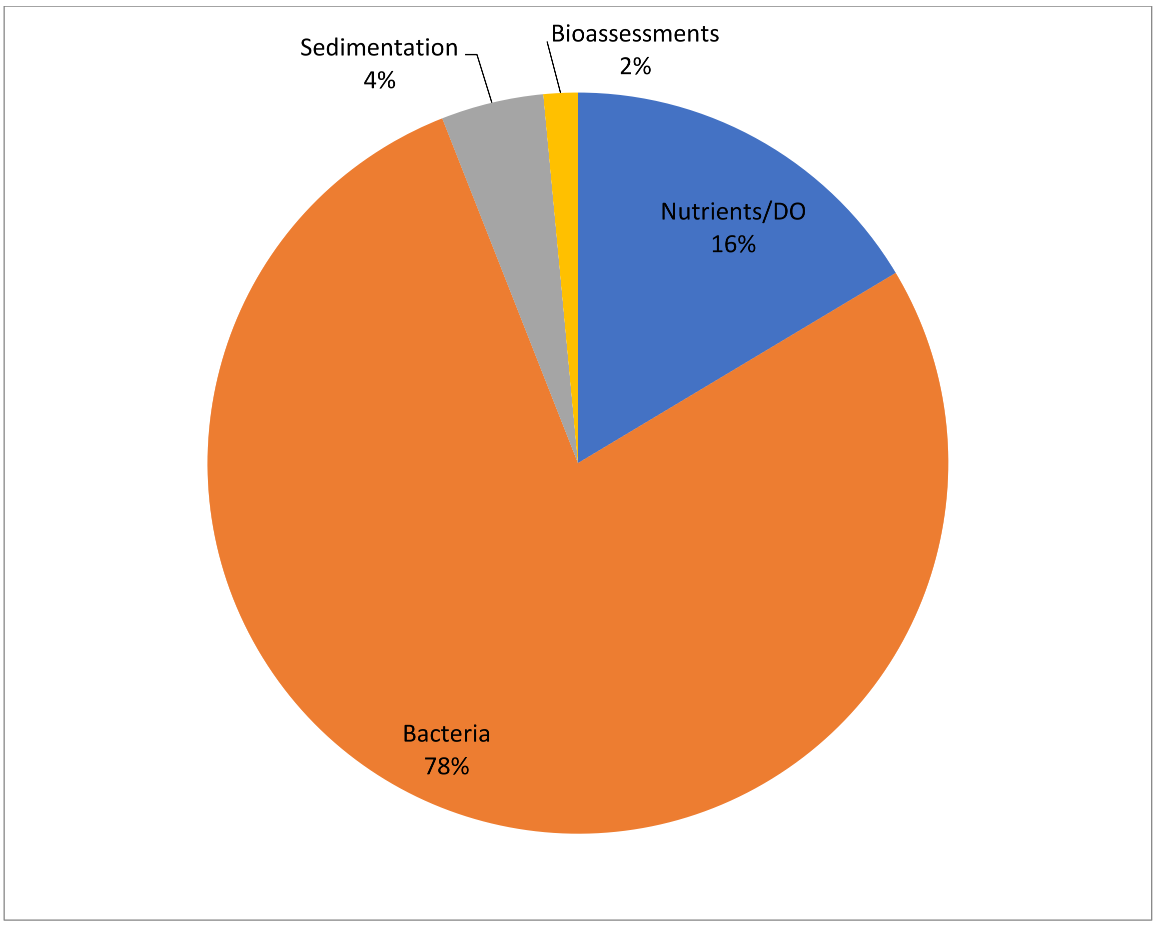


Figure 1. Phase 1 Long Term (2016-2022) TMDL and Advanced Restorative Plan Development Priorities (n=67).

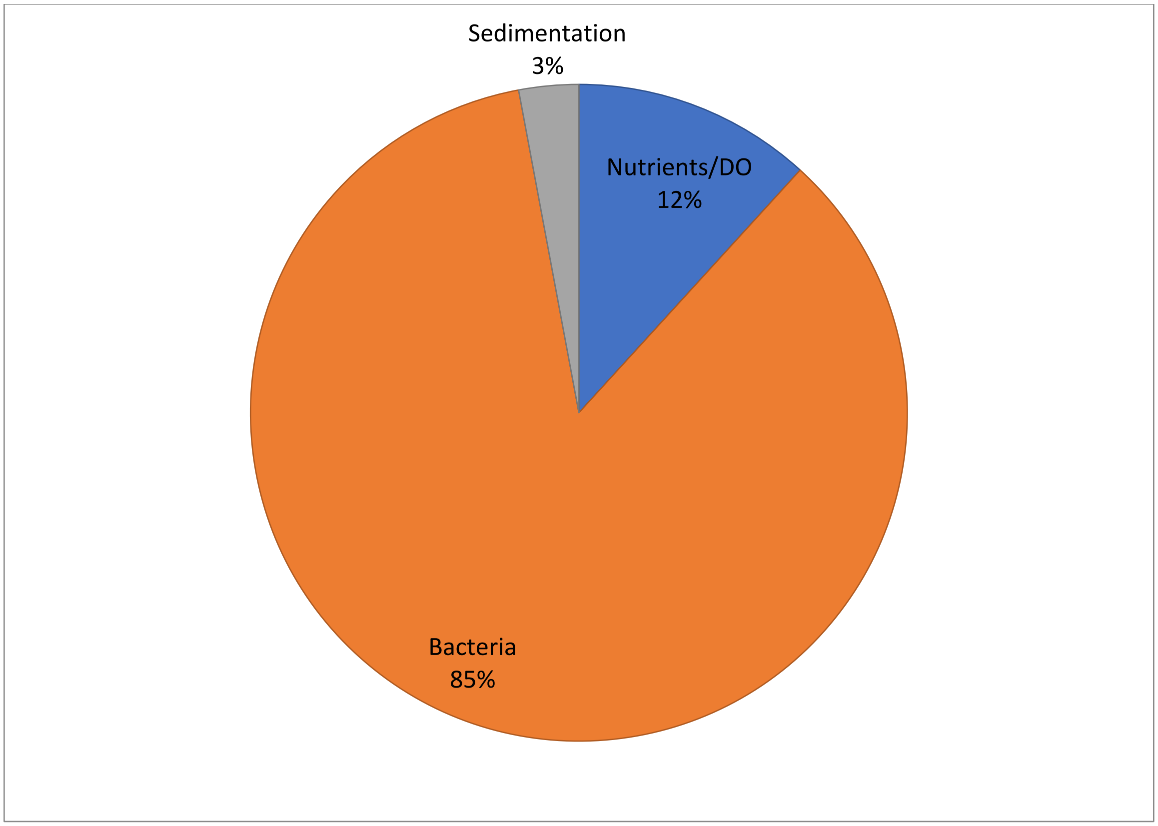


Figure 2. Phase 1 Near Term (2017-2018) TMDL and Advanced Restorative Plan Development Priorities (n=34).

Low Priority Impaired Waters Cause Categories

As described earlier, the WMP identified as low priority, waterbodies and/or waterbody-pollutant combinations listings which had insufficient data for immediate TMDL development, where there was uncertainty regarding the basis for the impairment listing, or where the TMDL was beyond the technical and financial ability of the WMP. Excluded from the list of high priority impaired waters were several categories of waterbodies and/or pollutant causes where there is considerable uncertainty regarding the status of the impairment. The rational for identifying a waterbody or waterbody/pollutant combination as low priority for TMDL development is described for the following waterbody/pollutant categories.

Mercury

Water bodies are listed as impaired due to mercury due to elevated levels of methylmercury in fish tissue. Mercury accumulates in fish tissues as methylmercury, the form that presents the greatest risk to human health through the consumption of contaminated fish. Contributions may come from a combination of local, regional, and global sources. Because of this great variety of potential mercury sources, developing TMDLs for mercury-impaired waters will involve the coordination among multiple programs. Because of the complexity of how mercury moves through natural systems as well as those issues associated with source identification and control, the WMP is identifying TMDL development for mercury impairments as a lower priority while additional information is acquired and evaluated. While the WMP prepares for mercury TMDL development, fish consumption advisories are in place throughout the State to protect human health.

Trace Elements-As, Cd, Cu, Pb, and Se (Rivers and Streams)
TMDLs for trace elements provide another series of challenges for this State's TMDL development. Most of those rivers and streams listed in the State's Integrated Report as impaired for these elements are thought to have significant background levels that may be contributing to the elevated concentrations. It will be necessary to conduct a Use Attainability Analysis to determine if naturally occurring pollutant concentrations are preventing the attainment of the use. As mentioned before, due to the State's limited resources of time, manpower, and funding, the WMP is identifying TMDL development for trace element impairments as a lower priority.

Sedimentation/Siltation (Rivers and Streams)
Sediment listings were identified by the WMP as a low priority for TMDL development primarily because the State has no numeric criteria for sediment. Additionally, implementation of BMPs to control nonpoint source pollution through the State's Section 319 Nonpoint Source Program will reduced sediment loading to the watershed along with the reduction of other pollutant loadings. Using the Restorative Plan approach through Section 319 NPS PIPs and including all the waterbody/pollutant combinations in the watershed, reduction for sediment can occur alongside reductions in E. coli bacteria and other NPS pollution without a separate TMDL being created.

Biological Indicators (Rivers and Streams)
The WMP has developed ecoregion specific multi-metric indices of biological integrity (IBIs) for North Dakota. This tool is designed to detect environmental stresses that result in alteration of the biological community (i.e., aquatic life impairment), but does not identify specific stressors. Once a segment is listed, the cause of impairment must be identified through additional data collection. Only once the pollutant/cause is identified, can a TMDL be written. For this reason, these aquatic life use impairment listings due to biological indicators were given a low priority for TMDL development.

Nutrients (Rivers and Streams)
Rivers and streams listed as impaired for nutrients/eutrophication are considered low priority by the WMP. Narrative nutrient criteria are being proposed for the next triennial water quality standards update later this year. These narrative criteria will provide the justification for the development of numeric thresholds which can be used for water quality assessment and TMDL development. As numeric nutrient thresholds are developed and as waterbodies are assessed as impaired for nutrients, this prioritization will be reviewed, and revised, if necessary. Also, it is believed that with the adoption of BMPs implemented through Section 319 NPS watershed project, a variety of nonpoint source pollutants will be reduced, including nutrients.

Nutrient/Dissolved Oxygen/Sedimentation (Lakes and Reservoirs)
In order to immediately address as many waterbody impairments as possible, a priority focus is on waterbodies where data are both available and recent. Where the data are limited and old, such as for some nutrient/dissolved oxygen/sediment impairments to lakes and reservoirs, these listings were given a low priority for TMDL development. These lakes and reservoirs, while a low priority for TMDL develop, will be a high priority for monitoring and assessment.

PHASE 2 PRIORITIZATION

While Phase 1 of the TMDL prioritization process focused on the near-term creation of TMDLs and advanced restoration plans, Phase 2 will look at addressing longer term goals and identifying data gaps and information needs through an inclusive stakeholder driven process whereby priorities will be identified in each of the state's five major river basins (Figure 3). This approach is called the Basin Water Quality Management Framework and is described below.

As the list of impaired waters changes with each biennial Integrated Report, the state TMDL development priorities will likely change during Phase 2. This may result in priority changes. It is also expected that TMDL development priorities will be adjusted as the WMP implements the Basin Framework.

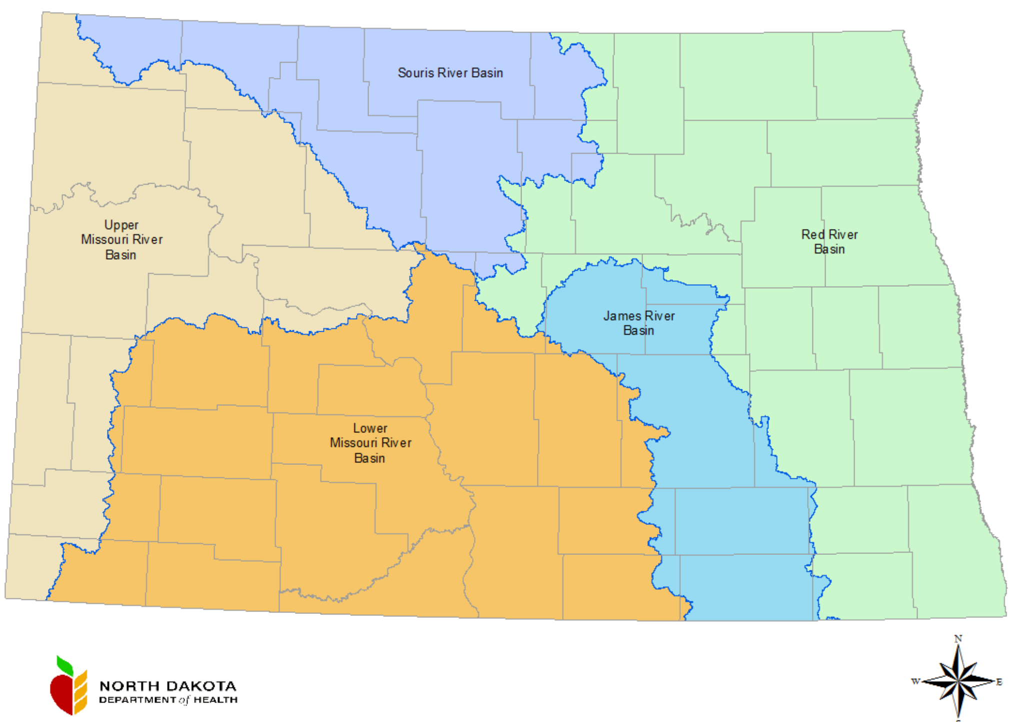


Figure 3. Major River Basins in North Dakota.

Overview of Basin Water Quality Management Framework

To improve the delivery of its water quality management programs, the WMP recognized the need for a locally led process to identify and address water quality restoration and protection issues in the State's major river basins. The North Dakota Basin Water Quality Management Framework (Basin Framework) was developed to serve as a guide for water quality management planning and implementation through a targeted basin management approach (Appendix A). This process will also promote a more coordinated effort for the collection and sharing of data and information, increased availability of technical and financial resources, and more focused and effective water quality management activities. Phase 2 of the prioritization strategy, which will help refine the prioritization of the remaining 86 waterbody/pollutant combinations identified in Phase 1 as well as future waterbody/pollutant listings, will be guided by input which will be obtain from basin stakeholders through implementation of the Basin Framework.

Starting with the Red River Basin, a Basin Stakeholder Advisor Group (BSAG) will be organized. This BSAG will be made up of stakeholders living in the basin who have a resource interest in the basin and will provide local leadership to assist the WMP in the development of priorities for impaired waterbodies within the basin. Priorities for each basin in the State will be included in that basin's 5-year basin plan. Basin Technical Advisory Groups (BTAG) will provide technical guidance for plan development and will be made up of various agencies, academic representatives, and resource professionals.

Overview of the Recovery Potential Screening Tool

The primary method used for prioritization within the Basin Framework will be the Recovery Potential Screening Tool (RPST). The RPST is a watershed prioritization tool that uses several ecological, stressor, and social indicators which are selected based on a watershed management scenario or question being asked. The RPST has the advantage over other watershed prioritization methods in that it also measures the likelihood of success regarding the management or restoration efforts applied to a watershed.

Below are descriptions of the three types of indicators:

- The ecological index score reflects overall condition and the capacity of the watershed to regain functionality, based on metrics related to natural watershed processes and structure.

- The stressor score reflects the pressures on watershed condition from several primary sources of pollutants and water quality impairments.

- The social context score includes many factors, such as community involvement, incentives, economics, governance, regulation, and planning status that do not constitute watershed condition but often strongly influence the level of effort and complexity of making improvements.

The BSAGs along with the WMP will identify a few indicators specific to their basin from each category. Using these indicators, the tool calculates individual index scores as well as a combined Recovery Potential Index score, which then can be used to focus TMDL development and advanced lternative plan priorities in support of waterbodies with the greatest potential for restoration. These priorities will be used in the development of the 5-year basin plan. For more information about the RPST, please reference http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/recovery/overview.cfm

Initial work in the development of the North Dakota RPST has been completed and several indicators have been added. Based on the availability of information and other feasibility considerations, the WMP will continue to add RPST indicators as each basin's 5-year basin plan is developed and issues of concern for the BSAG are identified.

After the development of a 5-yr basin plan, organization of the next basin's BSAG will occur. This process will continue until all five basins in North Dakota (Figure 3) are addressed. It is expected that the list of 129 priorities remaining after 2017 will grow as each basin contributes to the discussion of impairments in their watershed and nutrient criteria for the State are finalized.

North Dakota Basin Water Quality Management Framework

North Dakota Basin Water Quality Management Framework 2015-2027

Final
October 2015

North Dakota Department of Environmental Quality
Division of Water Quality
Watershed Management Program

Introduction

The North Dakota Department of Environmental Quality, Division of Water Quality's Watershed Management Program (WMP) is responsible for the development, implementation, and delivery of several water quality management programs, including monitoring and assessment, Total Maximum Daily Loads (TMDLs), Section 319 Nonpoint Source Pollution Management and nutrient management. To date, the WMP has implemented these programs and projects on a statewide basis which has led to a lack of watershed priorities and an inefficient allocation of limited resources, both technical and financial.

To improve the delivery of its water quality management programs, the WMP recognizes the need for a locally led process to identify and address water quality restoration and protection issues in the state's major river basins. In response, the WMP has developed the "North Dakota Basin Water Quality Management Framework" (Basin Framework). The purpose of this framework is to serve as a guide for water quality management planning and implementation through a targeted basin management approach. It is also anticipated that the basin water quality management planning process will promote a more coordinated effort for the collection and sharing of data and information, increased availability of technical and financial resources, and more focused and effective water quality management activities.

Vision and Mission

As stated in the North Dakota Department of Environmental Quality's Strategic Plan (2011-2015), the mission of the North Dakota Department of Environmental Quality (NDDEQ) is "to protect and enhance the health and safety of all North Dakotans and the environment in which we live." To accomplish this mission the NDDEQ is committed "to preserving and improving the quality of the environment," including the state's water resources.

To accomplish the NDDEQ's mission, the WMP has as its **vision** "to protect and restore the water quality and beneficial uses of the state's rivers, streams, lakes, reservoirs and wetlands through an integrated basin management approach" and as its **mission** "to develop and implement an efficient and coordinated process for the delivery of water quality monitoring, assessment, restoration and protection programs, projects and activities in the state's major river basins."

Basin Water Quality Management Framework

The Basin Water Quality Management Framework (Basin Framework) is organized around five major river basins in the state (Figure 1):

1. Red River Basin;
2. James River Basin;
3. Souris River Basin;
4. Upper Missouri River Basin (including Lake Sakakawea); and
5. Lower Missouri River Basin (including Lake Oahe).

The WMP will begin implementation of the Basin Framework with the Red River Basin. The WMP is starting with the Red River Basin because this basin already has a well established stakeholder structure (i.e., Red River Basin Commission) which will facilitate and aid in the organization of a Basin Stakeholder Advisory Group (BSAG) and with collection of existing information and data. The order in which basins will be selected for implementation of the Basin Framework in subsequent years will be determined by the WMP as the Basin Framework is further developed and implemented.

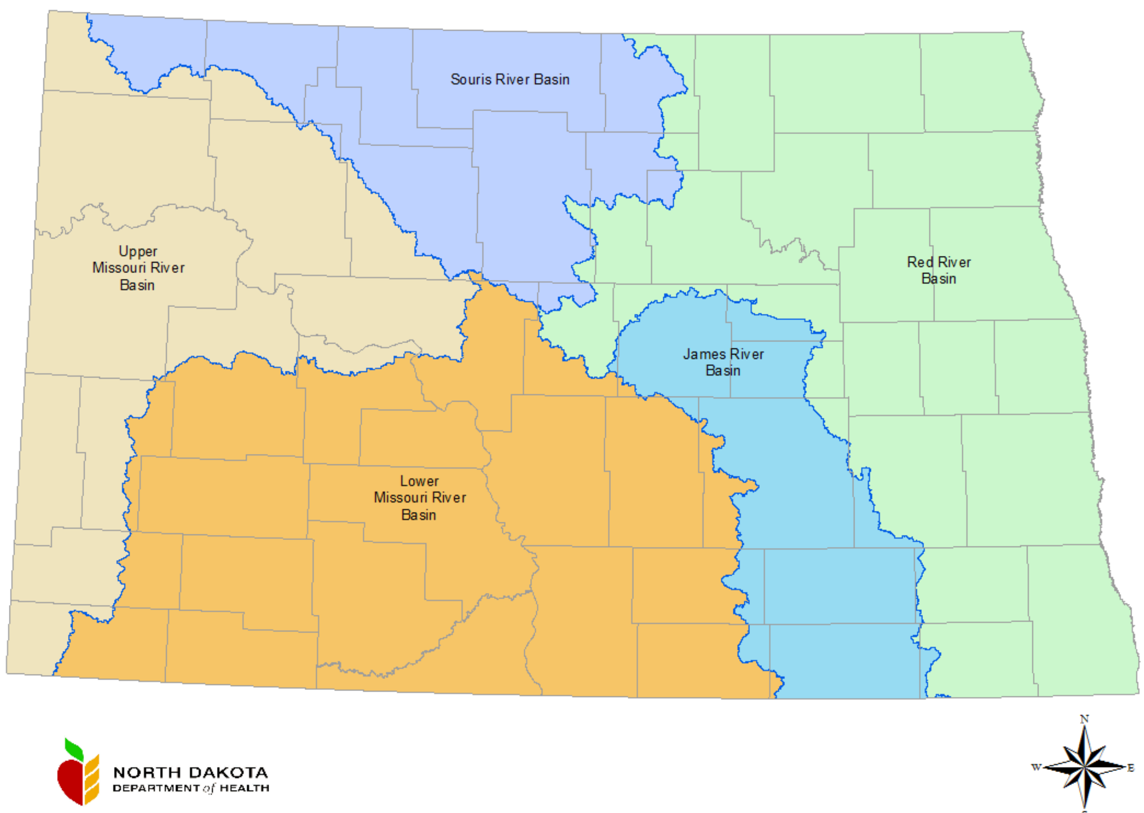


Figure 1. Major River Basins in North Dakota.

Roles and Responsibilities

The WMP is committed to providing the necessary assistance to develop a locally led process for basin water quality management. WMP staff will assist newly formed BSAGs through each step of the basin water quality management planning process. Initially, WMP staff will aid in the gathering of existing data and information, identifying data gaps and preparing a summary report which describes water quality and resource conditions in the basin, as well as, where there is a need for additional data and information (see Phase 1 Goal, Objective 2).

The first step in implementing the Basin Framework in a specific basin will be the formation and organization of the Basin Stakeholder Advisory Group (BSAG). Each BSAG will be made up of stakeholders living in the basin who have a resource interest in the basin. The BSAG will provide the local leadership for developing and implementing each Basin Water Quality Management Plan (Basin Plan). Each BSAG, in cooperation with the WMP, will be responsible for overseeing the two phases of the Basin Plan. The BSAG will be responsible for the facilitation, coordination and implementation of the water quality assessment, restoration and protection, and education activities outlined by the basin plan.

The Basin Technical Advisory Groups (BTAGs) will provide expertise and technical guidance to the BSAG for the development and implementation of the basin plan. It is anticipated that members of this group will be primarily from state and federal agencies and academic representatives, including, but not limited to the NDDEQ, US Geological Survey, Natural Resources Conservation Service, US Fish and Wildlife Service, ND State Water Commission, ND Game and Fish Department, ND Department of Agriculture, ND Forest Service and NDSU Extension.

Utilizing the data that has been gathered, the BSAGs will identify and prioritize water quality problems and issues in the basin. It is expected that the primary method for prioritization will be through the use of the Recovery Potential Screening Tool (RPST). The RPST is a watershed prioritization tool that uses several ecological, stressor, and social indicators which are selected based on the watershed management scenario or question being asked. The RPST has the advantage over other watershed prioritization methods in that it also measures the likelihood of successful management or restoration efforts in a watershed. The precise indicators selected for use in the RPST will vary based on the watershed management scenario, question, or priority interest (e.g., pathogen impairments, urban waters, heavily agricultural watersheds).

The WMP will work with the BSAG and associated BTAG in each basin to implement the RPST in each basin. Based on the results of the RPST, the BSAGs will set watershed and educational priorities within the basin and develop a 5-year basin plan from its list of priorities. WMP staff will provide the necessary technical assistance to finalize the plan and secure financial assistance for the implementation of the priority projects. In subsequent years, WMP staff will be committed to providing technical support in the form of identifying changes and amendments to the plan based on issues identified during plan implementation, training and guidance for field staff, and maintaining communications with the BSAGs to insure the success of the Basin Plans.

Over the long term, the BSAG’s, in cooperation with the BTAGs and the WMP, will be responsible for all updates to the Basin Plans. Also, the BSAGs may choose to evolve into a more formalized structure and take a more proactive approach in implementing their Basin Plan.

Phased Basin Water Quality Management Planning and Implementation Approach

Phase one of each basin water quality management planning process will involve development of an initial Basin Plan. The phase one Basin Plan will be the key document used by the BSAG and its partners to: 1) describe resource conditions in the basin; 2) identify water quality management priorities; 3) identify information and education priorities; 4) schedule implementation of priority projects; and 5) estimate financial needs for the five year project implementation period. An outline describing the proposed elements of a Basin Plan is provided in Appendix A.

Phase two of the basin water quality management planning process will involve updating the initial Basin Plan. To coincide with the five major river basins on which this Framework is organized, each phase two Basin Plan update will be completed on a 5-year cycle. Updates to the Basin Plans will be conducted to: 1) evaluate the progress/success of implementation projects and activities; 2) measure the performance of meeting Basin Plan goals and objectives; 3) incorporate new data; 4) set new Basin Plan goals and objectives; and 5) establish schedules for new or ongoing priority projects.

Key to the implementation of the Phase 1 Basin Plans and Phase 2 Basin Plan updates will be the adaptive management process. Adaptive management, also known as adaptive resource management (ARM), is a systematic approach for improving resource (or in this case water quality) management policies and practices by learning from management outcomes. ARM acknowledges uncertainty about how natural resource systems function and how they respond to management actions. ARM is designed to improve our understanding of how a resource system works, so as to achieve management objectives. ARM also makes use of management interventions and follow-up monitoring to promote understanding and improve subsequent decision making. In the context of the Basin Framework, ARM consists of the development, implementation and evaluation of a Basin Plan. If a desired outcome is not accomplished, then the plan will be modified or changed. It is expected that this phase of the planning and implementation process will be repeated several times throughout the 5-year cycle as new data becomes available and lessons are learned. Therefore, the Basin Plan will be a dynamic and living document with changes expected.

Goals, Objectives and Tasks of the Basin Water Quality Management Framework

Goals, objectives and tasks for development, implementation, and continuation of the Basin Water Quality Management Framework are:

Phase 1 Goal – Develop and implement an initial Basin Water Quality Management Plan (Basin Plan) for each of the state's five major river basins

Objective 1. Establish a Basin Stakeholder Advisory Group (BSAG) for each major river basin which will be responsible for the development and implementation of the basin plan.

Task 1. Coordinate with "core" local entities (e.g., soil conservation disctricts, water resource boards) to identify specific local organizations/agencies to be represented on the BSAG. BSAG membership will be limited to representatives with water management and resource interests in the basin.

Task 2. Convene an initial meeting with the full membership of the newly formed BSAG to discuss roles and responsibilities of the BSAG, establish an organizational structure, and set a schedule and milestones for developing and completing the initial Basin Plan.

Task 3. Establish a Basin Technical Advisory Group (BTAG) for each major river basin. Each BSAG will work with the WMP to identify agencies/organizations to be on the BTAG and to define the responsibilities of the BTAG in the development and implementation of the Basin Plan.

Task 4. Identify resource needs (e.g., staffing, funding) and responsibilities (project reviews, prioritization) for organizing and conducting BSAG meetings and other activities related to the development and implementation of the Basin Plan.

Objective 2. Compile existing information/data and determine information needs and data gaps.

Task 1. Identify existing reports, plans, studies, and datasets to characterize water quality and resource conditions in the basin.

Task 2. Determine data gaps and additional information that is needed to characterize water quality and resource conditions in the basin and in watersheds and sub-watersheds in the basin..

Task 3. Complete a summary report which describes water quality and resource conditions in the basin, as well as, where there is a need for additional data and information.

Objective 3. Identify priority water quality management issues, problems and concerns in the basin.

Task 1. Based on existing data and information (see Objective 2) and input from the BSAG, BTAG, and the WMP, identify and prioritize water quality management issues, problems and concerns in the basin and at the watershed (10 digit HUC) and sub-watershed (12 digit HUC) scale within each basin.

Objective 4. Establish basin water quality management program and project (e.g., monitoring and assessment, TMDL, Section 319 NPS source pollution implementation, nutrient reduction) priorities in the basin which will address priority water quality problems, issues and concerns in the basin (see Objective 3).

Task 1. Develop water quality management scenarios and/or questions which will be the basis for the development of basin prioritization.

Task 2. Using the Recovery Potential Screening Tool (RPST) or other standardized prioritization methods, establish priorities for water quality management programs, projects and activities in the basin.

Note: For most water quality management screnarios and/or questions, basin priorities will be established at the watershed or sub-watershed scale.

Task 3. Identify potential roadblocks to the implementation of basin priorities.

Task 4. Identify short (1-5 years) and long term (5-10 years) basin water quality management priorities.

Objective 5. Educate and inform the public as to the basin issues that were used to develop the goals, objects and priorities described in the Basin Plan.

Task 1. Define information and education goals and objectives based on the stakeholder representation.

Task 2. Identify and analyze the target audience.

Task 3. Create and package the message.

Task 4. Distribute the message by using methods and/or focus groups as the BSAG and BTAG determines most effective (e.g. media outlets, public meetings, etc.).

Task 5. Create evaluation criteria and a schedule to determine effectiveness, update content, and make changes.

Objective 6. Develop five year Basin Plan.

Task 1. Using the outline provided in Appendix A as a template, develop a 5-year Basin Plan. The Basin Plan will describe the programs, projects and activities that, when implemented, will address priority water quality problems and issues in the basin. The Basin Plan should also include milestones for implementation and identify performance criteria for meeting basin goals.

Objective 7. Secure financial support and implement priority programs, projects and activities in the basin.

Task 1. Compile list of potential funding sources from federal, state, local, nonprofit, and industry organizations.

Task 2. Identify sponsors for the implementation of priority programs, projects and activities in the basin.

Task 3. Work with sponsors to secure funding for the implementation of programs, project and activities indentified in the Basin Plan.

Objective 8. Evaluate progress in meeting the Phase 1 Basin Plan goals, objectives and tasks.

Task 1. Determine the extent of implementation of priority projects.

Task 2. Complete a summary of Basin Plan implementation progress, including a description of lessons learned, financial issues, and project improvements.

Phase 2 Goal – Long Term Implementation, Support, and Revision of Basin Plan

The goal of Phase 2 is to provide ongoing updates to the Basin Plan based on ARM, the summary of Phase 1 progress (see Phase 1 Goal, Objective 8), and long term support for assessment and implementation projects identified as priorities in the Basin Plan. This will be accomplished by making any necessary modifications to the BSAGs and/or BTAGs, revising watershed priorities, if needed, identifying additional data gaps and educational needs, and continued support of priority projects. To assure these objectives are met, basin monitoring and assessment will be conducted to evaluate the progress of the Basin Plan.

Basin Plan Template

River Basin Water Quality Management Plan Outline

A. Introduction

1) Overview of the basin, major industries, landuse, etc.
2) Identify current state or locally driven water quality monitoring activities in the basin
3) Describe the relationship/interaction of the basin plan with the statewide Basin Framework and other Programs addressing water quality.
4) Summarize the purpose/focus of the basin plan

B. Basin Description

1) General description of the basin - landuse, industries, waterbody types, population, cities, land ownership, etc.
2) Current and state/federal/local programs focused on water quality restoration and assessment. (e.g., USDA Programs, state & local monitoring programs, 319 projects)
3) Current water quality and beneficial use conditions

C. Beneficial Use Impairments and Pollution Sources and Causes

1) Identify documented beneficial use impairments (e.g., listed waterbodies, TMDLs)
2) Point Sources – Identify sources and types of point source pollution, associated beneficial use impairments, and industry in the state. Also identify known solutions
3) Nonpoint Sources - Identify sources and types of NPS pollution; associated beneficial use impairments; and related industries in the state. Also identify known solutions.
4) Identify emerging or potential point/nonpoint source pollution sources and causes

D. Management Plan Purpose

1) Describe the goals and objectives of the Plan

E. Advisory Committees and Partnerships

1) Describe interaction with other state/local/federal agencies, NGO's and other entities to coordinate and/or pool financial and technical resources focused on water quality management
2) Identify membership on the Statewide Pollution Management Task Force and describe roles and responsibilities in the review of statewide Also describe the Task Force role in the review of basin-specific plans and projects.
3) Describe potential membership on the BSAGs and BTAGs and the roles these groups play in the development and implementation of the basin-specific management plans and local projects within the basins.

F. Water Quality Management Goals and Priorities

1) Identify basin-wide pollution priorities; subwatershed priorities for assessment and restoration; healthy watersheds priorities and land management priorities.
2) Set goals for priorities and establish milestones for gauging progress toward those goals
3) Describe process for soliciting and selecting assessment, restoration or protection projects in the basin

G. Assessment, Restoration and Protection Initiatives

1) Identify Basin and Local Assessment Projects and Prioritization and Planning Programs. The QAPPs and budgets can be attached in the appendices of the Plan
2) Identify Watershed Restoration and Protection projects and Basin-wide Actions and Programs. The PIPs, QAPPs and budgets can be attached in the Plan appendix

H. Public Out-Reach and Education

1) Describe the strategy for basin and local level public out-reach.
2) Identify basin and local level public education programs for the 5-year period. The PIPs and budgets can be attached in the Plan appendix

I. Milestones for Gauging Implementation Progress

1) Table displaying the 5-year and interim milestones and outputs for local projects and basin-wide activities supported under the plan

J. Financial and Technical Support

1) Identify financial and technical assistance available through the NDDEQ and describe the processes for soliciting assistance to support basin plans/projects.

2) Identify and describe other local, state and federal sources for financial and/or technical support for water quality improvement projects.

K. Evaluation and Reporting

1) Describe annual reporting requirements and performance measures at the basin and local levels.

2) Identify responsibilities and timelines for reporting monitoring and evaluation results to the BSAGs, NDDEQ, local residents and project partners.

PART IX. Appendix C: Standards of Quality for Waters of the State of North Dakota

CHAPTER 33.1-16-02.1

STANDARDS OF QUALITY FOR WATERS OF THE STATE

Section

33.1-16-02.1-01. Authority.

These rules are promulgated pursuant to North Dakota Century Code chapters 61-28 and 23.1-11; specifically, sections 61-28-04 and 23.1-11-05, respectively.

History: Effective January 1, 2019.
General Authority: NDCC 61-28-04; S.L. 2017, ch. 199, § 1 **Law Implemented:** NDCC 23.1-11, 61-28; S.L. 2017, ch. 199, § 26

33.1-16-02.1-02. Purpose.

1. The purposes of this chapter are to establish a system for classifying waters of the state; provide standards of water quality for waters of the state; and protect existing and potential beneficial uses of waters of the state.

2. The state and public policy is to maintain or improve, or both, the quality of the waters of the state and to maintain and protect existing uses. Classifications and standards are established for the protection of public health and environmental resources and for the enjoyment of these waters, to ensure the propagation and well-being of resident fish, wildlife, and all biota associated with, or dependent upon, these waters; and to safeguard social, economical, and industrial development. Waters not being put to use shall be protected for all reasonable uses for which these waters are suitable. All known and reasonable methods to control and prevent pollution of the waters of this state are required, including improvement in quality of these waters, when feasible.

   a. The "quality of the waters" shall be the quality of record existing at the time the first standards were established in 1967, or later records if these indicate an improved quality. Waters with existing quality that is higher than established standards will be maintained at the higher quality unless affirmatively demonstrated, after full satisfaction of the intergovernmental coordination and public participation provisions of the continuing planning process, that a change in quality is necessary to accommodate important social or economic development in the area in which the waters are located. In allowing the lowering of existing quality, the department shall assure that existing uses are fully protected and that the highest statutory and regulatory requirements for all point sources and cost-effective and reasonable best management practices for nonpoint sources are achieved.

b. Waters of the state having unique or high-quality characteristics that may constitute an outstanding state resource shall be maintained and protected.

c. Any public or private project or development which constitutes a source of pollution shall provide the best degree of treatment as designated by the department in the North Dakota pollutant discharge elimination system. If review of data and public input indicates any detrimental water quality changes, appropriate actions will be taken by the department following procedures approved by the environmental protection agency. (North Dakota Antidegradation Implementation Procedure, Appendix IV.)

History: Effective January 1, 2019.
General Authority: NDCC 61-28-04, 61-28-05; S.L. 2017, ch. 199, § 1

Law Implemented: NDCC 23.1-11, 61-28-04; S.L. 2017, ch. 199, § 26

33.1-16-02.1-03. Applicability.

Nothing in this chapter may be construed to limit or interfere with the jurisdiction, duties, or authorities of other North Dakota state agencies.

History: Effective January 1, 2019.
General Authority: NDCC 61-28-04; S.L. 2017, ch. 199, § 1

Law Implemented: NDCC 23.1-11, 61-28; S.L. 2017, ch. 199, § 26

33.1-16-02.1-04. Definitions.

The terms used in this chapter have the same meaning as in North Dakota Century Code chapter 61-28, except:

1. "Acute standard" means the one-hour average concentration does not exceed the listed concentration more than once every three years.

2. "Best management practices" are methods, measures, or procedures selected by the department to control nonpoint source pollution. Best management practices include structural and nonstructural measures and operation and maintenance procedures.

3. "Chronic standard" means the four-day average concentration does not exceed the listed concentration more than once every three years.

4. "Consecutive thirty-day average" is the average of samples taken during any consecutive thirty-day period. It is not a requirement for thirty consecutive daily samples.

5. "Department" means the department of environmental quality.

6. A standard defined as "dissolved" means the total quantity of a given material present in a filtered water sample, regardless of the form or nature of its occurrence.

7. "Eutrophication" means the process of enrichment of rivers, streams, lakes, reservoirs, and wetlands with nutrients needed to maintain primary production.

8. "Nutrients" mean the chemical elements, primarily nitrogen and phosphorus, which are critical to the growth of aquatic plants and animals.

9. "Pollution" means such contamination, or other alteration of the physical, chemical, or biological properties, of any waters of the state, including change in temperature, taste, color, turbidity, or odor. Pollution includes discharge of any liquid, gaseous, solid, radioactive, or other substance into any waters of the state that will or is likely to create a nuisance or render such waters harmful, detrimental, or injurious to public health, safety, or welfare; domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses; or livestock, wild animals, birds, fish, or other aquatic biota.

10. "Site-specific standards" mean water quality criteria developed to reflect local environmental conditions to protect the uses of a specific water body.

11. A standard defined as "total" means the entire quantity of a given material present in an unfiltered water sample regardless of the form or nature of its occurrence. This includes both dissolved and suspended forms of a substance, including the entire amount of the substance present as a constituent of the particulate material. Total recoverable is the quantity of a given material in an unfiltered aqueous sample following digestion by refluxing with hot dilute mineral acid.

12. "Water usage". The best usage for the waters shall be those uses determined to be the most consistent with present and potential uses in accordance with the economic and social development of the area. Present principal best uses are those defined in subdivisions a, b, c, d, and e. These are not to be construed to be the only possible usages.

a. Municipal and domestic water. Waters suitable for use as a source of water supply for drinking and culinary purposes after treatment to a level approved by the department.

b. Fish and aquatic biota. Waters suitable for the propagation and support of fish and other aquatic biota and waters that will not adversely affect wildlife in the area. Low flows or natural physical and chemical conditions in some waters may limit their value for fish propagation or aquatic biota.

c. Recreation. Primary recreational waters are suitable for recreation where direct body contact is involved, such as bathing and swimming, and where secondary recreational activities such as boating, fishing, and wading are involved. Natural high turbidities in some waters and physical characteristics of banks and streambeds of many streams are factors that limit their value for bathing.

d. Agricultural uses. Waters suitable for irrigation, stock watering, and other agricultural uses, but not suitable for use as a source of domestic supply for the farm unless satisfactory treatment is provided.

e. Industrial water. Waters suitable for industrial purposes, including food processing, after treatment. Treatment may include that necessary for prevention of boiler scale and corrosion.

History: Effective January 1, 2019.
General Authority: NDCC 61-28-04, 61-28-05; S.L. 2017, ch. 199, § 1

Law Implemented: NDCC 23.1-11, 61-28; S.L. 2017, ch. 199, § 26

33.1-16-02.1-05. Variances and compliance schedules.

Upon written application by the responsible discharger, the department finds that by reason of substantial and widespread economic and social impacts the strict enforcement of state water quality criteria is not feasible, the department can permit a variance to the water quality standard for the affected segment. The department can set conditions and time limitations with the intent that progress toward improvements in water quality will be made. This can include interim criteria which must be reviewed at least once every three years. A variance will be granted only after fulfillment of the approved requirements at 40 CFR section 131.14, including public participation requirements and environmental protection agency approval. A variance will not preclude an existing use.

A North Dakota pollutant discharge elimination system permit may contain a schedule to return a permittee to compliance with water quality based effluent limits consistent with federal and state regulations. Compliance schedules in North Dakota pollutant discharge elimination system permits are subject to the requirements of section 33.1-16-01-15 and cannot be issued for new discharges or sources.

History: Effective January 1, 2019.
General Authority: NDCC 61-28-04, 61-28-05; S.L. 2017, ch. 199, § 1 **Law Implemented:** NDCC 23.1-11, 61-28; S.L. 2017, ch. 199, § 26

33.1-16-02.1-06. Severability.

The rules contained in this chapter are severable. If any rules, or part thereof, or the application of such rules to any person or circumstance are declared invalid, that invalidity does not affect the validity of any remaining portion of this chapter.

History: Effective January 1, 2019.
General Authority: NDCC 61-28-04; S.L. 2017, ch. 199, § 1 **Law Implemented:** NDCC 23.1-11, 61-28; S.L. 2017, ch. 199, § 26

33.1-16-02.1-07. Classification of waters of the state.

General. Classification of waters of the state shall be used to maintain and protect the present and future beneficial uses of these waters. Classification of waters of the state shall be made or changed whenever new or additional data warrant the classification or a change of an existing classification.

History: Effective January 1, 2019.
General Authority: NDCC 61-28-04; S.L. 2017, ch. 199, § 1

Law Implemented: NDCC 23.1-11, 61-28; S.L. 2017, ch. 199, § 26

33.1-16-02.1-08. General water quality standards.

1. **Narrative standards.**

a. The following minimum conditions are applicable to all waters of the state except for class II ground waters. All waters of the state shall be:

(1) Free from substances attributable to municipal, industrial, or other discharges or agricultural practices that will cause the formation of putrescent or otherwise objectionable sludge deposits.

(2) Free from floating debris, oil, scum, and other floating materials attributable to municipal, industrial, or other discharges or agricultural practices in sufficient amounts to be unsightly or deleterious.

(3) Free from materials attributable to municipal, industrial, or other discharges or agricultural practices producing color, odor, or other conditions to such a degree as to create a nuisance or render any undesirable taste to fish flesh or, in any way, make fish inedible.

(4) Free from substances attributable to municipal, industrial, or other discharges or agricultural practices in concentrations or combinations which are toxic or harmful to humans, animals, plants, or resident aquatic biota. For surface water, this standard will be enforced in part through appropriate whole effluent toxicity requirements in North Dakota pollutant discharge elimination system permits.

(5) Free from oil or grease residue attributable to wastewater, which causes a visible film or sheen upon the waters or any discoloration of the surface of adjoining shoreline or causes a sludge or emulsion to be deposited beneath the surface of the water or upon the adjoining shorelines or prevents classified uses of such waters.

(6) Free from nutrients attributed to municipal, industrial, or other discharges or agricultural practices, in concentrations or loadings which will cause accelerated eutrophication resulting in the objectionable growth of aquatic vegetation or algae or other impairments to the extent that it threatens public health or welfare or impairs present or future beneficial uses.

b. There shall be no materials such as garbage, rubbish, offal, trash, cans, bottles, drums, or any unwanted or discarded material disposed of into the waters of the state.

c. There shall be no disposal of livestock or domestic animals in waters of the state.

d. The department shall propose and submit to the state engineer the minimum streamflows of major rivers in the state necessary to protect the public health and welfare. The department's determination shall address the present and prospective future use of the rivers for public water supplies, propagation of fish and aquatic life and wildlife, recreational purposes, and agricultural, industrial, and other legitimate uses.

e. No discharge of pollutants, which alone or in combination with other substances, shall:

(1) Cause a public health hazard or injury to environmental resources;

(2) Impair existing or reasonable beneficial uses of the receiving waters; or

(3) Directly or indirectly cause concentrations of pollutants to exceed applicable standards of the receiving waters.

f. If the department determines that site-specific criteria are necessary and appropriate for the protection of designated uses, procedures described in the environmental protection agency's Water Quality Standards Handbook 1994 or other defensible methods may be utilized to determine maximum limits. Where natural chemical, physical, and biological characteristics result in exceedances of the limits set forth in this section, the department may derive site-specific criteria based on the natural background level or condition. All available information shall be examined, and all possible sources of a contaminant will be identified in determining the naturally occurring concentration. All site-specific criteria shall be noticed for public comment and subjected to other applicable public participation requirements prior to being adopted.

2. **Narrative biological goal.**

a. Goal. The biological condition of surface waters shall be similar to that of sites or water bodies determined by the department to be regional reference sites.

b. Definitions.

(1) "Assemblage" means an association of aquatic organisms of similar taxonomic classification living in the same area. Examples of assemblages include fish, macroinvertebrates, algae, and vascular plants.

(2) "Aquatic organism" means any plant or animal which lives at least part of its life cycle in water.

(3) "Biological condition" means the taxonomic composition, richness, and functional organization of an assemblage of aquatic organisms at a site or within a water body.

(4) "Functional organization" means the number of species or abundance of organisms within an assemblage which perform the same or similar ecological functions.

(5) "Metric" means an expression of biological community composition, richness, or function which displays a predictable, measurable change in value along a gradient of pollution or other anthropogenic disturbance.

(6) "Regional reference sites" are sites or water bodies which are determined by the department to be representative of sites or water bodies of similar type (e.g., hydrology and ecoregion) and are least impaired with respect to habitat, water quality, watershed land use, and riparian and biological condition.

(7) "Richness" means the absolute number of taxa in an assemblage at a site or within a water body.

(8) "Taxonomic composition" means the identity and abundance of species or taxonomic groupings within an assemblage at a site or within a water body.

c. Implementation. The intent of the state in adopting a narrative biological goal is solely to provide an additional assessment method that can be used to identify impaired surface waters. Regulatory or enforcement actions based solely on a narrative biological goal, such as the development and enforcement of North Dakota pollutant discharge elimination system permit limits, are not authorized. However, adequate and representative biological assessment information may be used in combination with other information to assist in determining whether designated uses are attained and to assist in determining whether new or revised chemical-specific permit limitations may be needed. Implementation will be based on the comparison of current biological conditions at a particular site to the biological conditions deemed attainable based on regional reference sites. In implementing a narrative biological goal, biological condition may be expressed through an index composed of multiple metrics or through appropriate statistical procedures.

History: Effective January 1, 2019; amended effective July 1, 2021. **General Authority:** NDCC 61-28-04; S.L. 2017, ch. 199, § 1
Law Implemented: NDCC 23.1-11, 61-28; S.L. 2017, ch. 199, § 26

33.1-16-02.1-09. Surface water classifications, mixing zones, and numeric standards.

1. **Surface water classifications.** Procedures for the classifications of streams and lakes of the state shall follow this subsection. Classifications of streams and lakes are listed in appendix I and appendix II, respectively.

a. Class I streams. The quality of the waters in this class shall be suitable for the propagation or protection, or both, of resident fish species and other aquatic biota and for swimming, boating, and other water recreation. The quality of the waters shall be suitable for irrigation, stock watering, and wildlife without injurious effects. After treatment consisting of coagulation, settling, filtration, and chlorination, or equivalent treatment processes, the water quality shall meet the bacteriological, physical, and chemical requirements of the department for municipal or domestic use.

b. Class IA streams. The quality of the waters in this class shall be the same as the quality of class I streams, except that where natural conditions exceed class I criteria for municipal and domestic use, the availability of softening or other treatment methods may be considered in determining whether ambient water quality meets the drinking water requirements of the department.

The Sheyenne River from its headwaters to one-tenth mile downstream from Baldhill Dam is not classified for municipal or domestic use.

c. Class II streams. The quality of the waters in this class shall be the same as the quality of class I streams, except that additional treatment may be required to meet the drinking water requirements of the department. Streams in this classification may be intermittent

in nature which would make these waters of limited value for beneficial uses such as municipal water, fish life, irrigation, bathing, or swimming.

d. Class III streams. The quality of the waters in this class shall be suitable for agricultural and industrial uses. Streams in this class generally have low average flows with prolonged periods of no flow. During periods of no flow, they are of limited value for recreation and fish and aquatic biota. The quality of these waters must be maintained to protect secondary contact recreation uses (e.g., wading), fish and aquatic biota, and wildlife uses.

e. Wetlands. These water bodies, including isolated ponds, sloughs, and marshes, are to be considered waters of the state and will be protected under section 33.1-16-02.1-08.

f. Lakes and reservoirs. The type of fishery a lake or reservoir may be capable of supporting is based on the lake's or reservoir's geophysical characteristics. The capability of a lake or reservoir to support a fishery may be affected by seasonal or climatic variability or other natural occurrences, which may alter the physical and chemical characteristics of the lake or reservoir.

Class	Characteristics
1	Cold water fishery. Waters capable of supporting growth of cold water fish species (e.g., salmonids) and associated aquatic biota.
2	Cool water fishery. Waters capable of supporting natural reproduction and growth of cool water fishes (e.g., northern pike and walleye) and associated aquatic biota. These waters are also capable of supporting the growth and marginal survival of cold water species and associated biota.
3	Warm water fishery. Waters capable of supporting natural reproduction and growth of warm water fishes (e.g., largemouth bass and bluegill) and associated aquatic biota. Some cool water species may also be present.
4	Marginal fishery. Waters capable of supporting a fishery on a short-term or seasonal basis (generally a "put and take" fishery).
5	Not capable of supporting a fishery due to high salinity.

2. **Mixing zones.** North Dakota mixing zone and dilution policy is contained in appendix III.

3. **Numeric standards.**

a. Class I streams. The physical and chemical criteria for class I streams are listed in table 1 and table 2.

b. Class IA streams. The physical and chemical criteria shall be those for class I streams, with the exceptions for chloride, percent sodium, and sulfate as listed in table 1.

c. Site-specific sulfate standard. The physical and chemical criteria for the Sheyenne River from its headwaters to one-tenth of a mile downstream from Baldhill Dam shall be those for class IA streams, with the exception of sulfate as listed in table 1.

d. Class II streams. The physical and chemical criteria shall be those for class IA, with the chloride and pH as listed in table 1.

e. Class III streams. The physical and chemical criteria shall be those for class II, with the exceptions for sulfate as listed in table 1.

f. Wetlands, including isolated ponds, class 4 lakes not listed in appendix II, sloughs and marshes. The physical and chemical criteria shall be those for class III streams, with exceptions for temperature, dissolved oxygen as listed in paragraph 6 of subdivision g, and other conditions not attributable to municipal, industrial, domestic, or agricultural sources.

g. Lakes and reservoirs.

(1) The physical and chemical criteria for class I streams shall apply to all classified lakes or reservoirs listed in appendix II.

(2) In addition, a guideline for use as a goal in any lake or reservoir improvement or maintenance program is a growing season (April through November) average chlorophyll-a concentration of twenty µg/l.

(3) The temperature standard for class I streams does not apply to Nelson Lake in Oliver County. The temperature of any discharge to Nelson Lake shall not have an adverse effect on fish, aquatic biota, recreation, and wildlife.

(4) A numeric temperature standard of not greater than fifty-nine degrees Fahrenheit [15 degrees Celsius] shall be maintained in the hypolimnion of class I lakes and reservoirs during periods of thermal stratification.

(5) The numeric dissolved oxygen standard of five mg/l as a daily minimum does not apply to the hypolimnion of class III and IV lakes and reservoirs during periods of thermal stratification.

(6) The numeric dissolved oxygen standard of five mg/l as a daily minimum and the maximum temperature of eighty-five degrees Fahrenheit [29.44 degrees Celsius] shall not apply to wetlands and class 4 lakes.

(7) Lake Sakakawea must maintain a minimum volume of water of five hundred thousand-

acre feet [61,674-hectare meters] that has a temperature of fifty-nine degrees Fahrenheit [15 degrees Celsius] or less and a dissolved oxygen concentration of not less than five mg/l.

History: Effective January 1, 2019; amended effective July 1, 2021. **General Authority:** NDCC 61-28-04; S.L. 2017, ch. 199, § 1
Law Implemented: NDCC 23.1-11, 61-28; S.L. 2017, ch. 199, § 26

TABLE 1 MAXIMUM LIMITS FOR SUBSTANCES IN
OR CHARACTERISTICS OF CLASSES I, IA, II, AND III STREAMS

CAS[1] No.	**Substance or Characteristic (a = aquatic life) (b = municipal & domestic drinking water) (c = agricultural, irrigation, industrial) (d= recreation)**	**Maximum Limit**
7429905	Aluminum[2] (a)	**Acute Standard** 750 micrograms per liter (µg/l) **Chronic Standard** 87 µg/l Where the pH is equal to or greater than 7.0, and the hardness is equal to or greater than 50 mg/l as $CaCO_3$ in the receiving water after mixing, the 87 µg/l chronic total recoverable aluminum criterion will not apply, and aluminum will be regulated based on compliance with the 750 µg/l acute total recoverable aluminum criterion.

746-41-7	Ammonia (Total as N) (a)	**Acute Standard** The one-hour average concentration of total ammonia as nitrogen in mg/l does not exceed, more often than once every three years on the average, the numerical value given by the following: $$0.7249 \times \left(\frac{0.0114}{1+10^{7.204-pH}}+\frac{1.6181}{1+10^{pH-7.204}}\right) \times \mathrm{MIN}\left(51.93, 23.12 \times 10^{0.036 \times(20-\mathrm{T})}\right)$$ Where Oncorhynchus are absent; or $$\mathrm{MIN}\left(\frac{0.275}{1+10^{7.204-\mathrm{pH}}} \quad \frac{39.0}{1+10^{pH-7.204}}\right) \left(0.7249 \times \left(\frac{0.0114}{1+10^{7.204-pH}}+\frac{1.6181}{1+10^{pH-7.204}}\right) \times \left(23.12 \times 10^{0.036\times(20-T)}\right)\right)$$ Where Oncorhynchus are present **Chronic Standard** The 30-day rolling average concentration of total ammonia as nitrogen expressed in mg/l is not to exceed, more than once every three years on average, the chronic criteria magnitude calculated using the following formula: $$0.8876 \times \left(\frac{0.278}{1+10^{7.688-\mathrm{pH}}}+\frac{1.1994}{1+10^{\mathrm{pH}-7.688}}\right) \times \left(2.126 \times 10^{0.028\ \mathrm{X}\ (20-\mathrm{MAX}(\mathrm{T},7))}\right)$$ In addition, the highest four-day average within the 30-day averaging period should not be more than 2.5 times the criteria more than once in three years on average.
7440-39-3	Barium (Total) (b)	1.0 mg/l (1-day arithmetic average)
7440-42-8	Boron (Total) (c)	0.75 mg/l (30-day arithmetic average)

16887-00-6	Chloride (Total) (a, b, c)	**Class I:** 100 mg/l (30-day arithmetic average) **Class IA:** 175 mg/l (30-day arithmetic average) **Class II and Class III:** 250 mg/l (30-day arithmetic average)
7782-50-5	Chlorine Residual (Total) (a)	**Acute:** 0.019 mg/l **Chronic:** 0.011 mg/l
7782-44-7	Dissolved Oxygen (a)	5 mg/l as a daily minimum (up to 10% of representative samples collected during any 3-year period may be less than this value provided that lethal conditions are avoided)
14797-55-8	Nitrate as N[2] (a, b)	1.0 mg/l (up to 10% of samples may exceed)
14797-65-0	Nitrite as N (b)	1.0 mg/l
None	E. coli[3] (d)	Not to exceed 126 organisms per 100 ml as a geometric mean of representative samples collected during any 30-day consecutive period, nor shall more than 10 percent of samples collected during any 30-day consecutive period individually exceed 409 organisms per 100 ml. For assessment purposes, the 30-day consecutive period shall follow the calendar month. This standard shall apply only during the recreation season May 1 to September 30.
None	pH (a)	**Class I and IA:** 6.5 - 9.0 (up to 10% of representative samples collected during any 3-year period may exceed this range, provided that lethal conditions are avoided). **Class II and Class III:** 6.0 - 9.0 (up to 10% of representative samples collected during any 3-year period may exceed this range, provided that lethal conditions are avoided).
108-95-2	Phenols (Total) (b)	0.3 mg/l (organoleptic criterion) (one-day arithmetic average)
7782-49-2	Selenium in Fish[4] Flesh[5] (a)	**Egg-Ovary:** 15.1 mg/kg Dry Weight **Whole Body:** 8.5 mg/kg Dry Weight **Muscle:** 11.3 mg/kg Dry Weight
7440-23-5	Sodium (b, c)	**Class I:** 50 percent of total cations as milliequivalents per liter (mEq/l) **Class IA, II, and III:** 60 percent of total cations as mEq/l
18785-72-3	Sulfates (Total as SO_4) (b)	**Class I:** 250 mg/l (30-day arithmetic average) **Class IA and II:** 450 mg/l (30-day arithmetic average) **Class III:** 750 mg/l (30-day arithmetic average)

	Sulfates (Total as SO_4) (a, b)	**Site Specific:** 750 mg/l (maximum) applies to the Sheyenne River from its headwaters to 0.1 mile downstream from Baldhill Dam **131.10(b) requirement:** The water quality standards for the Red River and the portions of the Sheyenne River located downstream from the segment of the Sheyenne River to which the site-specific sulfate standard applies must continue to be maintained. The Sheyenne River from 0.1 mile downstream from Baldhill Dam to the confluence with the Red River shall not exceed 450 mg/l sulfate (total) 30-day arithmetic average, and the Red River shall not exceed 250 mg/l sulfate (total) 30-day arithmetic average after mixing downstream from the confluence of the Sheyenne River. Regulated pollution control efforts must be developed to achieve compliance with these water quality standards.
None	Temperature (a)	Eighty-five degrees Fahrenheit [29.44 degrees Celsius]. The maximum increase shall not be greater than five degrees Fahrenheit [2.78 degrees Celsius] above natural background conditions.
None	Combined radium 226 and radium 228 (Total) (b)	5 pCi/l (30-day arithmetic average)
None	Gross alpha particle activity, including radium 226, but excluding radon and uranium (b)	15 Ci/l (30-day arithmetic average)

[1]CAS No. is the chemical abstract service registry number. The registry database contains records for specific substances identified by the chemical abstract service.

[2]The standard for nitrates (N) is intended as benchmark concentration when stream or lake specific data is insufficient to determine the concentration that will cause excessive plant growth (eutrophication). However, in no case shall the concentration for nitrate plus nitrite N exceed 10 mg/l for any waters used as a municipal or domestic drinking water supply.

[3]Where the E. Coli criteria are exceeded and there are natural sources, the criteria may be considered attained, provided there is reasonable basis for concluding that the indicator bacteria density attributable to anthropogenic sources is consistent with the level of water quality required by the criteria. This may be the situation, for example, in headwater streams that are minimally affected by anthropogenic activities.

[4]Fish tissue elements are expressed as steady-state instantaneous measurement not to exceed the criteria in the table. When fish egg/ovary concentrations are measured, the egg/ovary criterion element supersedes any whole-body, or muscle criterion element. The fish flesh values in Table 1 and the water column criteria in Table 2 are independently applicable. Water column criterion elements that are derived site-specifically using an empirical bioaccumulation factor approach or a bioaccumulation mechanistic model approach, once duly established under the provisions of 40 CFR 131 will supersede the criteria in Table 2 and will be subordinate to fish tissue criterion elements when both fish and water concentrations are measured. Any site-specific water column criterion element established under the provisions of 40 CFR 131 is the applicable criterion in the absence of fish tissue measurement, or in waters with new discharges of selenium where steady state has not been achieved between water and fish tissue at the site.

TABLE 2
WATER QUALITY CRITERIA[1] (MICROGRAMS PER LITER)

		Aquatic Life Value Classes I, IA, II, III		Human Health Value	
CAS No.	Pollutant (Compounds)	Acute	Chronic	Classes I, IA, II[2]	Class III[3]
71-55-6	1,1,1-Trichloroethane			10,000[7]	200,000
79-00-5	1,1,2-Trichloroethane[4]			0.55	8.9
79-34-5	1,1,2,2-Tetrachloroethane[4]			0.2	3
75-35-4	1,1-Dichloroethylene[4]			300	20,000
156-60-5	1,2-trans-Dichloroethylene[7]			100	4,000
120-82-1	1,2,4-Trichlorobenzene			0.071	0.076
95-50-1	1,2-Dichlorobenzene[7]			1,000	3,000
541-73-1	1,3-Dichlorobenzene			7	10
106-46-7	1,4-Dichlorobenzene[7]			300	900
107-06-2	1,2-Dichloroethane[4]			9.9	650
78-87-5	1,2-Dichloropropane			0.90	31
542-75-6	1,3-Dichloropropylene (1,3-Dichloropropene) (cis and trans isomers)			0.27	12
122-66-7	1,2-Diphenylhydrazine[4]			0.03	0.20
121-14-2	2,4-Dinitrotoluene[4]			0.049	1.7
95-57-8	2-Chlorophenol			30	800
120-83-2	2,4-Dichlorophenol			10	60
88-06-2	2,4,6-Trichlorophenol[4]			1.5	2.8
91-58-7	2-Chloronaphthalene			800	1,000
91-94-1	3,3'-Dichlorobenzidine[4]			0.049	0.15
105-67-9	2,4-Dimethylphenol			100	3,000
51-28-5	2,4-Dinitrophenol			10	300
94-75-7	2,4-D			1,300	12,000
72-54-8	4,4'-DDD[4]			0.00012	0.00012
75-55-9	4,4'-DDE[4]			0.000018	0.000018
50-29-3	4,4'-DDT[4]	0.55[12]	0.001[12]	0.000030	0.000030
534-52-1	2-Methyl-4,6-Dinitrophenol			2	30
59-50-7	3-Methyl-4-Chlorophenol			500	2,000
83-32-9	Acenaphthene			70	90
107-02-8	Acrolein	3	3	3	400
107-13-1	Acrylonitrile[4]			0.061	7.0
15972-60-8	Alachlor			2[7]	
309-00-2	Aldrin[4]	1.5		7.7E-07	7.7E-07
319-84-6	alpha-BHC[4] (Hexachlorocyclohexane-alpha)			0.00036	0.00039
319-85-7	beta-BHC[4] (Hexachlorocyclohexane-beta)			0.008	0.014
58-89-9	gamma-BHC (Lindane)[4] (Hexachlorocyclohexane-gamma)	0.95		4.2[7]	4.4

959-98-8	alpha-Endosulfan	0.11[11]	0.056[11]	20	30
33213-65-9	beta-Endosulfan	0.11[11]	0.056[11]	20	40
120-12-7	Anthracene (PAH)[5]			300	400
1332-21-4	Asbestos[4,7]			7,000,000 f/l	7,000,000 f/l
1912-24-9	Atrazine			3[7]	
71-43-2	Benzene[4]			2.1	58
92-87-5	Benzidine[4]			0.00014	0.011
56-55-3	Benzo(a)anthracene (PAH)[4] (1,2-Benzanthracene)			0.0012	0.0013
50-32-8	Benzo(a)pyrene (PAH)[4] (3,4-Benzopyrene)			0.00012	0.00013
205-99-2	Benzo(b)fluoranthene (PAH)[4] (3,4-Benzofluoranthene)			0.0012	0.0013
207-08-9	Benzo(k)fluoranthene (PAH)[4] (11,12-Benzofluoranthene)			0.012	0.013
12587-47-2	Beta/photon emitters			4 mrem/yr[7]	
111-44-4	Bis(2-chloroethyl) ether[4]			0.030	2.2
108-60-1	Bis(2-chloro-1-Methylethyl) ether			200	4,000
117-81-7	Bis(2-ethylhexyl) phthalate[4]			0.32	0.37
15541-45-4	Bromate			10[7]	
75-25-2	Bromoform (HM)[5] (Tribromomethane)			7.0	120
85-68-7	Butyl benzyl phthalate			0.10	0.10
63-25-2	Carbaryl (1-naphthyl-N-methycarbamate)	2.1	2.1		
1563-66-2	Carbofuran			40[7]	
56-23-5	Carbon tetrachloride[4] (Tetrachloromethane)			0.40	5
57-74-9	Chlordane[4]	1.2	0.0043	0.00031	0.00032
14998-27-7	Chlorite			1,000[7]	
108-90-7	Chlorobenzene (Monochlorobenzene)			100[7]	800
124-48-1	Chlorodibromomethane (HM)[5]			0.80	21
67-66-3	Chloroform (HM)[4] (Trichloromethane)			60	2,000
2921-88-2	Chlorpyrifos	0.083	0.041		
218-01-9	Chrysene (PAH)[4]			0.12	0.13
57-12-5	Cyanide (total)	22	5.2	4	400
75-99-0	Dalapon			200[7]	
103-23-1	Di(2-ethylhexyl)adipate			400[7]	
333-41-5	Diazinon	0.17	0.17		
53-70-3	Dibenzo(a,h)anthracene (PAH)[4] (1,2,5,6-Dibenzanthracene)			0.00012	0.00013
67708-83-2	Dibromochloropropane			0.2[7]	
75-27-4	Dichlorobromomethane (HM)[5]			0.95	27
156-59-2	Dichloroethylene (cis-1,2-)			70[7]	
60-57-1	Dieldrin[4]	0.24	0.056	1.2E-06	1.2E-06
84-66-2	Diethyl phthalate			600	600

131-11-3	Dimethyl phthalate			2,000	2,000
84-74-2	Di-n-butyl phthalate			20	30
88-85-7	Dinoseb			7[7]	
1746-01-6	Dioxin (2,3,7,8-TCDD)[4]			5.00E-09	5.10E-09
85-00-7	Diquat			20[7]	
1031-07-8	Endosulfan sulfate			20	40
145-73-3	Endothall			100[7]	
72-20-8	Endrin	0.086	0.036	0.03	0.03
7421-93-4	Endrin aldehyde			1	1
100-41-4	Ethylbenzene[7]			68	130
106-93-4	Ethylene dibromide (EDB)			0.05[7]	
206-44-0	Fluoranthene			20	20
86-73-7	Fluorene (PAH)[5]			50	70
1071-83-6	Glyphosate			700[7]	
	Halocetic acids[14]			60[7]	
1024-57-3	Heptachlor epoxide[4]	0.26	0.0038	0.000032	0.000032
76-44-8	Heptachlor[4]	0.26	0.0038	0.0000059	0.0000059
118-74-1	Hexachlorobenzene[4]			0.000079	0.000079
87-68-3	Hexachlorobutadiene[4]			0.01	0.01
77-47-4	Hexachlorocyclopentadiene			4	4
67-72-1	Hexachloroethane[4]			0.10	0.10
193-39-5	Indeno(1,2,3-cd) pyrene (PAH)[4]			0.0012	0.0013
78-59-1	Isophorone[4]			34	1,800
72-43-5	Methoxychlor			0.02	0.02
74-83-9	Methyl bromide (HM) (Bromomethane)			100	10,000
75-09-2	Methylene chloride (HM)[4] (Dichloromethane)			20	1,000
98-95-3	Nitrobenzene			10	600
62-75-9	N-Nitrosodimethylamine[4]			0.00069	3
621-64-7	N-Nitrosodi-n-propylamine[4]			0.005	0.51
86-30-6	N-Nitrosodiphenylamine[4]			3.3	6
84852-15-3	Nonylphenol (Isomer mixture)[13]	28	6.6		
23135-22-0	Oxamyl (Vydate)			200[7]	
56-38-2	Parathion	0.065	0.013		
53469-21-9	PCB-1242 (Arochlor 1242)[4]		0.014[10]	0.000064[10]	0.000064[10]
126764-11-2	PCB-1016 (Arochlor 1016)[4]		0.014[10]	0.000064[10]	0.000064[10]
11104-28-2	PCB-1221 (Arochlor 1221)[4]		0.014[10]	0.000064[10]	0.000064[10]
11141-16-5	PCB-1232 (Arochlor 1232)[4]		0.014[10]	0.000064[10]	0.000064[10]
12672-29-6	PCB-1248 (Arochlor 1248)[4]		0.014[10]	0.000064[10]	0.000064[10]
11097-69-1	PCB-1254 (Arochlor 1254)[4]		0.014[10]	0.000064[10]	0.000064[10]
11096-82-5	PCB-1260 (Arochlor 1260)[4]		0.014[10]	0.000064[10]	0.000064[10]
87-86-5	Pentachlorophenol	19[8]	15[8]	0.03	0.04

108-95-2	Phenol			4,000	300,000
1918-02-1	Picloram			500[7]	
129-00-0	Pyrene (PAH)[5]			20	30
122-34-9	Simazine			4[7]	
100-42-5	Styrene			100[7]	
127-18-4	Tetrachloroethylene[4]			10	29
108-88-3	Toluene			57	520
8001-35-2	Toxaphene[4]	0.73	0.0002	0.0007	0.00071
688-73-3	Tributyltin	0.46	0.072		
79-01-6	Trichloroethylene[4]			0.60	7
75-01-4	Vinyl chloride[4] (Cloroethylene)			0.022	1.6
1330-20-7	Xylenes			10,000[7]	
		Aquatic Life Value Classes I, IA, II, III		Human Health Value	
CAS No.	Pollutant (Elements)	Acute	Chronic	Classes I, IA, II[2]	Class III[3]
7440-36-0	Antimony			5.6	640
7440-38-2	Arsenic[7]	340[9]	150[9]	10[7]	
7440-41-7	Beryllium[4]			4[7]	
7440-43-9	Cadmium	1.8[6,15]	0.72[6,15]	5[7]	
16065-83-1	Chromium (III)	1,800[6,15]	86[6,15]	100(total)[7]	
18540-29-9	Chromium (VI)	16	11	100(total)[7]	
7440-50-8	Copper	14.0[6,15,16]	9.3[6,15,16]	1000	
7782-41-4	Fluoride			4,000[7]	
7439-92-1	Lead	82[6]	3.2[6]	15[7]	
7439-97-6	Mercury	1.7	0.012	0.050	0.051
7440-02-0	Nickel	470[6,15]	52[6,15]	100[7]	4,200
7782-49-2	Selenium	20	5	50[7]	
7440-22-4	Silver	3.8[6,15]			
7440-28-0	Thallium			0.24	0.47
7440-61-1	Uranium			30[7]	
7440-66-6	Zinc	120[6,15]	120[6,15]	7,400	26,000

[1]Except for the aquatic life values for metals, the values given in this appendix refer to the total (dissolved plus suspended) amount of each substance. For the aquatic life values for metals, the values refer to the total recoverable method for ambient metals analyses.

[2]Based on two routes of exposure - ingestion of contaminated aquatic organisms and drinking water.

[3]Based on one route of exposure - ingestion of contaminated aquatic organisms only.

[4]Substance classified as a carcinogen, with the value based on an incremental risk of one additional instance of cancer in one million persons.

[5]Chemicals which are not individually classified as carcinogens but which are contained within a class of chemicals, with carcinogenicity as the basis for the criteria derivation for that class of chemicals; an individual carcinogenicity assessment for these chemicals is pending.

[6]Hardness dependent criteria. Value given is an example only and is based on a CaCO3 concentration of 400 mg/l. Criteria for each case must be calculated using the following formula:

For the Criterion Maximum Concentration (CMC):

Cadmium	CMC $=e^{0.9789[\ln (\text{hardness})]-3.866}$
Chromium (III)	CMC $= e^{0.8190[\ln (\text{hardness})] + .7256}$
Copper	CMC $= e^{0.9422[\ln (\text{hardness})] -1.7000}$
Lead	CMC $= e^{1.2730[\ln (\text{hardness})] - 1.4600}$
Nickel	CMC $= e^{0.8460[\ln (\text{hardness})] + 2.2550}$
Silver	CMC $= e^{1.7200[\ln (\text{hardness})] - 6.5900}$
Zinc	CMC $= e^{0.8473[\ln (\text{hardness})] + 0.8840}$

CMC = Criterion Maximum Concentration (acute exposure value)
The threshold value at or below which there should be no unacceptable effects to freshwater aquatic organisms and their uses if the one-hour concentration does not exceed that CMC value more than once every three years on the average.

For the Criterion Continuous Concentration (CCC):

Cadmium	CCC $= e^{0.7977[\ln (\text{hardness})]-3.909}$
Chromium (III)	CCC $= e^{0.8190[\ln (\text{hardness})] + 0.6848}$
Copper	CCC $= e^{0.8545[\ln (\text{hardness})] - 1.7020}$
Lead	CCC $= e^{1.2730[\ln (\text{hardness})] - 4.7050}$
Nickel	CCC $= e^{0.8460[\ln (\text{hardness})] + 0.0584}$
Silver	No CCC criterion for silver
Zinc	CCC $= e^{0.8473[\ln (\text{hardness})] + 0.8840}$

CCC = Criterion Continuous Concentration (chronic exposure value)
The threshold value at or below which there should be no unacceptable effects to freshwater aquatic organisms and their uses if the four-day concentration does not exceed that CCC value more than once every three years on the average.

[7]Safe Drinking Water Act (MCL).

[8]Freshwater aquatic life criteria for pentachlorophenol are expressed as a function of pH. Values displayed in the table correspond to a pH of 7.8 and are calculated as follows:

CMC =exp [1.005 (pH) - 4.869]   CCC = exp [1.005 (pH) - 5.134]

[9]This criterion applies to total arsenic.

[10]This criterion applies to total PCBs (i.e., the sum of all congener or all isomer or homolog or Arochlor analyses).

[11]This criterion applies to the sum of alpha-endosulfan and beta-endosulfan.

[12]This criterion applies to DDT and its metabolites (i.e., the total concentration of DDT and its metabolites should not exceed this value).

[13]The nonylphenol criteria address CAS numbers 84852-15-3 and 25154-52-3.

[14]The criterion is for a total measurement of 5 haloacetic acids, dichloroacetic acid, trichloroacetic acid, monochloroacetic acid, bromoacetic acid, and dibromoacetic acid.

[15]Hardness values shall be no greater than 400 mg/l. For waters with hardness concentrations greater than 400 mg/l, the actual ambient hardness may be used where a site-specific water effect ratio has been determined consistent with the environmental protection agency's water effect ratio procedure.

[16]The department will recognize the biotic ligand model as an appropriate tool for developing site-specific limits for copper as well as the water-effects ratio (WER) method.

33.1-16-02.1-10. Ground water classifications and standards.

1. Class I ground waters. Class I ground waters are those with a total dissolved solids concentration of less than 10,000 mg/l. The minimum conditions described in subsection 1 of section 33.1-16-02.1-08 apply. Class I ground waters are not exempt under the North Dakota underground injection control program in section 33.1-25-01-05.

2. Class II ground waters. Class II ground waters are those with a total dissolved solids concentration of 10,000 mg/l or greater. Class II ground waters are exempt under the North Dakota underground injection control program in section 33.1-25-01-05.

History: Effective January 1, 2019.
General Authority: NDCC 61-28-04, 61-28-05; S.L. 2017, ch. 199, § 1
Law Implemented: NDCC 61-28-04

33.1-16-02.1-11. Discharge of wastes.

On-surface discharges. The following are general requirements for all waste discharges or chemical additions:

1. No untreated domestic sewage shall be discharged into the waters of the state.

2. No untreated industrial wastes or other wastes which contain substances or organisms which may endanger public health or degrade the water quality of water usage shall be discharged into the waters of the state.

3. The department must be notified at least twenty days prior to the application of any herbicide or pesticide to surface waters of the state for control of aquatic pests. Only certified applicators are allowed to apply chemicals. The notification must include the following information:

    a. Chemical name and composition.

    b. Map which identifies the area of application and aerial extent (e.g., acres or square feet).

    c. A list of target species of aquatic biota the applicant desires to control.

    d. The calculated concentration of the active ingredient in surface waters immediately after application.

    e. Name, address, and telephone number of the certified applicator.

4. Any spill or discharge of waste which causes or is likely to cause pollution of waters of the state must be reported immediately. The owner, operator, or person responsible for a spill or discharge must notify the department as soon as possible by telephoning 1-833-99SPILL (1833-997-7455) or on the website www.spill.nd.gov and provide all relevant information about the spill. The owner or operator is required to:

    a. Take immediate remedial measures appropriate for the severity of the spill;

    b. Determine the extent of pollution to waters of the state;

c. Provide alternate water sources to water users impacted by the spill or accidental discharge;

d. Provide on request any documents, reports, or other information relevant to the spill or discharge; or

e. Any other actions necessary to comply with this chapter.

History: Effective January 1, 2019; amended effective July 1, 2021. **General Authority:** NDCC 61-28-04; S.L. 2017, ch. 199, § 1
Law Implemented: NDCC 23.1-11, 61-28; S.L. 2017, ch. 199, § 26

APPENDIX I

STREAM CLASSIFICATIONS

The following intrastate and interstate streams are classified as the class of water quality which is to be maintained in the specified stream or segments noted. All tributaries, minor or intermittently flowing watercourse, unnamed creeks, or draws not specifically mentioned are classified as class III streams.

RIVER BASINS, SUBBASINS, TRIBUTARIES	CLASSIFICATION
Missouri River, including Lake Sakakawea and Oahe Reservoir	I
Yellowstone	I
Little Muddy Creek near Williston	II
White Earth River	II
Little Missouri River	II
Knife River	II
Spring Creek	IA
Square Butte Creek below Nelson Lake	IA
Heart River	IA
Green River	IA
Antelope Creek	II
Muddy Creek	II
Apple Creek	II
Cannonball River	II
Cedar Creek	II
Beaver Creek near Linton	II
Grand River	IA
Spring Creek	II
Souris River	IA
Des Lacs River	II
Willow Creek	II
Deep River	III
Mauvais Coulee	I
James River	IA
Pipestem	IA
Cottonwood Creek	II
Beaver Creek	II

RIVER BASINS, SUBBASINS, TRIBUTARIES	CLASSIFICATION
Elm River	II
Maple River	II
Bois de Sioux	I
Red River	I
Wild Rice River	II
Antelope Creek	III
Sheyenne River (except as noted below)	IA
Baldhill Creek	II
Maple River	II
Rush River	III
Elm River	II
Goose River	IA
Turtle River	II
Forest River	II
North Branch of Forest River	III
Park River	II
North Branch	III
South Branch	II
Middle Branch	III
Cart Creek	III
Pembina River	IA
Tongue River	II

The Sheyenne River from its headwaters to 0.1 mile downstream from Baldhill Dam is not classified for municipal or domestic use.

APPENDIX II

LAKE AND RESERVOIR CLASSIFICATION

Lakes and reservoirs are classified according to the water characteristics which are to be maintained in the specified lakes and reservoirs. The physical and chemical criteria for class I streams shall apply to all classified lakes and reservoirs listed. For lakes and other lentic water bodies not listed, the physical and chemical criteria designated for class III streams shall apply.

COUNTY	LAKE	CLASSIFICATION
Adams	Mirror Lake	3
Adams	N. Lemmon Lake	1
Barnes	Lake Ashtabula	3
Barnes	Moon Lake	2
Barnes	Clausen Springs	3
Benson	Wood Lake	2
Benson	Graves	3
Benson	Reeves	3
Bottineau	Lake Metigoshe	2
Bottineau	Long Lake	2
Bottineau	Pelican Lake	3
Bottineau	Carbury Dam	2
Bottineau	Cassidy Lake	4
Bottineau	Strawberry Lake	2
Bowman	Bowman-Haley Dam	3
Bowman	Gascoyne Lake	3
Bowman	Kalina Dam	3
Bowman	Lutz Dam	2
Bowman	Spring Lake	3
Burke	Powers Lake	3
Burke	Short Creek Dam	2
Burke	Smishek Dam	2
Burke	Northgate Dam	2
Burleigh	McDowell Dam	3
Burleigh	Mitchell Lake	3
Burleigh	New Johns Lake	2
Cass	Casselton Reservoir	3
Cass	Brewer Lake	2
Cavalier	Mt. Carmel Dam	2
Dickey	Moores Lake	3

Dickey	Pheasant Lake	3
Dickey	Wilson Dam	3
Divide	Baukol-Noonan Dam	2
Divide	Baukol-Noonan East Mine Pond	2
Divide	Skjermo Dam	2
Dunn	Lake Ilo	3
Eddy	Battle Lake	3
Eddy	Warsing Dam	3
Emmons	Braddock Dam	3
Emmons	Nieuwsma Dam	2
Emmons	Rice Lake	3
Foster	Juanita Lake	3
Golden Valley	South Buffalo Gap Dam	4
Golden Valley	Camel Hump Dam	1
Golden Valley	Odland Dam	3
Grand Forks	Fordville Dam	2
Grand Forks	Kolding Dam	3
Grand Forks	Larimore Dam	2
Grand Forks	Niagara Dam	3
Grant	Heart Butte Dam (Lake Tschida)	2
Grant	Niagara Dam	3
Grant	Raleigh Reservoir	2
Grant	Sheep Creek Dam	2
Griggs	Carlson-Tande Dam	3
Griggs	Red Willow Lake	2
Hettinger	Blickensderfer Dam	2
Hettinger	Castle Rock Dam	4
Hettinger	Indian Creek	2
Hettinger	Larson Lake	3
Hettinger	Mott Watershed Dam	3
Kidder	Alkaline Lake	2
Kidder	Cherry Lake	3
Kidder	Crystal Springs	3
Kidder	Frettim Lake	2
Kidder	George Lake	5

Kidder	Horsehead Lake	2
Kidder	Lake Isabel	3
Kidder	Lake Josephine	2
Kidder	Lake Williams	3
Kidder	Round Lake	2
LaMoure	Heinrich-Martin Dam	3
LaMoure	Kalmbach Lake	3
LaMoure	Kulm-Edgeley Dam	3
LaMoure	Lake LaMoure	3
LaMoure	Lehr Dam	3
LaMoure	Limesand-Seefeldt Dam	3
LaMoure	Schlecht-Thom Dam	3
LaMoure	Schlecht-Weix Dam	3
Logan	Beaver Lake	3
Logan	Mundt Lake	3
Logan	Rudolph Lake	3
McHenry	Cottonwood Lake	3
McHenry	George Lake	3
McHenry	Round Lake	3
McHenry	Buffalo Lodge Lake	3
McIntosh	Blumhardt Dam	2
McIntosh	Clear Lake	3
McIntosh	Coldwater Lake	3
McIntosh	Dry Lake	2
McIntosh	Green Lake	2
McIntosh	Lake Hoskins	3
McKenzie	Arnegard Dam	4
McKenzie	Leland Dam	2
McKenzie	Sather Dam	2
McLean	Brush Lake	3
McLean	Crooked Lake	3
McLean	Custer Mine Pond	2
McLean	East Park Lake	2
McLean	Lake Audubon	2
McLean	Lake Brekken	2
McLean	Lake Holmes	2

McLean	Lightning Lake	1
McLean	Long Lake	4
McLean	Riverdale Spillway Lake	1
McLean	Strawberry Lake	3
McLean	West Park Lake	2
Mercer	Harmony Lake	3
Morton	Crown Butte Dam	3
Morton	Danzig Dam	3
Morton	Fish Creek Dam	1
Morton	Harmon Lake	3
Morton	Nygren Dam	2
Morton	Sweetbriar Dam	2
Mountrail	Clearwater Lake	3
Mountrail	Stanley City Pond	3
Mountrail	Stanley Reservoir	3
Mountrail	White Earth Dam	2
Nelson	McVille Dam	2
Nelson	Tolna Dam	2
Nelson	Whitman Dam	2
Oliver	East Arroda Lake	2
Oliver	Nelson Lake	3
Oliver	West Arroda Lake	2
Pembina	Renwick Dam	3
Pierce	Balta Dam	3
Pierce	Buffalo Lake	3
Ramsey	Cavanaugh Lake	3
Ramsey	Devils Lake	2
Ransom	Dead Colt Creek Dam	3
Renville	Lake Darling	2
Richland	Lake Elsie	3
Richland	Mooreton Pond	3
Rolette	Belcourt Lake	2
Rolette	Carpenter Lake	2
Rolette	Dion Lake	2
Rolette	Gordon Lake	2
Rolette	Gravel Lake	2

Rolette	Hooker Lake	2
Rolette	Island Lake	3
Rolette	Jensen Lake	3
Rolette	School Section Lake	2
Rolette	Upsilon Lake	2
Rolette	Shutte Lake	2
Sargent	Alkali Lake	3
Sargent	Buffalo Lake	3
Sargent	Lake Tewaukon	3
Sargent	Silver Lake	3
Sargent	Sprague Lake	3
Sheridan	Hecker Lake	2
Sheridan	South McClusky Lake (Hoffer Lake)	2
Sioux	Froelich Dam	2
Slope	Cedar Lake	3
Slope	Davis Dam	2
Slope	Stewart Lake	3
Stark	Belfield Pond	1
Stark	Dickinson Dike	1
Stark	Patterson Lake	3
Steele	North Golden Lake	3
Steele	North Tobiason Lake	3
Steele	South Golden Lake	3
Stutsman	Arrowwood Lake	4
Stutsman	Bader Lake	3
Stutsman	Barnes Lake	3
Stutsman	Clark Lake	3
Stutsman	Crystal Springs	3
Stutsman	Hehn-Schaffer Lake	3
Stutsman	Jamestown Reservoir	3
Stutsman	Jim Lake	4
Stutsman	Spiritwood Lake	3
Stutsman	Pipestem Reservoir	3
Towner	Armourdale Dam	2
Towner	Bisbee Dam	2

Walsh	Bylin Dam	3
Walsh	Homme Dam	3
Walsh	Matejcek Dam	3
Ward	Hiddenwood Lake	3
Ward	Makoti Lake	4
Ward	North-Carlson Lake	3
Ward	Rice Lake	3
Ward	Velva Sportsmans Pond	1
Wells	Harvey Dam	3
Wells	Lake Hiawatha (Sykeston Dam)	4
Williams	Blacktail Dam	3
Williams	Cottonwood Lake	3
Williams	East Spring Lake Pond	3
Williams	Epping-Springbrook Dam	3
Williams	Iverson Dam	2
Williams	Kettle Lake	2
Williams	Kota-Ray Dam	1
Williams	McCleod (Ray) Reservoir	3
Williams	McGregor Dam	1
Williams	Tioga Dam	3
Williams	Trenton Lake	2
Williams	West Spring Lake Pond	3
Burleigh, Emmons, Morton, Sioux	Lake Oahe	1
Dunn, McKenzie, McLean, Mercer, Mountrail, Williams	Lake Sakakawea	1

APPENDIX III

MIXING ZONE AND DILUTION POLICY AND IMPLEMENTATION PROCEDURE

PURPOSE

This policy addresses how mixing and dilution of point source discharges with receiving waters will be addressed in developing chemical-specific and whole effluent toxicity discharge limitations for point source discharges. Depending upon site-specific mixing patterns and environmental concerns, some pollutants/criteria may be allowed a mixing zone or dilution while others may not. In all cases, mixing zone and dilution allowances shall be limited, as necessary, to protect the integrity of the receiving water's ecosystem and designated uses.

MIXING ZONES

Where dilution is available and the discharge does not mix at a near instantaneous and complete rate with the receiving water (incomplete mixing), an appropriate mixing zone may be designated. In addition, a mixing zone may only be designated if it is not possible to achieve chemical-specific standards and whole effluent toxicity objectives at the end-of-pipe with no allowance for dilution. The size and shape of a mixing zone will be determined on a case-by-case basis. At a maximum, mixing zones for streams and rivers shall not exceed one-half the cross-sectional area or a length ten times the stream width at critical low flows, whichever is more limiting. Also, at a maximum, mixing zones in lakes shall not exceed five percent of lake surface area or two hundred feet in radius, whichever is more limiting. Individual mixing zones may be limited or denied in consideration of designated beneficial uses or presence of the following concerns in the area affected by the discharge:

1. There is the potential for bioaccumulation in fish tissues or wildlife.
2. The area is biologically important, such as fish spawning/nursery areas.
3. The pollutant of concern exhibits a low acute to chronic ratio.
4. There is a potential for human exposure to pollutants resulting from drinking water use or recreational activities.
5. The effluent and resultant mixing zone results in an attraction of aquatic life to the effluent plume.
6. The pollutant of concern is extremely toxic and persistent in the environment.
7. The mixing zone would prohibit a zone of passage for migrating fish or other species (including access to tributaries).
8. There are cumulative effects of multiple discharges and their mixing zones.

Within the mixing zone designated for a particular pollutant, certain numeric water quality criteria for that substance may not apply. However, all mixing zones shall meet the general conditions set forth in section 33-16-02-08 of the state water quality standards.

While exceedances of acute chemical specific numeric standards are not allowed within the entire mixing zone, a portion of the mixing zone (the zone of initial dilution or ZID) may exceed acute chemical-specific numeric standards established for the protection of aquatic life. The ZID shall be determined on a case-by-case basis where the statement of basis for the discharge permit includes a rationale for concluding that a zone of initial dilution poses no unacceptable risks to aquatic life. Acute whole effluent toxicity (WET) limits shall be achieved at the end-of-pipe with no allowance for a ZID.

DILUTION ALLOWANCES

An appropriate dilution allowance may be provided in calculating chemical-specific acute and chronic and WET discharge limitations where: 1) the discharge is to a river or stream, 2) dilution is available at low-flow conditions, and 3) available information is sufficient to reasonably conclude that there is near instantaneous and complete mixing of the discharge with the receiving water (complete mixing). The basis for concluding that such near instantaneous and complete mixing is occurring shall be documented in the statement of basis for the North Dakota pollutant discharge elimination system permit. In the case of field studies, the dilution allowance for continuous dischargers shall be based on the critical low flow (or some portion of the critical low flow). The requirements and environmental concerns identified in the paragraphs above may be considered in deciding the portion of the critical low flow to provide as dilution. The following critical low flows shall be used for streams and effluents:

Stream Flows	
Aquatic life, chronic	4-day, 3-year flow (biologically based*)**
Aquatic life, acute	1-day, 3-year flow (biologically based)
Human health (carcinogens)	Harmonic mean flow
Human health (noncarcinogens)	4-day, 3-year flow (biologically based) or 1-day, 3-year flow (biologically based)

Effluent Flows	
Aquatic life, chronic	Mean daily flow
Aquatic life, acute	Maximum daily flow
Human health (all)	Mean daily flow

* Biologically based refers to the biologically based design flow method developed by the environmental protection agency. It differs from the hydrologically based design flow method in that it directly uses the averaging periods and frequencies specified in the aquatic life water quality criteria for individual pollutants and whole effluents for determining design flows.

** A 30-day, 10-year flow (biologically based) can be used for ammonia or other chronic standard with a 30-day averaging period.

For chemical-specific and chronic WET limits, an appropriate dilution allowance may also be provided for certain minor publicly owned treatment works where allowing such dilution will pose insignificant environmental risks. For acute WET limits, an allowance for dilution is authorized only where dilution is available, and mixing is complete.

For controlled discharges, such as lagoon facilities that discharge during high ambient flows, the stream flow to be used in the mixing zone analysis should be the lowest statistical flow expected to occur during the period of discharge.

Where a discharger has installed a diffuser in the receiving water, all or a portion of the critical low stream flow may be provided as a dilution allowance. The determination shall depend on the diffuser design and on the requirements and potential environmental concerns identified in the above paragraphs. Where a diffuser is installed across the entire river/stream width (at critical low flow), it will generally be presumed that near instantaneous and complete mixing is achieved and that providing the entire critical low flow as dilution is appropriate.

OTHER CONSIDERATIONS

Where dilution flow is not available at critical conditions (i.e., the water body is dry), the discharge limits will be based on achieving applicable water quality criteria (i.e., narrative and numeric, chronic and acute) at the end-of-pipe; neither a mixing zone or an allowance for dilution will be provided.

All mixing zone dilution assumptions are subject to review and revision as information on the nature and impacts of the discharge becomes available (e.g., chemical or biological monitoring at the mixing zone boundary). At a minimum, mixing zone and dilution decisions are subject to review and revision, along with all other aspects of the discharge permit upon expiration of the permit.

For certain pollutants (e.g., ammonia, dissolved oxygen, metals) that may exhibit increased toxicity or other effects on water quality after dilution and complete mixing is achieved, the waste load allocation shall address such effects on water quality, as necessary, to fully protect designated and existing uses. In other words, the point of compliance may be something other than the mixing zone boundary or the point where complete mixing is achieved.

The discharge will be consistent with the Antidegradation Procedure.

IMPLEMENTATION PROCEDURE

This procedure describes how dilution and mixing of point source discharges with receiving waters will be addressed in developing discharge limitations for point source discharges. For the purposes of this procedure, a mixing zone is defined as a designated area or volume of water surrounding or downstream of a point source discharge where the discharge is progressively diluted by the receiving water and numerical water quality criteria may not apply. Based on site-specific considerations, such a mixing zone may be designated in the context of an individual permit decision. Discharges may also be provided an allowance for dilution where it is determined that the discharge mixes with the receiving water in near instantaneous and complete fashion. Such mixing zones and allowances for dilution will be granted on a parameter-by-parameter and criterion-by-criterion basis as necessary to fully protect existing and designated uses.

The procedure to be followed is composed of six individual elements or steps. The relationship of the six steps and an overview of the mixing zone/dilution procedure is shown in figure 1.

Step 1 - No dilution available during critical low-flow conditions

Where dilution flow is not available at critical low-flow conditions, discharge limitations will be based on achieving applicable narrative and numeric water quality criteria at the end-of-pipe during critical low-flow conditions.

Step 2 - Dilution categorically prohibited for wetland discharges

Permit limitations for discharges to a wetland shall be based on achieving all applicable water quality criteria (i.e., narrative and numeric, chronic and acute) at end-of-pipe.

Step 3 - Procedure for certain minor publicly owned treatment works

Minor publicly owned treatment works that discharge to a lake or to a river/stream at a dilution greater than a 50-to-1 ratio qualify for this procedure. Minor publicly owned treatment works with dilution ratios less than a 50-to-1 ratio may also qualify (at the discretion of the permit writer) where it can be adequately demonstrated that this procedure poses insignificant environmental risks. For the purposes of this procedure, the river/stream dilution ratio is defined as the chronic low flow of the segment upstream of the publicly owned treatment works discharge divided by the mean daily flow of the publicly owned treatment works. For controlled discharges from lagoon facilities (discharging during high flows), the river/stream dilution ratio is defined as the lowest upstream flow expected during the period of discharge divided by the mean daily flow of the discharge.

For minor publicly owned treatment works that qualify for this procedure and discharge to lakes, the allowance for dilution for chemical-specific and chronic WET limits will be determined on a case-by-case basis. Dilution up to a 19-to-1 ratio (five percent effluent) may be provided.

For minor publicly owned treatment works that qualify for this procedure and discharge to a river/stream segment, dilution up to the full chronic aquatic life, acute aquatic life, and human health critical flows may be provided.

Step 4 - Site - specific risk considerations

Where allowing a mixing zone or a dilution allowance would pose unacceptable environmental risks, the discharge limitations will be based on achieving applicable narrative and numeric water quality criteria at the end-of-pipe. The existence of environmental risks may also be the basis for a site-specific mixing zone or dilution allowance. Such risk determinations will be made on a case-by-case and parameter-by-parameter basis. These decisions will take into account the designated and existing uses and all relevant site-specific environmental concerns, including the following:

1. Bioaccummulation in fish tissues or wildlife.
2. Biologically important areas such as fish spawning areas.
3. Low acute to chronic ratio.
4. Potential human exposure to pollutants resulting from drinking water or recreational areas.
5. Attraction of aquatic life to the effluent plume.
6. Toxicity/persistence of the substance discharged.

7. Zone of passage for migrating fish or other species (including access to tributaries).

8. Cumulative effects of multiple discharges and mixing zones.

Step 5 - Complete mix procedures

For point source discharges to rivers/streams where available data are adequate to support a conclusion that there is near instantaneous and complete mixing of the discharge with the receiving water (complete mix) the full critical low flow or a portion thereof may be provided as dilution for chemical-specific and WET limitations. Such determinations of complete mixing will be made on a case-by-case basis using best professional judgement. Presence of an effluent diffuser that covers the entire river/stream width at critical low flow will generally be assumed to provide complete mixing. Also, where the mean daily flow of the discharge exceeds the chronic low stream flow of the receiving water, complete mixing will generally be assumed. In addition, where the mean daily flow of the discharge is less than or equal to the chronic low flow of the receiving water, it will generally be assumed that complete mixing does not occur unless otherwise demonstrated by the permittee. Demonstrations for complete mixing should be consistent with the study plan developed in cooperation with the states/tribes and environmental protection agency region VIII. Near instantaneous and complete mixing is defined as no more than a ten percent difference in bank-to-bank concentrations within a longitudinal distance not greater than two river/stream widths. For controlled discharges (lagoon facilities), the test of near instantaneous and complete mixing will be made using the expected rate of effluent discharge and the lowest upstream flow expected to occur during the period of discharge.

The following critical low flows shall be applied for streams and effluents:

Stream Flows	
Aquatic life, chronic	4-day, 3-year flow (biologically based*)**
Aquatic life, acute	1-day, 3-year flow (biologically based)
Human Health (carcinogens)	Harmonic mean flow
Human Health (noncarcinogens)	4-day, 3-year flow (biologically based) or 1-day, 3-year flow (biologically based)
Effluent Flows	
Aquatic life, chronic	Mean daily flow
Aquatic life, acute	Maximum daily flow
Human Health (all)	Mean daily flow

* Biologically based refers to the biologically based design flow method developed by the environmental protection agency. It differs from the hydrologically based design flow method in that it directly uses the averaging periods and frequencies specified in the aquatic life water quality criteria for individual pollutants and whole effluents for determining design flows.

** A 30-day, 10-year flow (biologically based) can be used for ammonia or other chronic standard with a 30-day averaging period.

Where complete mixing can be concluded and the environmental concerns identified in step 4 do not justify denying dilution, but are nevertheless significant, some portion of the critical low flows identified above may be provided as dilution. Such decisions will take site-specific environmental concerns into account as necessary to ensure adequate protection of designated and existing uses.

Step 6 - Incomplete mix procedures

This step addresses point source discharges that exhibit incomplete mixing. Because acute WET limits are achieved at the end-of-pipe in incomplete mix situations, this step provides mixing zone procedures for chronic aquatic life, human health, and WET limits, and ZID procedures for acute chemical-specific limits. Where a ZID is allowed for chemical limits, the size of the ZID shall be limited as follows:

Lakes: The ZID volume shall not exceed ten percent of the volume of the chronic mixing zone.

Rivers The ZID shall not exceed ten percent of the chronic mixing zone volume or flow, nor and shall the ZID exceed a maximum downstream length of one hundred feet, whichever is Streams: more restrictive.

The following provides guidelines for determining the amount of dilution available for dischargers that exhibit incomplete mixing.

Default Method

This method addresses situations where information needed for modeling is not available or there are concerns about potential environmental impacts of allowing a mixing zone. The default method provides a conservative dilution allowance.

Stream/river dischargers: Dilution calculation which uses up to ten percent of the critical low flow for chronic aquatic life limits or human health limits. However, this allowance may be adjusted downward on a case-by-case basis depending upon relevant site-specific information, designed and existing uses of the segment, and especially the uses of the segment portion affected by the discharge.

Lake/reservoir dischargers: Dilution up to a 4-to-1 ratio (twenty percent effluent) may be provided for chronic aquatic life analyses or human health analyses. However, this allowance may be adjusted downward on a case-by-case basis depending upon discharge flow, lake size, lake flushing potential, designated and existing uses of the lake, and uses of the lake portion affected by the discharge.

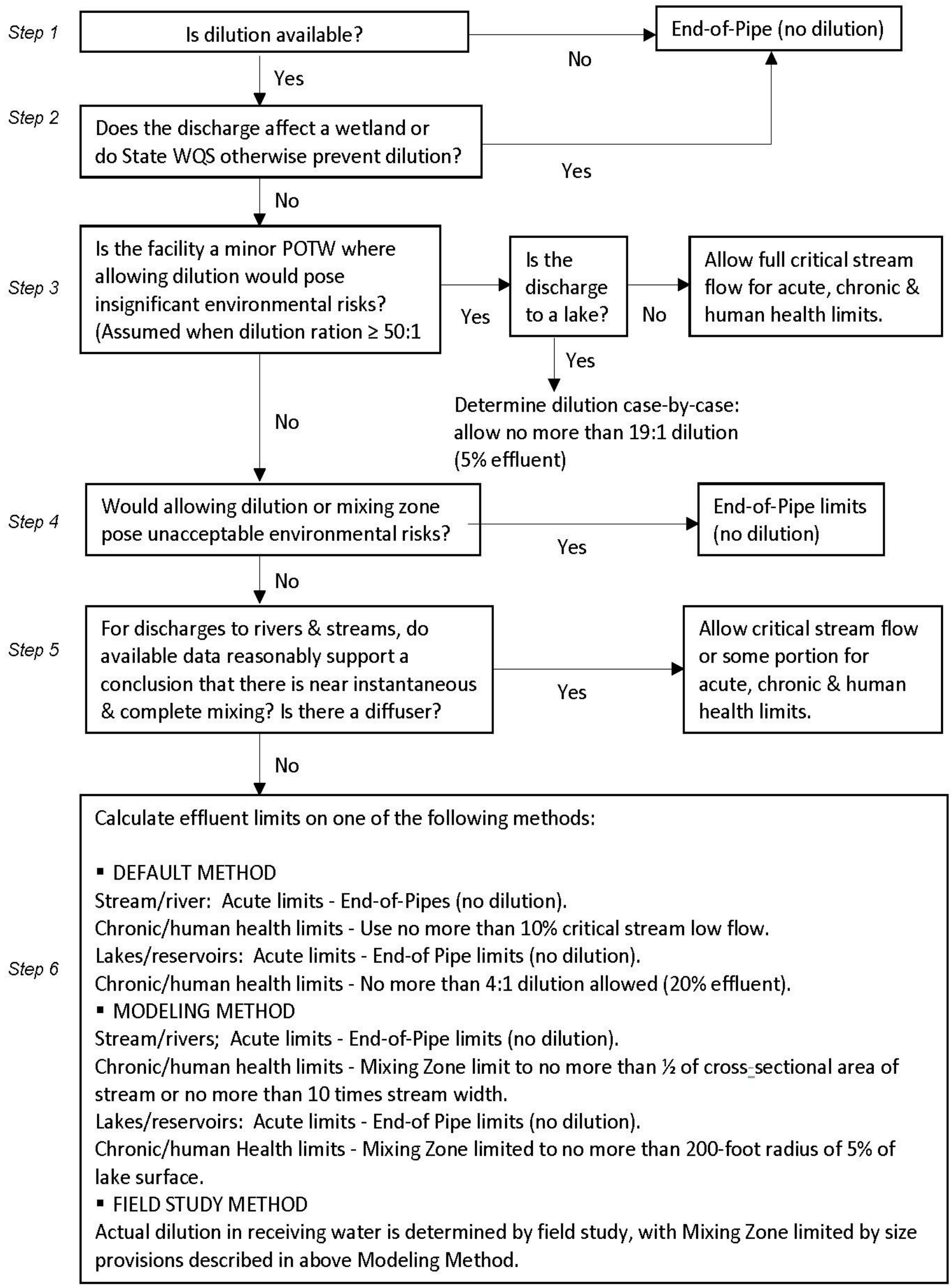
Modeling Method

An appropriate mixing zone model is used to calculate the dilution flow that will allow mixing zone limits to be achieved at the critical low flow. Prior to initiating modeling studies, it should be determined that compliance with criteria at the end-of-pipe is not practicable.

Field Study Method

Field studies which document the actual mixing characteristics in the receiving water are used to determine the dilution flow that will allow mixing zone size limits to be achieved at the critical low flow. For the purposes of field studies, "near instantaneous and complete mixing" is operationally defined as no more than a ten percent difference in bank-to-bank concentrations within a longitudinal distance not greater than two stream/river widths.

FIGURE 1
NORTH DAKOTA MODEL MIXING ZONE/DILUTION PROCEDURE*



*The procedure is applied to both chemical-specific and WET limits. In the case of complex discharges, the dilution of mixing zone may vary parameter-by parameter.

APPENDIX IV

NORTH DAKOTA ANTIDEGRADATION PROCEDURE

I. INTRODUCTION

This antidegradation implementation procedure delineates the process that will be followed by the department of environmental quality for implementing the antidegradation policy found in Standards of Quality for Waters of the State, chapter 33.1-16-02.1.

Under this implementation procedure, all waters of the state are afforded one of three different levels of antidegradation protection. All existing uses, and the water quality necessary for those uses, shall be maintained and protected. Antidegradation requirements are necessary whenever a regulated activity is proposed that may have some effect on water quality. Regulated actions include permits issued under sections 402 (North Dakota pollutant discharge elimination system) and 404 (dredge and fill) of the Clean Water Act, and any other activity requiring section 401 water quality certification. Nonpoint sources of pollution are not included. When reviewing section 404 nationwide permits, the department will issue section 401 certifications only where it determines that the conditions imposed by such permits are expected to result in attainment of the applicable water quality standards, including the antidegradation requirements. However, it is anticipated that the department will exclude certain nationwide permits from the antidegradation procedures for category 1 waters on the basis that the category of activities covered by the permit is not expected to have significant permanent effects on the quality and beneficial uses of those waters, or the effects will be appropriately minimized and temporary.

II. EXISTING USE PROTECTION FOR CATEGORY 1, 2, AND 3 WATERS

Existing use means a use that was attained in the water body on or after 1967, whether or not it is included in the water quality standards. This procedure presumes that attainment of the criteria assigned to protect the current water body classification will serve to maintain and protect all existing uses. However, where an existing use has water quality requirements that are clearly defined, but are not addressed by the current classification and criteria, the department will ensure that such existing uses are protected fully, based on implementation of appropriate numeric or narrative water quality criteria or criteria guidance. In some cases, water quality may have improved in the segment since the classification was assigned, resulting in attainment of a higher use. In other cases, the classification may have been assigned based on inadequate information, resulting in a classification that does not describe or adequately protect actual uses of the segment. In such cases, the department will develop requirements necessary to protect the existing uses and, where appropriate, recommend reclassification of the segment.

III. ANTIDEGRADATION REVIEW PROCEDURE

The department will complete an antidegradation review for all proposed regulated activities. The findings of these reviews will be summarized using an antidegradation worksheet. A statement of basis for all conclusions will be attached to the completed worksheet. The level of detail of the review will depend upon the antidegradation protection applicable to the various classes of water.

In conducting an antidegradation review, the division of water quality will sequentially apply the following steps:

A. Determine which level of antidegradation applies.

B. Determine whether authorizing the proposed regulated activity is consistent with antidegradation requirements.

C. Review existing water quality data and other information submitted by the project applicant.

D. Determine if additional information or assessment is necessary to make a decision.

E. A preliminary decision is made by the department and subsequently distributed for public participation and intergovernmental coordination.

- The content of public notices will be determined case by case. In preparing a public notice, the department may address: a) the department's preliminary antidegradation review conclusions; b) a request for public input on particular aspects of the antidegradation review that might be improved based on public input (e.g., existing uses of a segment that needs to be protected); c) notice of the availability of the antidegradation review worksheet; d) notice of the availability of general information regarding the state antidegradation program; and e) a reference to the state antidegradation policy.

- The antidegradation review findings will be available for public comment; however, publication of a separate notice for purposes of antidegradation is not necessary. For example, the antidegradation preliminary findings may be included in the public notice issued for purposes of a North Dakota pollutant discharge elimination system permit or Clean Water Act section 401 certification.

The department will ensure appropriate intergovernmental coordination on all antidegradation reviews. At a minimum, the department will provide copies of the completed antidegradation review worksheet and/or the public notice to appropriate local, state, and federal government agencies, along with a written request to provide comments by the public comment deadline. F. Comments are considered.

G. The department determines if the change in quality is necessary to accommodate important economic or social development. H. The department makes a final decision.

The level of antidegradation protection afforded each water body in the state is consistent with beneficial uses of those water bodies. Appendix I and appendix II of the Standards of Quality for Waters of the State identify rivers, streams, and lakes in the state with their classification. The classification shall be consistent with the following categories:

Category 1: Very high level of protection that automatically applies to class I and class IA streams and class I, II, and III lakes, and wetlands that are functioning at their optimal level. In addition, category 1 is presumed to apply to class II and class III streams. Particular class II and class III streams may be excluded from category 1 if, at the time of the antidegradation review, it is determined that one or both of the following criteria are applicable: 1) there is no remaining assimilative capacity for any of the parameters that may potentially be affected by the proposed regulated activity in the segment in question, or 2) an evaluation submitted by the project applicant demonstrates (based on adequate and representative chemical, physical, and biological data) that aquatic life and primary contact recreation uses are not currently being attained because of stressors that will require a long-term effort to remedy. Evaluations in response to criterion #2 must include more than an identification of current water quality levels. They must include evidence of the current status of the aquatic life and primary contact recreation uses of the segment.

Category 2: Class 4 and class 5 lakes and particular wetlands after antidegradation review. In addition, class II and class III streams or wetlands meeting one of the criteria identified above at the time of the antidegradation review shall be included in category 2.

Category 3: Highest level of protection; outstanding state resource waters.

Procedures for Category 1 Waters

Regulated activities that result in a new or expanded source of pollutants to this category of water are subject to the review process, unless the source would have no significant permanent effect on the quality and beneficial uses of those waters, or if the effects will be appropriately minimized and temporary.

- Proposed activities that would lower the ambient quality in a water body of any parameter by more than fifteen percent, reduce the available assimilative capacity by more than fifteen percent, or increase permitted pollutant loadings to a water body by more than fifteen percent will be deemed to have significant effects.

- The department will identify and eliminate from further review those proposed activities that will have no significant effect on water quality or beneficial uses. Category 1 reviews will be conducted where significant effects are projected for one or more water quality parameters. Findings of significant effects may be based on the following factors: a) percent change in ambient concentrations predicted at the appropriate conditions; b) percent change in loadings for the individual discharge or to the segment from all discharges; c) reduction in available assimilative capacity; d) nature, persistence, and potential effects of the parameter; e) potential for cumulative effects; f) predicted impacts to aquatic biota; and g) degree of confidence in any modeling techniques utilized.

- The applicant may be required to provide available monitoring data or other information about the affected water body and/or proposed activity to help determine the significance of the proposed degradation for specific parameters. The information includes recent ambient chemical, physical, or biological monitoring data sufficient to characterize, during the appropriate conditions, the spatial and temporal variability of existing background quality of the segment for the parameters that would be affected by the proposed activity. The information would also describe the water quality that would result if the proposed activity were authorized.

The project applicant is required to provide an evaluation of the water quality effects of the project. This evaluation may consist of the following components:

1. Pollution prevention measures.

2. Reduction in scale of the project.

3. Water recycle or reuse.

4. Process changes.

5. Alternative treatment technology.

6. Advanced treatment technology.

7. Seasonal or controlled discharge options to avoid critical water quality periods.

8. Improved operation and maintenance of existing facilities.

9. Alternative discharge locations.

The primary emphasis of the category 1 reviews will be to determine whether reasonable nondegrading or less-degrading alternatives to the proposed degradation are available. The department will first evaluate any alternatives analysis submitted by the applicant for adherence to the minimum requirements described below. If an acceptable analysis of alternatives was completed and submitted to the department as part of the initial project proposal, no further evaluation of alternatives will be required of the applicant. If an acceptable alternatives analysis has not been completed, the department will work with the project applicant to ensure that an acceptable alternatives analysis is developed.

Once the department has determined that feasible alternatives to allowing the degradation have been adequately evaluated, the department shall make a preliminary determination regarding whether reasonable nondegrading or less-degrading alternatives are available. This determination will be based primarily on the alternatives analysis developed by the project applicant but may be supplemented with other information or data. As a rule-of-thumb, nondegrading or less-degrading pollution control alternatives with costs that are similar to the costs of the applicant's favored alternative shall be considered reasonable. If the department determines that reasonable alternatives to allowing the degradation do not exist, the department shall continue with the antidegradation review and document the basis for the preliminary determination.

If the department makes a preliminary determination that one or more reasonable alternatives exist, the department will work with the applicant to revise the project design. If a mutually acceptable resolution cannot be reached, the department will document the alternative analysis findings and provide public notice of a preliminary decision to deny the activity.

Although it is recognized that any activity resulting in a discharge to surface waters may have positive and negative aspects, the applicant must show that any discharge or increased discharge will be of economic or social importance in the area. Where there are existing regulated sources located in the area, the department will assure that those sources are complying with applicable requirements prior to authorizing the proposed regulated activity. New sources of a particular parameter will not be allowed where there are existing unresolved compliance problems (involving the same parameter) in the zone of influence of the proposed activity. The "zone of influence" is determined as appropriate for the parameter of concern, the characteristics of the receiving water body (e.g., lake versus river, etc.), and other relevant factors. Where available, a total maximum daily load analysis or other watershed-scale plan will be the basis for identifying the appropriate zone of influence. The department may conclude that such compliance has not been achieved where existing sources are violating their North Dakota pollutant discharge elimination system permit limits. However, the existence of a compliance schedule in the North Dakota pollutant discharge elimination system permit may be taken into consideration in such cases. Required controls on existing regulated sources need not be finally achieved prior to authorizing a proposed activity provided there is reasonable assurance of future compliance.

Procedures for Category 2 Waters

Regulated activities that result in a permanent or temporary, new or expanded source of pollution to this category of water are permitted if the following conditions are met:

1. The classified uses of the water would be maintained.

2. The assimilative capacity of the water is available for the parameters that would be affected by the regulated activity, and existing uses would be protected as discussed in section II.

A decision will be made on a case-by-case basis, using available data and best professional judgment. The applicant may be required to provide additional information necessary for the department to characterize or otherwise predict changes to the physical, chemical, and/or biological condition of the water.

Procedures for Category 3 Waters

Outstanding state resource waters - Eligibility. Outstanding state resource waters may be designated category 3 waters only after they have been determined to have exceptional value for present or prospective future use for public water supplies, propagation of fish or aquatic life, wildlife, recreational purposes, or agricultural, industrial, or other legitimate beneficial uses. The factors that may be considered in determining whether a water body is eligible for inclusion in category 3 include the following: a) location, b) previous special designations, c) existing water quality, d) physical characteristics, e) ecological value, and f) recreational value.

Nomination. Any person may nominate any waters of the state for designation as outstanding state resource waters. The nomination must be made in writing to the department, must describe its specific location and present uses, and must state the reasons why the resource has exceptional value for present or prospective future beneficial use.

Review process. The department with cooperation of the state water commission shall review any nomination to determine whether the nominated waters of the state are eligible, clearly defined, and identify beneficial uses of exceptional value for present or prospective future use. The department of environmental quality with cooperation of the state water commission shall provide as a part of its assessment: 1) a verification of the uses, properties, and attributes that define the proposed "exceptional" value; 2) an evaluation of the current and historical condition of the water with respect to the proposed value using the best data available; and 3) an estimate of likely regulatory measures needed to achieve the desired level of protection. If the identified waters of the state are eligible, clearly defined, and appear to identify beneficial uses of exceptional value for present or prospective future use, the department, and the state water commission will solicit public comment and/or hold a public hearing regarding the nomination. After reviewing the public comments and views, the department jointly with the state water commission will make a decision on whether to designate the defined water body as an outstanding state water resource. If both the department and the state water commission agree that the defined water body should be designated as an outstanding state water resource, the department shall submit the recommendation to the department of environmental quality advisory council as part of the water quality standard revision process. The designation, if made, may be reviewed on a periodic basis.

Implementation process. Effects on category 3 waters resulting from regulated activity will be determined by appropriate evaluation and assessment techniques and best professional judgment. Any proposed regulated activity that would result in a new or expanded source of pollutants to a segment located in or upstream of a category 3 segment will be allowed only if there are appropriate restrictions to maintain and protect existing water quality. Reductions in water quality may be allowed only if they are temporary and negligible. Factors that may be considered in judging whether the quality of a category 3 water would be affected include: a) percent change in ambient concentrations predicted at the appropriate critical conditions; b) percent change in loadings; c) percent reduction in available assimilative capacity; d) nature, persistence, and potential effects of the parameter; e) potential for cumulative effects; and f) degree of confidence in any modeling techniques utilized.

PART X. Appendix D: 2020 and 2022 Agency and Organization Data Request Letter, Form and Contacts

September 13, 2019 (For 2020 IR)

Contact

Dear:

The Clean Water Act requires states and tribes to monitor and assess the quality of its lakes, reservoirs, rivers, streams and wetlands and to report on the status and condition of its surfaces waters every two years. The next report, which will be a consolidation of both the Section 305(b) Water Quality Assessment Report and Section 303(d) List of Impaired Waters Needing Total Maximum Daily Loads is due to the US Environmental Protection Agency on April 1, 2018. The North Dakota Department of Health is the primary agency for water quality monitoring and assessment in the state of North Dakota and is therefore responsible for assessing the state's surface waters and preparing the integrated report.

As part of its responsibility, the Department maintains a network of water quality monitoring sites where it collects data on the chemical, physical and biological quality. While these data will be used to provide an assessment of the state's surface water quality, the Department is also requesting additional data that may be used for the 2018 report. If your agency or organization has chemical, physical or biological water quality data that you believe would be beneficial to the state's water quality assessment then please fill out the attached form and return it to me at your earliest convenience.

If you have any questions concerning this request, please contact me at 701.328.5214. Your cooperation in this matter is appreciated.

Sincerely,

Aaron Larsen
Environmental Sciences Administrator
Division of Water Quality

August 3, 2021 (For 2022 IR)

Contact

Dear:

The Clean Water Act requires states and tribes to monitor and assess the quality of its lakes, reservoirs, rivers, streams and wetlands and to report on the status and condition of its surfaces waters every two years. The next report, which will be a consolidation of both the Section 305(b) Water Quality Assessment Report and Section 303(d) List of Impaired Waters Needing Total Maximum Daily Loads is due to the US Environmental Protection Agency on April 1, 2018. The North Dakota Department of Health is the primary agency for water quality monitoring and assessment in the state of North Dakota and is therefore responsible for assessing the state's surface waters and preparing the integrated report.

As part of its responsibility, the Department maintains a network of water quality monitoring sites where it collects data on the chemical, physical and biological quality. While these data will be used to provide an assessment of the state's surface water quality, the Department is also requesting additional data that may be used for the 2018 report. If your agency or organization has chemical, physical or biological water quality data that you believe would be beneficial to the state's water quality assessment then please fill out the attached form and return it to me at your earliest convenience.

If you have any questions concerning this request, please contact me at 701.328.5214. Your cooperation in this matter is appreciated.

Sincerely,

Aaron Larsen
Environmental Sciences Administrator
Division of Water Quality

Letter Contacts (2020 and 2022)

Alison Kammer
Dakota Prairies Grasslands
US Forest Service
2000 Miriam Circle
Bismarck, ND 58501

Bethany Kurz
Energy and Environmental Research Center
University of ND
PO Box 9018
Grand Forks, ND 58202-9018

Jim Zeigler
Minnesota Pollution Control Agency
714 Lake Ave, No. 220
Detoit Lakes, MN 56501

Edward Murphy
North Dakota Geological Survey
600 E Boulevard Ave.
Bismarck, ND 58505-0840

Darrin Kron
Water Quality Monitoring and Assessment Section
Montana Dept. of Environmental Quality
1520 E 6th Ave
PO Box 200901
Helena, MT 59620

Pete Jahraus
Watershed Protection Program
SD Dept of Environment and Natural Resources
Joe Foss Building
523 E Capitol Ave
Pierre, SD 57501-3181

Rick Rymerson
Bureau of Land Management
99 23rd Ave W, Ste A
Dickinson, ND 58601-2202

Jeb Williams, Director
North Dakota Game and Fish Department
100 N Bismarck Expressway

Bismarck, ND 58501-5095

Garland Erbele, State Engineer
North Dakota State Water Commission
900 E Boulevard Ave, Dept 770
Bismarck, ND 58505-0850

Kevin Shelly
US Fish and Wildlife Service
3425 Miriam Ave
Bismarck, ND 58501-7926

David Rosenkrance
US Bureau of Reclamation
Dakotas Area Office
304 E Broadway Ave
Bismarck, ND 58501

Todd Hagel
Natural Resources Conservation Service
220 E Rosser Ave
PO Box 1458
Bismarck, ND 58502-1458

Joel Galloway
ND Water Science Center
US Geological Survey
821 E Interstate Ave
Bismarck, ND 58503

Duane DeKrey, District Manager
Garrison Diversion Conservancy District
P.O. Box 140
Carrington, ND 58421

John Hargrave
US Army Corps of Engineers
Omaha District (CENWO-ED-HA)
1616 Capitol Ave.
Omaha, NE 68102-4901

James Noren
St. Paul District
US Army Corps of Engineers
190 5th St E
St. Paul, MN 55101-1638

Water Quality Data Summary for North Dakota

Contact Person: ____

Address: ____

____

____

Phone: ____

Email: ____

Data Description: ____

____

____

____

____

____

Data Period of Record: ____

____

Was the data collected according to standard operating procedures and/or by following a documented quality assurance/quality control plan?

Yes No Other: ____

Data Availability (e.g., electronic, report): ____________________________

____

If you have any questions concerning this information, please contact Mike Ell at 701.328.5214

Please return form to: Aaron Larsen, North Dakota Department of Environmental Quality, Division of Water Quality, 918 E Divide Ave, 4th Floor, Bismarck, ND 58501-1947

PART XI. Appendix E: Public Notices (Abridge and Full) Statement Requesting Public Comment on the State of North Dakota’s Draft 2018 Section 303(d) List, and Affidavit of Publishing

ABBREVIATED PUBLIC NOTICE REQUESTING PUBLIC COMMENT ON THE STATE OF NORTH DAKOTA'S DRAFT 2020-2022 INTEGRATED REPORT AND SECTION 303(d) LIST OF WATERS NEEDING TOTAL MAXIMUM DAILY LOADS.

Take Notice that the draft 2022 Section 303(d) list will be submitted to EPA as part of the integrated Section 305(b) water quality assessment report and Section 303(d) Total Maximum Daily Loads (TMDL). The Integrated Report outlines the quality of the state's waters and includes a list of waters not meeting water quality standards (303(d) list). Copies of the Draft Integrated Report and 303(d) list may be obtained by writing or visiting the NDDEQ at 4201 Normandy St., Bismarck ND 58503-1324, at http://www.deq.nd.gov, or by emailing pwax@nd.gov. Comments should be submitted to the attention of the Section 303(d) TMDL Coordinator, North Dakota Department of Environmental Quality, Division of Water Quality, 4201 Normandy Street, 3 rd Floor, Bismarck, ND 58503 or by email at pwax@nd.gov. Comments received in writing through August 1, 2023, will be considered.

PUBLIC NOTICE REQUESTING PUBLIC COMMENT ON THE STATE OF NORTH DAKOTA'S DRAFT 2020-2022 INTEGRATED REPORT AND SECTION 303(d) LIST OF WATERS NEEDING TOTAL MAXIMUM DAILY LOADS.

Notice that the North Dakota Department of Environmental Quality will submit the draft 2022 Clean Water Act Section 303(d) list to EPA as part of the Integrated Section 305(b) water quality assessment report. The Integrated Report outlines the quality of the state's waters and includes a list of waters not meeting water quality standards known as the 303(d) list. 1. Summary Section 303(d) of the Clean Water Act and its accompanying regulations (CFR Part 130 Section 7) requires the state to identify water quality limited lakes, rivers, and wetlands (waterbodies). A waterbody is considered water quality limited when it does not meet or is not expected to meet applicable water quality standards. Waterbodies can be water quality limited due to point sources of pollution, nonpoint sources of pollution, or both. These waterbodies require total maximum daily loads with load and waste load allocations. Section 303(d) of the Clean Water Act requires the state to submit a list of water quality limited waterbodies by April 1st of every even-numbered year (303(d) List). The draft 2022 Section 303(d) list will be submitted to EPA as part of the integrated Section 305(b) water quality assessment report (Integrated Report). The 2020-2022 Integrated Report includes a list of waterbodies not meeting water quality standards that need TMDLs, and a list of waterbodies that have been removed from the 2020 303(d) list. Following an opportunity for public comment, the state must submit its 303(d) list to the EPA Regional Administrator. The EPA Regional Administrator has 30 days to approve or disapprove the state's listings. The purpose of this notice is to solicit public comment on the draft 303(d) list prior to formally submitting the list to the EPA Regional Administrator. The North Dakota Department of Environmental Quality is also requesting comments on the draft 2020-2022 Integrated Report. 2. Public Comments Persons wishing to comment on the draft 303(d) List, 2020-2022 Integrated Report or both may do so in writing. Comments received through August 1, 2023, will be considered. Comments should include the name, address and telephone number of the person submitting comments. Comments should be submitted to the attention of Peter Wax, at the North Dakota Department of Environmental Quality, Division of Water Quality, 4201 Normandy Street, 3 rd Floor, Bismarck, ND 58503 or by email at pwax@nd.gov. The 303(d) list may be reviewed at the above address during normal business hours or on the Department's web address (http://www.deq.nd.gov). Copies may also be requested by writing to the Department at the above address or by calling 701.328.5210

NDNA
NORTH DAKOTA NEWSPAPER ASSOCIATION

Affidavit of Publication

Liz Prather, being duly sworn, states as follows:

1. I am the designated agent, under the provisions and for the purposes of, Section 31-04-06, NDCC, for the newspapers listed on the attached exhibits.

2. The newspapers listed on the exhibits published the advertisement of: **ND Department of Environmental Quality — Division of Water Quality – Section 303(d) list of waters needing total maximum daily loads; 1** time(s) as required by law or ordinance.

3. All of the listed newspapers are legal newspapers in the State of North Dakota and, under the provisions of Section 46-05-01, NDCC, are qualified to publish any public notice or any matter required by law or ordinance to be printed or published in a newspaper in North Dakota.

Signed: Liz Prather

State of North Dakota

County of Burleigh

Subscribed and sworn to before me this 30th day of June, 2023.

Sharon L. Peterson

SHARON L. PETERSON
NOTARY PUBLIC
STATE OF NORTH DAKOTA
MY COMMISSION EXPIRES NOV. 08, 2025

PART XII. Appendix F: Public and EPA Region 8 Comments on the State of North Dakota's Draft 2018 Section 303(d) List and the North Dakota Department of Health's Responses

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
DENVER, CO 80202-1129
Phone 800-227-8917
http://www.epa.gov/region08

August 1, 2023

Ref: 8WD-CWB

SENT VIA EMAIL

Peter Wax
North Dakota Department of Environmental Quality
Division of Water Quality
4201 Normandy Street, 3rd Floor
Bismarck, ND 59503

Re: EPA Comments on the North Dakota 2020-2022 Integrated Section 305(b) Water Quality Assessment Report and Section 303(d) List of Waters Needing Total Maximum Daily Loads

Dear Mr. Wax:

Thank you for notifying the U.S. Environmental Protection Agency (EPA) Region 8 of the public comment period on the *North Dakota 2020-2022 Integrated Section 305(b) Water Quality Assessment Report and Section 303(d) List of Waters Needing Total Maximum Daily Loads* (IR).[1] We appreciate the opportunity to review the draft IR and commend North Dakota Department of Environmental Quality (NDDEQ) for its work to assess and document water quality conditions in the State. EPA's detailed comments are provided below.

Comments on the Draft IR

EPA's Assessment and Total Maximum Daily Load Tracking and Implementation System (ATTAINS) database[2] includes state-reported information on support of designated uses in assessed waters, causes and sources of impairment, identifies impaired waters, and tracks TMDL status. Since 2008, EPA has expected states to use ATTAINS for electronic submission of the IR. EPA uses the information stored in ATTAINs to develop and publish the National Water Quality Inventory Report to Congress (CWA Section 305(b)); determine states' variable portion of the Section 106 grant allocation formula; inform water quality decisions; and conduct national analyses. For states interested in publishing a hard copy IR, it is important to ensure consistency

[1] See announcement: Public Notice Requesting Public Comment on the State of North Dakota's Draft 2020-2022 Integrated Report and Section 303(d) List of Waters needing Total Maximum Daily Loads. deq.nd.gov/PublicComment/IntegratedReportPN-20230801.pdf.

between the hard copy reports and the electronic data submitted to EPA for review and approval in ATTAINS.

As part of EPA's review of NDDEQ's draft IR, EPA noted several discrepancies between the State's hard copy IR (IR Report) compared to electronic results generated from ATTAINs. EPA recommends NDDEQ consider using ATTAINS to generate the tables used in the IR Report to minimize errors.

Table V-1. Assessment summary for Rivers/streams:

- NDDEQ's IR Report indicates that 197 Assessment Units (AU), totaling 6,120.51 stream/river miles are in Category 5 compared to 194 AUs listed in ATTAINs, totaling 6023.39 stream/river miles.
- NDDEQ's IR Report lists 5 AUs in Table V-1, totaling 234.82 miles. However, there are 9 AUs listed as Category 5R in Table V-2 of the hard copy report as well as in ATTAINS. Please update Table V-1 to reflect the current number of waters listed in 5R.

Table V-3. Use Support Summary for Rivers and Streams in North Dakota (miles):

EPA identified several discrepancies between the rivers/streams use support summary in NDDEQ's IR Report to the information loaded to ATTAINS. Table 1 in Appendix A highlights discrepancies in yellow. EPA recommends NDDEQ review in ATTAINS and reconcile the IR Report and information in ATTAINS.

Table V-4. Impairment Summary for Rivers and Streams in North Dakota

EPA identified discrepancies in the impairment summary from the NDDEQ's IR Report and ATTAINS. For example, NDDEQ's hard copy IR lists 4,179.38 stream miles as impaired for fecal coliform compared to 3,481.21 miles in ATTAINS. Similarly, for *E. coli*, NDDEQ's IR Report shows 3,533.61 stream miles impaired compared to 3,755.6 in ATTAINS. EPA recommends NDDEQ review the information in ATTAINS and reconcile the IR Report and information in ATTAINS.

Category 5D Waters

NDDEQ's IR report specifies that 187 waterbody/pollutant combinations are identified as Category 5D. Category 5D was created by NDDEQ to target waters for additional monitoring to verify the use impairment and pollutant causes. However, ATTAINS only identifies one waterbody, Carlson-Tande Reservoir (ND-09020203-005-L_00), as Category 5D. EPA recommends updating ATTAINs to include Category 5D as the Organization IR Category for the other 5D waters.

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[2] https://attains.epa.gov/attains/login.

Conclusion

We look forward to receiving your final 2020-2022 IR and continuing our cooperative efforts. If you have any questions regarding these comments, please contact Tina Laidlaw at (406) 457-5016 or laidlaw.tina@epa.gov.

Sincerely,

ANDREW TODD

Digitally signed by ANDREW TODD
Date: 2023.08.01 08:09:50 -06'00'

Andrew Todd, PhD.
Supervisor, Water Quality Section

APPENDIX A
Comparison between ATTAINS results and ND's hard copy Integrated Report (IR)

Table 1. Comparison of attainment decisions for ND rivers and streams from Table V-3 in the IR report compared to results in ATTAINS

Use	Fully Supporting - Hard Copy IR	Fully Supporting ATTAINS	Fully Supporting but Threatened - Hard Copy IR	Threatened-ATTAINS	Not Supporting - Hard Copy IR	Not Supporting-ATTAINS	Not Assessed - Hard Copy IR	Not Assessed-ATTAINS	Insufficient Information-Hard Copy IR	Insufficient Information - ATTAINS
Aquatic Life	1,608.57	1608.56	2,123.37	2123.36	1,711.15	1711.13	47,536.57	47,536.59	3,831.30	3831.28
Fish Consumption	90.15	90.15	0	0	401.81	401.81	3,655.86	3,655.86	0	0
Recreation	1,368.81	1,368.83	3,257.31	3,262.74	3,262.73	3,347.93	48,280.66	48,280.66	550.75	550.75
Drinking Water	409.82	409.81	126.49	126.49	0	0	2,454.22	2,454.22	2,183.64	2,183.64
Agriculture	0	56,811.02	0	0	0	0	0	0	56,810.99	0
Industrial	0	56,811.02	0	0	0	0	0	0	56,810.99	0

NDDEQ Response to EPA Comments

1. The department appreciates US Environmental Protection Agencies (EPA) catching the discrepancies between ATTAIN and the Integrated Report in Table V-1, V-3, and V-5 and have made the appropriate updates to the hard copy report.

2. The Integrated Report (IR) specified 187 waterbodies as Category 5D as the NDDEQ assesses Category 5D waterbodies at the waterbody use/pollutant combination level (**USE_STATE_IR_CAT** and **PARAM_STATE_IR_CAT**). There was a rouge waterbody use/pollutant that had been placed at the **ASSESSMENT_UNIT** level. That waterbody has been placed in the correct location use/pollutant combination level location and ATTAINs and the IR match 188 5Ds.