North Dakota 2016 Integrated Section 305(b) Water Quality Assessment Report and Section 303(d) List of Waters Needing Total Maximum Daily Loads

Submitted to the US EPA
January 23, 2017

Approved
February 21, 2017

NORTH DAKOTA
DEPARTMENT *of* HEALTH

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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Ref: 8WP-CWQ

FEB 21 2017

Karl Rockeman, Director
Division of Water Quality
North Dakota Department of Health
918 East Divide Avenue, 4th Floor
Bismarck, North Dakota 58501-1947

Re: Clean Water Act Section 303(d) Total Maximum Daily Load (TMDL) Waterbody List

Dear Mr. Rockeman:

Thank you for your submittal of the North Dakota Department of Health (NDDoH) 2016 Water Quality Integrated Report received January 23, 2017. The Environmental Protection Agency Region 8 has conducted a complete review of the Clean Water Act Section 303(d) waterbody list (Section 303(d) list) and supporting documentation and information. The EPA has determined that North Dakota's 2016 Section 303(d) list meets the requirements of Section 303(d) of the Clean Water Act (CWA) and the EPA's implementing regulations found at 40 C.F.R. Part 130 and approves North Dakota's 2016 Section 303(d) list.

The EPA's approval of North Dakota's 2016 Section 303(d) list extends to waterbodies on the list with the exception of those waters that are within Indian country, as defined at 18 U.S.C. § 1151. The EPA is taking no action with respect to the Indian country area at this time. EPA, or eligible Indian Tribes, as appropriate, will retain responsibilities for Indian country lands.

The attachment describes the statutory and regulatory requirements of the CWA Section 303(d) list and a summary of the EPA's review of North Dakota's compliance with each requirement. The EPA appreciates your work to produce North Dakota's 2016 Section 303(d) list. If you have questions, the most knowledgeable EPA staff person is Kris Jensen and she may be reached at (303) 312-6237.

Sincerely,

for Darcy O'Connor
Assistant Regional Administrator
Office of Water Protection

Attachment

cc: Mike Ell, NDDoH
Kris Jensen, EPA, 8WP-CWQ

North Dakota 2016 Integrated
Section 305(b) Water Quality Assessment Report and
Section 303(d) List of Waters Needing
Total Maximum Daily Loads

Doug Burgum, Governor
Arvy Smith and L. David Glatt, Co-acting State Health Officer

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Cover Photograph

Photograph of Gravel Lake located in the Turtle Mountain region of the state (Rolette County). Gravel Lake was sampled by the North Dakota Department of Health in 2012 as part of the US EPA sponsored National Lakes Assessment.

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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 2014-2015. 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 Health (hereafter referred to as the department) currently recognizes 295 public lakes and reservoirs. Of the 295 public lakes and reservoirs recognized as public waters and included in the Assessment Database (ADB), only 200 lakes and reservoirs totaling 622,382 acres that are specifically listed in the state's water quality standards as classified lakes and therefore are assigned designated beneficial uses. The remaining 95 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.
Based on the state's Assessment Database (ADB), the 146 reservoirs have a combined surface area of 476,709 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 or 43 percent attributed to Devils Lake. The remaining 148 lakes average 925 acres, with approximately 40 percent being smaller than 250 acres.

There are 56,644 miles of rivers and streams in the state. Estimates of river stream miles in the state are based on river and stream waterbodies in the ADB that are reach indexed to the 1:100,000 National Hydrography Dataset (NHD plus) and include ephemeral, intermittent and perennial rivers and streams. The estimate of river and stream miles for this report reflects an increase in 622 miles from what was reported in 2014.

For purposes of 2016 Section 305(b) reporting and Section 303(d) listing, the U.S. Environmental Protection Agency (EPA) is encouraging 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 and 2016 IR guidance memos (http://water.epa.gov/lawregs/lawsguidance/cwa/tmdl/guidance.cfm). 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 1,253 miles of the rivers and streams assessed for this report, while another 2,165 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 1,125 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 7,920 miles of rivers and streams in the state. Recreation use was fully supporting, fully supporting but threatened and not supporting on 1,449 miles, 3,318 miles and 3,153 miles, respectively. 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 5,598 miles of rivers and streams in the state. Of the 916 miles assessed for this report, 151 miles were assessed as threatened for drinking water supply use.

A total of 4,137 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 200 lakes and reservoirs, representing 622,403 surface acres, are specifically listed in the state water quality standards as classified lakes and reservoirs. Each of these 200 lakes and reservoirs were assessed for this report. In some cases the only beneficial uses assessed were agriculture and industrial uses. In others cases, all designated uses were assessed. There were also 95 lakes and reservoirs which were included in the ADB, but were not assessed. The non-classified lakes represent 93,565 acres or only 13 percent of the total lake and reservoir acres in the state. One-hundred-thirty-two (132) lakes and reservoirs, representing 592,914 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 29 lakes and reservoirs representing 8,168 acres are 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 859 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 168 lakes and reservoirs in the state totaling 602,295 acres. Of this total, eight (8) lakes, representing 8,212 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. Sources of nutrients causing algal blooms and weed growth were described earlier. One-hundred-twenty-two (122) lakes and reservoirs totaling 567,644 acres were assessed as fully supporting recreation use. An additional 38 lakes and reservoirs totaling 26,439 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 620,968 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 the ADB 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 620,968 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 and 2013-2014, the National Lakes Assessment (NLA) in 2007 and 2012, 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 2012-2013 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 (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.

Wetland condition was assessed for the 2011 NRSA and state intensification project using the North Dakota Rapid Assessment Method (NDRAM) and the Index of Plant Community Integrity (IPCI). Both methods were developed by NDSU in cooperation with the department. The NDRAM is used to rapidly assess wetlands based on a variety of wetland attributes including buffer width, amount of soil disturbance, level of alteration to hydrology, land use, and the plant community present. By comparison, the IPCI only uses the plant community data collected from sites in the wetland. Both methods allow the user to rank wetland condition on a scale of good, fair, and poor. Based on the IPCI, 61 percent of wetlands in North Dakota (1,317,072 acres) were in good condition, while 11 percent (237,505 acres) were in fair condition. Twenty-eight (28) percent of wetlands in the state (604,558 acres) were in poor condition. When compared to the IPCI, the NDRAM rated a lower percentage of wetlands in the state as being in good condition (14 percent; 302,279 acres), while the majority (62 percent, 1,342,982 acres) were rated in fair condition and 24 percent (513,874 acres) were in poor condition.

There are many potential anthropogenic impacts (i.e., stressors) that can, directly or indirectly, negatively affect wetland condition. Of the eight stressors measured and assessed as part of the NWCA and state intensification project, vegetation removal was rated high for more wetland area in the state (67 percent; 1,450,939 acres) than any other stressor. Following vegetation removal, the presence of nonnative plant species (as measured by the NPSI) was rated as either high or very high for over 66 percent of wetlands in the state (1,489,803 acres). The stressor termed hardening, which included the presence of roads, trails, and trampling by livestock was rated high in 59 percent of wetlands in the state (1,280,367 acres). Surprisingly, the physical stressors damming, ditching, and filling affected the lowest percentage of wetlands in the state. Damming was rated low for 88 percent of wetlands in the state (1,897,880 acres), while ditching was rated low for 63 percent (1,364,573 acres) and filling was low for over 73 percent of wetland area in the state (1,591,282 acres).

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 has developed a "North Dakota Total Maximum Daily Load Prioritization Strategy" (Appendix B). This TMDL Prioritization Strategy describes a two-phased approach for prioritizing impaired waters for TMDL development and watershed planning. Specifically, the TMDL prioritization strategy will be used to identify 1) a list of priority waters targeted for TMDL development or alternative approaches in the next two years (near term); and 2) a list of priority waters scheduled for likely TMDL development or alternative 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 alternative restoration approaches.

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 alternative restoration approaches for impaired waters that will achieve water quality standards (i.e., alternative plans)." For purposes of tracking this measure all near term (next two years) and long term (through 2022) high priority TMDL listed waterbodies will be used to track progress towards meeting the WQ-27 measure.

The 2016 TMDL list is represented by 225 AUs (32 lakes and reservoirs[1] and 192 river and stream segments) and 356 individual waterbody/pollutant combinations. For purposes of TMDL development, each waterbody/pollutant combination requires a TMDL or alternative restoration plan. Of the 356 individual waterbody/pollutant combinations listed in 2016, 157 waterbody\ Pollutant combinations were further identified as category 5A. These waterbodies will be targeted for additional monitoring in the next two to four years to verify the current use impairment assessments and pollutant causes.

The 2016 Section 303(d) TMDL list for North Dakota has targeted 61 waterbodies or 67 waterbody/pollutant combinations as “High” priority. These “High” priority waterbody/pollutant combinations are AUs for which TMDLs or alternative restoration approaches will be develop by 2022. For the remaining 289 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 and watersheds for TMDL development. Of the 67 waterbody/pollutant combinations which are high priority and, therefore, are targeted for TMDL development or alternative plans by 2022, 34 waterbody/pollutant combinations have further been targeted for TMDL development or alternative plans in the next two years (i.e., 2017 and 2018).

[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) 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). In its regulations implementing Section 303(d), the U.S. Environmental Protection Agency (EPA) has defined "time to time" to mean April 1 of every even-numbered year. While due at the same time, states have historically submitted separate reports to EPA under these two sections. However, 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 brief summary of the requirements of each reporting section.

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 2014-2015. 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.

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.

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."

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.

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 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. In other words, all pollutants are pollution, but not all pollution is a pollutant.

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.

Section 303(d) requires states to submit their lists of water quality-limited waterbodies “from time to time.” Federal regulations have clarified this language; therefore, beginning in 1992 and by April 1 of every even-numbered year thereafter, states are required to submit a revised list of waters needing TMDLs. North Dakota’s last TMDL list was submitted to EPA on December 31, 2014 and was approved by EPA on February 12, 2015.

This Section 303(d) list includes waterbodies not meeting water quality standards, waterbodies needing TMDLs and waterbodies which have been removed from the 2014 list. Reasons for removing a waterbody from the 2014 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 lacking to determine water quality status and/or the original basis for listing was incorrect.

PART III. BACKGROUND

A. Atlas

Table III-1. Atlas.

Topic	Value
State Population[1]	756,927
State Surface Area (Sq. Miles)	70,700
Total Miles of Rivers and Streams[2]	56,643.75
Total Miles of Rivers and Streams by Stream Class[3]	
Class I, IA and II Streams	6,012.47
Class III Streams	50,579.02
Total Miles of Rivers and Streams by Basin	
Red River (including Devils Lake)	12,164.46
Souris River	3,890.52
Upper Missouri (Lake Sakakawea)	14,381.87
Lower Missouri (Lake Oahe)	23,141.00
James River	3,013.64
Border Miles of Shared Rivers and Streams[4]	426.57
Total Number of Lakes and Reservoirs[5]	295
Number of Natural Lakes	149
Number of Manmade Reservoirs	146
Total Acres of Lakes and Reservoirs	715,946.13
Acres of Natural Lakes	239,237.10
Acres of Manmade Reservoirs[6]	476,709.03
Total Acres of Lakes and Reservoirs by Lake Class[7]	
Class 1	411,975.65
Class 2	165,143.01
Class 3	40,730.36
Class 4-Listed	3,118.60
Class 4-Not Listed	93,564.51
Class 5	1,414.00
Acres of Freshwater Wetlands[8]	3,206,820

[1] Based on 2015 U.S. Census Bureau estimate
[2] Total miles are based on rivers and streams entered into the Assessment Database (ADB) 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* (North Dakota Department of Health, 2014). 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 the ADB.
[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* (NDDoH, 2014a). 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] 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).

B. Total Waters

The North Dakota Department of Health (hereafter referred to as the department) currently recognizes 295 public lakes and reservoirs. Of the 295 public lakes and reservoirs recognized as public waters and included in the Assessment Database (ADB), only 200 lakes and reservoirs totaling 622,381.6 acres that 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 95 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. The increase in the number of lakes and reservoirs in the ADB from 289, which was reported in the 2014 cycle, to 295, as reported in 2016, is due to the addition of 6 new non-classified lakes to the ADB (Appendix A).

Of the 295 public lakes and reservoirs included in the ADB, there are 146 are manmade reservoirs and 149 are natural lakes. All lakes and reservoirs included in this assessment are considered significantly publicly owned. Based on the state's Assessment Database, 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 239,237.1 acres, with approximately 102,376 acres or 43 percent attributed to Devils Lake. The remaining 148 lakes average 924.74 acres, with approximately 40 percent being smaller than 250 acres.

There are 56,643.75 miles of rivers and streams in the state. Estimates of river stream miles in the state are based on river and stream waterbodies in the ADB 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. The estimate of river and stream miles for this report reflects an increase in 621.61 miles from what was reported in 2014. This increase is due to: 1) an increase in the number of stream assessment units; and 2) an increase in the estimated size of several river and stream assessment units (Appendix A). Previous to this report, the estimated size of river and stream assessment units entered into the ADB was based on estimates generated from EPA's reach file 3. For the 2014 and 2016 Integrated Report, assessment unit sizes for rivers and streams were calculated based on the 1:100,000 NHD plus. While some river and stream assessment units decreased in size, when compared to 2014, and some remained the same size based on the NHD, the vast majority increased in size (Appendix A). For example, assessment unit ND-09010004-012-S_00, the Snake Creek watershed located in McHenry County, increased from 15.5 stream miles to 113.36 stream miles.

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 provides a basin-by-basin estimate of total river and stream miles.

C. Water Pollution Control Program

Chapter 1. Water Quality Standards Program

State water quality standards describe the policy of the state which is to protect, maintain and improve the quality of water for use as public and private water supplies; for propagation of wildlife, fish and aquatic life; and for domestic, agricultural, industrial, recreational and other legitimate beneficial uses.

The state classifies its surface water resources into five categories. The assignment of a waterbody into a particular classification is based on the water quality of record (1967), existing uses at that time, hydrology and natural background factors.

Water quality standards also identify specific numeric criteria for chemical, biological and physical parameters. The specific numeric standard assigned to each parameter ensures protection of the beneficial uses for that classification. The water quality standards also contain general conditions, termed "narrative standards," applicable to all waters of the state. These general conditions contain provisions not specifically addressed in numeric criteria. These conditions add an extra level of protection for water quality.

The department has also developed a narrative biological goal for all waters of the state. The goal is to restore all surface waters to a condition similar to that of sites or waterbodies determined to be regional reference sites. The goal is non-regulatory; however, it may be used in combination with other information in determining whether aquatic life uses are attained. The state is also in the process of developing "biological criteria." These criteria will define ecological conditions in state waters and set goals for their attainment.

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 which currently have better water quality than applicable standards. Antidegradation policies and procedures are in place to maintain high quality water resources and prevent them from being degraded to the level of water quality standards.

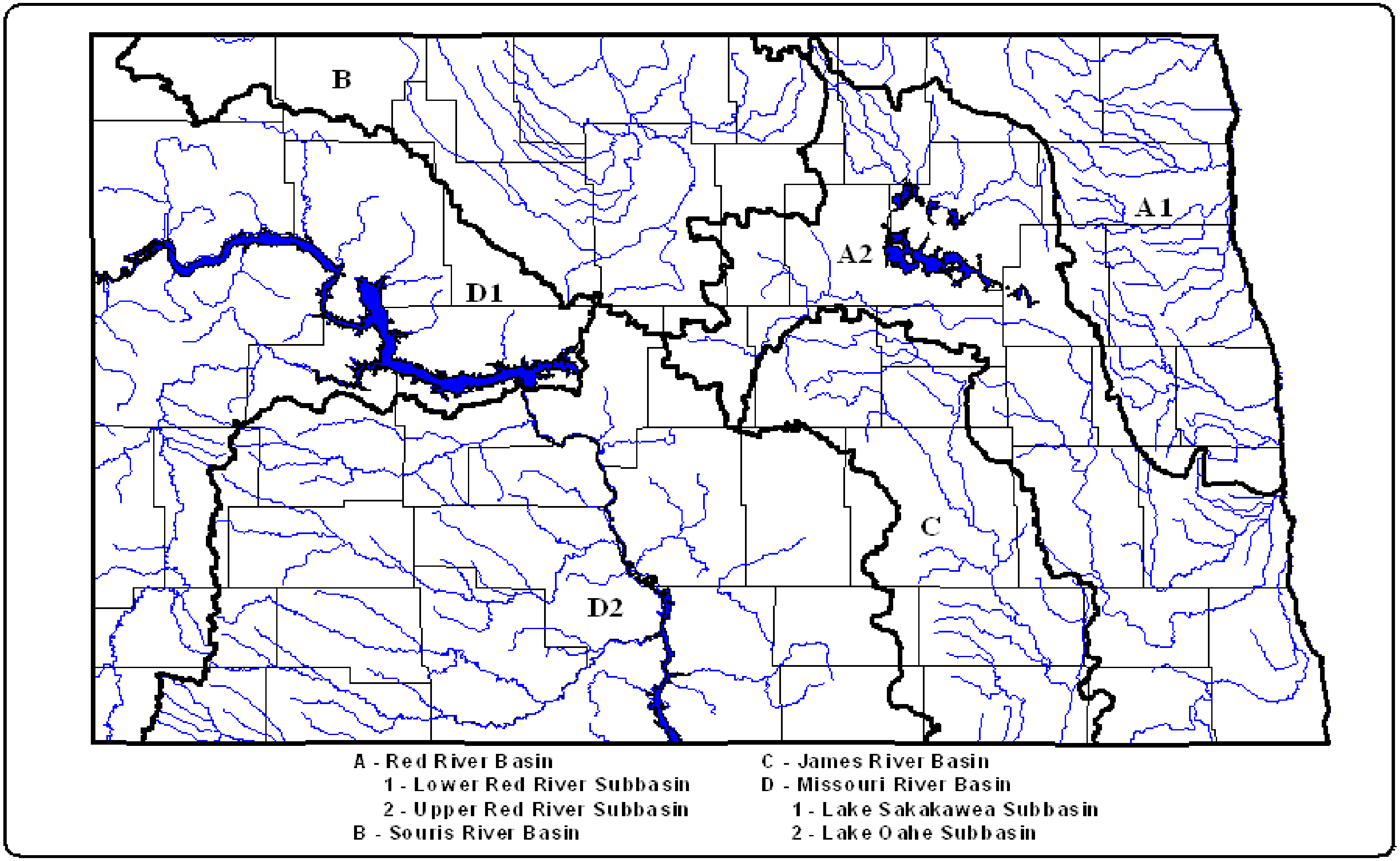


Figure III-1. Major Hydrologic Basins in North Dakota.

State water quality standards have established three categories or tiers of antidegradation protection. 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 future potential for public water supplies, propagation of fish or aquatic biota, wildlife, recreation, agriculture, industry, or other legitimate beneficial uses.

EPA requires the department to review and update, as necessary, the state water quality standards based on new information and EPA guidance a minimum of every three years. This process is termed the “triennial review.” Issues currently being considered for this review are beneficial use designations for wetlands and associated numeric criteria. Currently, wetlands are considered waters of the state and are protected by general conditions.

In 2007 the department developed a Nutrient Criteria Development Plan (NDDoH, 2007) that describes the anticipated conceptual approach for developing nutrient water quality criteria. The plan specifically focuses on lotic systems (i.e., small to large wadeable and non-wadeable streams and rivers) and lentic systems (i.e., lakes and reservoirs). The plan is intended to provide clear and meaningful guidance for the development of nutrient criteria within North Dakota.

As an additional tool to address nutrient related water quality problems across the state, the department is developing a “North Dakota Nutrient Reduction Strategy”. One of the core elements of this strategy is the development and implementation of nutrient standards which are based on the state Nutrient Criteria Development Plan. Stakeholders involved with development of the draft nutrient reduction strategy have recommended several priorities for nutrient criteria development, including the development of numeric nutrient criteria for the Red River of the North and Lake Sakakawea and the development of narrative nutrient criteria which would be applied to surface waters statewide. In addition to establishing beneficial use designations for wetlands, another critical for this triennial review is the development of a narrative nutrient criterion.

Once the narrative nutrient criteria are implemented in the state water quality standards, then numeric thresholds or targets would be developed as a means of translating the narrative criterion. This would likely be a 2 step process where the first step would be to identify a response indicator that is representative of the beneficial use impairment and its threshold for impairment. Once the indicator is identified then the second step would be to relate the indicator to a nutrient (N and P) concentration or load that causes the threshold to be exceeded. An example of this two step process would be an in-lake chlorophyll-a concentration that is known to cause recreation use to be impaired and the N and P concentration in the lake is known to cause that chlorophyll-a concentration to be exceeded. In some cases there may be multiple indicators affecting one or more use impairments which may result in more than one target nutrient concentration or load. In these cases the more sensitive use and indicator would take precedent.

Once the narrative standard is translated into a numeric threshold or target, then the threshold or target can be used to: 1) assess waters for nutrient impairments; or 2) set restoration targets in total maximum daily loads (TMDLs). Assessment can be done using the impairment indicator, the nutrient target or both. In the case of a TMDL the impairment indicator can be used as the TMDL target, but the load allocation would be based on the nutrient concentration or load.

Chapter 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 outline technology-based and/or water quality-based limits for wastewater 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 has become 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 continues to implement the Stormwater Phase II regulations (effective December 8, 1999) to the maximum extent possible. The federal stormwater regulations have also been incorporated into the state rules. The primary focus in the area of stormwater discharges continues to be meeting the obligations of Phase II of EPA's Stormwater Rule.

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 continues to work 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 NDDH 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 treated wastewater 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. Treated wastewater 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. In such cases, it is likely the reported concentrations for BOD-5 and TSS are further reduced prior to entering a waterbody.

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 effective 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.

Toxic pollutants in wastewater discharges are a concern, particularly for the larger cities and industries in North Dakota. They are regulated through the Industrial Pretreatment Program which the department has primacy (effective September 9, 2005) to implement in North Dakota. 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 select 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 appropriate 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/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 some types of 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, SSO's and CAFOs. Routine inspections result in formal and informal 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 noncompliance 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 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 an increasing concern in North Dakota. Currently, about 699 active livestock facilities have been approved 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 incorporated the February 12, 2003 federal CAFO rules into the state program. This consisted of updates to 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). These rules became final on January 7, 2005.

EPA's CAFO rules were challenged which resulted in new rules on CAFOs (November 2008) taking into account the Circuit Court of Appeals decision. The department has initiated the process of looking into potential state rule revisions as a result of the 2008 CAFO rule updates. Department review has determined that the current rules have sufficient authority to address the changes in the 2008 CAFO rules. The Department is proceeding with a CAFO general permit.

In the interim, 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. Several times each year, the department participates in presentations to producer groups. 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 prevent water quality impacts, if needed.

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 at a rapid pace, which has affected 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 additional record keeping and disposal. The stormwater program has also had a marked increase in permits for construction stormwater and industrial stormwater.

Chapter 3. Nonpoint Source (NPS) Pollution Management Program

Surface water and ground water are two of North Dakota's most valuable natural resources. Water quality is affected by both natural and cultural, point source and nonpoint source (NPS) pollution, with NPS pollution being the major factor affecting surface water quality in the state. Ground water quality has remained relatively unaffected by major sources of pollution. However, some aquifers have experienced minor water quality impairments (see Part VII. Ground Water Assessment).

All rivers, streams, reservoirs and lakes assessed within the state are impacted to some degree by NPS pollution. Generally, most surface water quality impacts are associated with agricultural activities in the watersheds, with the exception of watersheds with larger cities, where NPS pollution impacts are also related to urban activities. Ground water impacts can result from the improper use of agricultural chemicals, leaking underground petroleum storage tanks and pipelines, wastewater impoundments, oil and gas exploration activities, septic systems and improperly located and maintained solid waste disposal sites.

State and local efforts to address NPS pollution impacts to the beneficial uses of North Dakota's water resources are primarily accomplished through the North Dakota NPS Pollution Management Program (NPS Program). The NPS Program is a voluntary program, largely dependent on the formation of partnerships and coordination with local, state and federal resource managers. Through these coordinated efforts, the cumulative benefits of the NPS pollution control projects (NPS projects) will enable the NPS Program to fully implement the 2015 – 2020 NPS Pollution Management Program Plan (Management Plan) and, over the long term, achieve the NPS Program vision to abate all NPS pollution impairments to the waters of the state. To accomplish the vision, the mission for the NPS Program is to implement a voluntary, incentive-based program that restores and protects the chemical, physical, and biological integrity of waters where the beneficial uses are threatened or impaired due to nonpoint sources of pollution.

Three primary goals have been established for the Management Plan to carry out the NPS Program’s mission and ensure continued progress toward the NPS Program vision. These goals are focused on watershed assessment; implementation of corrective measures; and public education. Specific goals for the Management Plan period are as follows:

> Goal 1: Coordinate with the Total Maximum Daily Load Program (TMDL Program) and local partners to assess 15 priority watersheds to document the beneficial use conditions as well as the sources and causes of NPS pollutants impairing beneficial uses of the waterbodies within the watersheds.
>
> Goal 2: In cooperation with local partners, develop and implement watershed restoration or protection plans for 15 priority sub-watersheds.
>
> Goal 3: Through multiple forms of media at the state and local level, increase public awareness and understanding of water quality and beneficial use impairments associated with NPS pollution as well as the sources and causes of NPS pollution in the state.

Feasible solutions to NPS pollution impacts will also be a major part of NPS Program outreach efforts. The target audience will be the general public, with particular emphasis placed on reaching individuals and organizations involved in the agricultural industry. As the ND Nutrient Reduction Strategy evolves during the Management Plan period, the educational goal of the NPS Program will also be adjusted to ensure coordination and the delivery of a consistent message on nutrient management.

Given the size of the agricultural industry in North Dakota, approximately 75% of the projects supported by the NPS Program are focused on NPS pollution associated with agricultural production. Section 319 funds awarded to these projects are used to support educational activities; conduct watersheds assessments; and provide financial and technical assistance to landowners implementing best management practices (BMPs) in priority watersheds. In most cases, the BMPs address NPS pollution associated with the management of cropland, livestock manure, grazing lands and riparian corridors. Management of tile drain systems is also a relatively new and emerging pollutant source that will be addressed more frequently under the Management Plan. The educational programs are conducted at both the state and local levels and range in size from one day events to multi-year programs that provide "one-on-one" mentoring services. Support for the watershed assessments is primarily used to document existing water quality and beneficial use conditions as well as identify the sources and causes of NPS pollutants impairing the beneficial uses. Major non-agricultural NPS pollution sources being addressed in localized areas include failed onsite sewage treatment systems and eligible urban areas.

On an annual basis, the NPS Program uses Section 319 funding to support approximately 40-45 NPS projects throughout the state. While the size, target audience, and structure of the projects vary significantly, they all share the same basic objectives. These common objectives are: 1) increase public awareness of NPS pollution issues and solutions; 2) reduce/prevent the delivery of NPS pollutants to waters of the state; and 3) evaluate benefits of the project. Projects supported by the NPS Program will generally fall under one of four different categories that describe the basic focus of the project. These project categories are: 1) development phase projects; 2) watershed projects; 3) support projects; and 4) information/education (I&E) projects. A brief description of the project categories being implemented under the NPS Program 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 typically 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-specific 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), when applicable. In addition to the watershed assessments, the development phase projects also may include projects focused on the development of watershed assessment tools or the evaluation of new or emerging NPS

pollutant sources and causes. The development phase projects are generally one to two years in length.

Watershed Projects: Watershed projects are the most comprehensive and long-term projects implemented through the NPS Program. These projects are designed to address documented NPS pollution impacts identified through previous development/assessment projects or TMDL reports. The primary goal of the watershed projects is to restore or protect waterbodies where the beneficial uses are impaired or threatened due to NPS pollution. This watershed project goal is generally accomplished by: 1) promoting voluntary adoption of specific BMPs; 2) providing financial and technical assistance to implement BMPs; 3) disseminating information on the project and solutions to identified NPS pollution impacts; and 4) evaluating progress toward meeting NPS pollutant reduction goals. Local sponsors will utilize any available funding including; Section 319 funds, USDA cost-share, North Dakota Outdoor Heritage funds, and local contributions to support their watershed restoration efforts. Funds allocated to a watershed project will typically be used to employ staff, cost-share BMPs, conduct I&E events, and monitor trends in the aquatic community, water quality and/or land use. Watershed projects, which are generally initiated as five year projects, 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 can vary greatly in size, focus and target audience and be 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 information/education projects can be one to three years in length, with the option to extend the project 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. Active Section 319 Grants during the Integrated Report reporting period include the 2010, 2011, 2012, 2013, 2014 and 2015 Section 319 Grants (Active Grants). The cumulative effective period for the Active Grants is April 1, 2010 to present. To date, 56 local and state sponsored projects have been supported by the Active Grants. The budgets and status of these NPS projects and NPS Program staffing are provided in Table III-2.

Table III-2. Status and Budgets for Projects Supported Under the Fiscal Year 2010, 2011, 2012, 2013, 2014 and 2015 Section 319 Grants.

Development Phase - NPS Assessment Projects Project Name	Status	319 Allocation	Local Match	Total Budget
Antelope Creek Watershed Assessment - Grant Co.	Completed	$9,166	$6,111	$15,277
Fargo Water Quality Stewardship: Addressing WQ at the Community Level	Completed	$37,749	$25,166	$62,915
James River Basin Decision Support Tool Development Project	Active	$303,404	$202,269	$505,673
Little Missouri River Tributaries Assessment	Active	$3,165	$2,110	$5,275
Little Missouri Tributary Riparian & Stream Stability Assessment	Active	$24,567	$16,378	$40,945
Middle Sheyenne River Watershed Plan Development	Active	$22,470	$14,980	$37,450
NDSU Assess Multi-Element Composition of Soil Profiles in Prairie Wetlands	Complete	$72,604	$48,403	$121,007
NDSU Assessment of Increased Dust & Road Use to Western ND Wetlands	Complete	$42,343	$28,229	$ 70,572
NDSU Assessment of Wetland Efficacy in Improving Tile Drain Water Quality	Complete	$17,380	$11,587	$28,967
River Keepers 2013 Monitoring Program	Complete	$6,341	$4,227	$10,568
Development Phase Fund – 2010	Complete	$0	$0	$0
Development Phase Fund – 2011	Active	$10,882	$7,255	$18,137
Development Phase Fund – 2012	Active	$0	$0	$0
Development Phase Fund – 2013	Active	$2,642	$1,761	$4,403
Development Phase Fund – 2014	Active	$0	$0	$0
Development Phase Fund – 2015	Active	$38,100	$25,400	$63,500
Valley City Comprehensive Bank Stability & Restoration Study	Complete	$36,000	$24,000	$60,000
Wild Rice Water Quality Data Products & Planning Tool	Complete	$102,645	$68,430	$171,075
Subtotal		**$729,458**	**$486,305**	**$1,215,763**

Education – Demonstration Projects Project Name	Status	319 Allocation	Local Match	Total Budget
NDSU Discovery Farms Program	Active	$437,900	$291,933	$729,833
NDSU Discovery Farms Program – Phase II	Active	$140,000	$93,333	$233,333
NDSU Vegetative Buffer Demonstration & Evaluation Project – Phase II	Complete	$81,044	$54,029	$135,073
Subtotal		**$658,944**	**$439,296**	**$1,098,240**

Education – Public Outreach Projects Project Name	Status	319 Allocation	Local Match	Total Budget
Envirothon Program – Phase III	Complete	$120,150	$80,100	$200,250
Envirothon Program – Phase IV	Active	$133,000	$88,667	$221,667
Foster County - TREES Program – Phase II	Active	$366,350	$244,233	$610,583
Menoken Farm Soil Foodweb Project	Complete	$163,034	$108,689	$271,723
Menoken Farm Soil Foodweb Project – Phase II	Active	$155,000	$103,333	$258,333
ND Water Wisdom Project	Active	$145,000	$96,667	$241,667
NDSU Eastern ND Soil Salinity Program	Complete	$100,200	$66,800	$167,000
NDSU Eastern ND Soil Salinity Demonstration Network	Active	$112,474	$74,983	$187,457
NDSU Nutrient Management Educational Support Program	Complete	$352,000	$234,667	$586,667
NDSU Nutrient Management Education & Support Program - Phase II	Active	$295,500	$197,000	$492,500
Partners for Improving Water Quality I&E Program	Active	$325,000	$216,667	$541,667
Prairie Waters Education and Research Center	Complete	$526,946	$351,297	$878,243
Prairie Waters Education and Research Center - Phase II	Active	$190,000	$126,667	$316,667
Project WET – Phase II	Complete	$196,119	$130,746	$326,865
Project WET – Phase III	Active	$175,000	$116,667	$291,667
Ranchers Mentoring Project	Active	$290,000	$193,333	$483,333
Statewide ECO ED Camp – Phase III	Active	$289,098	$192,732	$481,830
Subtotal		**$3,934,871**	**$2,623,247**	**$6,558,118**

Table III-2 (con't). Status and Budgets for Projects Supported Under the Fiscal Year 2010, 2011, 2012, 2013, 2014 and 2015 Section 319 Grants.

Support Projects (TA or FA) Project Name	Status	319 Allocation	Local Match	Total Budget
NPS BMP Team – Phase II	Active	$431,920	$287,947	$719,867
Eastern ND Soil Salinity Specialist Program	Discontinued	$53,348	$35,565	$88,913
Livestock Pollution Prevention Program	Active	$1,304,443	$869,629	$2,174,072
Livestock Pollution Prevention Program - Phase III	Active	$479,300	$319,533	$798,833
Livestock Pollution Prevention Program - Phase IV	Active	$300,000	$200,000	$500,000
NDSU Riparian Ecological Site Description Development Project	Active	$157,343	$104,895	$262,238
Stockmen's Association Manure Management Specialist – Phase II	Complete	$284,155	$189,437	$473,592
Stockmen's Association Manure Management Specialist – Phase III	Active	$1,168,669	$779,113	$1,947,782
Subtotal		**$4,179,178**	**$2,786,119**	**$6,965,297**

NPS Program Staffing and Support Project Name	Status	319 Allocation	State Match	Total Budget
NPS Program Staffing & Support	Active	$4,015,041	$2,676,694	$6,691,735
Subtotal		**$4,015,041**	**$2,676,694**	**$6,691,735**

Watershed Projects Project Name	Status	319 Allocation	Local Match	Total Budget
Antelope Creek Watershed/Wild Rice Riparian Corridor Project – Phase II	Complete	$671,112	$447,408	$1,118,520
Antelope Creek Watershed/Wild Rice Corridor Project - Phase III	Active	$503,000	$335,333	$838,333
Baldhill Creek Watershed - Griggs Co	Active	$255,399	$170,266	$425,665
Barnes Co. Sheyenne River Watershed - Phase II	Complete	$791,098	$527,399	$1,318,497
Bear Creek Watershed – Phase II	Complete	$215,556	$143,704	$359,260
Beaver Creek/Seven Mile Coulee Watershed	Complete	$40,000	$26,667	$66,667
Beaver Creek/Seven Mile Coulee Watershed – Phase II	Active	$509,940	$339,960	$849,900
Cannonball River-Dogtooth Creek Watershed	Active	$270,371	$180,247	$450,618
Coyote Creek Watershed & Little Missouri Tributaries Assessment	Complete	$196,434	$130,956	$327,390
Dead Colt Creek TMDL Implementation Project	Complete	$227,294	$151,529	$378,823
James River Headwaters Watershed – Phase II	Complete	$322,107	$214,738	$536,845
Kelly Creek Watershed	Active	$243,900	$162,600	$406,500
Maple River Watershed (Cass Co.)	Complete	$219,624	$146,416	$366,040
Maple River Watershed Phase II - Buffalo Creek	Active	$283,778	$189,185	$472,963
Morton County Northeastern Watersheds Project	Active	$482,335	$321,557	$803,892
Powers Lake Watershed Restoration Action Strategy – Phase II	Complete	$129,017	$86,011	$215,028
Red River Riparian Project - Phase IV	Complete	$333,906	$222,604	$556,510
Red River Riparian Project - Phase V	Active	$390,315	$260,210	$650,525
Rush River & Brewer Lake Watershed	Complete	$44,183	$29,455	$73,638
Sheyenne Watershed Sedimentation Reduction Project	Active	$305,205	$203,470	$508,675
Spring Creek Watershed	Complete	$400,033	$266,689	$666,722
Spring Creek Watershed - Phase II	Active	$450,000	$300,000	$750,000
Stutsman Co. Livestock Manure Management Program	Active	$640,000	$426,667	$1,066,667
Timber Coulee Watershed	Active	$324,990	$216,660	$541,650
Turtle Creek Watershed (McLean Co.)	Active	$378,600	$252,400	$631,000
Turtle River Watershed	Complete	$24,507	$16,338	$40,845
Upper Red River Valley Riparian Project	Complete	$33,303	$22,202	$55,505
Upper Turtle River Watershed - North & South Branches	Active	$250,000	$166,667	$416,667
Walsh Co. Homme Dam Watershed	Active	$265,100	$176,733	$441,833
Wild Rice River Restoration & Riparian Project	Complete	$385,381	$256,921	$642,302
Wild Rice River Restoration and Riparian Project - Phase II	Active	$309,920	$206,613	$516,533
Subtotal		**$9,896,408**	**$6,597,605**	**$16,494,013**
Cumulative FY2010 - 2015 Grant Budget		**$23,413,900**	**$15,609,267**	**$39,023,167**

Delivery of the NPS Program is being accomplished through six objectives addressing: Waterbody Prioritization; Resource Assessment; Project Assistance; Coordination; Public Education and Program Evaluation. Each objective has specific tasks, planned outputs and milestones that describe the major actions to be completed during the Management Plan period. These objectives are presented as individual sections of the Management Plan and 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 sufficient 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 identified NPS pollution impacts.

- Public Out-Reach 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.

- Program Evaluation - Document the effectiveness and success of the NPS Program and its state and local partners in identifying and addressing the sources and causes of NPS pollution impairing or threatening beneficial uses of waters of the state.

The following sections summarize the cumulative accomplishments associated with each of the Management Plan objectives.

Waterbody Prioritization

In recent years, the NPS Program prioritization process has been in a state of transition. With the establishment of basin stakeholder advisory groups (BSAGs) within the Basin Water Quality Management Framework (Basin Framework) and the initiation of the TMDL visioning process, the composition of the local partnerships and the prioritization process itself will change significantly over the next 5 years. The most immediate actions that will affect the NPS Program prioritization process include the development and use of the Recovery Potential Screening Tool (RPST) in the TMDL visioning process as well as the inclusion of the BSAGs in the NPS Program prioritization process. Priorities established with the aid of the RPST will begin to be incorporated into the NPS Program prioritization process in 2016/2017 to set initial statewide and basin level priorities for watershed assessment, restoration or protection. As the Basin Framework develops, the BSAGs will further define the RPST priorities to establish more specific basin level priorities for NPS pollution management and assessment. This BSAG process will occur over multiple years and extend beyond 2021. Given the extended transition period, the current processes used to prioritize waterbodies will vary somewhat between river basins and local watersheds until the implementation of the RPST, TMDL Strategy, and Basin Framework are fully initiated over the next 5-7 years.

Coordination with the TMDL Program has always been a major component of the NPS Program prioritization process. As the TMDL visioning process matures, this coordination is expected to strengthen as the NPS Program more closely aligns with the long term TMDL priorities to further refine its own watershed priorities. Those waterbodies ranked as high priority for TMDL development and those with approved TMDLs will be considered the highest priority waterbodies for assessment and restoration under the NPS Program. Locally, the TMDL and NPS Program priorities will also be used for prioritization purposes, but other information such as public survey results; applied BMP data; and NPS Pollution Assessment Reports, may also be used to further evaluate priorities and set schedules for local watershed assessment, restoration or protection projects.

In addition to the watershed priorities, the NPS Program also establishes priorities based on pollutant sources. If a particular NPS pollutant source is consistently contributing to the impairment of beneficial uses in multiple watersheds, the pollutant source itself is identified as a high priority and targeted for abatement activities. Animal feeding operations and degraded riparian areas are the current statewide priority sources being addressed through the NPS Program. The Stockmen's Environmental Services Program, which is focused on livestock manure management and the Red River Riparian project, which is addressing degraded riparian areas are examples of two active projects addressing priority pollutant sources.

Within the priority watersheds, further prioritization is also being accomplished with the Annualized Agriculture Nonpoint Source Pollution model (AnnAGNPS), Water Quality Decision Support Tool (Decision Support Tool) and/or Prioritize, Target & Measure Application Tool (PTMApp). The Decision Support Tool and PTMApp, which are only available in the James and Wild Rice River Basins, are based on Light Detection and Ranging (LiDAR) derived data products. All these models are used to identify areas and/or sub-watersheds within the priority watersheds that are major sources of nitrogen, phosphorus and/or sediment.

The AnnAGNPS model is used throughout the state to map the target areas for all the priority watersheds receiving Section 319 support. Generally, the AnnAGNPS target areas range in number from a few to over one hundred per priority watershed. Separate AnnAGNPS priority areas are established for cropland and non-cropland (i.e., range, pasture, etc.) to provide direction for BMP implementation. Figures III-2 and III-3 are typical maps of the AnnAGNPS priority sections in a watershed.

The Decision Support Tool and PTMApp, are two new prioritization processes recently initiated by the state. These web-based applications provide the means to better identify priority sub-watersheds and target areas within the larger priority watersheds. In addition to this, both tools also allow the user to easily "zoom-in" at the field scale to identify critical sites for BMP planning purposes. When completed, the tools will also have the potential to analyze downstream load reductions associated with applied BMPs. The Decision Support Tool has been developed for the Wild Rice River Basin and the PTMApp is being developed for the James River Basin. The PTMApp for the James River Basin is scheduled to be completed in the fall of 2016.

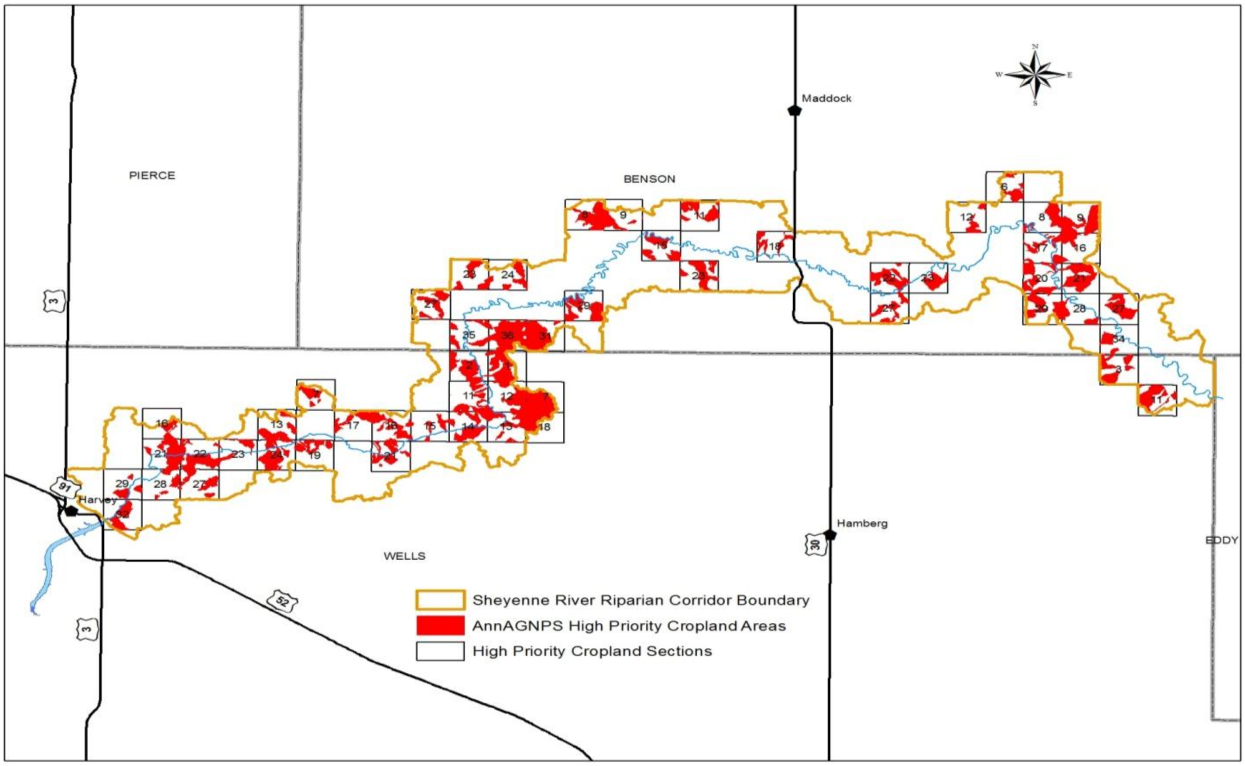


Figure III-2. AnnAGNPS Priority Sections for Cropland in the Middle Sheyenne River Watershed.

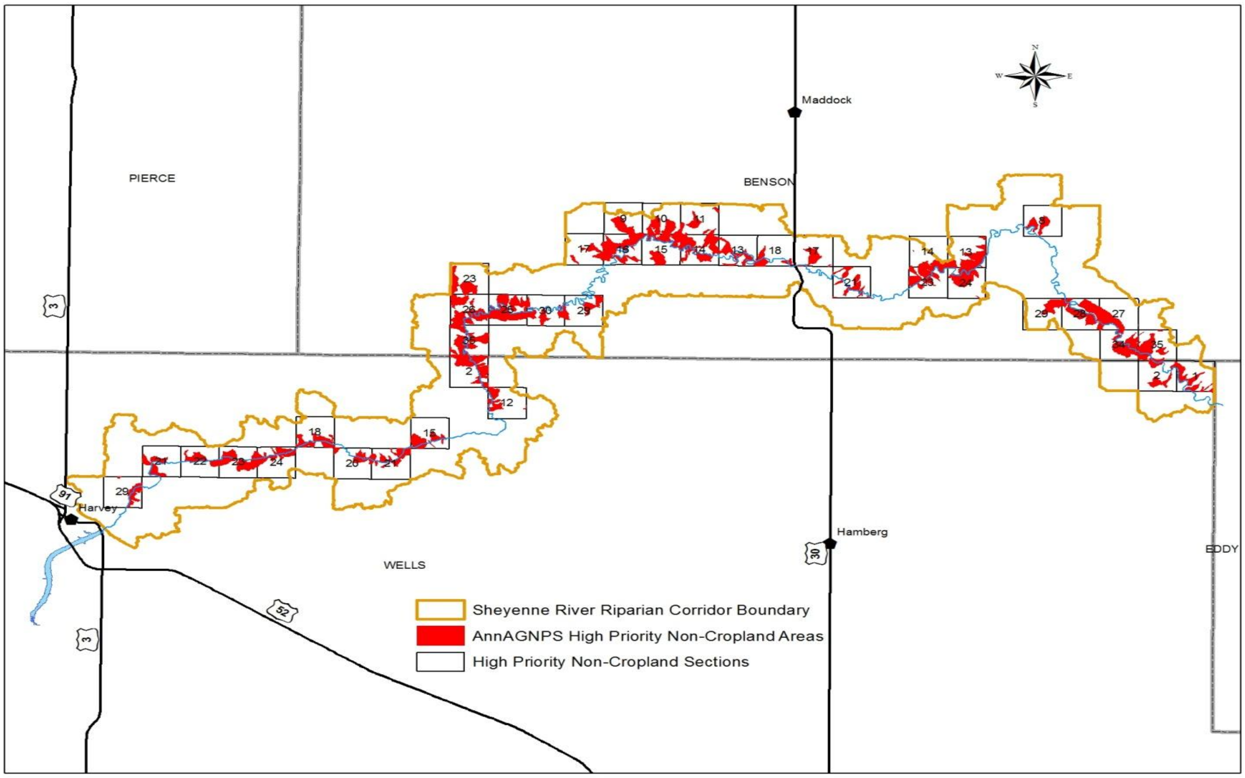


Figure III-3. AnnAGNPS Priority Sections for Non-Cropland in the Middle Sheyenne River Watershed.

Resource Assessment

Projects designed to assess and document the extent of beneficial use impairments associated with NPS pollution continue to be a critical component of the NPS Program. Data collected through assessment efforts are used to define state and local NPS pollution management needs as well as provide direction for ongoing and future educational initiatives. As the Basin Framework develops, assessment projects at the basin level and watershed level (e.g., 12 and 10 digit hydrologic units) will also provide BSAGs the necessary information to establish priorities for watershed restoration or protection, TMDL development, and public outreach. These priorities will be the foundation of their basin management plans. The first watershed assessments under the Basin Framework are tentatively scheduled to be initiated in the Red River Basin in 2017.

Within the NPS Program, the locally sponsored NPS assessment projects are the primary means used to identify watershed priorities and management measures needed to address NPS pollution impairments. The local NPS assessments, commonly referred to as "development projects," provide the foundation for all watershed projects by identifying specific sources and causes of NPS pollutants impairing or threatening beneficial uses. This information is used to establish watershed priorities as well as to develop multi-year project implementation plans (PIPs) that address the identified beneficial use impairments. When applicable, Department staff also coordinate with the local sponsors to utilize the assessment data to develop TMDLs.

Section 319 financial support for assessment projects is derived through two different sources. Short-term (i.e., 1-2 years) NPS assessment projects are supported with Section 319 funding available through the NPS Program's "Development Fund." The Development Funds are either reallocated funds from other NPS projects or funds budgeted for assessment projects under the NPS Program's staffing and support plan. If the waterbody is also on the TMDL List, alternative funds, such as 604[b] funding, may also be used to support the assessment activities. For the multi-year or basin-wide NPS assessments, local sponsors have also participated in the annual Section 319 grant application process to secure Section 319 support for the duration of the project.

To date, Development Funds under the 2010 – 2015 Section 319 Grants have been used to support 12 projects. These projects are quite variable with efforts focusing on issues such as watershed-scale assessment; BMP effectiveness monitoring; documentation of potential wetland impacts; and development of prioritization tools for future assessment efforts. Table III-1 lists the budget and status for the Development Phase projects supported by the Active Section 319 Grants.

Similar to the waterbody prioritization activities, NPS Program assessment efforts are also in a state of transition. Prior to the development of the ND TMDL Prioritization Strategy, Recovery Potential Screening Tool and Basin Framework, the NPS Program assessment activities were largely directed by the Integrated Report 303(d) list and local priorities. This process is expected to begin to be revised in 2016 as the "new" prioritization methods and tools are finalized and more direction is provided for the prioritization of future waterbody assessment projects.

Project Assistance

As a voluntary program, successful development and implementation of all NPS pollution management projects continues to be dependent on local support and involvement. Local participation provides the opportunity to ensure the project plans include goals and objectives that are focused on both the local and state water quality and NPS pollution priorities. Although the size, type, and target audience of the local NPS projects varies greatly, they all share the same basic objectives. These common objectives are: 1) increase public awareness of NPS pollution impacts and solutions; 2) reduce/prevent the delivery of NPS pollutants to waters of the state; and 3) evaluate and document the benefits of project activities.

NPS Program financial and technical assistance provided to NPS projects is being used to support local staff, BMP implementation, water quality monitoring, data interpretation, and public meetings or other I&E events. Section 319 funding is allocated at a 60% Section 319 and 40% local matching ratio. The local match, provided in the form of cash and/or in kind services, continues to be derived from a number of partners including, soil conservation districts, water resources boards, city councils, private foundations and trusts, landowners, nongovernmental organizations (NGO), agricultural groups and state agencies.

The Natural Resources Conservation Service (NRCS) is the primary source of federal financial and technical assistance within most of the NPS projects. Technical assistance provided by the NRCS has generally included staff time to assist with land use or riparian assessments, public meetings, educational events and/or farm unit planning. Office space and some equipment have also been provided to NPS Program watershed projects. Most importantly, the USDA cost share programs have continued to be extremely important sources for increasing the total cost share assistance available for BMP implementation in the watershed project areas. The Environmental Quality Incentive Program (EQIP), in particular, has been an important program for helping many NPS projects move toward their BMP implementation goals and objectives.

From a state perspective, two main sources of non-federal financial assistance have been available in recent years for local NPS projects. These sources are the State Water Commission Trust Funds and the ND Outdoor Heritage Fund. These sources are not direct state appropriations, but instead, they are state funds made available through competitive application processes and subject to approval by the state agencies administering the funds. The budgets for these two state funding pools are set on a biennial basis by the state legislature.

The State Water Commission Trust Fund (SWC Trust Fund) has been a longtime source of state funding for qualifying NPS projects. Qualifying projects are limited to the NPS projects that provide BMP design assistance to other projects supported by the NPS Program. Each biennium, $200,000 in SWC Trust Funds are awarded to the Department for allocation to eligible NPS projects. The SWC Trust Funds are used by the project to support eligible costs and supplement the 40% match requirements associated with the Section 319 funds awarded to the project.

A second source of state funding for NPS projects includes the ND Outdoor Heritage Fund (OHF). If state tax revenues are sufficient, the OHF can receive up to $40 million per biennium to support projects addressing natural resource management (including water quality) and outdoor recreation. Although this maximum allocation has not been met during any biennium, the OHF has awarded approximately $ 23,000,000 to a variety of projects since it was initiated in December 2013. To date, twelve NPS projects have received a total of $2,537,861 in OHF funding. Specific NPS Program projects supported with OHF funds are listed in Table III-3. All the OHF funds were awarded to support the installation of BMP.

Table III-3. North Dakota Outdoor Heritage Fund Allocations to Section 319 NPS Pollution Watershed Implementation Projects Since 2013.

Project Name	OHF Allocation
Stutsman Co. Manure Management Project	$ 300,000
Riparian Grazing Systems Project*****	$ 253,500
LaMoure County Memorial Park Streambank Restoration Project*****	$ 695,424
Antelope Creek Watershed and Wild Rice Riparian Corridor Project	$ 105,000
Wild Rice River Restoration and Riparian Project – Phase II	$ 9,937
Sheyenne River Sedimentation Reduction Project	$ 126,000
Turtle Creek Watershed	$ 138,000
Ransom Co. Water Quality Improvement Project *****	$ 115,000
Red River Riparian Project – Phase V	$ 230,000
Baldhill Creek Watershed	$ 300,000
Sheyenne River Sedimentation Reduction Project (2nd OHF Allocation)	$ 200,000
Homme Dam Watershed Project	$ 65,000
Total	**$ 2,537,861**

*Projects that only have 319 funds committed for staff. OHF funds will support all the BMP implementation.

Section 319 funding continues to be the main source of financial support for the NPS Program. The estimated annual Section 319 allocations for the NPS Program are approximately $3,500,000, with 15-20 % of the 319 funds being committed for NPS Program staffing and support. The balance (i.e., 80-85%) of the annual Section 319 allocations is awarded to NPS projects focused on public education, watershed restoration, and/or water quality assessment. Estimated non-federal match requirements to the annual Section 319 awards are $2,333,333. The non-federal match supporting NPS Program staffing is provided through the State General Fund and the balance of the non-federal match is provided through the local projects in the form of cash or inkind services. The main local match contributors are typically Soil Conservation Districts and participating producers and/or landowners installing BMP.

Although direct grant awards (e.g., Section 319 funds and OHF funds) are the major components of NPS project budgets, cash and inkind match contributions from sponsoring entities and their partners are also a significant part of most NPS project budgets. These local contributions represent a majority of the non-federal match commitments for the NPS projects. Given this level of investment, it is apparent the local sponsors and their partners have not only been responsible for managing most of the NPS projects, but they have also been the primary sources of the non-federal financial support needed to deliver the NPS Program. Table III-4 lists some of the key entities providing technical and/or financial support for the development, implementation and/or management of NPS projects.

Table III-4. Local Section 319 NPS Pollution Project Sponsors and Financial Partners in North Dakota.

Soil Conservation Districts	State Water Commission	Water Resource Districts
ND Department of Agriculture	ND Game and Fish Department	North Dakota State University
Industrial Commission (OHF)	Ducks Unlimited	ND Stockmen's Association
Valley City State University	NDSU Extension Service	Landowners/Producers
Grazing Lands Coalition	Regional Councils	

To date, Section 319 funding has been awarded to 56 NPS projects throughout the state. These projects included 26 watershed projects; 14 educational projects; and 12 development phase projects. Another 4 projects, defined as support projects, were also provided funding through the grants to address specific priority NPS pollution issues (e.g., manure management and soil salinity) or provide engineering assistance to watershed restoration projects. The NPS projects supported with Section 319 funds are grouped under one of seven categories. Inclusion in a particular category is primarily based on the goal of the project. Table III- 5 lists the cumulative Section 319 allocations per project category under the grants that were active during the reporting period for the Integrated Report.

Table III- 5. Section 319 Funding Allocations per Project Category under the 2010 – 2015 Grants.

Project Type *	Cumulative 319 Allocations	Percent of Total 319 Allocations
Development Phase - NPS Assessment	$ 729,458	4%
Development Phase – TMDL Development	$ 0	0%
Education - Demonstration	$ 658,944	3%
Education - Public Outreach	$ 3,934,871	20%
Support Projects (TA or FA)	$ 4,179,178	22%
NPS Assessment - Multi Year Grant Award	$ 0	0%
Watershed Projects	$9,896,408	51%
Total	**$ 19,398,859**	**100%**

*NPS Program staffing and support has not been included in the table to more accurately display the distribution of Section 319 funding between the project categories.

Coordination

With limited technical and financial resources at the state and local level, effective delivery of the NPS Program requires a significant amount of coordination with federal, state, and local agencies; landowners; agricultural producers; and nongovernmental organizations (NGOs). The primary means for coordinating statewide efforts is through direct interaction with the resource management partners (e.g., NRCS, NDASCD, and Extension Service) as well as through the North Dakota NPS Pollution Task Force (Task Force).

Locally, coordination is primarily accomplished through direct contact and participation with local resource management groups, (e.g., soil conservation districts, NRCS, etc.) and/or project advisory committees. As the Basin Framework is initiated in 2016 - 2020, the local project advisory committees will be consolidated to establish basin stakeholder advisory groups (BSAGs). Once established, the BSAGs will play a lead role in facilitating coordination between all entities with interests in water quality management in their basin. Participation on the technical advisory groups (TAGs) formed by the BSAGs will be an important link for state and federal resource professionals (including NPS Program staff) to coordinate resources and participate in the decision-making process for water quality and NPS pollution management in the major river basins of the state.

At the state level, the annual Task Force review process for the Section 319 project proposals provides the forum to connect NPS project sponsors with potential partners represented on the Task Force. During the Task Force review, the members are given the opportunity to become familiar with the proposed NPS projects seeking Section 319 financial support. Conversely, the local project sponsors are also given the opportunity to describe their projects to several potential state and federal partners in one setting. This interaction serves as a catalyst to encourage follow-up contacts between interested organizations on the Task Force and the NPS project sponsors. The Task Force meetings also provide the outlet for members to exchange information on how and where their agency programs are addressing water quality and/or NPS pollution management in the state.

The long standing partnership between the NPS Program and NRCS is a key relationship for most of the state's NPS pollution management efforts. Nearly all of the Section 319 watershed projects utilize USDA Programs (e.g. EQIP, EWP, CSP, and CRP), to some degree, to expand the amount of financial resources available for BMP planning and implementation. When possible, the NRCS also provides training and technical support to NPS project staff to assist them in conducting riparian assessments, developing conservation plans, evaluating range conditions, and planning or designing manure management systems. Most watershed project coordinators are also co-located in a NRCS field office, which has strengthened coordination between the NRCS district conservationists and NPS project coordinators. By coordinating multiple funding sources and co-locating staff with NRCS, the NPS projects have been able to implement more BMPs, which have greatly enhanced the overall effectiveness of their NPS pollution abatement efforts. Given the benefits of the NRCS/NPS Program partnership, all NPS project sponsors are encouraged to utilize USDA programs to compliment Section 319 funds budgeted for BMP implementation.

Coordination and cooperation between the NRCS and NPS Program was further strengthened in 2015, with the signing of a memorandum of understanding (MOU) that recognizes the Department as a conservation cooperator. With the MOU, data sharing has been simplified and the affects of applied BMP on water quality should be able to be interpreted with more confidence in the USDA National Water Quality Initiative (NWQI) watersheds as well as the local watershed projects supported with Section 319 funding. Looking forward, this same NRCS BMP data will also prove to be beneficial when evaluating the extent of land use management needs in the watersheds for priority waterbodies being assessed.

The NDSU Extension Service (Extension Service) is another major partner of the NPS Program. For the past several years, the Extension Service has coordinated with the NPS Program to deliver a statewide educational program focused on improving livestock manure management. This program, not only assists the NPS Program in educating livestock producers, but it also serves as a technical support program for NPS projects by providing planning assistance focused on manure management. The NDSU manure management specialist has assisted most of the active watershed projects in the state through direct one-on-one assistance or through participation in various local educational events. In addition to this program, the Extension Service is also sponsoring other statewide or regional projects focused on issues such as: 1) development of riparian ecological site descriptions; 2) documentation of BMP benefits; and 3) soil salinity and soil health management. County Extension Agents have also continued to be involved in the planning and delivery of many of the educational events sponsored by the NPS projects.

Sponsorship and management of the NPS projects is provided by a variety of entities. Soil conservation districts (SCDs) are typically the lead sponsors and partners for the waterbody assessments and watershed projects, while Extension Service, Resource Conservation and Development Councils, state agencies and NGOs are typically the partners and sponsors for the education and support projects. Primary responsibilities of all project sponsors include: 1) project plan development; 2) project administration; 3) progress reporting; 4) financial and technical assistance delivery; 5) PIP revisions; and 6) public outreach and education. The BSAGs, established through the Basin Framework, will have these same responsibilities, but will also have a larger role in project prioritization within the basins and the development and implementation of basin water quality management plans. Membership on the BSAGs will also be more diverse to include representation from the entire basin. However, the BSAGs will likely still have a have a "core" membership of soil conservation districts, county Extension Agents, and water resource boards.

Given the agricultural focus of most projects, SCDs are the lead sponsor for most of the NPS projects and will be key members of the BSAGs. The SCDs provide the local leadership necessary to implement and manage projects as well as the "familiar face" to encourage greater producer/landowner involvement. The SCDs long-standing partnership with NRCS also strengthens the coordination of cost share funds provided through the EQIP and NPS Program. Other local or regional organizations that are important partners and sponsors include universities; state agencies, resource conservation and development councils, and water resource boards. Specific organizations currently working with the NPS Program and the general type of assistance each entity provides are listed in Table III-6.

Public Outreach and Education

Delivery of a balanced information and education (I&E) program throughout the state is a critical component of the NPS Program. While watershed projects are effective at abating known sources and causes of NPS pollution, the state and local I&E projects are the primary means for creating widespread awareness and understanding of NPS pollution issues to ensure future support and participation in NPS pollution management efforts. The delivery method, NPS pollution topic, and target audience of the educational projects vary considerably, which is reflective of the diversity in NPS pollution education in the state. However, despite the differences, the state and local I&E projects deliver a common message focused on NPS pollution impacts and solutions to form the delivery network for the statewide educational program.

The NPS Program's statewide educational efforts coordinate with several partners to implement programs and projects targeting all age groups. Currently, 42% of the state's educational projects are focused on teacher/youth education and the other 58% are targeting the general adult population. In most cases, the programs targeting adults place particular emphasis on reaching natural resource managers such as soil conservation district staff, agricultural producers and others involved in farm or ranch planning. This agricultural emphasis is also not lost in the youth programs, where the causes and sources as well as the solutions for agricultural NPS pollution are addressed to some degree.

Table III-6. NPS Pollution Management Program Partners' Assistance and Involvement in the Delivery of the Program.

	Organization Type	Assistance Type **		NPS Program Interaction with Partner Organizations				
Agency or Organization	Federal, NGO* or State/Local	TA	FA	Task Force Member	Attend Partner Meetings	NPS Project Sponsor	BMP Support	NPS Project Planning Assistance
Natural Resource Conservation Service	Federal	X	X	X	X		X	X
US Geological Survey	Federal	X	X	X	X			X
Us Farm Services Agency	Federal	X	X	X			X	
US Fish & Wildlife Service	Federal	X		X				X
US Forest Service	Federal	X		X				X
US Environmental Protection Agency	Federal	X	X	X	X		X	X
US Army Corps of Engineers	Federal	X						
ND Association of Soil Conservation Districts	NGO	X		X	X			
ND Stockmen's Association	NGO	X	X	X	X	X	X	X
Red River Basin Commission	NGO	X		X	X			X
Resource Conservation & Development Councils	NGO	X	X		X	X	X	X
Ducks Unlimited	NGO	X	X		X		X	
ND Grazing Lands Coalition	NGO	X	X		X	X	X	X
ND Certified Crop Advisors Board	NGO	X			X			
Keep ND Clean Inc.	NGO	X			X			X
International Water Institute	NGO	X			X	X		X
Local Soil Conservation Districts	State/Local	X	X		X	X	X	X
Water Resource Boards (county-level)	State/Local	X	X		X	X	X	X
ND Department of Agriculture	State/Local	X	X	X		X	X	X
ND Game & Fish Department	State/Local	X	X	X			X	X
Upper Sheyenne Joint Water Resource Boards	State/Local	X			X			X
NDSU Extension Service (State-level)	State/Local	X	X	X	X	X		X
ND State Water Commission	State/Local	X	X	X	X	X	X	X
ND Forest Service	State/Local	X		X	X		X	X
ND Industrial Commission	State/Local		X				X	
Universities (NDSU, UND, VCSU)	State/Local	X	X			X		X
ND Department of Public Instruction	State/Local	X			X			X
Cities	State/Local	X	X		X			X
ND State Historic Preservation Office	State/Local	X						X

* NGO- Nongovernmental Organization

** TA – Technical Assistance; FA – Financial Assistance

For youth education, the NPS Program has continued to support four long term education programs focused on K-12 students and teachers. These projects include the ECO ED Program, Project WET, Envirothon and The Regional Environmental Education Series (TREES). Each project is focused on a slightly different audience and delivers a message that compliments the messages of the other three projects. As a fifth component to the youth education efforts, the Prairie Waters Education and Research Center (Center) was established in 2010. The Center strengthened the ongoing youth education efforts by providing a location to conduct some of the educational programs as well as by providing training for facilitators or teachers involved in water education for students. The Center also manages the River Watch Program, which expanded youth participation in volunteer monitoring efforts at several locations in the state.

As previously indicated, a majority of the NPS Program's I&E projects are targeting the adult population, with emphasis placed on reaching individuals involved in the agricultural industry. Collectively, these I&E projects address a variety of agricultural topics, including; manure management, nutrient management, soil health, cover crops, and grazing rotations. Soil health, in particular, has become the center piece for many of the educational projects supported over the past 10 years. While improved soil health is recognized as a product of good cropland and grazing land management, soil health management as a component of a systems approach is viewed as one of the foundational tools for reducing the transport of NPS pollutants from agricultural fields. This holistic approach is the "new" message being emphasized by many of the educational events and programs supported by the NPS Program.

A third component of the NPS Program's education network, that is often overlooked, are the educational events supported by the local watershed projects. Although the watershed projects are not specifically focused on education, they typically implement a variety of agriculture-based educational events (e.g., tours, newsletters and BMP demonstrations). These events generally attract between 10-25 individuals, although some of the larger workshops and demonstrations have recorded over 100 participants. Cumulatively, there are thousands of people who benefit from the watershed projects' education programs each year. The main target audience for the watershed events is agricultural producers and land owners, although, in recent years, representatives from such groups as lending institutions, county and city government, and crop consultants are also being invited to increase their understanding of agriculture's role in water quality management.

Twelve I&E projects are currently supported by the NPS Program. These projects range in size from local county events to statewide programs. Target audiences include the general public, K-12 students, teachers, agricultural producers and local resources managers. The products of the educational efforts are just as diverse, with outputs such as newsletters, workshops, lyceums, BMP demonstrations, tours, mentoring services, fact sheets, radio ads, and videos. Table III-7 provides a summary of the goals and target audiences of the active I&E projects.

Table III-7. Primary Goals and Target Audience of NPS Pollution Education Projects in North Dakota.

Project Name	Primary Target Audience	Major Goals
Envirothon Program	Students in grades 9-12	Deliver a statewide program that strengthens problem solving skills by providing the opportunity to learn and use science based information to identify and prescribe potential solutions that address NPS pollution and other natural resource concerns.
The Regional Environmental Education Series (TREES)	Students in grades K-12	Deliver a series of lyceum-style programs to schools to create greater appreciation for the state's water resources and increase participants understanding of the importance of wise use of all natural resources.
NDSU Nutrient Management Educational Support Program	Resource Managers & Livestock Producers	Maintain a statewide program focused on the development and delivery of training programs, bulletins, workshops, demonstrations, and one-on-one planning assistance to promote better management of livestock manure.
ND Project WET (Water Education for Teachers)	K-12 Teachers & Students	Deliver a variety of educational offerings throughout the state to increase participants' knowledge and understanding of NPS pollution impacts to our water resources and potential solutions to those impacts.
Statewide ECO ED Program	Students in grades 6-8	Provide technical and financial assistance for local soil conservation districts to conduct one-day tours or two-day camps that provide hands-on outdoor instruction on water quality, soil/erosion; wetlands, prairies, and woodlands.
ND Water Wisdom Project	Resource Managers & Agricultural Producers	Deliver an educational program in south central and western ND that supports a variety of local educational offerings (e.g. workshops, tours, newsletters, & demonstrations) focused on agricultural management practices that are effective at controlling NPS pollution. Two regional soil health workshops and one statewide grazing planning workshop will also be supported.
Discovery Farm Program	Resource Managers & Agricultural Producers	Establish a series of BMP demonstration sites on three working farms. These sites will be used to evaluate the water quality benefits of various BMP. Water quality and quantity will be collected to quantify the positive or negative impacts of the applied BMP. The current focus of the program is on BMP associated with livestock manure management and tile drain management.
Prairie Waters Education Center	Resource Managers & K -12 Teachers & Students	Develop and manage an educational center to provide training and educational offerings addressing topics such as water quality monitoring; stream morphology; macroinvertebrate sampling and watershed management. Training and instruction will include both classroom style presentations and in-field educational sessions.
Menoken Farm Soil Foodweb Project	Resource Managers & Agricultural Producers	Utilize the Menoken demonstration farm to showcase farming systems that improve soil health; increase water use efficiency and improve water quality. Management of the demonstration fields will focus on the importance of continuous live roots in the soil, crop diversity; livestock grazing, and cover crops for improving soil health. Tours, newsletter, and meeting presentations will be used to disseminate information gained through the Menoken farm project.

Table III-7 (con't). Primary Goals and Target Audience of NPS Pollution Education Projects in North Dakota.

Project Name	Primary Target Audience	Major Goals
Eastern ND Soil Salinity Specialist Program	Resource Managers & Agricultural Producers	Increase landowner and resource manager awareness and understanding of soil salinity issues in eastern ND. Salinity specialists employed by the project will: 1) promote proper use and protection of saline areas; 2) train local SCD staff and others on management options for saline areas; 3) maintain demonstration sites; and 4) disseminate information regarding the management of saline areas through participation in workshops, tours, and conferences.
Ranchers Mentoring Program	Farmers and Ranchers	Promote land management systems that will improve water quality and soil health. A network of mentors will be established to provide interested ranchers technical support and advice (from fellow ranchers) regarding management options that can be used to improve soil health and water quality as well as maintain the sustainability of their ranch or farm.
Partners for Improving Water Quality I/E Program	Resource Managers & Agricultural Producers	As a follow-up phase to the Water Quality Mentorship and Outreach Program, the project will continue to deliver a balanced educational program in southwestern ND that promotes concepts and practices that will improve cropland and grazing management and protect water quality.

*****Resource managers include individuals from NRCS, Extension Service, Soil Conservation Districts, 319 Projects, State Agencies, Private Organizations, Water Resource Districts, etc. involved in farm planning and resource management.

Program Evaluation

Evaluation of NPS Program progress is primarily based on the accomplishments of the NPS projects and completion of the measurable outputs identified in the most current Management Plan. The EPA Grants Reporting and Tracking System (GRTS); annual and final project reports; EPA performance measures (e.g., WQ10 & SP12 reports); and annual programmatic reports are the main reporting tools used to disseminate information on NPS Program and local project progress and success.

At the project level, progress toward established goals is tracked through several different monitoring approaches dependent on many factors. These factors include such variables as project size; project goals; planned BMPs; NPS pollution sources and causes; target audience; water quality parameters; location; and beneficial use impairments. The monitoring methods employed are also variable and may include: photo-monitoring, exit surveys, pre/post testing, macroinvertebrate sampling, water quality sampling, and BMP tracking. However, given the delayed water quality response to applied BMP, the Department also uses computer models during the short term to estimate pollutant load reductions resulting from applied BMPs. Models such as the STEPL and the animal feedlot runoff risk index worksheet (AFRRIW) compliment the in-stream or in-lake data by providing the interim measures needed to evaluate annual project progress. Upon completion of a project, all data and information collected for evaluation purposes are interpreted and incorporated into the final project reports to describe project success. These final project reports, including applicable data summaries, are entered in the GRTS. Overall, the success of the NPS Program is directly linked to the cumulative accomplishments and success of the NPS projects supported by the program, which is reflected in the annual and final reports posted in the GRTS.

From a program perspective, progress annually and/or at the end of the Management Plan period is measured by evaluating progress toward the task outcomes described in the Management Plan. Each Management Plan covers a 5- year period and includes a series of tasks with planned outcomes that must be completed to ensure progress toward the NPS Program vision to abate NPS pollution threats and impairments to beneficial uses. The current Management Plan describes the NPS Program's focus for the period of 2015 – 2020. Evaluation of progress under the current Management Plan will be based on the extent to which the task outcomes are achieved by 2020. Specific planned outcomes under the 2015-2020 Management Plan and progress toward those outcomes, as of January 2016, are as follows:

- Waterbodies assessed and associated TMDLs completed --- 15 assessed waterbodies with approved TMDLs or Alternative Plans (3/year) --- *Two TMDLS were submitted to EPA for review and approval in 2015. These TMDL's addressed one reach in Turtle Creek watershed and 4 reaches in Maple River watershed. No alternative plans were developed.*

- Waterbodies with one or more restored beneficial uses – 5 waterbodies (1/year); 5 WQ-10 success stories --- *In 2015, beneficial use restoration was not recorded for any waterbodies in the watershed projects and no WQ-10 success stories were submitted to EPA. Due to the dynamic nature of agriculture (our dominant land use) and limited resources, the ability to fully restore impaired beneficial uses has remained a challenge. To address this challenge, the Management Plan includes additional actions for 2015-2020 to improve waterbody prioritization and assessment; BMP targeting; and local coordination.*

- Waterbodies with improving trends in water quality and/or beneficial uses – 10 waterbodies (2/year); 10 SP-12 waterbodies --- *Water quality data collected in the Antelope Creek watershed has indicated a declining trend in the geometric means for E. coli bacteria. A SP-12 report on Antelope Creek Watershed was submitted to EPA for review and approval. As previously indicated, documenting improving trends is also a continuing challenge that is being addressed through the updated Management Plan.*

- Estimated annual nitrogen and phosphorus load reductions based on model results. Annual nitrogen and phosphorus load reductions will be approximately 100,000 and 50,000 pounds, respectively. --- *The estimated nitrogen and phosphorus load reductions reported in the GRTS in 2015 are 109,532 and 52,880 pounds, respectively.*

- Increased public awareness and understanding of NPS pollution issues in the state – 20% increase in survey respondents with a good understanding of NPS pollution issues. --- *Targeted surveys have been initiated and follow-up surveys and/or other measures will be conducted the final year of the Management Plan period to evaluate gains in public awareness and understanding.*

- <u>Basin Stakeholder Advisory Groups (BSAGs) established in 3 of the 5 major river basins in the state – 3 BSAGs (1 BSAG established in 2015; 2017 & 2019)</u> --- *The Red River basin will be the first basin targeted under the Basin Framework. The BSAG for the Red River basin will be a part of an existing resource management group in the basin.*

- <u>Basin Management Plans developed, in cooperation with the BSAGs, for 2 of the 5 major river basins in the state (1 Plan in 2017 & 2019)</u> --- *The management plan for the Red River basin will be developed in 2017/2018.*

To gauge land use improvements and interim progress, the number and type of BMPs applied within the project areas are tracked by the NPS projects. Table III-8 lists the amounts and costs of the BMPs applied within the project areas during effective period for the Active Grants (i.e., April 2010 to Present). Sixty (60) percent of the total BMP costs listed in Table III-7 were supported with Section 319 funds. The balance of costs (i.e., 40%) were supported by the cooperating producers, landowners and/or program partners.

Table III-8. BMPs Supported Under the Fiscal Year 2010 – 2015 Section 319 Grants.

Category/Practice	Amount	Units	Total Cost
Cropland Management			
Cover Crop	16,227.23	Acres	$ 280,107.84
Nutrient Management	3,839.90	Acres	$ 51,089.49
Precision Nutrient Management	2,299.90	Acres	$ 39,762.14
Subtotal			**$ 370,959.47**
Erosion Control			
Critical Area Planting	58.80	Acres	$20,746.14
Subtotal			**$20,746.14**
Grazing Management			
Alternative Power Source (Livestock Watering Only)	6.00	Number	$ 30,335.84
Electric Fence Energizer	4.00	Number	$ 1,132.00
Fencing	212,568.70	Linear Feet	$ 231,278.97
Electric Fencing (Single & Multiple Strand)	91,230.50	Linear Feet	$ 31,416.77
Fencing (Woven Wire)	5,374.50	Linear Feet	$ 8,867.92
Miscellaneous (Grazing Management)	14.00	Misc	$ 16,018.21
Pasture/Hayland Planting	1,573.40	Acres	$ 91,384.69
Pipelines	87,961.80	Linear Feet	$ 273,614.12
Pond	1.00	Number	$ 3,319.41
Prescribed Grazing	1,812.90	Acres	$ 0
Range Planting	47.00	Acres	$ 0
Rural Water Hookup	6.00	Number	$ 3,234.54
Spring Development	1.00	Number	$ 850.00
Trough and Tank	71.00	Number	$ 106,059.99
Well (Livestock Only)	24.00	Number	$ 169,005.04
Subtotal			**$ 966,517.50**

Table III-8 (con't). BMPs Supported Under the Fiscal Year 2010 – 2015 Section 319 Grants.

Category/Practice	Amount	Units	Total Cost
Livestock Manure Management System (Full System)			
Irrigation System (for irrigating from containment pond)	1.00	Number	$ 25,000.00
Miscellaneous (Full Manure Management System)	1.00	Misc.	$ 8,323.45
Phase I Waste Management System	11.00	System(s)	$ 1,490,218.08
Phase II Waste Management System	12.00	System(s)	$ 1,437,540.87
Phase III Waste Management System	4.00	System(s)	$ 223,052.98
Waste Management System (Coordinated With EQIP)	2.00	System(s)	$ 333,330.70
Waste Management System (Full System Completed)	4.00	System(s)	$ 1,142,985.63
Subtotal			**$ 4,660,451.71**
Livestock Manure Management System (Partial Sys)			
Fence Removal (Ag Waste)	2,326.00	Linear Feet	$ 8,141.00
Fencing (Ag Waste)	32,800.00	Linear Feet	$ 94,207.84
Heavy Use Protection (Ag Waste/Concrete)	11.25	Cubic Yards	$ 3,171.00
Miscellaneous (Partial Manure Management System)	4.00	Misc	$ 5,968.45
Perimeter Fence (Ag Waste)	12,690.00	Linear Feet	$ 9,248.70
Pipeline	763.00	Linear Feet	$ 22,181.72
Portable Windbreak	26,580.00	Linear Feet	$ 675,382.37
Trough & Tank	3.00	Number	$1,290.45
Waste Utilization	18,803.00	Tons	$ 3,461.07
Water Supply (Ag Waste)	4.00	Number	$ 25,309.02
Watering Facility (Ag Waste: Tank, Pipeline, Well)	9.00	Number	$ 58,983.40
Well (Livestock Only)	2..00	Number	$ 7,470.84
Subtotal			**$ 914,815.86**
Miscellaneous Practices			
Cultural Resource Review	8.00	Number	$ 10,366.67
Miscellaneous Practices (Grazing, Partial Systems & Miscellaneous)	10.00	Misc.	$ 9,567.98
Septic System Renovation	109.00	System(s)	$ 1,011,741.52
Solar Pumps	3.00	Number	$ 9,817.81
Well Decommissioning	52.00	Number	$ 56,885.18
Subtotal			**$ 1,098,379.16**
Riparian Area Management			
Evergreen Revetment	250.00	Linear Feet	$ 1,047.50
Exclusion Fence	6,551.40	Linear Feet	$ 0
Miscellaneous (Riparian Area Management)	6.00	Misc.	$ 99,555.11
Riparian Easement (On Cropland)	448.80	Acres	$ 159,861.92
Riparian Forest Buffer	13.42	Acres	$ 2,293.75
Riparian Herbaceous Cover	258.50	Acres	$ 6,153.16
Site Prep for Trees (Light Mechanical w/ Chemical)	38.00	Acres	$ 0
Streambank and Shoreline Stabilization	1,566.83	Linear Feet	$ 371,979.84
Tree Hand Plants (2' Non-Rooted Stakes)	750.00	Number	$ 1,600.00

Table III-8 (con't). BMPs Supported Under the Fiscal Year 2010 – 2015 Section 319 Grants.

Category/Practice	Amount	Units	Total Cost
Riparian Area Management (continued)			
Tree Planting – Machine (Scalp Plant/Site Pep)	84.95	Per 100 Feet	$ 2,718.70
Tree/Shrub Establishment	96.30	Per 100 Feet	$ 2,533.80
Weed Control for Established Trees (Chemical)	5.00	Acres	$ 40.00
Weed Control for Established Trees (Weed Barrier)	2,656.75	Linear Feet	$ 3,737.50
Subtotal			**$ 651,521.28**
Upland Tree Planting			
Miscellaneous (Upland Tree Planting)	6,520.00	Misc.	$ 0
Site Prep for Trees (Light Mechanical)	2.90	Acres	$ 116.00
Tree/Shrub Establishment	253.86	Per 100 Feet	$ 6,557.06
Weed Control For Tree Establishment (Weed Barrier)	11,841.13	Linear Feet	$ 19,932.80
Windbreak/Shelterbelt	115.75	Per 100 Feet	$ 11,249.35
Subtotal			**$ 37,855.21**
Vegetative Buffers			
Filter Strip	80.08	Acres	$ 11,618.09
Subtotal			**$ 11,618.09**
Total BMP Costs			**$ 8,732,864.42**

The type and amount of BMPs applied within a project area provides the most immediate means for evaluating short term progress and potential success. 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 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 over 60% of the NPS Program's Section 319 funds awarded to Support projects and Watershed projects focused on the implementation of BMPs (Table III-2), it is apparent the NPS Program is directing a majority of its resources toward the planning and implementation of projects that address NPS pollution sources and causes. The BMP implemented by these projects are quite diverse and can be grouped into one of nine different categories. Table III-9 indicates the total expenditures under all the BMP categories recognized by the NPS Program.

Table III-9. Expenditures per BMP Category under the 2010-2015 Section 319 Grants

BMP Category	Total Expenditures	Percent Expenditures
Cropland Management	$370,959	4.2%
Grazing Management	$966,518	11.1%
Livestock Manure Management System (Full Systems)	$4,660,452	53.3%
Livestock Manure Management System (Partial Systems)	$914,816	10.5%
Erosion Control /Upland Tree Plantings/Vegetative Buffers	$70,219	0.8%
Miscellaneous Practices *****	$1,098,379	12.6%
Riparian Area Management	$651,521	7.5%
TOTAL	**$8,732,864**	

*****Ninety-two percent (92%) of the Miscellaneous costs were associated with septic system renovations.

As indicated in Table III-9, a significant portion (i.e., 75 percent) of NPS Program BMP expenditures are associated with practices addressing livestock grazing and manure management. However, as the development and, ultimately, the implementation of the ND Nutrient Reduction Strategy proceeds, more of the NPS Program's financial resources will undoubtedly be targeted toward cropland nutrient management in identified priority areas. Within these areas, some resources will continue to be directed toward manure management issues, but, an increasing percentage may also be used to achieve more efficient nutrient use and minimize runoff on cropland acres. This will be particularly true for waterbodies in the eastern half of the state where nutrient (i.e., nitrogen and phosphorus) applications for crop production are more intensive. Some of the cropland BMPs that will be promoted and implemented include practices such as cover crops, precision nutrient management, vegetative buffers, grassed waterways, and crop rotations.

Although there are many challenges in measuring the short term achievements of watershed projects in the state, there are some projects where the accomplishments and benefits are measureable over a relatively short period. A thirty eight mile reach of the Wild Rice River in Richland County is one such area that has shown targeted financial and technical assistance can be effective at restoring impaired beneficial uses. More specifically, within this reach, assistance was provided to repair failed septic systems and install other best management practices which resulted in the reach achieving full recreational use. This, in turn, resulted in the reach being delisted from the 303(d) list in the 2014 Integrated Report. Given these accomplishments, this 38 mile reach was also recognized by EPA as a "WQ-10 Success Story. The following case history provides more detail on the accomplishments of targeted planning and management in the watershed of the Wild Rice River in Richland County.

Watershed Project Case History: Wild Rice River Watershed (Richland County) - Recreational Uses Attained Through Best Management Practice (BMP) Implementation and Targeted Technical Assistance

The Wild Rice River drains 1.43 million acres in Dickey, Sargent, Ransom, Richland, and Cass Counties in southeastern North Dakota, and Marshall and Roberts Counties in northeastern South Dakota. It is a sub-watershed of the larger Upper Red River Watershed (HUC 09020105). The listed segment of concern was a 38.6 mile portion of the Wild Rice River from its confluence with the Colfax watershed, downstream to its confluence with the Red River ((ND-09020105-001-S_00). The Wild Rice River, including this 38 mile reach, was listed in 1998 as having recreational uses impaired due to fecal coliform bacteria.

A watershed assessment conducted by the Richland County Soil Conservation District (SCD) in 2002-2005 determined that pasture/rangeland, degraded riparian areas, livestock concentration areas and "hobby farms" in close proximity to the river were negatively affecting water quality in the Wild Rice River. The Richland County watershed coordinator also cited improperly functioning septic systems as a contributor to the water quality problems. Water quality samples collected during the 2002-2005 assessment supported the 1998 303(d) listing that the recreational uses of the Wild Rice River were impaired due to elevated concentrations of fecal coliform bacteria.

In 2006, the Richland County SCD developed a watershed project implementation plan to restore the recreational uses of the Wild Rice River. Through this watershed plan and the partnerships with local landowners and homeowners, seven septic system renovations and one well decommissioning were completed within the 12-digit HUCs associated with the listed segment. Restoration practices, completed from 2007 to present, within the entire Wild Rice River watershed included 136 septic system renovations, 31 wells decommissioned, 868 acres of cover crop, 12,690 feet of perimeter fencing installed, 1 watering facilitated constructed, and 1 partial livestock waste management system installed.

In 2009, North Dakota's bacteria standard changed from fecal coliform bacteria to E. coli bacteria. The new standard required a geometric mean during any consecutive 30 day period during the recreational season to be less than 126 CFU/100 mL, with less than 10% of the samples exceeding 409 CFU/100. Based on the data collected during the implementation phase of the Richland County watershed project, the E. coli bacteria concentrations in the 38 mile reach of the Wild Rice River met both criteria for E. coli bacteria concentrations. These improvements in the E. coli bacteria concentrations allowed the Department to de-list the 38 mile segment of the Wild Rice River (ND-09020105-001-S_00) from the 2014 Integrated Report for bacterial impairment.

Chapter 4. Total Maximum Daily Load (TMDL) Program

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 department'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 (i.e., not meeting water quality standards) and which require load allocations, waste load allocations and TMDLs. This list of impaired waters is prepared and submitted to EPA every two years in the form this report, referred to as 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 prioritizing waters on the TMDL list and then developing TMDLs for those priority waters. Historically, 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. In addition, 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.

While not the case in North Dakota, it should be pointed out that for many states, TMDL priorities and the pace of TMDL development, were 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 alternative approaches are adaptively implemented to achieve water quality goals with the collaboration of States, Federal agencies, tribes, stakeholders, and the public."

Included with the Vision are a six goal organized around 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.

"Alternatives" By 2018, States use alternative 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.

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 "North Dakota Total Maximum Daily Load Prioritization Strategy" (Appendix B). This TMDL Prioritization Strategy describes a two-phased approach for prioritizing impaired waters for TMDL development and watershed planning. Specifically, the TMDL prioritization strategy will be used to identify:

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

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. 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 alternative restoration approaches for impaired waters that will achieve water quality standards (i.e., alternative plans).

The responsibility for TMDL or alternative plan development for the state's priority TMDL listed waterbodies lies primarily with the WMP. To facilitate the development of TMDLs, the department created three regional offices located in Fargo, Bismarck and Towner, N.D. (Figure III-8). The focus of the regional TMDL/Watershed Liaison staff is to work with local stakeholders in the development of TMDL water quality assessments, TMDLs and alternative plans based on the Section 303(d) list of impaired waters. Technical support for TMDL development projects and overall program coordination are provided by WMP staff also located in Bismarck, North Dakota.

Typically, TMDL development projects involve monitoring and assessment activities which will:

- Quantify the amount of a pollutant that the impaired water can assimilate and still meet water quality standards.
- Identify all sources of the pollutant contributing to the water quality impairment or threat.
- Calculate the pollutant loading entering the waterbody from each source.
- Calculate the reduction needed in the pollutant load from each source necessary for attainment of water quality standards.

The goals, objectives, tasks and procedures associated with each TMDL development project are described in project-specific Quality Assurance Project Plans.

Equally as important as the development of TMDLs is their implementation. The regional TMDL liaisons provide technical assistance to local SCDs and water resource boards in the development of NPS pollution management projects that address TMDL-listed waterbodies. The liaisons also provide technical expertise to local stakeholder groups and assist with youth and adult information/education events in their regions.

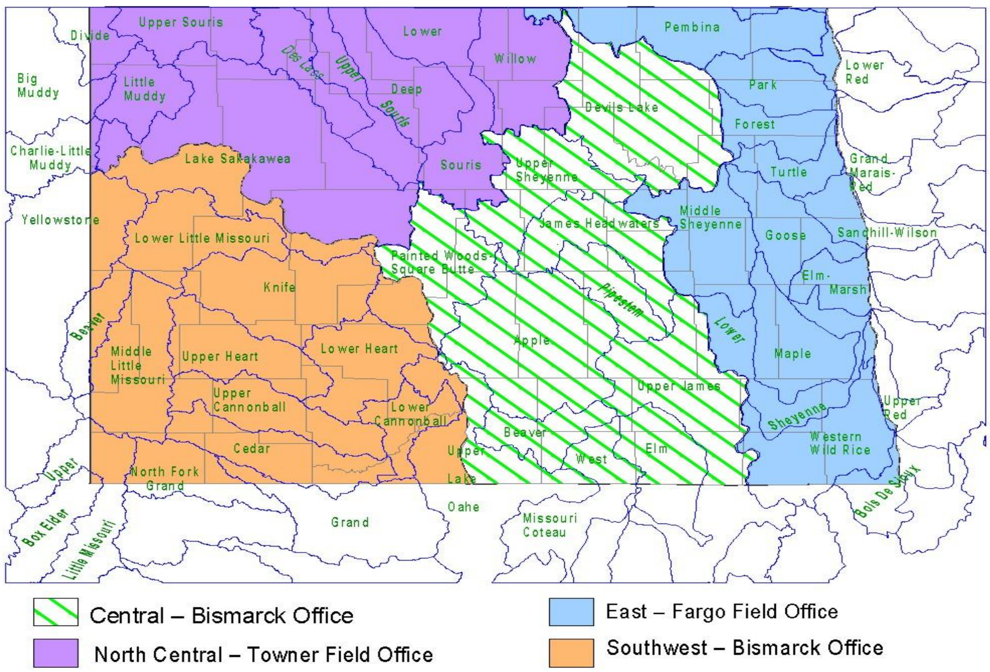


Figure III-4. Map Depicting Areas of Responsibility for Regional TMDL/Watershed Liaison Staff.

Chapter 5. 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 (Figure III-1). 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) and its responsibilities, the 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 Board. 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 discharges and control measures, establishes a spill contingency plan and identifies future water quality issues. Board activities are detailed in annual reports. The board is represented by 18 members, nine from the US and 9 from Canada representing federal, state and provincial government agencies. Recently, the board was expanded to include non-governmental representation with a US and Canadian member from the Red River Basin Commission.

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 rising 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. There also are four at-large members. The governors of North Dakota and Minnesota and the premier of the province of Manitoba have also appointed members to the board.

D. Cost/Benefit Assessment

Costs associated with municipal point source pollution control have been extensive. Capital investments in the form of additions to and construction of new wastewater treatment facilities account for the largest expenditure of funds. While the Clean Water State Revolving Fund (CWSRF) and other state and federal programs have been the major sources of funding, many communities have upgraded wastewater treatment facilities at their own expense.

In the last two years, approximately $224 million has been obligated from the CWSRF for the construction of wastewater system improvements. The cumulative amount invested in wastewater system improvements since passage of the Clean Water Act in 1972 is approximately $825 million. In addition to the capital costs, an estimated $32 million per year is spent operating and maintaining wastewater treatment systems in the state.

While the costs of construction and maintenance of municipal wastewater treatment systems are relatively easy to compile, monetary benefits cannot be so easily quantified. Qualitative benefits include the reduction or elimination of waste loads to receiving waters (Figure III-2, page III-6) and the elimination of public health threats such as malfunctioning drain-field systems and sewer backups.

Federal, state and local governments have also made significant investments in NPS pollution controls. Since 2009, the state's Section 319 NPS Pollution Control Program has provided more than $20.7 million in financial support to more than 53 state and local projects, including more than $8.5 million to 23 watershed restoration projects. In addition to the Section 319 investment in these watershed projects, project sponsors have provided more than $5.7 million in local match to these watershed projects (Table III-2). A variety of agricultural and other BMPs have been implemented through these watershed projects (Table III-7). Total costs of these BMPs were more than $7.6 million.

While the water quality benefits of these Section 319 NPS Pollution Management Program expenditures are substantial, measuring and documenting actual pollutant reductions through monitoring continues to be extremely challenging. Alternately, EPA's STEPL model and the Animal Feedlot Runoff Risk Index Worksheet (AFRRIW) are being used to estimate the nitrogen, phosphorus and sediment reductions associated with Section 319 cost-shared BMP. Using these models, the estimated annual nitrogen, phosphorus and sediment load reductions for BMP supported under the 2008 through 2011 Section 319 Grants are 318,636 pounds, 149,256 pounds and 280 tons, respectively. Primary BMP used to achieve these reductions include grassed waterways, manure management systems, and septic system renovations.

E. Special State Concerns and Recommendations

As the dominant land use in North Dakota, agriculture has always been the primary focus of the state's NPS Pollution Management Program. This long term focus has again held true the past five years, during which time a majority of Section 319 expenditures have been associated with efforts addressing agricultural NPS pollution (see Part III. C. Chapter 3). Because of the magnitude and complexity of the agricultural industry, the department and its local partners have maintained a close working relationship with the NRCS to ensure sufficient resources are available to address NPS pollution within the project areas. State/federal/local partnerships such as this are always crucial for the success of any project addressing NPS pollution associated with agricultural production. Given the importance of this partnership, EPA must continue to work with NRCS, at the national level, to establish policies and/or agreements that will target additional USDA financial and technical support to priority NPS pollution management areas within the states. To ensure on-the-ground success of the policies, the goals of the partnership must be clearly communicated to the appropriate state and county level offices through a joint announcement signed and released by EPA and NRCS.

The effectiveness of the national Section 319 Program has been under increasing scrutiny over the past several years. While this scrutiny has some merit, the diversity and long term nature of the nation's NPS pollution challenges are often misunderstood, resulting in an inaccurate assessment of the NPS Program's value and benefits. In particular, one of the most persistent questions being expressed is what load reductions or beneficial use improvements have resulted from NPS Program expenditures. To some degree, project-specific success stories submitted to EPA and load reduction data entered in the GRTS have helped answer this question. However, these projects only represent a small portion of the universe of projects being implemented across the nation. The remaining projects are not necessarily unsuccessful, but instead, the measurement of benefits may be extremely complicated and protracted or the nature of the project does not call for water quality data collection. It is likely this larger group of projects is the reason for much of the scrutiny being directed toward the NPS Program. To dispel any misconceptions about NPS Program benefits, the EPA and states need to expand efforts to disseminate more information on the diversity of the NPS Program as well as the importance of all components of the NPS Program. The overriding message of these efforts needs to emphasize that the NPS Program is a comprehensive program where success is founded in the education and assessment projects and realized through the watershed-based projects.

The desire to meet annual nutrient and sediment load reduction goals appears to have lead to a variety of methods being used to generate load reduction data entered in GRTS. Given the diversity of these methods, the potential exists for the quality of the GRTS data to come into question. To prevent such a situation, the adequacy of current QA/QC procedures must be examined to ensure the actual or modeled data entered in the GRTS are consistent and comparable between states. EPA should also work with the states to identify a core set of models or methods that can be used for estimating load reduction data for the GRTS. Training and support for these preferred methods or models would also need to be provided by EPA to encourage adoption and ensure data quality. Additionally, in the absence of reliable load reduction data, EPA should accept the use of surrogate measures, such as the "amount of BMP applied," to describe the annual progress of locally sponsored projects.

It is very well understood that the NPS Program is largely a voluntary program, particularly in agricultural areas. As such, the success of the NPS Program is always dependent on a number of uncontrollable factors. Some of these variables include: 1) weather patterns; 2) degree of landowner interest; 3) local economies; 4) commodity prices; and 5) frequent land management or ownership changes. While most of these challenges can be dealt with over time, it is not uncommon to see some projects delayed significantly by any one of these variables. Unfortunately, the current five year time period for Section 319 grants limits the flexibility to provide the additional time needed to overcome or address any of these unforeseen impediments. The only option currently available to provide the additional time is to re-apply for subsequent 319 funding under another grant. Although this option does work, it generally interjects uncertainties regarding the approval or availability of additional financial support and it does not address management of unexpended funds that might remain under the grant that initially supported the project. Both of these issues could be more efficiently addressed by developing Section 319 grants for ten year periods rather than limiting them to five years. Under a ten year grant, states could continue to set project periods for five to seven years, but the extra time under a ten year grant award would provide the flexibility to extend a project and budget period if an unexpected delay occurs.

North Dakota has seen dramatic growth in the oil exploration sector in the last four years. With the active drilling rig count more than doubling, it is estimated that over 2000 new oil wells are being developed each year. This growth in active drilling rigs has resulted in approximately 20,000 new jobs in the area. This rapid development has caused a dramatic increase in the request for point source permits, specifically permits for storm water, wastewater discharge and dewatering/hydrostatic testing. Of particular concern is the amount of domestic wastewater produced from temporary crew housing facilities, known as "man camps". This is causing an increase in the amount of waste handled by both POTW's and septic haulers. One of the positive impacts is the increased reuse of treated wastewater for the drilling and hydraulic fracturing processes. Treating of the fracturing flow back and produced water for surface water discharge is not occurring in this area due to the availability of Class II underground injection wells.

The installation of tile drains in North Dakota, especially in the Red River valley, is increasing at an exponential rate and presents new challenges to improving and maintaining water quality. Tile drains are designed remove excessive sub-surface soil moisture and to reduce the movement of salts upward into the root zone. Tile drainage allows farmers to plant their fields earlier when wet spring conditions prevail, reduces the potential for drown out during heavy summer rains, and reduces soil salinity. Tile drains can also enhance crop yields and improve soil health. While the production benefits from tile drainage are clear, the cumulative water quality impacts of the water discharged from tile drains is unknown. Tile drainage water often contains high concentrations of nitrates, minerals, and some trace metals. The cumulative impacts from these drains on tributaries and subsequently the Red River are largely unknown.

In North Dakota, a large portion of the potable groundwater resource underlies agricultural areas. The department, in conjunction with the State Water Commission, is involved in several projects designed to evaluate and monitor the effects of agricultural practices on groundwater quality and quantity. The department also reviews water appropriation permits to assess potential impacts to groundwater quality.   The department will need to allocate sufficient resources to continue providing project oversight and monitoring, reviewing appropriation permits and working with producers regarding irrigation and chemigation practices to protect groundwater resources.

Careful attention must be paid to the water quality and supply issues associated with the continued energy development, for example, in-situ fossil fuel recovery (oil and coal bed methane development) and the production of ethanol and biodiesel. Sufficient resources must be allocated to avoid impacts to water quality.

While efforts to protect water quality have been successful, more remains to be done to achieve the goal of restoring and maintaining the chemical, physical and biological integrity of the state's and nation's waters.

PART IV. SURFACE WATER MONITORING AND ASSESSMENT METHODOLOGY

A. Surface Water Quality Monitoring Program

Chapter 1. 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 also 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.

Chapter 2. Monitoring Programs, Projects and Studies

In order to meet the goals and objectives outlined above, the department has taken an approach which integrates several monitoring designs, both spatially and temporally. Monitoring programs include fixed station sites, stratified random sites, rotating basin designs, statewide networks, chemical parameters and biological attributes. In some cases, department staff members conduct the monitoring, while in other instances monitoring activities are contracted to other agencies such as soil conservation districts, the USGS or private consultants. In the following sections, current monitoring activities are documented in the form of narrative descriptions. These include the project or program purpose (objectives), monitoring design (selection of monitoring sites), selected parameters and the frequency of sample collection.

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 North Dakota Department of Health's (NDDoH) 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 NDDoH, 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; NDDoH site 385414) and Red River at Grand Forks (USGS site 05082500; NDDoH 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).

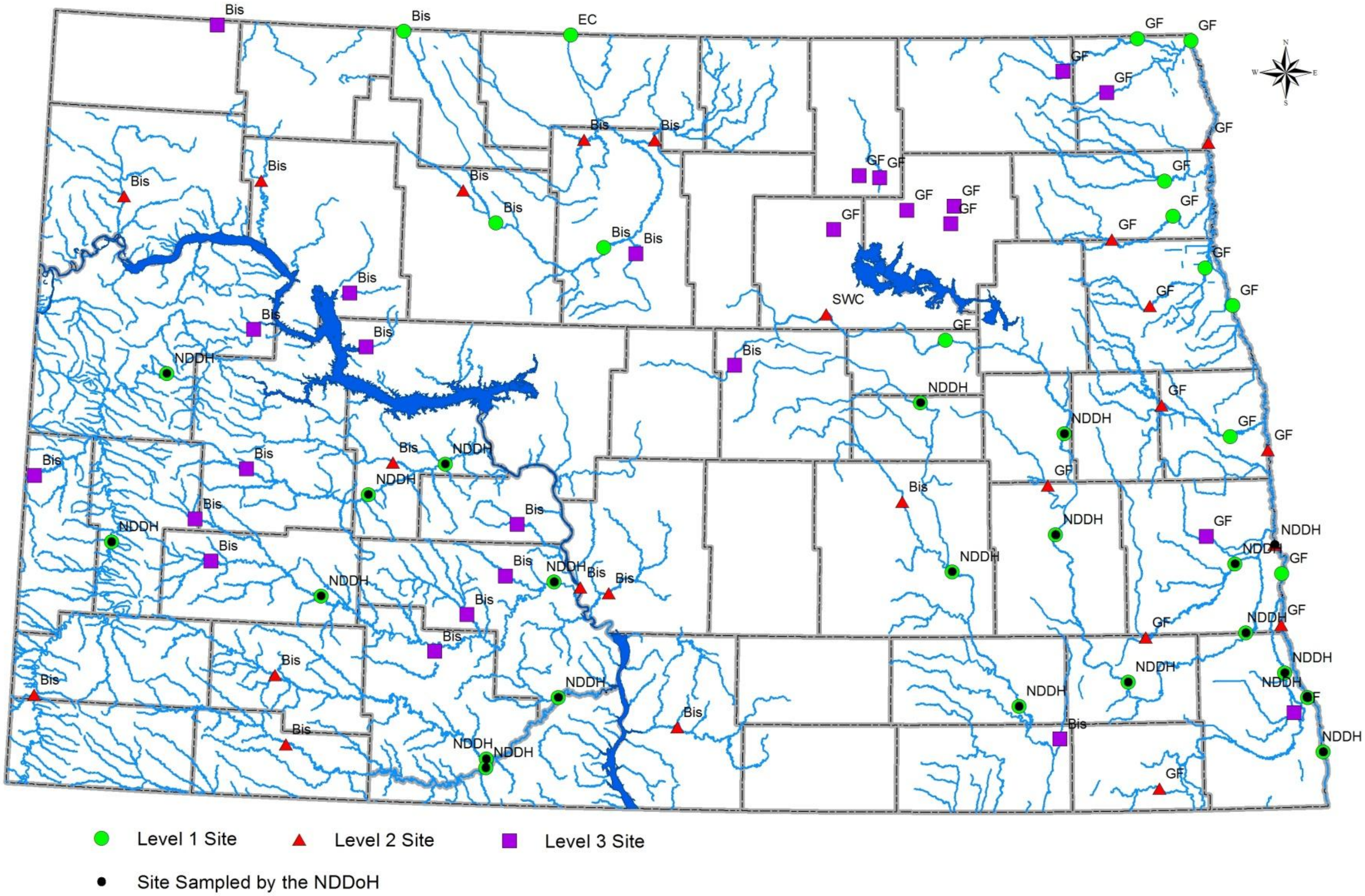


Figure IV-1. Ambient River and Stream Water Quality Monitoring Sites.

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

USGS Site ID	NDDoH Site ID	Site Name	Latitude	Longitude	Design Level	Responsible Agency
05051300	385055	Bois de Sioux River near Doran, MN	46.1522	-96.5789	1	NDDH
05051510	380083	Red River at Brushville, MN	46.3695	-96.6568	1	NDDH
05053000	380031	Wild Rice River near Abercrombie, ND	46.4680	-96.7837	1	NDDH
05054000	385414	Red River at Fargo, ND[1]	46.8611	-96.7837	1	USGS-GF
05057000	380009	Sheyenne River near Cooperstown, ND	47.4328	-98.0276	1	NDDH
05058000	380153	Sheyenne River below Baldhill Dam, ND	47.0339	-98.0837	1	NDDH
05058700	385168	Sheyenne River at Lisbon, ND	46.4469	-97.6793	1	NDDH
05059000	385001	Sheyenne River near Kindred, ND	46.6316	-97.0006	1	NDDH
05060100	384155	Maple River below Mapleton, ND	46.9052	-97.0526	1	NDDH
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	Environment Canada
06336000	380022	Little Missouri River at Medora, ND	46.9195	-103.5282	1	NDDH
06337000	380059	Little Missouri River nr Watford City, ND	47.5958	-103.2630	1	NDDH
06339500	384131	Knife River nr Golden Valley, ND	47.1545	-102.0599	1	NDDH
06340500	380087	Knife River at Hazen, ND	47.2853	-101.6221	1	NDDH
06345500	380160	Heart River nr Richardton, ND	46.7456	-102.3083	1	NDDH
06349000	380151	Heart River nr Mandan, ND	46.8339	-100.9746	1	NDDH
06351200	380105	Cannonball River nr Raleigh, ND	46.1269	-101.3332	1	NDDH
06353000	380077	Cedar Creek nr Raleigh, ND	46.0917	-101.3337	1	NDDH
06354000	380067	Cannonball River at Breien, ND	46.3761	-100.9344	1	NDDH
06468170	384130	James River nr Grace City, ND	47.5581	-98.8629	1	NDDH
06470000	380013	James River at Jamestown, ND	46.8897	-98.6817	1	NDDH
06470500	380012	James River at Lamoure, ND	46.3555	-98.3045	1	NDDH

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

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

USGS Site ID	NDDoH Site ID	Site Name	Latitude	Longitude	Design Level	Responsible Agency
05051522	NA	Red River at Hickson, ND	46.6597	-96.7959	2	USGS-GF
05051600	385573	Wild Rice River near Rutland, ND	46.0222	-97.5115	2	USGS-GF
05054200	385040	Red River at Harwood, ND	46.9770	-96.8203	2	NDDH
05055300	385505	Sheyenne R above DL Outlet nr Flora, ND	47.9078	-99.4162	2	SWC
05056000	385345	Sheyenne River near 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 River 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	NDDoH Site ID	Site Name	Latitude	Longitude	Design Level	Responsible Agency
05052500	385232	Antelope Creek at Dwight, 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 River 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]	
	Chloride[1,2]	Cadmium[1,2]	Ammonia (Dissolved) [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.

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.

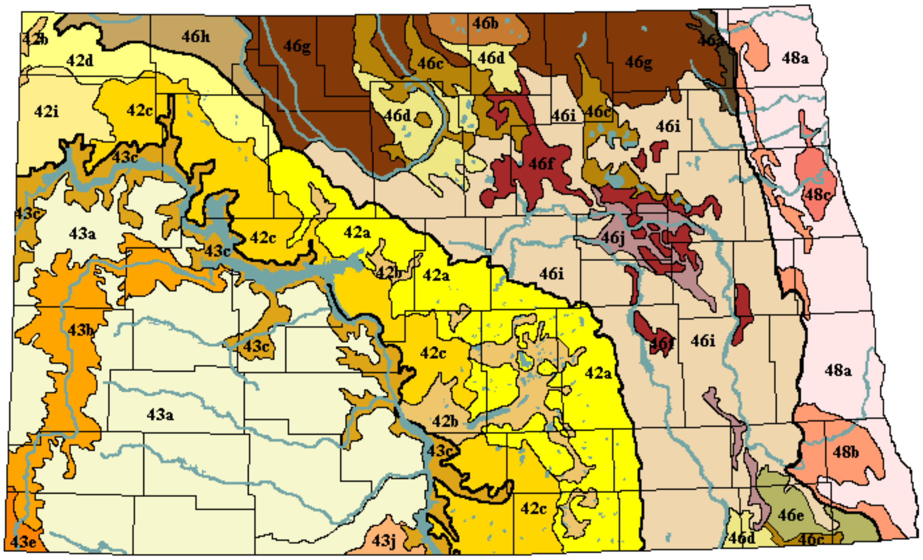


Figure IV-2. Map Depicting Ecoregions in North Dakota (Lake Agassiz Plain [48], Northern Glaciated Plain [46], Northwestern Glaciated Plain [42], Northwestern Great Plain [43]).

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 and in the Northern Glaciated Plains in 2016.

Lake Water Quality Assessment Program

Historic Program

The department currently recognizes 295 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 the state's Assessment Database (ADB), the 146 reservoirs cover 476,730 acres. Reservoirs comprise about 67 percent of North Dakota's total lake/reservoir surface acres. Of these, 411,496 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 65,234 acres, with an average surface area of 450 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 148 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.

[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.

Current Program

As was stated previously the department recognizes 295 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 were sampled in 2015, and 20 lakes were be sampled in 2016.

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.

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 is now in its second round of aquatic resource assessments which are conducted on a five-year rotation (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**	**2027**	**2028**	**2029**	**2030**	**2031**
NLA	■					■					■					■					■				
NRSA		■	■				■	■				■	■				■	■				■	■		
NCCA				■					■					■					■					■	
NWCA					■					■					■					■					■

National Lakes Assessment

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

State Intensification of the National Lakes Assessment

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.

National Rivers and Streams Assessment

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.

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 3^{rd} 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 3^{rd} order, thirteen (13) were on 4^{th} order, twenty (20) each on 5^{th} and 6^{th} order, one (1) on a 7^{th} order, and three (3) on 8^{th} 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.

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. However, due to difficulties in obtaining the national survey data in a timely manner, the final report did not include statewide wetland condition or wetland stressor estimates.   The Department is currently in the process of compiling all of the NWCA and intensification data along with the individual wetland sample weights. Once this phase is completed, Department staff will be preparing a detailed report summarizing the ecological condition of wetlands in North Dakota with known precision and accuracy. While not finalized, the results from the 2011 state intensification study (i.e., statistical survey) are summarized in Section V of this report.

Fish Tissue Contaminant Surveillance Program

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).

NPS Pollution Management Program Monitoring

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.

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 Surface Water Quality 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 Surface Water Quality 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).

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, Surface Water Quality 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.

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 Surface Water Quality 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 reareation studies in support of water quality model development.
- An assessment of dust impacts to wetlands 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.

Complaint and Fish Kill Investigations

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.

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 Surface

Water Quality 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.

Harmful Algal Blooms (HABs) Surveillance Program

Algae are natural components of both marine and fresh waters that perform many functions that are vital for the health of aquatic ecosystems. However, when certain conditions are favorable, algae can rapidly multiply causing "blooms" or dense surface scums. When blooms are present in large quantities they can pose a significant potential threat to human and ecological health. In addition to algae, microorganisms like cyanobacteria, historically known as blue-green algae, are able to form blooms. The production of blue-green algae often happens during hot weather in bodies of water that are used by people, pets, and livestock. Blue-green algae discolor the water they live in, and can cause foam, scum, or mats to appear on the surface. Blue-green algae can 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 the department responded to 19 reports of blue-green algae blooms on lakes and reservoirs in the state in 2016. Of these, investigations resulted in the department issuing advisories or warnings for 15 lakes and reservoirs.

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.ndhealth.gov/WQ/SW/HABs/Default.aspx). Following notification

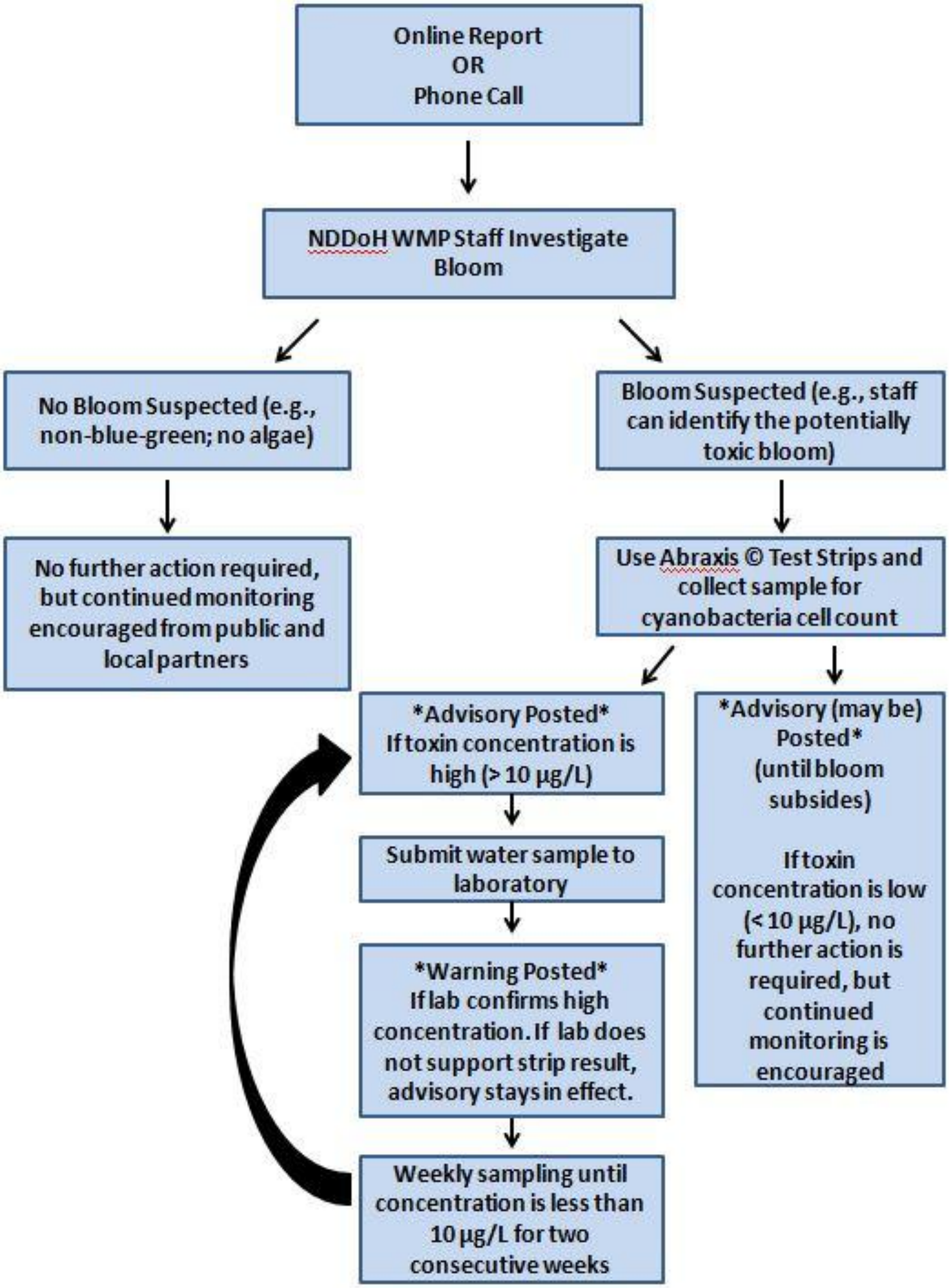


Figure IV-3. North Dakota Department of Health Harmful Algal Blooms (HABs) Response Plan.

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.

B. Assessment Methodology

Chapter 1. Introduction

As stated earlier, for purposes of 2016 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 and 2016IR guidance memos (http://water.epa.gov/lawregs/lawsguidance/cwa/tmdl/guidance.cfm). The purpose of this section is to briefly summarize the assessment methodology used in this integrated report. A complete description of the state's assessment methodology for surface waters is provided in Appendix C. In general, the state's assessment methodology is consistent with the state's beneficial use designations defined in the state's water quality standards (NDDoH, 2014a). The assessment methodology is also consistent with the department's interpretation of the narrative and numeric criteria described in its state water quality standards (NDDoH, 2014a).

Assessments are conducted by comparing all available and existing information for an assessment unit to applicable water quality criteria (narrative and numeric). 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 Database Version 2.3.1 (ADB).

Chapter 2. Assessment Database (ADB)

Developed by EPA, the ADB is an Access® based "accounting"/database management system that provides a standard format for water quality assessment information. It includes a software program for adding and editing assessment data and transferring assessment data between the personal computer and EPA. Assessment data, as compared to raw monitoring data, describes the overall health or condition of the waterbody by describing beneficial use impairment and, for those waterbodies where beneficial uses are impaired or threatened, the causes and sources of pollution affecting the beneficial use. The ADB also allows the user to track and report on TMDL-listed waters, including their development and approval status. A complete description of the ADB is provided in the "Water Quality Assessment Methodology for North Dakota's Surface Waters" (Appendix B).

North Dakota's ADB for the 2016 assessment cycle contains 1,790 discreet assessment units (AUs) representing 56,591 miles of rivers and streams and 295 lakes and reservoirs. Within the ADB, designated uses are defined for each AU (i.e., river or stream reach, lake or reservoir) based on the state's water quality standards. Each use is then assessed using available chemical, physical and/or biological data.

As part of integrated Section 305(b) and Section 303(d) reporting to EPA, the state also provides a copy of the ADB with the 2016 assessment cycle data. While the Section 303(d) TMDL list in Tables VI-1 through VI-5 provides all Category 5 waterbodies, the listing of all Category 1, 2, 3, 4A, 4B and 4C waterbodies are provided to EPA through the ADB.

Chapter 3. Beneficial Use Designation

Water quality reporting requirements under Sections 305(b) and 303(d) of the CWA require states to assess the extent to which their lakes and reservoirs and 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 the waterbody or AU is supporting its designated beneficial uses.

Beneficial uses are not arbitrarily assigned to AUs, but rather are assigned based on the *Standards of Quality for Waters of the State* (NDDoH, 2014a). These regulations define the protected beneficial uses of the state's rivers, streams, lakes and reservoirs. Six beneficial uses (aquatic life, recreation, drinking water, fish consumption, agriculture, industrial and fish consumption) were assessed for purposes of Section 305(b) reporting and Section 303(d) listing.

All waterbodies or AUs entered into the ADB 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 lakes are assigned the drinking water beneficial use.

While not specifically identified in state standards, fish consumption is protected through both narrative and numeric human health criteria specified in the state's water quality standards. Fish consumption has been assigned 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.

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 are applicable to all stream classes and, unless available data provide evidence of impairment, are presumed to be fully supporting.

Chapter 4. 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 NDDoH 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.

- Water column chemical or biological 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). There is no age limit for fish tissue mercury data. 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 are 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 collected during the growing season, May-September. 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 2007, two samples collected in May 2010 and one sample collected in May 2014).

- 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. 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 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.

Chapter 5. Existing and Available Water Quality Data

River and Stream Assessment Data

Chemical Data

Beginning January 1, 2013, the department began implementation of a revised ambient water quality monitoring program for rivers and streams in the state (see Part IV. A. Chapter 2. Water Quality Monitoring Program, Projects and Studies). The revised network, which is operated in conjunction with the USGS-North Dakota Water Science Center and the North Dakota State Water Commission, consists of 82 sites located on 47 rivers and streams in the state.

Prior to 2013, the department operated a network of 34 ambient chemical monitoring sites. Where practical, sites were collocated with USGS flow gauging stations, thereby facilitating the analysis of chemical data with stream hydrologic data. All of these sites were established as basin or sub-basin integrator sites, where the chemical characteristics measured at each of these sites reflect water quality effects in the entire watershed.

The department also uses historic water quality data collected by the USGS. Many of these historic water quality monitoring sites were maintained by the USGS through cooperative agreements with other agencies (e.g., North Dakota State Water Commission, U. S. Bureau of Reclamation and U.S. Army Corps of Engineers), through international agreements (e.g., the Souris River Bilateral Agreement) or with the department itself.

In addition to the current 82-station ambient chemical monitoring network, the department cooperates with local project sponsors (e.g., soil conservation districts and water resource districts) in small watershed monitoring and assessment projects and in waterbody-specific TMDL development projects. These projects entail intensive water quality monitoring, stream flow measurements, land use assessments and biological assessments. Where lake water quality is a concern, lake monitoring also is included in the sampling and analysis plan. The goal of these small watershed monitoring and assessment projects and TMDL development projects is to estimate pollutant loadings to the lake or stream and, where appropriate, set target load reductions (i.e., TMDLs) necessary to improve beneficial uses (e.g., aquatic life and recreation). Most of these projects are followed by Section 319 NPS Pollution Management Program watershed implementation projects. Water quality data collected through these cooperative efforts also are used in assessment of waterbodies for the Section 305(b) report and the TMDL list.

Based on the department's "credible and sufficient data requirements," only the previous 10 years of water column chemistry data will be used for assessments. Years of record are based on the USGS water year. Water years are from October 1 (or 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**.** For purposes of assessments conducted for 2016

Section 305(b) report and Section 303(d) list, the period of record will be from October 1, 2005 through September 30, 2015.

Biological Data

In response to the growing need for better water quality assessment information, the department initiated a biological monitoring program in 1993 and 1994. This program, which was a cooperative effort with the Minnesota Pollution Control Agency and the USGS's Red River National Water Quality Assessment Program, involved approximately 100 sites in the Red River Basin. The result of this initial program was the development of the Index of Biotic Integrity (IBI) for fish in the Lake Agassiz Plain ecoregion of the Red River Basin. The program continued in the Red River Basin in 1995 and 1996. The Upper Red River Basin, including the Sheyenne River and its tributaries, was sampled in 1995, while the Lower Red River Basin was sampled in 1996. Following these initial monitoring efforts in the Red River Basin, biological monitoring was expanded statewide with sampling in the Souris River Basin in 1997, the James River Basin in 1998, the Lake Sakakawea subbasin of the Missouri River Basin in 1999 and the Lake Oahe subbasin of the Missouri River Basin in 2000. Beginning in 1995, biological monitoring was expanded to include macroinvertebrate sampling in addition to fish.

Following these initial biological monitoring and IBI development efforts, the department intiated it's 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 1). 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.

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" sampled per ecoregion/ecoregion combination, the department also selected and sampled 30 companion "highly disturbed" or "trashed" sites. These sites are being used as a basis of comparison when selecting and calibrating metrics used in IBIs. To date, the department has developed final multi-metric IBIs for fish in the Lake Agassiz Plain ecoregion and macroinveretebrates in the Lake Agassiz Plain (48) and Northern Glaciated Plain (46) level III ecoregions. The department has also developed draft IBIs for both fish and macroinvertebrates for the combined Northwestern Glaciated Plains (43) and Northwestern Great Plains (42) ecoregions.

Lake and Reservoir Assessment Data

From 1991 through 1996 the department conducted a Lake Water Quality Assessment (LWQA) Project. 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.

The lakes and reservoirs targeted for assessment were chosen in conjunction with the 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 have been 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 assessments and watershed condition.

One of the most useful measures of lake water quality is trophic condition. Trophic condition is a means of expressing a lake’s productivity as compared to other lakes in a district or geographical area. In general, oligotrophic lakes are deep, clear lakes with low primary production, while eutrophic lakes are shallow and contain macrophytes and/or algae. Eutrophic lakes are considered moderately to highly productive.

The trophic condition or status was assessed for each of the lakes and reservoirs included in the LWQA. Accurate trophic status assessments are essential for making sound preservation or improvement recommendations. In order to minimize errors in classification, a multiple indicator approach was initiated.

Beginning in 1997, LWQA Project activities were integrated into the department’s rotating basin monitoring strategy. Lake Darling and the Upper Des Lacs Reservoir were sampled as the department focused its monitoring activities in the Souris River Basin in 1997. 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.

In addition to its inclusion in the annual LWQA Project, Devils Lake and Lake Sakakawea have received special attention. Devils Lake has increased in elevation approximately 25 feet since 1993 and is now spilling over into East and West Stump Lakes. In response to questions regarding 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 sampled approximately four times per year, including once during the winter.
While Devils Lake has increased in elevation during 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. 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. Beginning in 2003 through 2015, the U.S. Army Corps of Engineers also conducted water quality monitoring at several fixed-station sites on Lake Sakakawea.

In 2005 the department initiated a cooperative Lake Water Quality Assessment Project with the NDGF Fisheries Division. The goal of this lake water quality monitoring and assessment project was to: (1) monitor the chemical, physical and biological character of the state's lakes and reservoirs; (2) use chemical, physical and biological indicators to assess the current water quality condition and trophic status of monitored lakes and reservoirs; (3) determine spatial differences among lakes and reservoirs; and (4) determine temporal trends in lake water quality by comparing project data to Lake Water Quality Assessment data or other historic water quality data. Assessment information generated from this project was used by both the NDGF and the North Dakota Department of Health's Division of Water Quality to prioritize lakes, reservoirs and their watersheds for lake maintenance and improvement projects (i.e., Save Our Lakes, Total Maximum Daily Loads, Section 319 Nonpoint Source Pollution Management Program). Through this cooperative program samples were collected from each lake or reservoir two to four times per year and was coordinated with existing NDGF district lake sampling activities (e.g., standard adult fish population sampling, summer water quality sampling, fall reproduction sampling and winter water quality sampling). At a minimum, two samples were collected during the year, one during the summer (June, July and/or August) and one during the winter under ice cover (January or February). Sixty lakes within five of the six NDGF districts were targeted for sampling in 2005/2006. Ten lakes were targeted for sampling in 2006/2007, and six lakes were targeted in 2007/2008.

While field sampling was done primarily by NDGF Fisheries Division staff from 2005-2007, beginning in 2008 and extending through 2011, the department conducted lake water quality monitoring and assessment. Through this project 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 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 (http://www.ndhealth.gov/WQ/SW/A_Publications.htm).

Utilizing Supplemental Section 106 Water Quality Monitoring grant funding from EPA, the department has continued to sample targeted lakes and reservoirs each year. Through this program 15 lakes were sampled in 2014, 16 lakes were sampled in 2015, and 20 lakes were be sampled in 2016.

Fish Consumption Use Assessment Data

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 the state's major lakes, reservoirs and rivers and analyzed for methyl-mercury. These data are then used to issue species-specific fish advisories for the state's rivers, lakes and reservoirs. These data have also been used to assess fish consumption use for the integrated report.

Other Agency/Organization Assessment Data

In addition to the water quality data available through existing department programs and projects and that provided by the USGS, the department also requested data from other agencies and organizations. In a letter dated October 22, 2015 the department requested all readily available and credible data from 16 agencies and organizations believed to have water quality data (Appendix D). In response to this request, the department received notification from only one organization as to the availability of additional data. The River Keepers, located in Fargo, ND, indicated they had additional data available for the Red River in the Fargo-Moorhead area. While the North Dakota State Water Commission did respond to the request for additional data, it was determined that their data had already been provided to the department by the USGS.

Chapter 6. Beneficial Use Assessment Methodology

The assessment methodology or decision criteria used to assess aquatic life, recreation, drinking water, fish consumption, agricultural, and industrial uses where they are assigned to the state's surface waters is provided in Appendix B. All water quality assessments entered into the ADB 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 included conventional pollutants (e.g., DO, pH, temperature, ammonia, and fecal coliform and E. coli bacteria) and toxic pollutants (e.g., trace elements and pesticides) data collected between October 1, 2005 and September 30, 2015. Biological monitoring data used for this report included fish community and macroinvertebrate community data collected by the department between 1999 and 2013. If more than one site occurred within a delineated AU, data from all sites and for all years were pooled for analysis.

Chapter 7. Assessment Categories

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. Guidance provided by the U.S. EPA (U.S. EPA, 2005) provides for five assessment categories representing varying levels of water quality standards attainment. These assessment categories range 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 (Table IV-6). These category determinations are based on consideration of all existing and readily available data and information consistent with the state's assessment methodology (Appendix C).

Beginning with the 2010 Integrated Report and Section 303(d) list of impaired waterbodies needing TMDLs, the department has identified a subcategory to Category 5 waterbodies. This subcategory, termed Subcategory 5A, includes rivers, streams, lakes or reservoirs that were assessed and listed in earlier Section 303(d) lists, but where the original basis for the assessment decision and associated cause of impairment is questionable. These Subcategory 5A waterbodies include rivers and streams listed for biological impairments based on only one sample for the entire segment or on samples collected more than 10 years ago, waterbodies listed for sediment/siltation impairments, or lakes and reservoirs where the assessments are based on one sampling event or on data that are greater than 10 years old. These waterbodies will remain on the 2016 Section 303(d) list, but will be targeted for additional monitoring and assessment during the next two to four years.

Table IV-6. Assessment Categories for the Integrated Report.

Assessment Category	Assessment Category Description
Category 1	All of 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 of time; 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. • 5A – 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.

PART V. WATER QUALITY ASSESSMENT

A. Rivers and Streams Water Quality Assessment

Chapter 1. Assessment Category Summary

In EPA's guidance for preparing the Integrated Report, the states were encouraged to report on their waters based on five assessment categories (Table IV-6). In broad terms, the five assessment categories are as follows:

- Category 1: All designated uses are met.
- Category 2: Some designated uses are met, but there are insufficient data to determine if remaining designated uses are met.
- Category 3: There are 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 of Category 5 waterbodies as Subcategory 5A. This subcategory includes rivers, streams, lakes or reservoirs that were assessed and listed in previous Section 303(d) lists, including the 2008 list, but where the original basis for the assessment decision and associated cause of impairment is questionable. These Subcategory 5A waterbodies include rivers and streams listed for biological impairments based on only one sample for the entire segment or on samples collected more than 10 years ago, waterbodies listed for sediment/siltation impairments, waterbodies listed for fecal coliform bacteria impairments, or lakes and reservoirs where the assessments are based on one sampling event or on data that are greater than 10 years old. These waterbodies will remain on the 2014 Section 303(d) list, but they will be targeted for additional monitoring and assessment during the next two to four years.

The ADB that has been submitted to EPA as part of this Integrated Report provides an assessment category for each lake, reservoir, river or stream AU.

Table V-1 provides a summary of the number of river and stream AUs and total miles of rivers and streams in each category that were assessed for this report. Eight (8) AUs, totaling 200 miles, were classified as Category 1, meaning all uses were assessed and fully supporting. A total of 1243 AUs totaling 47,923 miles were assessed as Category 2. These are AUs where at least one designated use was assessed as fully supporting, but the other uses were 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 52 AUs were assessed as Category 4 where at least one designated use was impaired or threatened, but where a TMDL is not required. Of these, 49 AUs do not need TMDLs because TMDLs have already been completed and approved by EPA (Category 4A) and 3 AUs do not need a TMDL because the cause of the impairment is not a pollutant (Category 4C). These are typically river and stream reaches where habitat degradation or flow alteration is impairing aquatic life use. A total of 192 AUs (6,076 miles) were assessed where at least one beneficial use is impaired and a TMDL is required. These Category 5 AUs are provided in a list in Tables VI-1 through VI-4.

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

Category	Description	Number AUs	Total Size (miles)
1	All uses met	8	199.65
2	Some uses met, others not assessed	1243	47,921.72
3	No uses assessed	0	0
4A	Some or all uses impaired or threatened, but a TMDL(s) has been approved for all impaired uses.	49	2,395.83
4B	Some or all uses impaired or threatened, but other pollutant controls will result in water quality standards attainment.	0	0
4C	Some or all uses impaired or threatened, but impairment is not due to a pollutant.	3	50.08
5	Some or all uses impaired or threatened, and a TMDL is required. Includes category 5A waterbodies.	192	6,076.47

Chapter 2. Section 305(b) Water Quality Summary

The beneficial use designated as aquatic life is fully supporting for 1,253 miles of the rivers and streams assessed for this report (Table V-2), while another 2,165 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 1,125 miles of rivers and streams assessed for this report were assessed as not supporting aquatic life use (Table V-2).

Table V-2. Individual Use Support Summary for Rivers and Streams in North Dakota (Miles).

Use	Fully Supporting	Fully Supporting, but Threatened	Not Supporting	Not Assessed	Insufficient Information for Assessment	Total Size
Aquatic Life	1,253.20	2,165.13	1,125.13	48,538.19	3,562.10	56,643.75
Fish Consumption	91.13	0	398.17	3,647.64	0	4,136.94
Recreation	1,448.88	3,317.99	3,153.37	48,480.77	242.74	56,643.75
Drinking Water Supply	764.63	151.48	0	2,531.49	2,149.93	5,597.53
Agriculture	56,643.75	0	0	0	0	56,643.75
Industrial	56,643.75	0	0	0	0	56,643.75

NPS pollution (e.g., siltation/sedimentation and stream habitat loss or degradation) was the primary cause of aquatic life use impairment (Table V-3). 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. 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).

Table V-3. Impairment Summary for Rivers and Streams in North Dakota.

Impairment	Miles
Total Fecal Coliform/E. coli Bacteria	6,471.36
Physical Habitat Alterations	2,038.78
Biological Indicators	2,150.53
Sedimentation/Siltation	1,724.92
Oxygen Depletion	610.06
Mercury in Fish Tissues	398.17
Trace Metals in the Water Column	293.46
Flow Alterations	309.51
Total Dissolved Solids/Sulfates	82.51
Nutrients	49.78

The primary sources of pollutants affecting aquatic life use in the state are cropland erosion and runoff, animal feeding operations and poor grazing management (Table V-4). Poor grazing management includes riparian grazing and season-long grazing, which result in the deterioration of the plant community or cause a shift in the plant community away from native grass and forb species to non-native invader species. Evidence of poor grazing practices would include cattle trailing, gully erosion, poor water infiltration rates resulting from soil compaction and severe streambank erosion. 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).

Recreation use was assessed on 7,920 miles of rivers and streams in the state. Recreation use was fully supporting, fully supporting but threatened and not supporting on 1,449 miles, 3,318 miles and 3,153 miles, respectively (Table V-2). E. coli or Fecal coliform bacteria data collected from monitoring stations across the state were the primary indicators of recreation use attainment (see Part IV. B., Chapter 6. "Beneficial Use Assessment Methodology"). For this reason, pathogens (as reflected by E. coli and fecal coliform bacteria) are the primary cause of recreation use impairment in North Dakota (Table V-3). 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 (Table V-4).

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

Source	Miles
Riparian Grazing	6,583.72
Animal Feeding and Handling Operations	4,429.45
Crop Production (Dry Land)	2,288.32
Loss of Riparian Habitat	2,098.29
Source Unknown	1,216.30
Stormwater Runoff	740.86
Highway and Road Runoff	616.14
Rangeland/Pastureland Grazing	539.62
On-site Treatment Systems (Septic Systems)	507.66
Streambank Modification	485.52
Channel Erosion/Incision from Upstream Hydromodifications	478.26
Wetland Loss (Drainage/Filling)	472.41
Upstream Impoundments	350.57
Hydrostructure Flow Regulation/Modification	248.86
Channelization	243.34
Natural Sources	217.04
Natural Conditions-Water Quality Standards Use Attainability Analysis Needed	211.24
Municipal Point Source Discharges	89.67
Land Development	85.94
Source Outside State Jurisdiction or Border	68.33
Industrial Point Source Discharge	27.33
Dam Construction	13.08
Golf Courses	13.02
Flow Alteration from Water Diversion	8.48

Drinking water supply use is classified for 5,598 miles of rivers and streams in the state. Of the 916 miles assessed for this report, 151 miles were assessed as threatened for drinking water supply use (Table V-2).

A total of 4,137 miles of rivers and streams were identified as capable of supporting a sport fishery from which fish could be used for consumption (Table V-2). The Red River of the North (398.17 miles) and the Missouri River from Garrison Dam to Lake Oahe are the only two rivers listed in the state's fish consumption advisory. Methyl-mercury data collected for these advisories were used to estimate the average methyl-mercury concentration for fish in each of these rivers (see Part IV. B. Chapter 6. "Beneficial Use Assessment Methodology – Fish Consumption Assessment Methodology for Rivers and Lakes," page IV-32). Based on the recommended EPA fish tissue criterion of 0.3 µg methyl-mercury/gram of fish tissue, only the Red River of the North was assessed as not supporting fish consumption. The Missouri River below Garrison Dam (91.13 miles) is assessed as fully supporting fish consumption use based on the EPA fish tissue criterion for methyl-mercury. 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 (Tables V-3 and V-4).

Chapter 3. State-wide Statistical Survey Results for Rivers and Streams

As described in Part IV.A. Chapter 2, Monitoring Programs, Projects and Studies, 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 draft 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.

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).

In order 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 ccategory and expressed as a percentage of the overall target population, which for North Dakota is 5152 miles (8291.93 km).

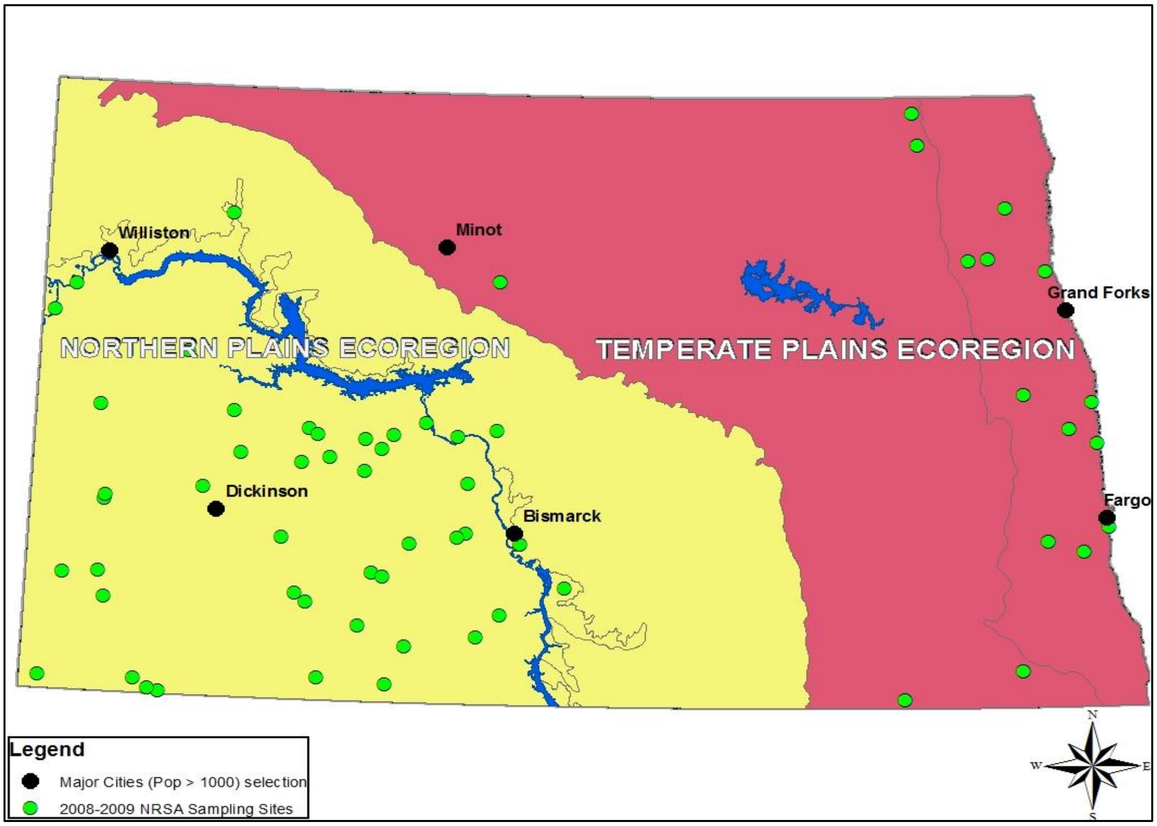


Figure V-1. Location of Sites Sampled in North Dakota for the 2008/2009 National Rivers and Streams Assessment and State Intensification Project.

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 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).

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).

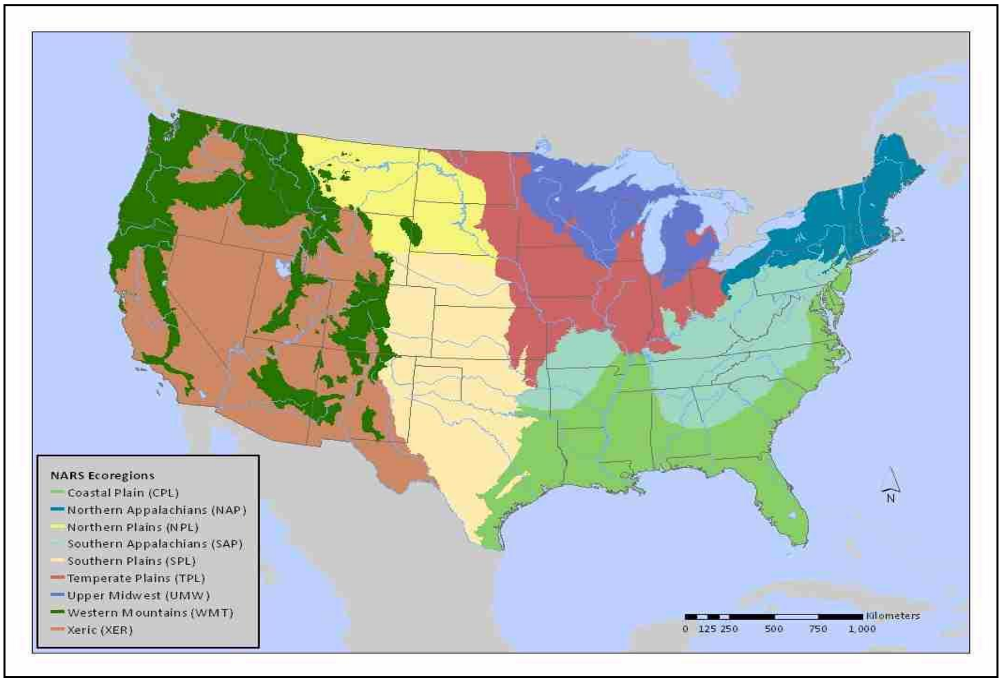


Figure V-2. Map Showing the Nine Major Ecoregions of the United States Used for National Aquatic Resource Surveys (NARS). Adapted from the 2008-2009 National Rivers and Streams Assessment report.

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

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 of these aspects are combined into an overall score for the community, which is known as a multi-metric index (MMI).

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) weree in fair condition, and 44.8 percent (2,307.6 miles) were assessed to be in poor (Figure V-3).

Within the Temperate Plains ecoregion of North Dakota 33.2 percent (694.4 miles) of rivers and streams were considered to be 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 considered to be in poor condition based on the macroinvertebrate community index (Figure V-4).

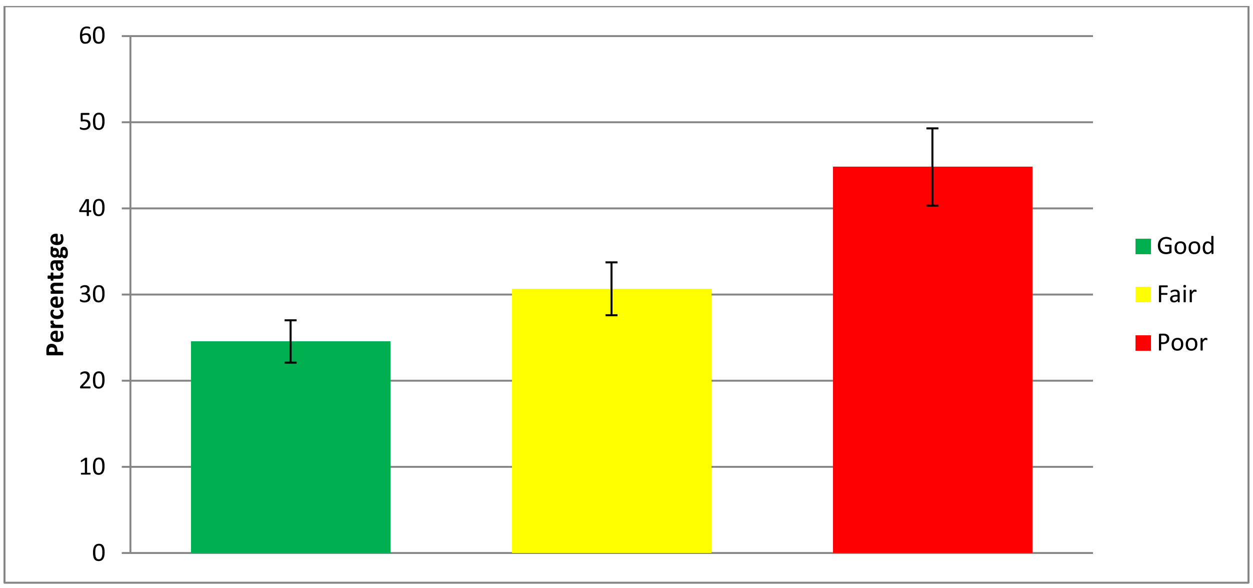


Figure V-3. Benthic Macroinvertebrate Condition Category Estimates for Perennial Rivers and Streams in North Dakota.

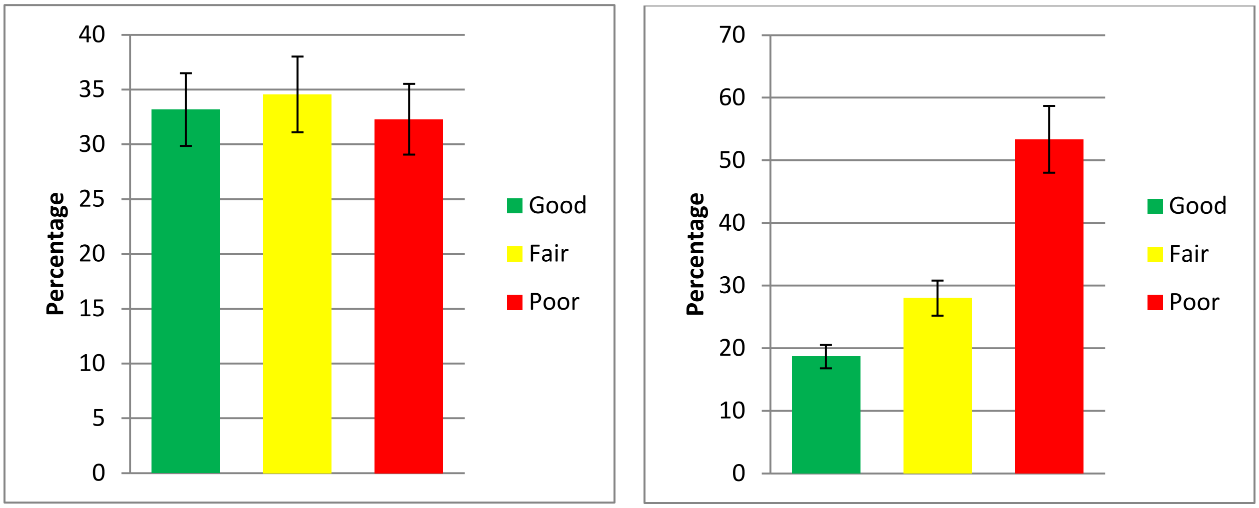


Figure V-4. Benthic Macroinvertebrate Condition Category Estimates for Perennial Rivers and Streams in the Temperate Plains (left) and Northern Plains (right) Ecoregions of North Dakota.

<u>Fish Condition</u>

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 with regard to 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 considered to be in poor condition with regard to 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.

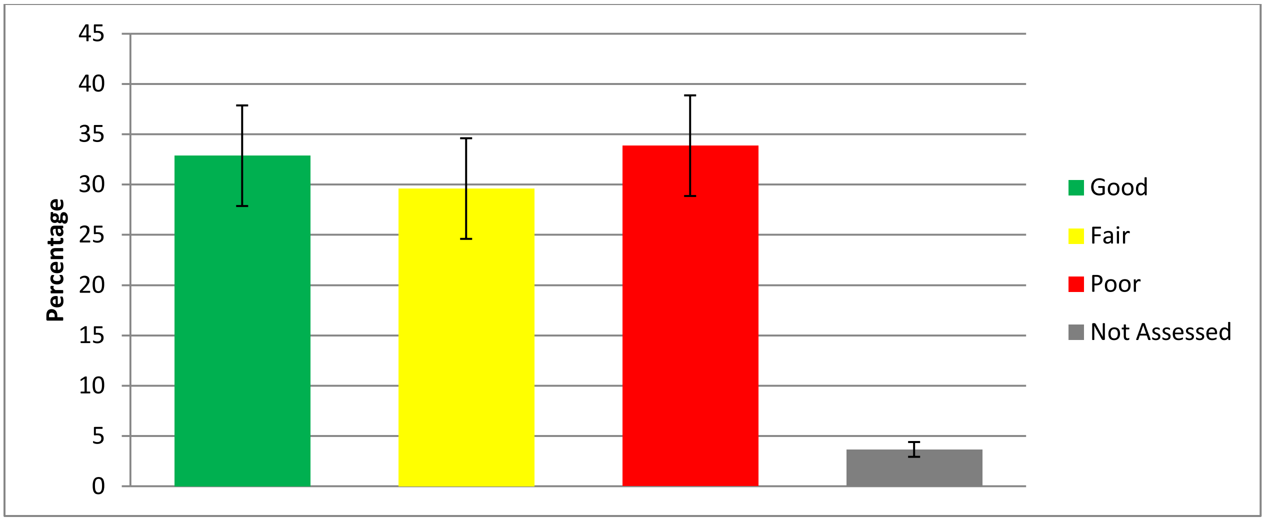


Figure V-5. Fish Condition Category Estimates for Perennial Rivers and Streams in North Dakota.

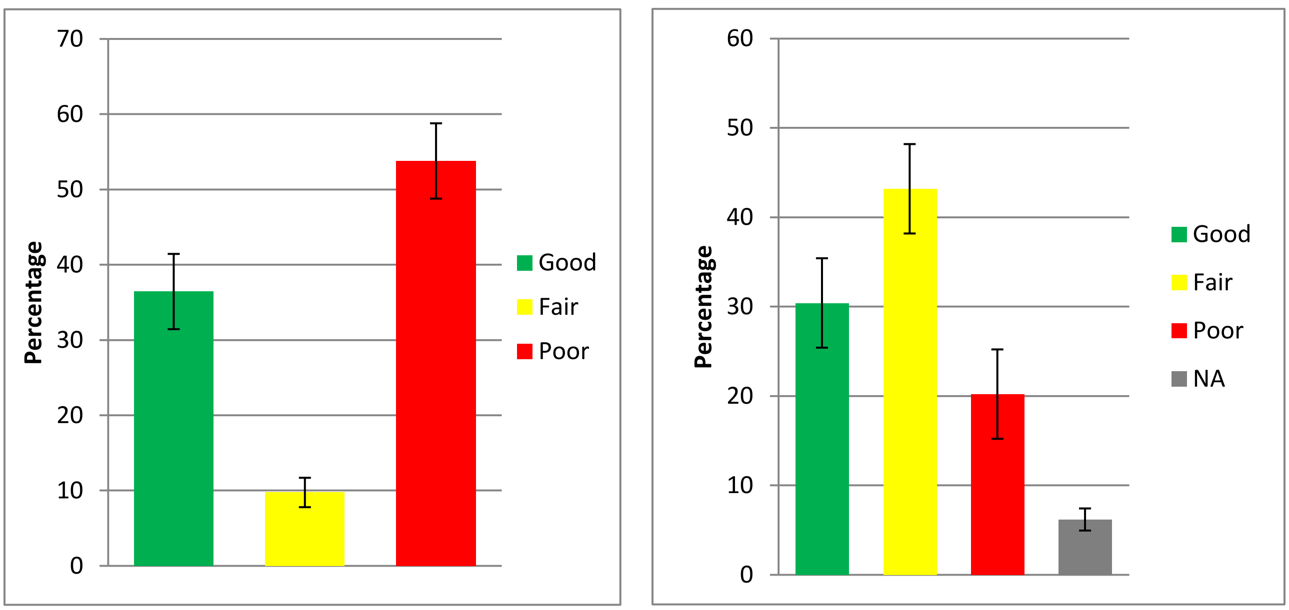


Figure V-6. Fish Condition Category Estimates for Perennial Rivers and Streams the Temperate Plains (left) and Northern Plains (right) Ecoregions of North Dakota (Note– NA stands for Not Assessed).

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.

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. Wadeable 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 with regard to total nitrogen (Figure V-7).

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 considered to be 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).

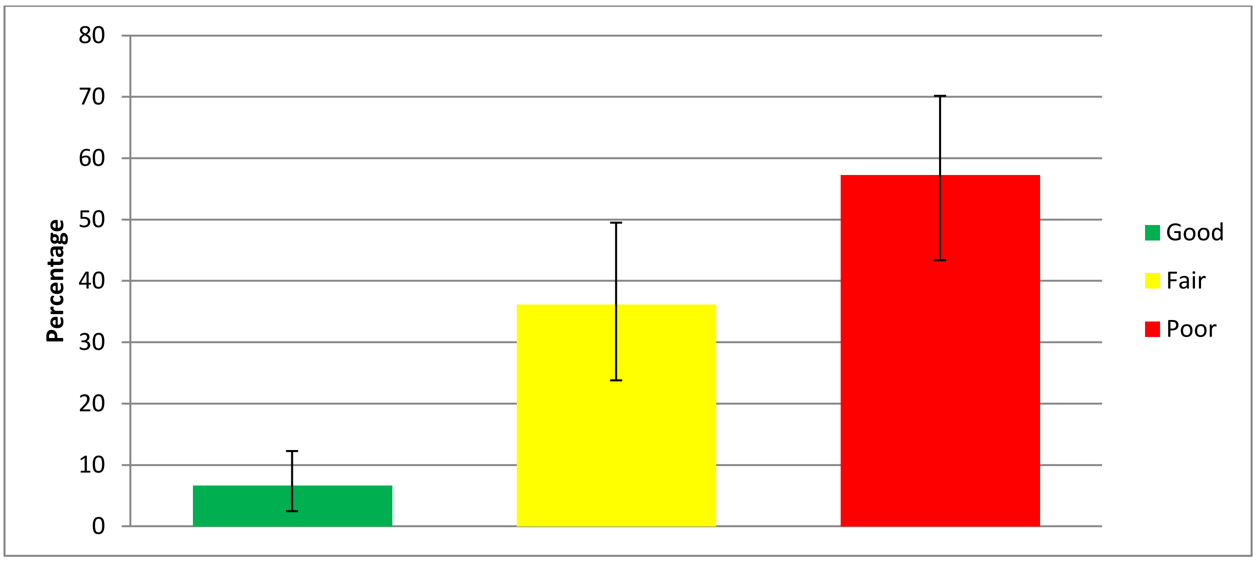


Figure V-7. Total Nitrogen Condition Category Estimates for Perennial Rivers and Streams in North Dakota.

As for total phosphorus, 23 percent (1,187.1 miles) of rivers and streams were considered to be 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.

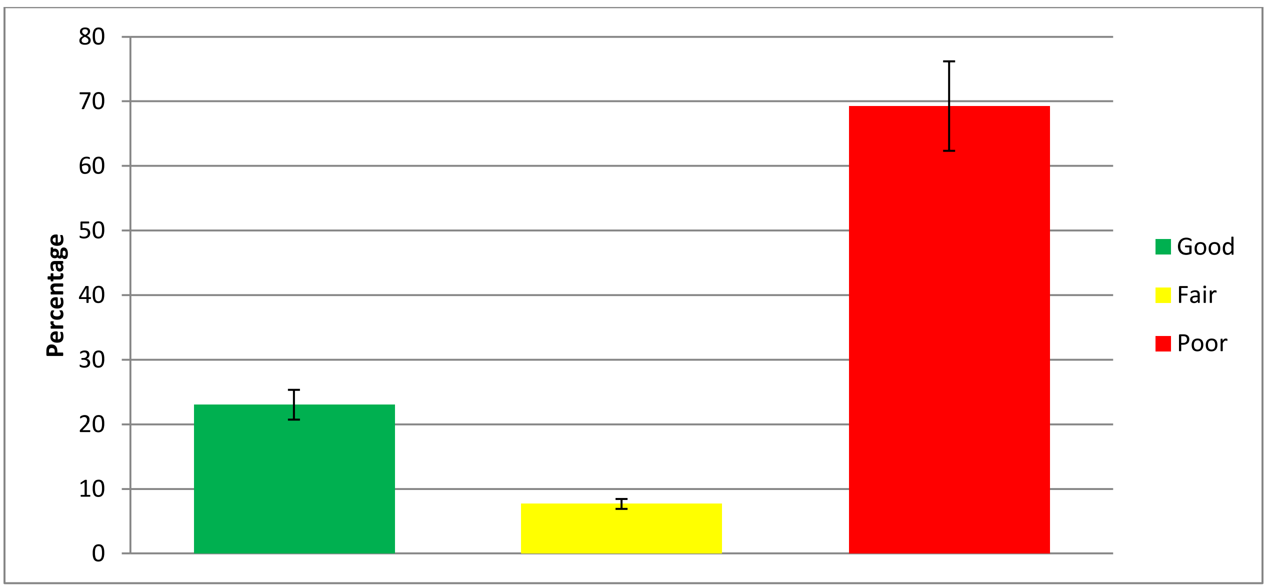


Figure V-9. Total Phosphorus Condition Category Estimates for Perennial Rivers and Streams in North Dakota.

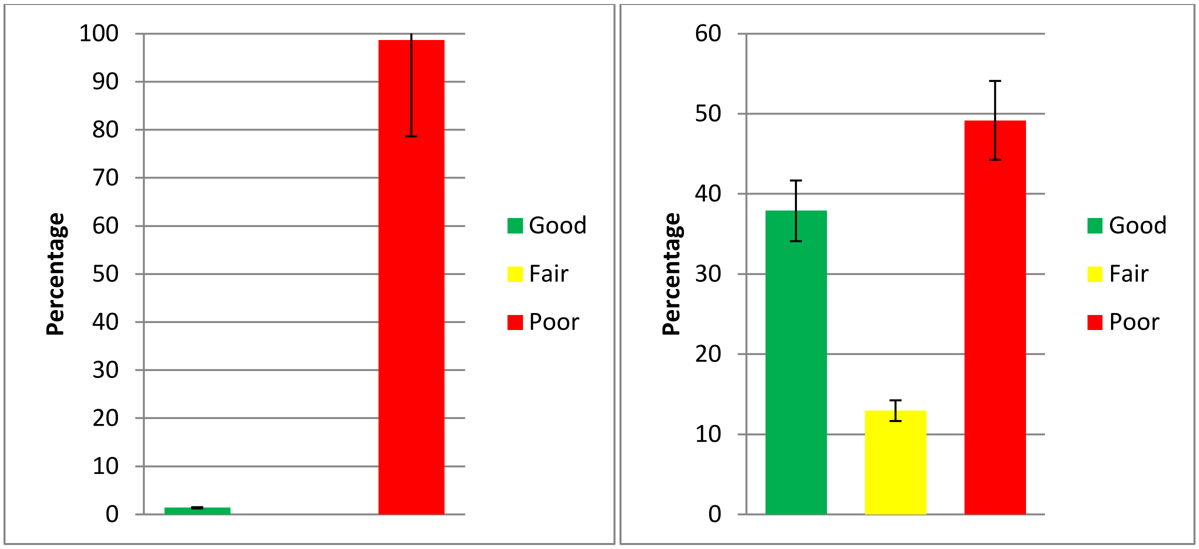


Figure V-10. Total Phosphorus Condition Category Estimates for Perennial Rivers and Streams in the Temperate Plains (left) and the Northern Plains (right) Ecoregions of North Dakota.

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).

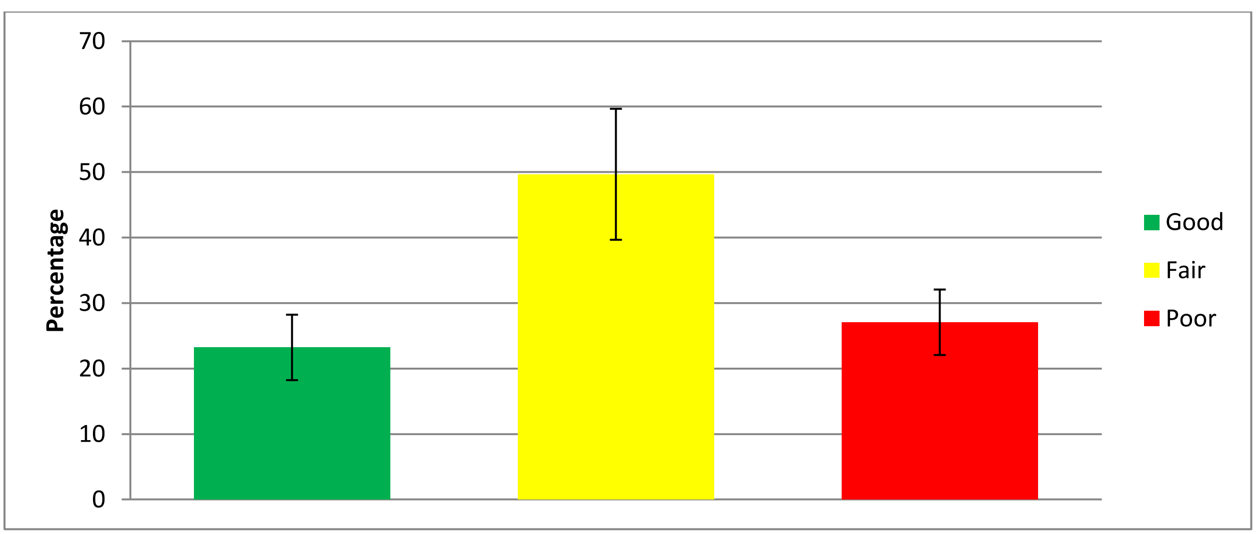


Figure V-11. Salinity Condition Category Estimates for Perennial Rivers and Streams in North Dakota.

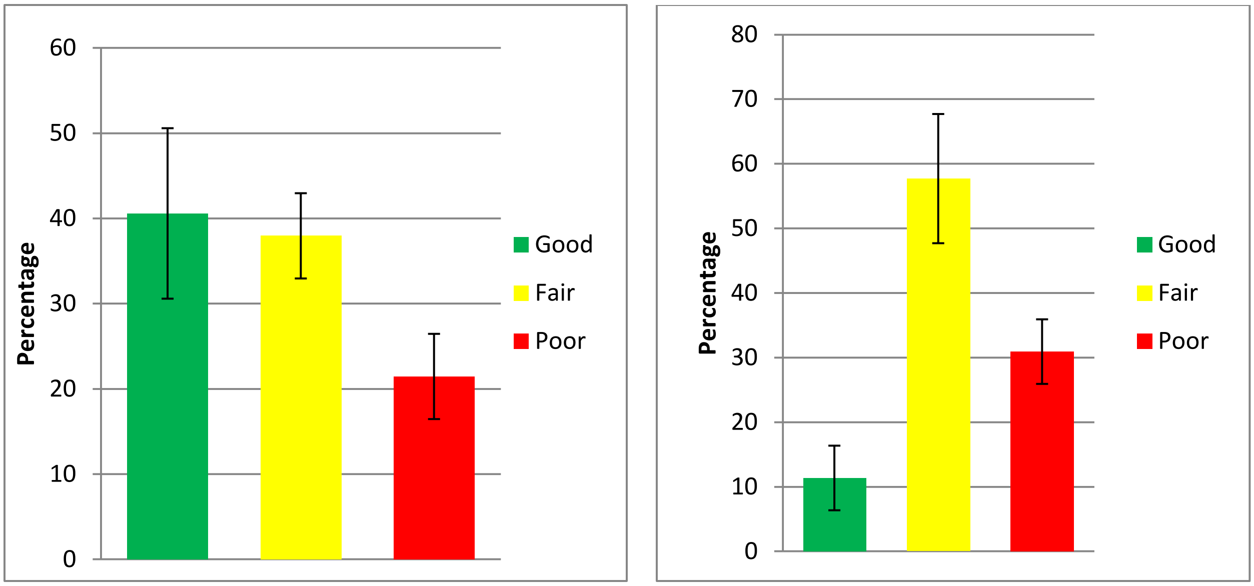


Figure V-12. Salinity Condition Category Estimates for Perennial Rivers and Streams in the Temperate Plains (left) and the Northern Plains (right) Ecoregions of North Dakota.

<u>Physical Stressors</u>

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.

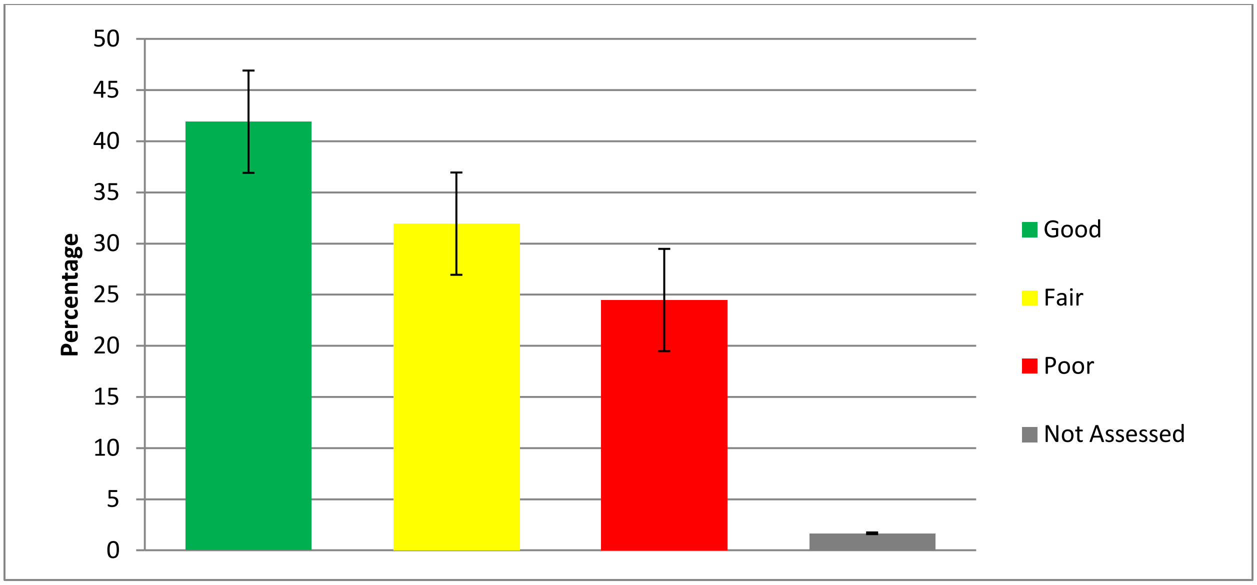


Figure V-13. Bed Sediment Condition Category Estimates for Perennial Rivers and Streams in North Dakota.

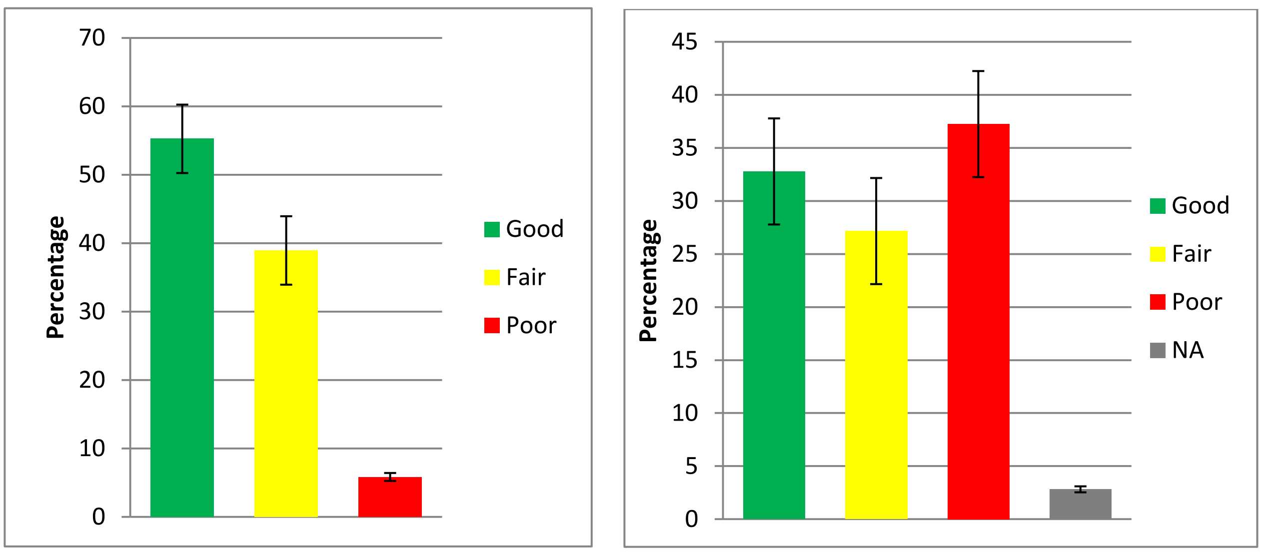


Figure V-14. Bed Sediment Condition Category Estimates for Perennial Rivers and Streams in the Temperate Plains (left) and Northern Plains (right) Ecoregions of North Dakota (Note– NA stands for Not Assessed).

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 considered to be 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, 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).

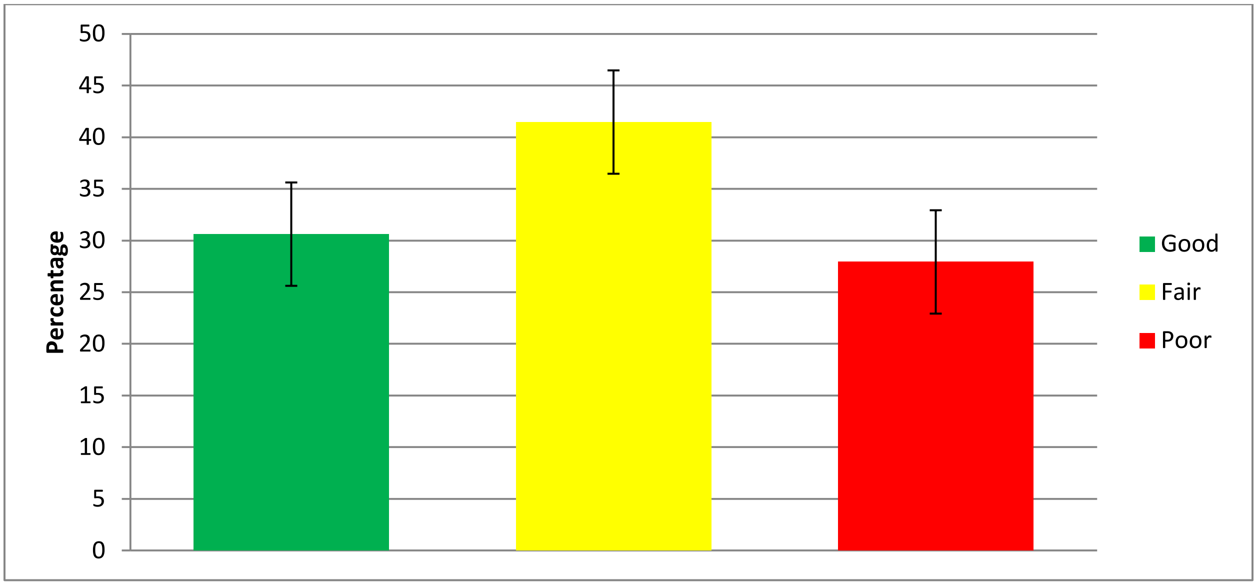
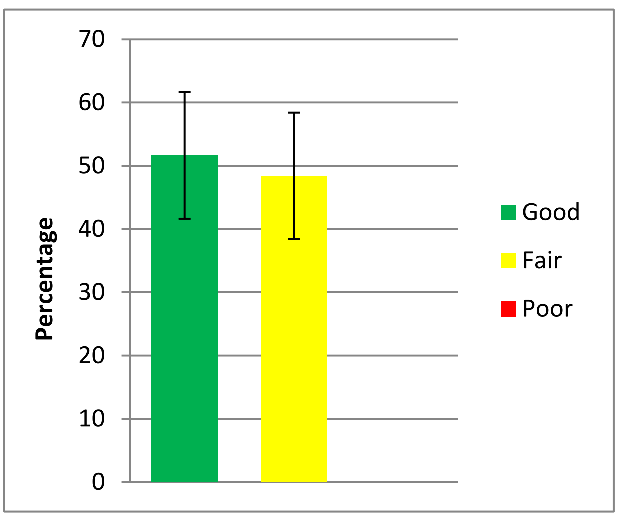


Figure V-15. In-stream Cover Condition Category Estimates for Perennial Rivers and Streams in North Dakota.



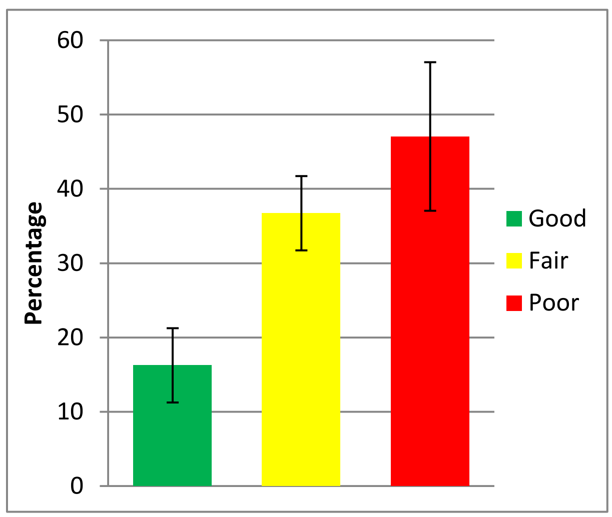


Figure V-16. In-stream Cover Condition Category Estimates for Perennial Rivers and Streams in the Temperate Plains (left) and Northern Plains (right) Ecoregions of North Dakota.

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 considered to be in poor condition with regard to the riparian vegetation condition estimate (Figure V-18).

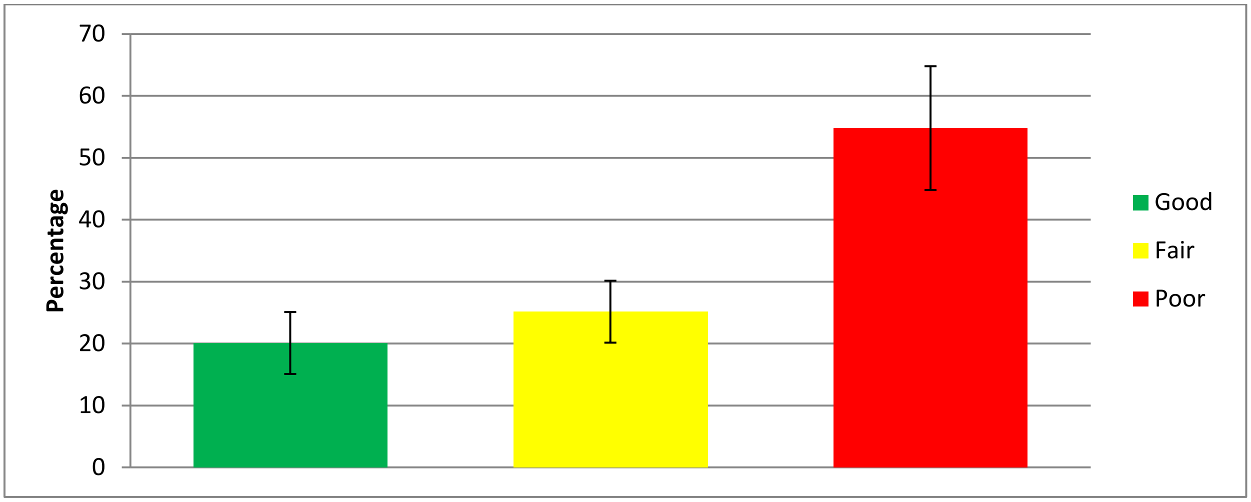
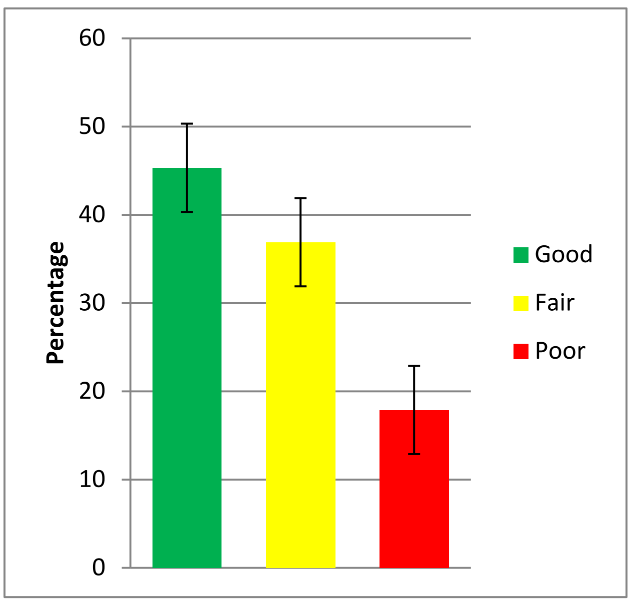


Figure V-17. Riparian Vegetation Condition Category Estimates for Perennial Rivers and Streams in North Dakota.



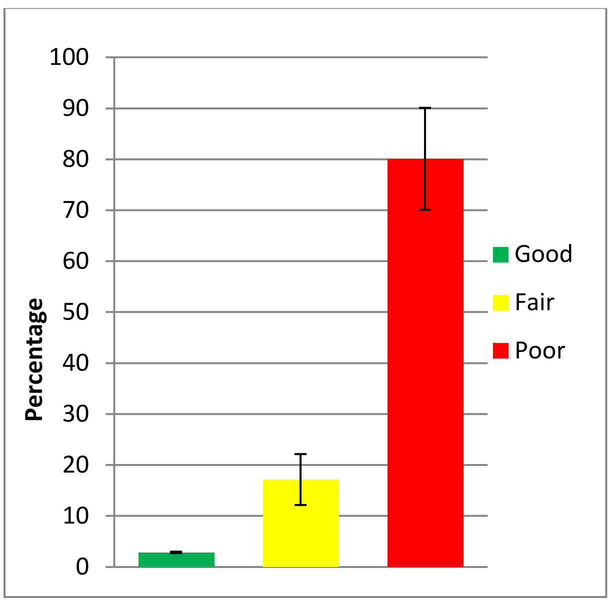


Figure V-18. Riparian Vegetation Condition Category Estimates for Perennial Rivers and Streams in the Temperate Plains (left) and Northern Plains (right) Ecoregions of North Dakota.

Human Health Considerations

In order 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). As for the fish tissue mercury analysis, only one sampling location exceeded the threshold of 300 mg Hg/g. This was a site on the Red River of the North near Perley, MN.

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 with regard to 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.

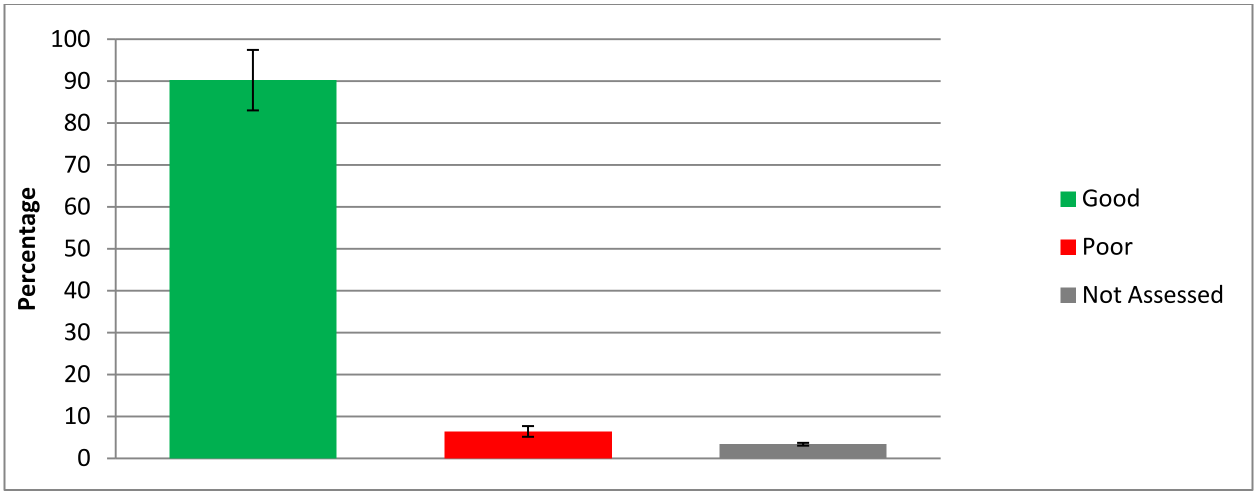


Figure V-19. Human Health Condition Category Estimates Based on Enterococci Bacteria for Perennial Rivers and Streams in North Dakota.

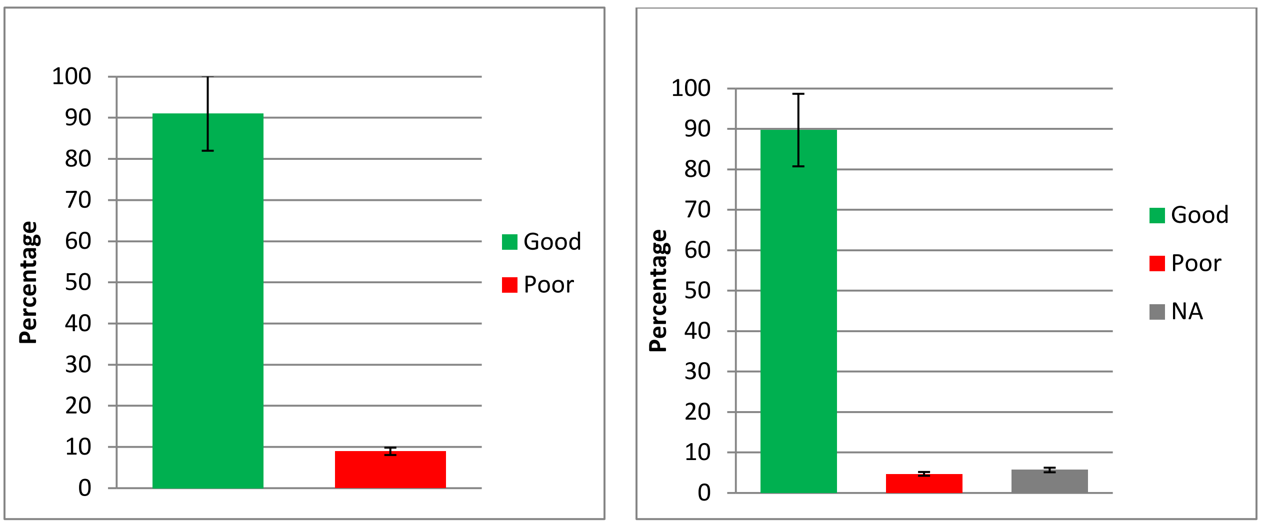


Figure V-20. Human Health Condition Category Estimates Based on Enterococci Bacteria for Perennial Rivers and Streams in the Temperate Plains (left) and Northern Plains (right) Ecoregions of North Dakota (Note– NA stands for Not Assessed).

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.

B. Lakes and Reservoirs Water Quality Assessment

Chapter 1. Assessment Category Summary

Of the 295 public lakes and reservoirs included in the Assessment Database (ADB), only 200 are included in the state's water quality standards as classified lakes and therefore are assigned designated beneficial uses. Beneficial use assessments for the remaining 95 lakes and reservoirs, while included in the state's estimate of total lake acres, were not conducted for this report. Where sufficient data were available, these 95 lakes and reservoirs were assessed for trophic status (Table V-10). Table V-6 provides an assessment category summary for the 200 classified lakes and reservoirs in the state. One lake was classified as Category 1, meaning all uses were assessed and were fully supporting. One-hundred-forty-seven (147) lakes and reservoirs totaling 141,812 acres were assessed as Category 2. These are lakes and reservoirs where at least one designated use, mostly agriculture use and industrial use, was assessed as fully supporting, but the other uses were not assessed. A total of 20 lakes and reservoirs were assessed as Category 4A, meaning at least one designated use was impaired or threatened, but a TMDL is not required because a TMDL already has been completed and approved by EPA. Thirty-three (33) lakes and reservoirs totaling 474,468 acres were assessed where at least one beneficial use is impaired and a TMDL is required. These Category 5 lakes and reservoirs are provided in the state's TMDL list (Tables VI-1 through VI-4).

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

Category	Description	Number AUs	Total Size (acres)
1	All uses met	1	1,414.0
2	Some uses met, others not assessed	147	141,812.3
3	No uses assessed	0	0
4A	Some or all uses impaired or threatened, but a TMDL(s) has been approved for all impaired uses.	20	4,687.8
4B	Some or all uses impaired or threatened, but other pollutant controls will result in water quality standards attainment.	0	0
4C	Some or all uses impaired or threatened, but impairment is not due to a pollutant.	0	0
5	Some or all uses impaired or threatened and a TMDL is required.	33	474,467.5

Chapter 2. Section 305(b) Water Quality Summary

As stated in Chapter 1, a total of 200 lakes and reservoirs, representing 622,403 surface acres, are specifically listed in the state water quality standards as classified lakes and reservoirs. Each of these 200 lakes and reservoirs were assessed for this report. In some cases the only beneficial uses assessed were agriculture and industrial uses. In others cases, all designated uses were assessed. There were also 95 lakes and reservoirs which were included in the ADB, but were not assessed. The non-classified lakes represent 93,565 acres or only 13 percent of the total lake and reservoir acres in the state.

For purposes of this report, the term "aquatic life use" is synonymous with biological integrity and is defined as the ability of a lake or reservoir to support and maintain a balanced, adaptive community of aquatic organisms (e.g., fish, zooplankton, phytoplankton, macroinvertebrates, vascular plants) having a species composition, diversity and functional organization comparable to that of least-impaired reference lakes and reservoirs in the region (modified from Karr et al., 1981). One-hundred-thirty-two (132) lakes and reservoirs, representing 592,914 acres, were assessed as fully supporting aquatic life use (Table V-7); in other words, they are considered capable of supporting and maintaining a balanced community of aquatic organisms. An additional 29 lakes and reservoirs representing 8,168 acres are assessed as fully supporting, but threatened (Table V-7). 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 859 acres, were assessed as not supporting aquatic life use (Table V-7).

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

Use	Fully Supporting	Fully Supporting, but Threatened	Not Supporting	Not Assessed	Insufficient Information for Assessment	Total Size
Aquatic Life	592,913.5	8,167.8	859.1	19,277.1	1,164.1	622,381.6
Fish Consumption	70,619.0	0	448,933.5	101,415.1	0	620,967.6
Recreation	567,643.8	26,439.4	8,211.8	19,816.6	270.0	622,381.6
Drinking Water Supply	342,070.5	0	0	278,897.1	0	620,967.6
Agriculture	622,381.6	0	0	0	0	622,381.6
Industrial	622,381.6	0	0	0	0	622,381.6

One of the primary causes of aquatic life impairment to the state's lakes and reservoirs is low DO in the water column (Table V-8). Low DO in lakes can occur in summer (summer kills), but usually occurs in the winter under ice-cover conditions. Low-DO and winter kills occur when senescent plants and algae decompose, consuming available oxygen. Because the lake is ice covered, re-aeration is minimal, and the lake goes anoxic resulting in a fish kill. Fish kills are the most apparent impact to sensitive fish species (e.g., walleye, trout, bass, bluegill, crappie, northern pike), but impacts to other DO-sensitive aquatic organisms also may occur. 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 that stimulate the production of organic matter also can cause aquatic life impairment. Two secondary pollutant causes are excessive nutrient loading and siltation (Table V-8). 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 (Table V-9). 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. Nutrients, sediment and organic matter that would be retained in wetlands under normal conditions become part of the lake's external budget.

Other sources of nutrient loading that affect lakes in the state are point source discharges from municipal wastewater treatment facilities, urban/stormwater runoff and shoreline development (Table V-9).

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

Impairment	Acres
Nutrients	35,004.5
Oxygen Depletion	6,598.3
Sedimentation/Siltation	4,185.0
Turbidity	1,191.0
Total Dissolved Solids	36.8
Mercury in Fish Tissues	448,933.5

Shoreline or cabin development directly contributes nutrients to lakes in many ways. Typically, lake cabins or homes use septic systems (tanks and drain fields) to contain their wastewater. Many of these systems are poorly designed, poorly maintained or nonexistent. Poorly designed septic systems provide a direct path of nutrients from the cabin to the lake. In addition, cabins or homes along lakes can contribute nutrients through fertilizer runoff from lawns.

Shoreline development can indirectly lead to increased nutrient loading when development results in a loss of the natural vegetation surrounding the lake. This buffer, between the lake and its watershed, provides for the assimilation of nutrients and retention of sediments contained in the runoff from the surrounding landscape. When this buffer is lost or degraded due to development, nutrients, sediment and other chemicals (e.g., pesticides, road salts) are afforded a direct path to the lake.

The previously mentioned sources are considered external or watershed-scale sources of nutrient loading. Another source that can represent a significant portion of the nutrient budget at times is internal cycling, particularly in those lakes that periodically go anoxic either during ice cover or through thermal stratification in the summer. Under these circumstances, phosphorus and reduced forms of nitrogen (e.g., ammonia) can be released into the water column. The increased nutrient concentrations impair use by stimulating noxious weed growth and algal blooms.

Recreation use (e.g., swimming, waterskiing, boating, sailing, sunbathing) was assessed for 168 lakes and reservoirs in the state totaling 602,295 acres. Of this total, eight (8) lakes, representing 8,212 acres, were assessed as not supporting use for recreation (Table V-6). The primary cause of use impairment is excessive nutrient loading, which results in nuisance algal blooms and noxious aquatic plant growth (Table V-8). Sources of nutrients causing algal blooms and weed growth were described earlier (Table V-9).

One-hundred-twenty-two (122) lakes and reservoirs totaling 567,644 acres were assessed as fully supporting recreation use. An additional 38 lakes and reservoirs totaling 26,439 acres were assessed as fully supporting, but threatened (Table V-7). 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-ninety-nine (199) classified lakes and reservoirs, representing 620,968 acres, were assigned the use for fish consumption (Table V-7). 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 the ADB 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 (Table V-7). The remaining 194 lakes and reservoirs that support a sport fishery were not assessed for this report.

Sources of methyl-mercury in fish remain largely unknown. Potential sources of mercury include natural sources and atmospheric deposition. Results of a report prepared by the department show an increase in mercury concentrations in the fillets of walleye, northern pike and chinook salmon in Lake Sakakawea following the drought and recent filling of the lake (Pearson et al., 1997). One possible reason for the higher mercury concentrations in fish is that the lake may be experiencing an increase in the rate of mercury methylization due to greater amounts of organic matter in the lake following flooding. The drought of the late 1980s and early 1990s lowered the lake level, allowing vast areas of dry lake bed to re-vegetate. When the lake began refilling in 1993, the vegetation was flooded and began decomposing. The organic matter provided to the lake during this period is thought to have favored the methylization process. This is a microbial process whereby bacteria present in the lake convert elemental mercury to its more bioavailable methyl-mercury form. The increase in bioavailable mercury in the lake is reflected in higher mercury concentrations in fish.

One-hundred-ninety-nine (199) lakes and reservoirs, representing 620,968 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 one other, Renwick Dam, serves 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 (Table V-7). Municipal drinking water supply use was not assessed for Lake Ashtabula, Bisbee Dam, Renwick Dam or for the other 193 classified lakes and reservoirs which are assigned a drinking water supply use.

Table V-9. Impairment Source Summary for Lakes and Reservoirs in North Dakota.

Source	Acres
Source Unknown (Associated with Mercury in Fish)	443,915.5
Crop Production (Dryland)	24,340.2
Internal Nutrient Recycling	21,806.3
Riparian Grazing	14,495.5
Animal Feeding and Handling Operations	13,881.4
On-site Treatment Systems (Septic Systems)	9,882.2
Rangeland/Pastureland Grazing	8,073.9
Wetland Loss (Drainage/Filling)	8,046.3
Anoxia Due to Thermal Stratification/Eutrophication	6,445.0
Sediment Resuspension	2,141.6
Upstream Impoundments	2,073.4
Streambank Modification	392.5
Loss of Riparian Habitat	194.0
Stormwater Runoff	100.1
Land Application of Biosolids/Septage Disposal	55.2
Flow Alteration for Water Diversion	36.8
Highway and Road Runoff	36.8

Chapter 3. Trophic Status

When sufficient data were available, all reservoirs and natural lakes were assessed for trophic status, these included lakes not specifically classified in the state's water quality standards, but were included in the ADB database. For purposes of this report, "trophic status" refers to the present condition or measure of eutrophication of the waterbody at the time of the assessment.

Accurate trophic status assessments are essential to making sound management decisions. In order to minimize errors in classification, all existing chemical, physical, quantitative and qualitative data were used in making final trophic status assessments.

Because there are no TSIs specific to North Dakota waters, Carlson's TSI (Carlson, R. E. 1977) was chosen as the initial method to describe a lake's or reservoir's trophic status. Carlson's TSI was selected because it is commonly used by limnologists and because it was developed for Minnesota, a state geographically close to North Dakota.

An attempt was made to gather enough chemical and ancillary data to group as many of North Dakota's 295 lakes/reservoirs into one of four trophic states (Table V-10). The four trophic states, in order of increasing productivity, are oligotrophic, mesotrophic, eutrophic and hypereutrophic. Adequate data were available to assess the trophic status of 175 of the 295 lakes and reservoirs entered into the ADB database. The majority of the state's assessed lakes and reservoirs range from mesotrophic to eutrophic. Thirty-one (31) lakes and reservoirs were assessed as hypereutrophic. There were no lakes or reservoirs assessed as oligotrophic in the state.

Table V-10. Trophic Status Summary for Lakes and Reservoirs in North Dakota.

Trophic Status	Number of Lakes	Acreage of Lakes
Oligotrophic	0	0.0
Mesotrophic	53	443,694.1
Eutrophic	91	157,931.9
Hypereutrophic	31	21,065.4
Not Assessed	120	93,254.8
Total Number of Lakes	295	715,946.2

Chapter 4. Control Methods

NPS pollution, particularly from agricultural lands and feedlots, is the main source of pollutants leading to the degradation of the state's lakes and reservoirs. North Dakota's Section 319 NPS Pollution Management Program is very active in reducing agricultural NPS pollution (see Part III. C. Chapter 3. "NPS Pollution Management Program"). This program has kept thousands of tons of soil, along with attached contaminants, out of the state's lakes and reservoirs.

Currently, the Section 319 NPS Pollution Management Program is providing cost-sharing for three (3) watershed restoration projects that have a direct impact on lakes or reservoirs in the state. These include Dead Colt Creek Dam, Powers Lake and Homme Dam. These projects treat entire watersheds through the promotion of sustainable agricultural and sound land management practices. Landowner participation is voluntary, with incentives provided by cost-share programs.

Point source pollution has the potential to severely impact individual lakes and reservoirs and is the second largest pollution problem. Protection of lakes and reservoirs from point source discharges is accomplished through the NDPDES Program (see Part III. C. Chapter 2. "Point Source Control Program"). While the NDPDES Program is thought of as regulating only industrial and municipal discharges, permits also are required for stormwater discharges and large animal feeding operations.

Chapter 5. Restoration/Rehabilitation Efforts

The primary intent of the Section 319 NPS Pollution Management Program is to control NPS pollution to lakes and reservoirs on a watershed scale. This program is complemented by the North Dakota Game and Fish Department's "Save Our Lakes" program. The main goal of the "Save Our Lakes" program is "to enhance and restore North Dakota's aquatic habitat resources in order to protect the fishery of North Dakota." In general, this encompasses shoreline enhancement projects, sediment dam installation, sediment removal, grass and tree plantings, cross fencing, alternate water sources, the installation of passive low water draw-downs, cost-share assistance for animal waste management systems and the establishment of exclusion areas in riparian corridors.

Chapter 6. Acid Effects on Lakes and Reservoirs

Acid precipitation and acid mine drainage pose significant threats to some of the nation's lakes and streams. Most surface waters in North Dakota are naturally alkaline ($pH>7$), while rainfall is naturally acidic ($pH<7$). Surface waters are able to resist acidification by what is termed "buffering capacity." In surface waters, buffering capacity is maintained largely by the carbonate (CO_3^{-2}) and bicarbonate (HCO_3^{-1}) ions in solution. These ions are collectively measured with hydroxide ions (OH^{-1}) as total alkalinity. Acidification in surface waters occurs when the buffering capacity is exhausted, thus causing a reduction in pH. North Dakota's lakes are highly alkaline and, as a result, do not show acidity caused by anthropogenic sources.

Chapter 7. Toxic Effects on Lakes and Reservoirs

Harmful Algal Blooms and Cyanotoxins

Harmful algal blooms (HABs) are not only uninviting but also potentially harmful. Typically, a HAB in North Dakota is caused by the rapid growth and overabundance of cyanobacteria. While these HABs typically occur in lakes and reservoirs, they can also occur in wetlands, ponds, stock dams and even in rivers. Cyanobacteria are microscopic organisms and are more like bacteria than plants, but because they live in water and use sunlight to create food (photosynthesis) they are often called 'blue-green algae.'

Under certain environmental conditions (i.e., warm water, sufficient sunlight, and excess nutrients) cyanobacteria can multiply quickly and form a bloom. Some species of cyanobacteria produce cyanotoxins that are released when the cells die and rupture. The toxins can cause harm to people, wildlife, livestock, pets and aquatic life. Almost every year in North Dakota, a few cases of pet and livestock deaths occur due to drinking water with HABs. Additional effects of HABs include:

- Blocking sunlight needed for other aquatic organisms
- Raising treatment costs for public water supply systems and industries
- Depleting dissolved oxygen as the algae dies off, resulting in fish kills
- Specific human health effects are:
- Allergic-like reactions
- Skin rashes
- Eye irritation
- Gastroenteritis
- Respiratory irritation
- Neurological effects

Once a waterbody has an excess of nutrients, the problem cannot be fixed overnight. Nutrients must be removed mechanically and/or allowed to be reduced naturally through internal cycling, while limiting the sources of nutrients in the watershed. Several North Dakota lakes have hypolimnetic drawdown systems that remove nutrient-rich water from the bottom of the lake. These systems can be effective at removing nutrients, but they do not address the nutrient sources.

Mercury in Fish

Mercury is another contaminant assessed as causing lake and reservoir use impairment. As stated previously, elevated mercury concentrations in the tissues of fish have resulted in site-specific consumption advisories for Devils Lake, Lake Sakakawea and Lake Oahe and a general fish consumption advisory for all lakes and reservoirs in the state. Again, very little is known about the source of the mercury contamination in fish from these lakes. It is likely, however, that sources are both natural and anthropogenic.

Chapter 8. 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 draft 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.

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.

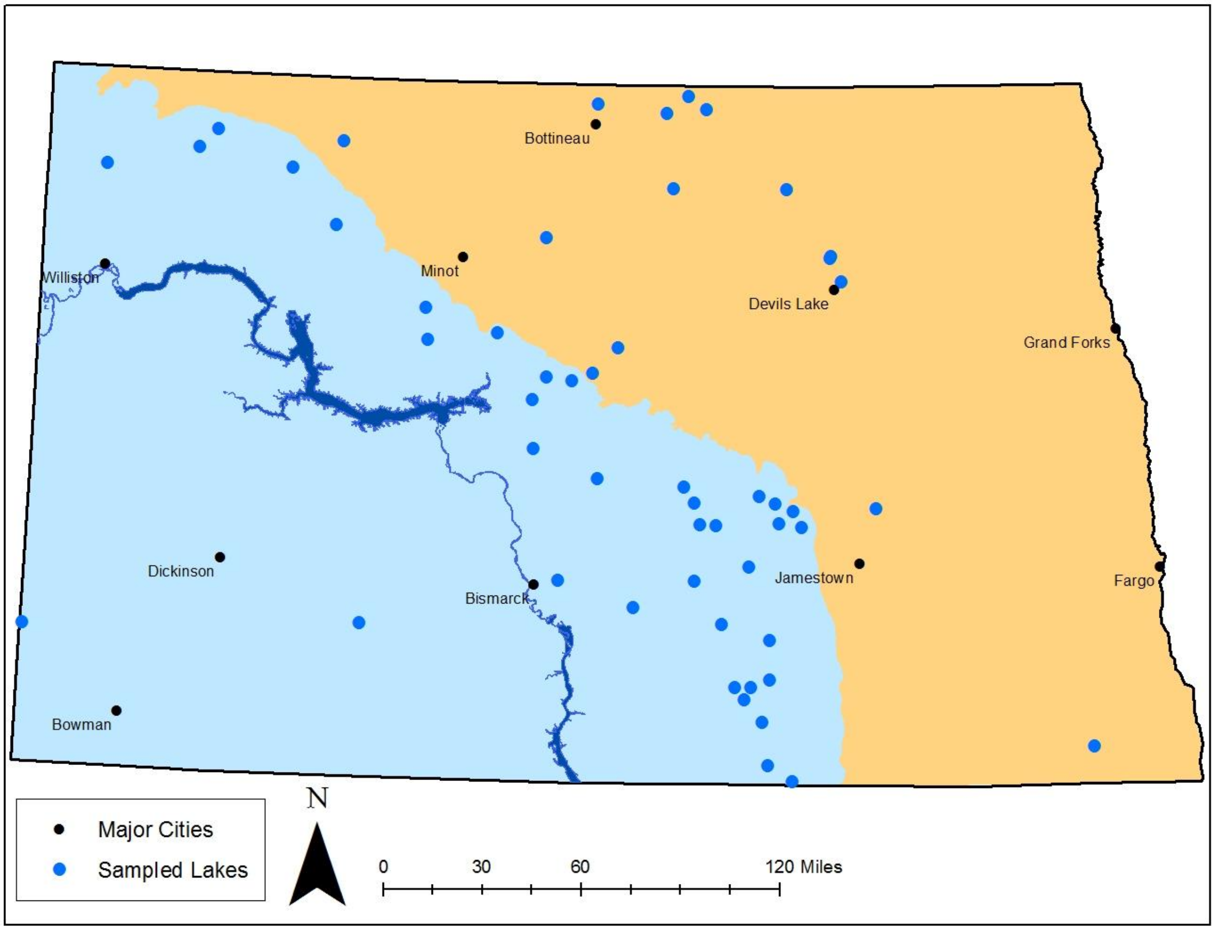


Figure V-21. Location of Lakes Sampled for the 2012 National Lakes Assessment and the State Intensification Project.

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-11).

Table V-11. 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

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).

Bethic Macroinvertebate 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.

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).

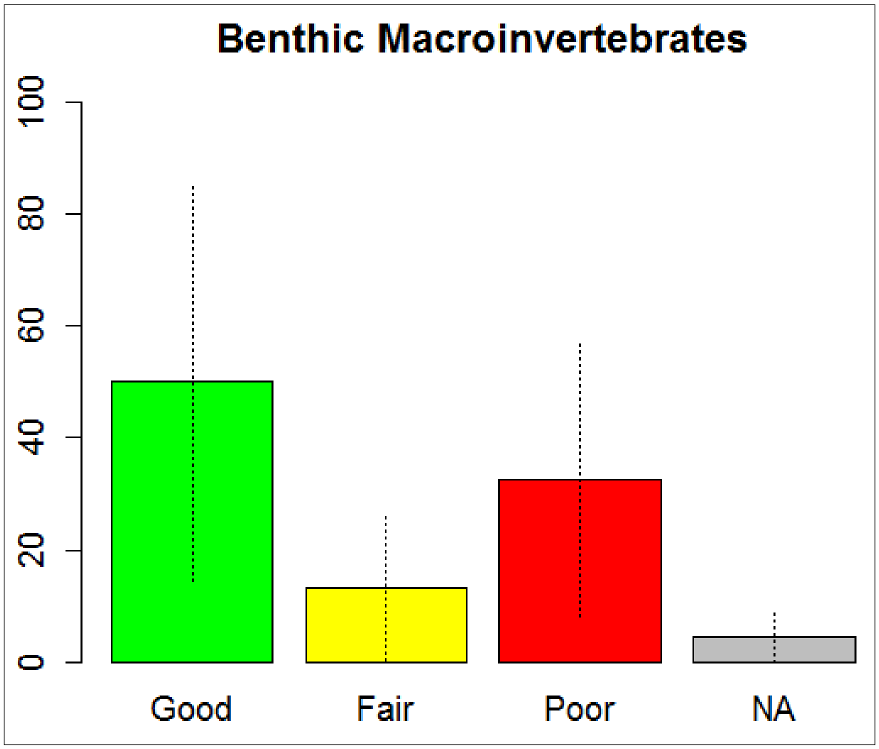


Figure V-22. Benthic Macroinvertebrate Condition Category Estimates for Lakes in North Dakota. (Lakes designated as Not Assessed (NA) were either not sampled for benthic macroinvertebrates or had fewer than 100 individuals counted.)

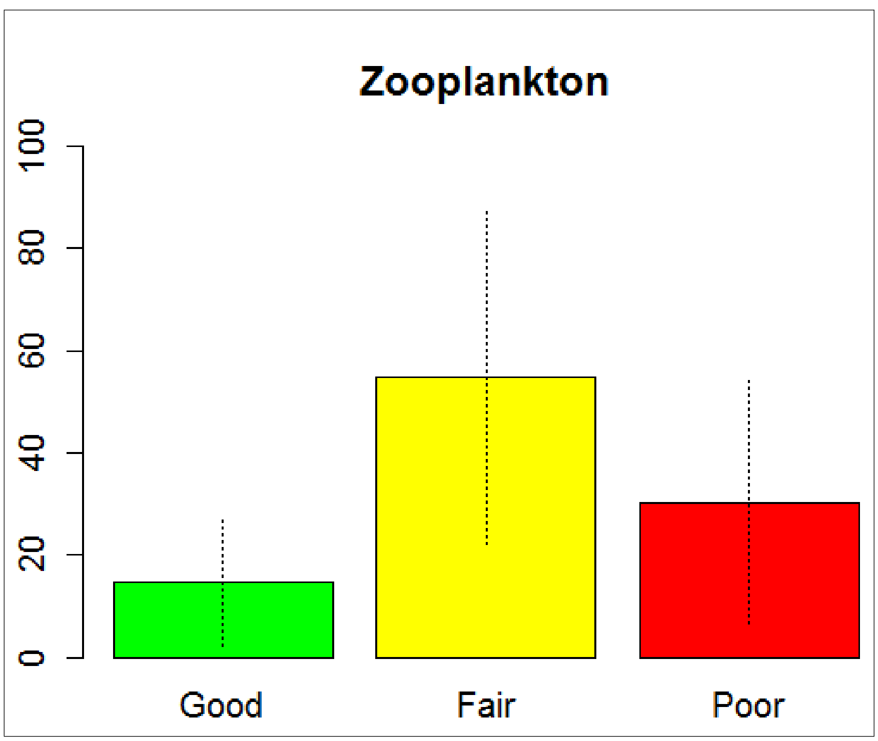


Figure V-23. Zooplankton Condition Category Estimates for Lakes in North Dakota.

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.

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).

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 ($\geq$ 5 mg/L), fair ($\geq$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).

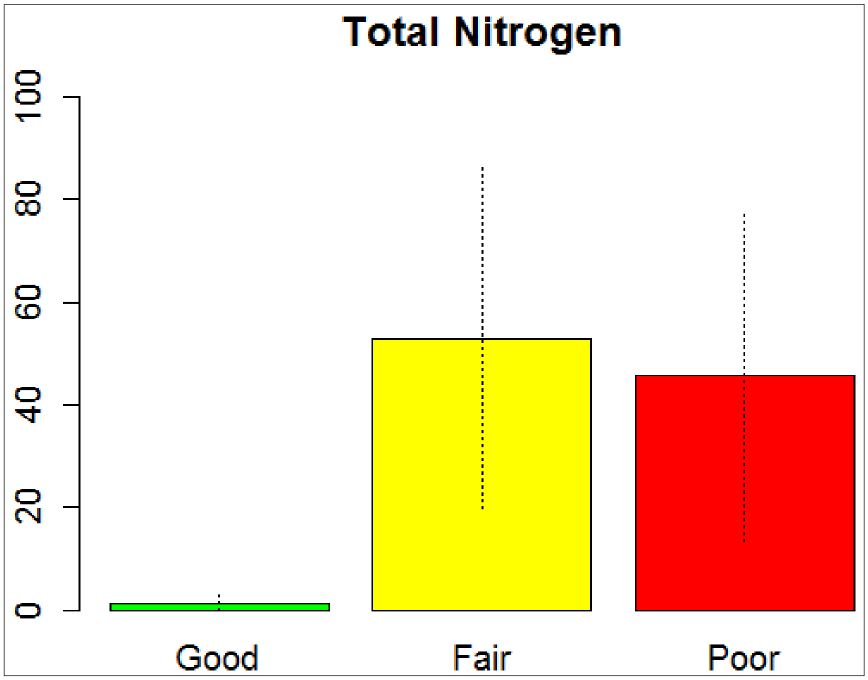


Figure V-24. Total Nitrogen Condition Category Estimates for Lakes in North Dakota.

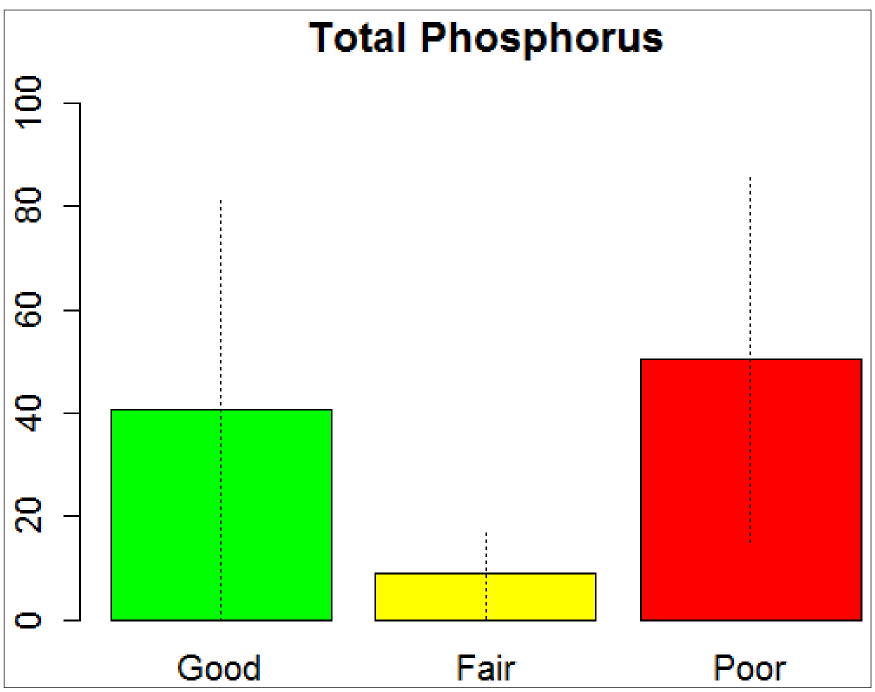


Figure V-25. Total Phosphorus Condition Category Estimates for Lakes in North Dakota.

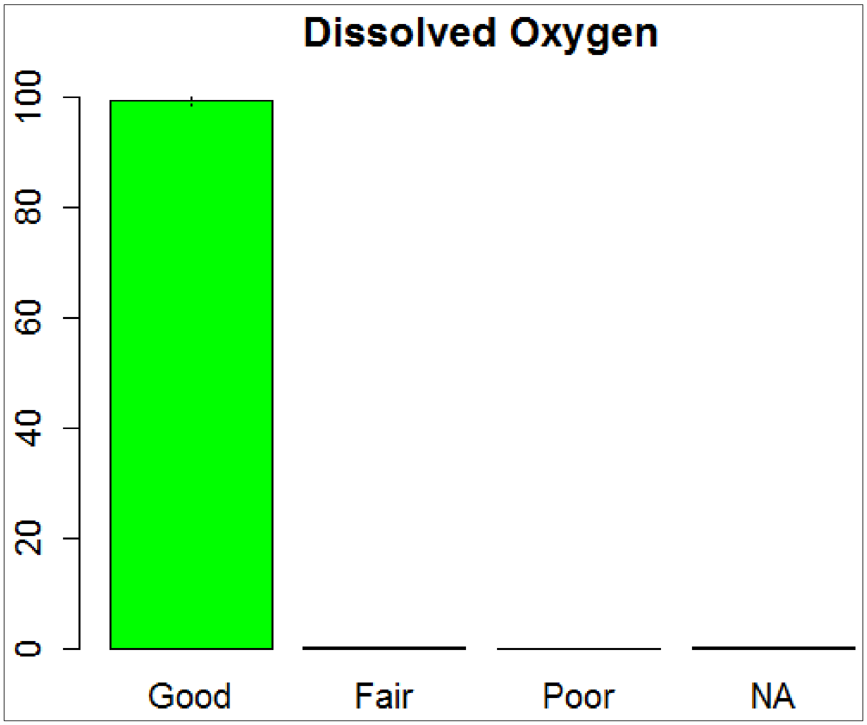


Figure V-26. Dissolved Oxygen Condition Category Estimates for Lakes in North Dakota. (Lakes designated as Not Assessed (NA) were not sampled for dissolved oxygen.**)**

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).

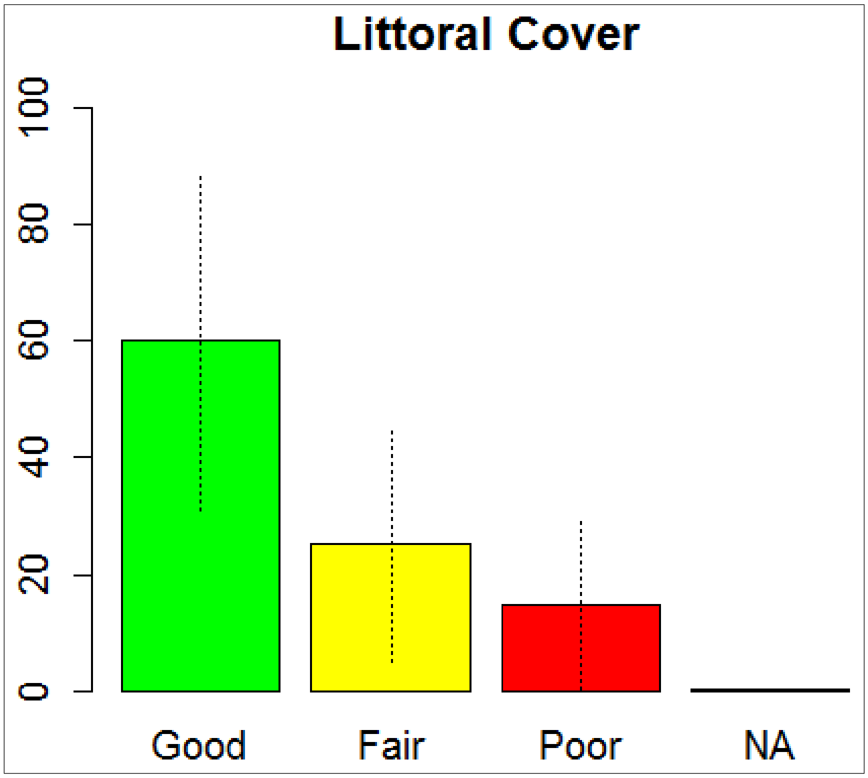


Figure V-27. Littoral Cover Condition Category Estimates for Lakes in North Dakota. **(**Lakes designated as Not Assessed (NA) were not assessed for littoral cover.**)**

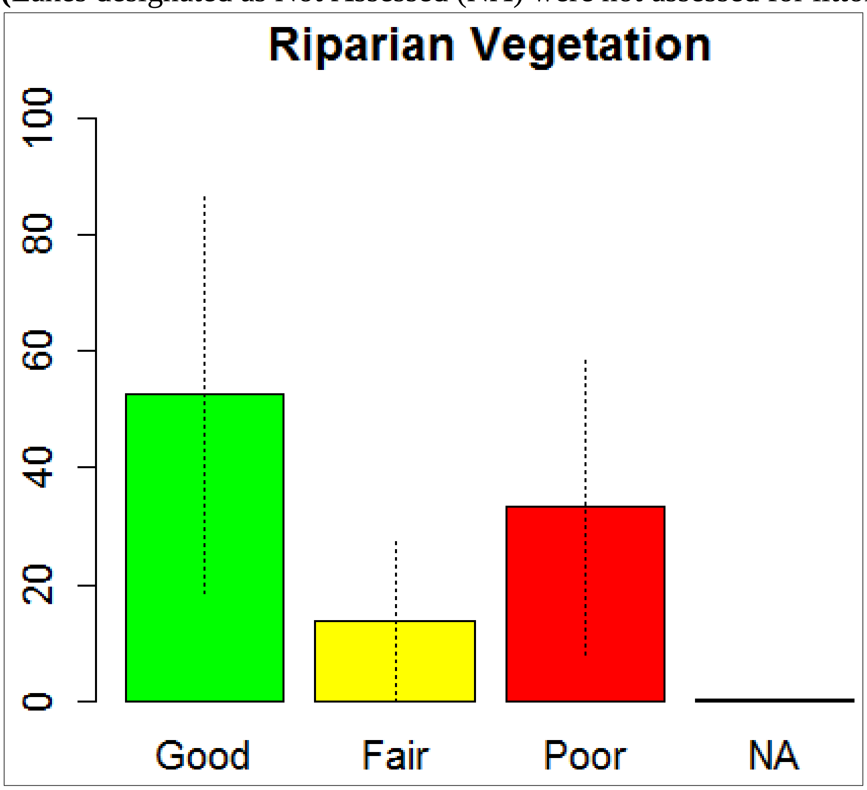


Figure V-28. Riparian Vegetation Condition Category Estimates for Lakes in North Dakota. (Lakes designated as Not Assessed (NA) were not assessed for riparian vegetation.)

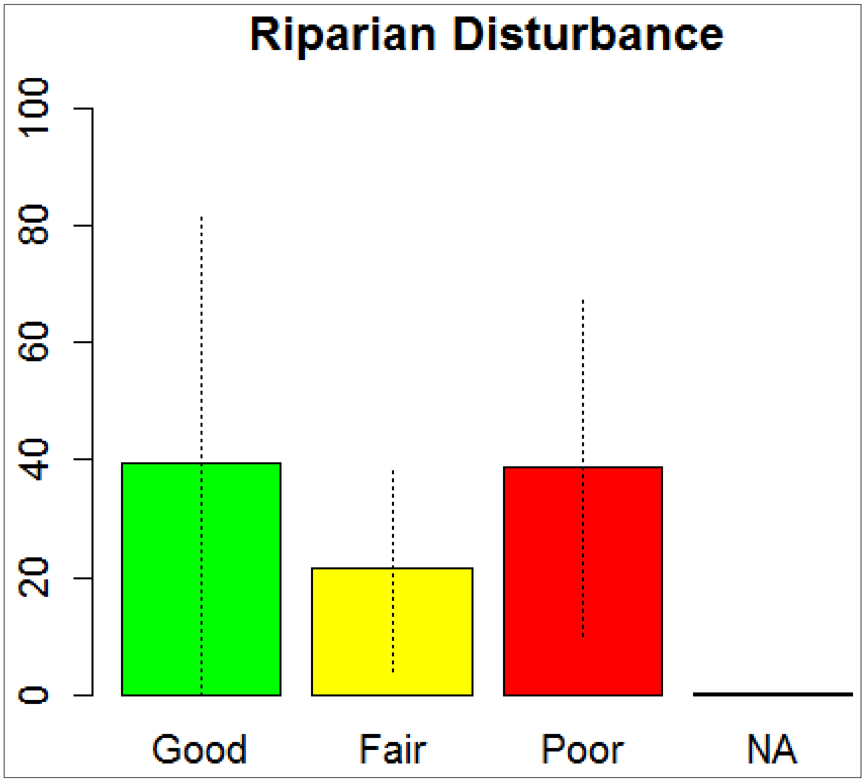


Figure V-29. Riparian Disturbance Condition Category Estimates for Lakes in North Dakota. (Lakes designated as Not Assessed (NA) were not assessed for riparian disturbance.)

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 foodwebs. 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) the 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.

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).

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 (ie., 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).

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 (ie., 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).

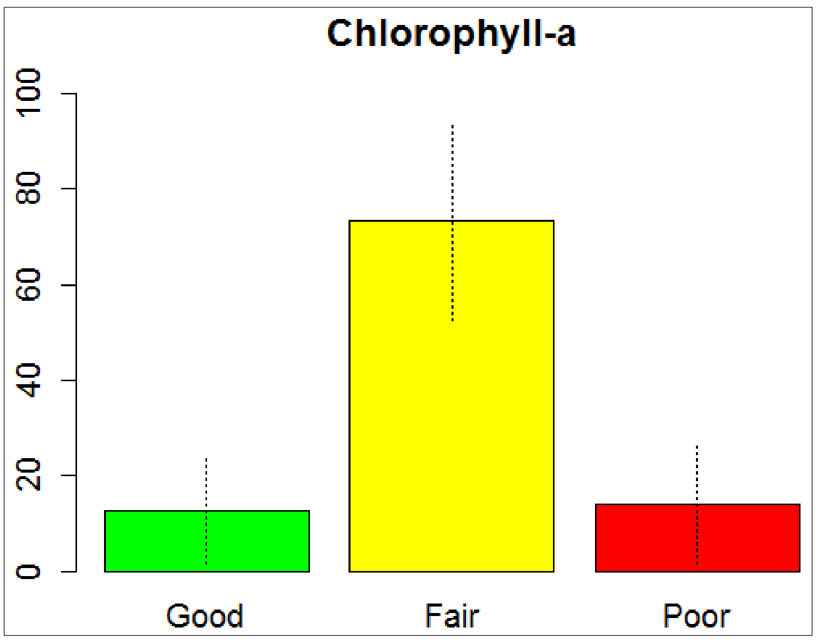


Figure V-30. Chlorophyll-a Condition Category Estimates for Lakes in North Dakota.

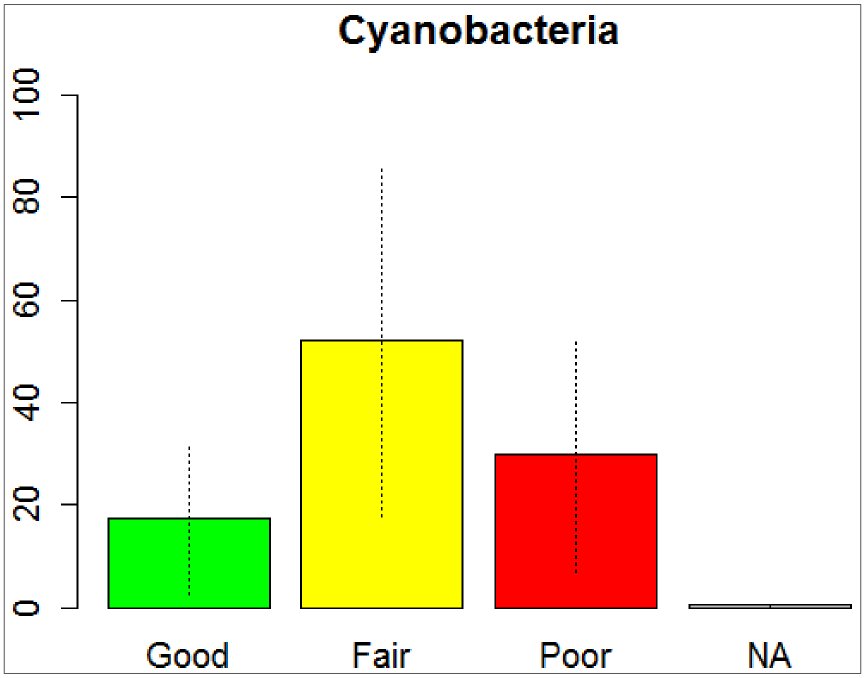


Figure V-31. Cyanobacteria Condition Category Estimates for Lakes in North Dakota. (Lakes designated as Not Assessed (NA) were not sampled for cyanobaceria.)

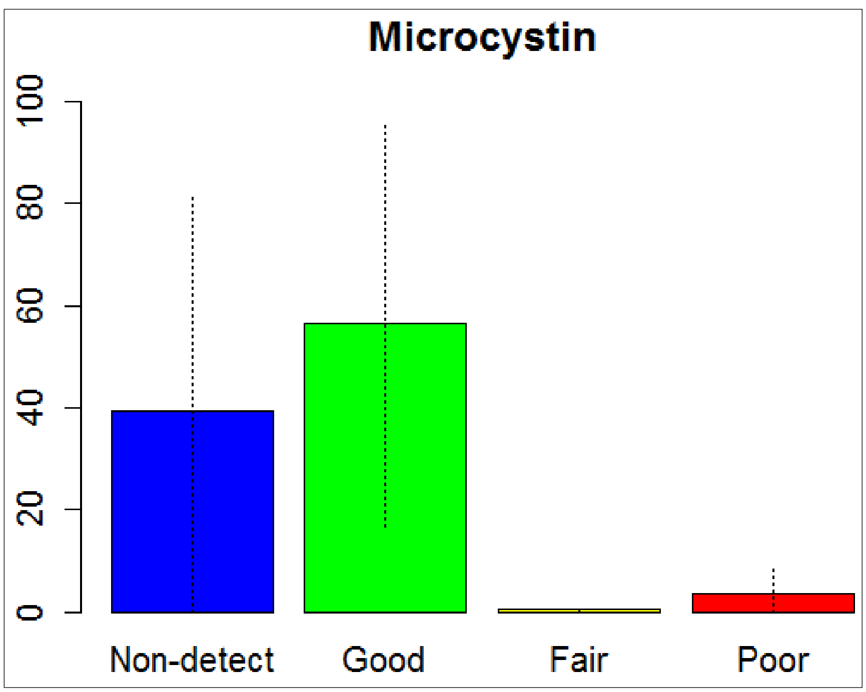


Figure V-32. Microcystin Condition Category Estimates for Lakes in North Dakota.

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 not surprising, however, and 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 rare within the plains region representing North Dakota, but, when present, can provide significant benefits for near-shore biological communities. With that said, North Dakota lakes were in relatively good condition with regard to 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.

C. Wetlands Assessment

Chapter 1. Background

Wetlands have long been regarded as nuisance areas or wastelands which only serve to impede agriculture, urban or transportation development. It is only recently that the ecological and social functions and values of wetlands been realized. It is now scientifically proven that wetlands are important for the storage of flood waters, for providing fish and wildlife habitat, for recharging ground water and for retaining and cycling chemical pollutants and particulates. Recently, wetlands have been recognized as a significant source for carbon sequestration. This could make wetlands an important component in the campaign to prevent global warming.

While these are important wetland functions, probably the best known function of wetlands in North Dakota is that of waterfowl production. Most of North Dakota's remaining wetlands are located in an area known as the Prairie Pothole Region (PPR). This area extends from the Missouri Coteau in central North Dakota eastward to the glacial Lake Agassiz Plain, also known as the Red River Valley. The region covers roughly 300,000 square miles and exists as a wide band extending from central Alberta southwest into northwestern Iowa (Dahl, 2014) (Figure V-33). In North Dakota the area covers over 31,000,000 acres (49,435 square miles) (Dahl, 2014). The PPR, with its many types of wetlands, is arguably the most biologically diverse and productive habitat in North America.

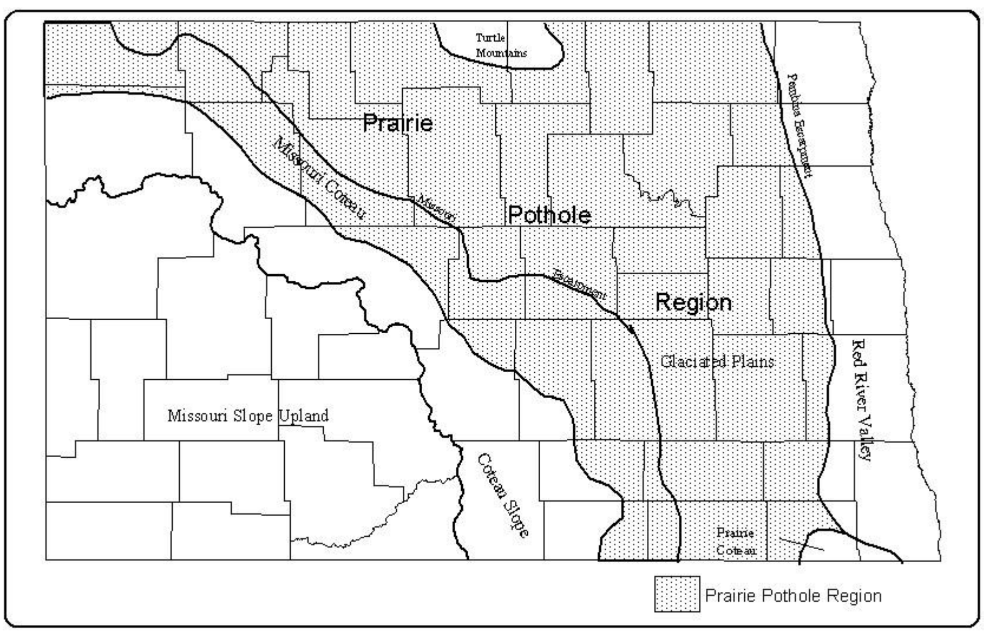


Figure V-33. Prairie Pothole Region in North Dakota.

Chapter 2. Extent of Wetland Resources

There seem to be as many ways to classify wetlands as there are wetlands themselves. The U. S. Fish and Wildlife Service first began to classify wetlands based on a system developed by Martin et al. (1953). This classification system was then modified by Stewart and Kantrud (1971), specifically for the Prairie Pothole Region of North America. With the Stewart and Kantrud classification system, vegetational zones are described in detail, along with the plant species most commonly found in the zone. These zones are used to identify phases which indicate the wetland's water regime or disturbed bottom soil (e.g., cropland tillage). Seven wetland classes are identified with the Stewart and Kantrud system. These include the familiar Class I - ephemeral ponds, Class II - temporary ponds, Class III - seasonal ponds and lakes, Class IV - semi-permanent ponds and lakes, and Class V -permanent ponds and lakes. Also included in the Stewart and Kantrud system are Class VI - alkali ponds and lakes, and Class VII - fens. Along with each class, there are five subclasses, A through E, based on variations in surface water salinity. Those familiar with the Stewart and Kantrud classification system refer to temporary depressional wetlands as Class II wetlands, seasonal wetlands as Class III wetlands and semi-permanent wetlands as Class IV.

In 1979, the U.S. Fish and Wildlife Service adopted the Cowardin et al. (1979) classification system for wetlands and deep water habitats of the United States. The Cowardin et al. classification system was developed to be used with the National Wetlands Inventory. In the highest level of classification, wetlands are grouped into five ecological systems: palustrine, lacustrine, riverine, estuarine and marine. The palustrine class includes only wetlands, whereas each of the four other systems includes wetlands and associated deep-water habitats. For purposes of classification, deep-water habitats are defined as areas where water is greater than 6.6 feet deep. In North Dakota, only the palustrine, lacustrine and riverine wetland types exist.

Brinson (1993) developed a classification system for use by the U.S. Army Corps of Engineers. This classification system, termed the Hydrogeomorphic (HGM) classification system, is based upon the wetland's position in the landscape (i.e., geomorphic setting), dominant source of water and the flow and fluctuation of water in the wetland. Brinson (1993) describes seven HGM wetland classes: riverine, depressional, slope, mineral soil flats, organic soil flats, estuarine fringe and lacustrine fringe.

In North Dakota, wetlands are classified into four broad categories according to the State Engineer's drainage rules. The state wetland classification includes temporary wetlands, seasonal wetlands, semi-permanent wetlands and permanent wetlands. The following are brief descriptions of each wetland class, as adopted by the North Dakota State Game and Fish Director and the State Engineer.

"Temporary wetlands" are shallow depressions which hold water or are waterlogged from spring runoff until early June. In years with normal runoff and precipitation, these areas may be tilled for crop production. In years with high runoff or heavy spring rain, these areas may not dry out until mid-July. They cannot be tilled, but may be used for hayland or pasture. Temporary wetlands frequently reflood during heavy summer and fall rains. Sheet water, as defined in North Dakota's Century Code 61-32-02, does not fall under the temporary wetland classification.

“Seasonal wetlands” are depressions, which normally hold water from spring runoff until mid-July. In years with normal runoff and precipitation, these wetlands cannot be tilled but may be used for hayland and pasture. In low runoff or dry years, these areas may be tilled for crop production but commonly reflood with heavy summer and fall rains.

“Semi-permanent wetlands” are located in well-defined depressions or basins. In normal years, these areas hold water throughout the summer. Semi-permanent wetlands generally become dry only in years of below normal runoff and precipitation. Freshwater semi-permanent wetlands (commonly called cattail sloughs) are characterized by a predominance of cattail and bulrush vegetation in scattered areas of open water. Saline semi-permanent wetlands have a preponderance of alkali bulrush in scattered areas of open water.

“Permanent wetlands” are located in well-defined basins which characteristically hold water throughout the year. The wetlands become dry only after successive years of below normal runoff and precipitation. Freshwater permanent wetlands typically have a border of aquatic vegetation and predominant open-water areas in the interior. Saline permanent wetlands are typically devoid of emergent vegetation and exhibit a white, salt-encrusted shoreline.

Currently, there is no accurate estimate of wetland area on a statewide basis. There are, however, estimates of wetland area for the PPR in both the US and in North Dakota which is where the majority of wetlands occur in the state. Stewart and Kantrud (1973) divided the state into four biotic regions: the Lake Agassiz Plain Region, the Coteau Slope Region, the Southwestern Slope Region, and the PPR. They estimated that 81 percent of the wetlands in the state are located in the PPR.

The most current and best estimates of wetland area in the PPR in North Dakota comes from a report entitled “Status and Trends of Prairie Wetlands in the United States 1997-2009” (Dahl, 2014). Based on this report, it was estimated that there were 6,427,350 acres of wetlands in the PPR in the US with the majority (2,847,680 acres) located in North Dakota. When compared to the approximately 4.9 million acres of wetlands which covered North Dakota prior to development (Dahl, 2014), this represents a 42 percent reduction in wetlands in the state.

Of the five PPR states, North Dakota also had the greatest number of wetland basins in 2009 with an estimated 1,498,716 basins at an average size of 2.5 acres (Dahl, 2014). This is twice the number wetland basins estimated to be in South Dakota in 2009, which is the PPR state with next greatest number (Dahl, 2014). Of the 1,498,716 wetland basins estimated to be in the PPR in North Dakota in 2009, temporary emergent and seasonally emergent wetlands were by far the most prevalent wetland types in the state. There were an estimated 677,163 temporary emergent wetlands and 661,099 seasonal emergent wetlands in the state in 2009 (Dahl, 2014). Temporary emergent wetlands are described as shallow depressions that fill with rain or snow-melt in the spring and retain water for short periods (2-4 weeks) during the growing season (Dahl, 2014). Saturated emergent wetlands, commonly referred to as shallow marshes, are characterized as having soils that are normally waterlogged during the growing season and where surface water persists for extended periods (30-90 days). Seasonal wetlands will usually lack standing water during the late summer (July-August). During dry years, standing water may be absent. Both temporary emergent and seasonal emergent wetlands are subject to cropping (Dahl, 2014).

There were also an estimated 29,991 farmed wetland basins in the state in 2009. Farmed wetlands are wetlands that have been tilled for agriculture, but are not actively drained and will retain their wetland characteristics if farming is discontinued. Under drier conditions farmed wetlands may be tilled and planted for crop production, but in wetter years they return as shallow emergent marshes (Dahl, 2014).

Chapter 3. Integrity of Wetland Resources

Wetland integrity should be thought of in terms of whether a wetland performs a set of functions or uses which would be expected for natural or “reference” wetlands of a similar class or type. The USDA NRCS and the U.S. Army Corps of Engineers have described 11 specific functions within three general functional categories for temporary and seasonal Prairie Pothole wetlands (Lee et al., 1997) (Table V-11). Therefore, whenever a wetland’s function is diminished, it can be said that wetland integrity is diminished.

Hydrologic manipulation (e.g., drainage, wetland consolidation, channelization, filling) continues to be the greatest impact on the integrity of the state’s wetlands. While not as dramatic, other factors such as chemical contamination, nutrient loading (i.e., eutrophication) and sedimentation can also affect a wetland’s function and, therefore, its chemical, physical and biological integrity.

Landscape level changes outside the edge of the wetland basin can also negatively affect wetland integrity. Changes to the landscape, such as road construction, cropland conversion, urbanization or the drainage of adjacent wetlands, all affect wetland functions. Cowardin et al. (1981) found 40 percent of wetlands were cultivated to the wetland edge, 33 percent were in pasture and 7 percent were hayed within a 3,877-square-mile area of the Prairie Pothole Region.

When viewed on a larger scale, wetlands are part of a larger unit known as a wetland complex. Wetland complexes are aggregates of individual wetland basins which are hydrologically connected. A typical wetland complex includes recharge wetlands, flow-through wetlands and discharge wetlands. Recharge wetlands are typically located at higher elevations in the landscape and receive the majority of their hydrologic budgets from precipitation and surface runoff. Recharge wetlands get their name because they recharge ground water. Flow-through wetlands, as their name implies, receive surface- and ground-water inflow and then outflow to both surface and ground water. Discharge wetlands receive the majority of their hydrologic budgets from ground-water discharge and rarely outflow to surface water. Because recharge wetlands receive most of their water through precipitation and surface-water inflow, they tend to be fresher. Discharge wetlands, which receive most of their water from ground water, tend to be higher in total dissolved solids.

Due to this hydraulic linkage in the landscape, any land use change which affects or changes the hydrologic relationship of wetlands in the complex can and will affect the hydrologic or physical integrity of each wetland basin in the complex. This, in turn, affects both the chemical and biological integrity of wetlands in the complex.

Table V-12. Definitions of Functions for Temporary and Seasonal Prairie Pothole Wetlands (Lee et al., 1997).

Physical/Hydrologic Functions
Maintenance of Static Surface Water Storage. The capacity of the wetland to maintain a hydrologic regime that supports static storage, soil moisture in the unsaturated zone and ground water interactions.
Maintenance of Dynamic Surface Water Storage. The capacity of the wetland to maintain a hydrologic regime that supports dynamic storage, soil moisture in the unsaturated zone and ground water interactions.
Retention of Particulates. Deposition and retention of inorganic and organic particulates (>0.45 Φm) from the water column, primarily through physical processes.
Biogeochemical Functions
Elemental Cycling. Short- and long-term cycling of elements and compounds on-site through the abiotic and biotic processes that convert elements (e.g., nutrients and metals) from one form to another; primarily recycling processes.
Removal of Imported Elements and Compounds. Nutrients, contaminants, and other elements and compounds imported to the wetland that are removed from cycling processes.
Biotic and Habitat Functions
Maintenance of Characteristic Plant Community. Characteristic plant communities not dominated by non-native or nuisance species. Vegetation is maintained by mechanisms, such as seed dispersal, seed banks and vegetative propagation which respond to variations in hydrology and disturbances, such as fire and herbivores. The emphasis is on the temporal dynamics and structure of the plant community as revealed by species composition and abundance.
Maintenance of Habitat Structure Within Wetland. Soil, vegetation and other aspects of ecosystem structure within a wetland required by animals for feeding, cover and reproduction.
Maintenance of Food Webs Within Wetland. The production of organic matter of sufficient quantity and quality to support energy requirements of characteristic food webs within a wetland.
Maintenance of Habitat Interspersion and Connectivity Among Wetland. The spatial distribution of an individual wetland in reference to adjacent wetlands within the complex.
Maintenance of Taxa Richness of Invertebrates. The capacity of a wetland to maintain characteristic taxa richness of aquatic and terrestrial invertebrates.
Maintenance of Distribution and Abundance of Vertebrates. The capacity of a wetland to maintain characteristic density and spatial distribution of vertebrates (aquatic, semi-aquatic and terrestrial) that utilize wetlands for food, cover and reproduction.

Chapter 4. State-wide Statistical Survey Results for Wetlands

As described in Part IV.A. Chapter 2, Monitoring Programs, Projects and Studies, the department completed a state-wide statistical survey of wetlands in 2011 as part of the EPA Sponsored National Wetland Condition Assessment (NWCA). For a detailed summary of the 2011 NWCA, including a description of the study design and sampling methods the reader is referred to EPA reports entitled “National Wetland Condition Assessment 2011 Technical Report” (US EPA, 2016b) and “National Wetland Condition Assessment 2011 – A Collaborative Survey of the Nations Wetlands” (US EPA, 2016c). For a more detailed description of the state intensification project, including a summary of the results of the state intensification project the reader is referred to the report entitled “Intensification of the National Wetland Condition Assessment in the Prairie Pothole Region of North Dakota” (Dekeyser et al., 2014). The following is a summary of some of the highlights from this project.

Sample Sites

The “target population” for the 2011 NWCA included “all wetlands of the conterminous US not currently in crop production, including tidal and nontidal wetted areas with rooted vegetation and, when present, shallow open water less than 1 meter in depth” (US EPA, 2016a). For the state intensification project this same target population definition applied, but rather than applying to wetlands of the conterminous US it only applied to wetlands of North Dakota thereby excluding tidal wetlands in addition to cropped wetlands. For purposes of the NWCA and state intensification project, wetlands were defined based on a scientific definition for wetlands described by Cowardin et al. (1979) which are “lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water.” The definition further states, “For purposes of this classification, wetlands must have one or more of the following three attributes: 1) at least periodically, the land supports predominantly hydrophytes (i.e., water dependent plants); 2) the substrate is predominantly undrained hydric soil; and 3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.” It should be noted that this is a much broader definition than the regulatory definition used in the federal Clean Water Act (CWA) which describes wetlands in terms of their CWA jurisdictional status.

Based on the Cowardin definition of wetlands, the sample frame used for the NWCA and the state intensification project were the US Fish and Wildlife Service (USFWS) 2005 National Wetland Status and Trends (S&T) survey plots. This sample frame consisted of all wetlands mapped based on 2005 remote sensing information and located with the 5,048 2-mile by 2-mile plots located across the contiguous lower 48 states. Wetlands sampled in North Dakota for the NWCA and state intensification were randomly selected from the S&T sample plots located in North Dakota.

In North Dakota, 11 wetland sites were selected and sampled for the 2011 NWCA. In addition to the wetland sites randomly selected and sampled for 2011 NWCA sampling, the department intensified the sampling for a statistically-acceptable sample size of 53 wetland sites (Figure V-34). NWCA and state intensification wetland sites were sampled between June and August of 2011 by two teams consisting of personnel with the department's Watershed Management Program (WMP) and North Dakota State University's Department of Natural Resources Management (NDSU).

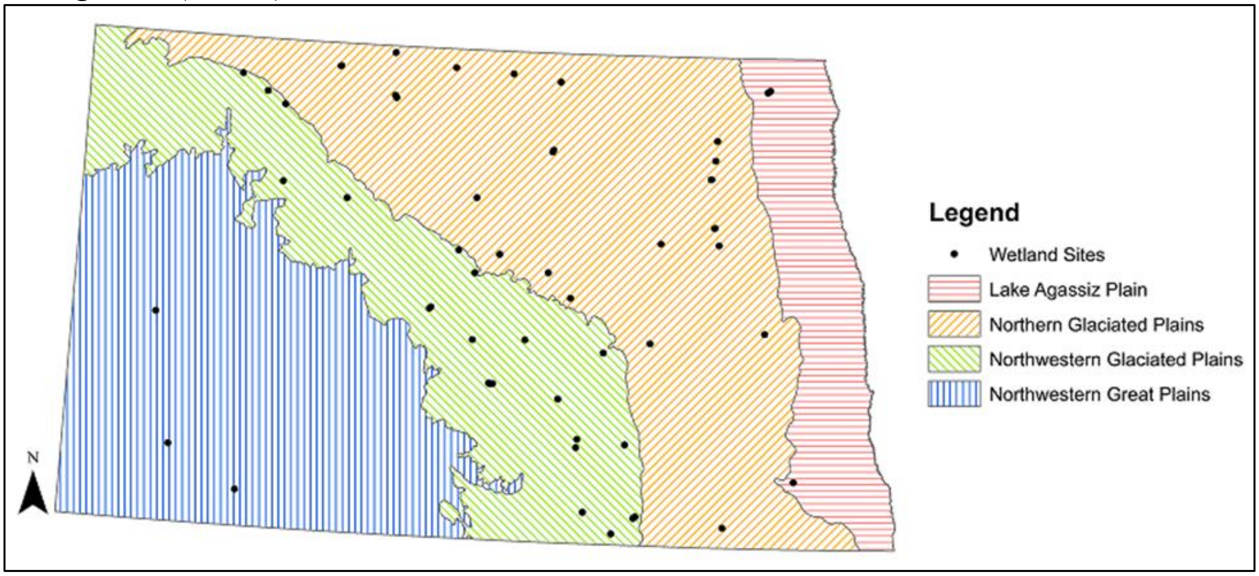


Figure V-34. Location of the 53 Randomly Selected National Wetland Condition Assessment (NWCA) and Intensification Project Wetland Sites in North Dakota.

Following random wetland site selection by EPA, North Dakota wetland sites were field-checked by staff with NDSU to ensure the site met the NWCA target population criteria and, if so, was accessible by field crews during the sampling index period (i.e., June-September). When field-checking wetland sites, if a wetland site either did not meet the target population criteria or access was not possible, randomly selected "over-sample" wetland sites were selected to replace "target" wetland sites. "Over-sample" sites were also field-checked to ensure suitability for inclusion in the study. To achieve the target population size of 53 sites, 95 sites were evaluated.

The treatment of sites eliminated from sampling affects the final population estimate. Taking into account wetland sites identified as non-NWCA wetland types (i.e., wetlands in active crop production, deeper water ponds, uplands), it was estimated that there were 3,203,801 acres of wetlands in the NWCA and state intensification project target population in North Dakota (Figure V-35). The wetland area in the state represented by sites that were part of the target population, but were not sampled due to access issues, were also excluded from the assessment of condition and stress. As a result, the final wetland acreage estimate represented by the 53 randomly selected and sampled sites and reported by the department for North Dakota (i.e., the inference population) was 2,159,135 acres or approximately 67.4 percent of the target population of NWCA wetland types (Figure V-35).

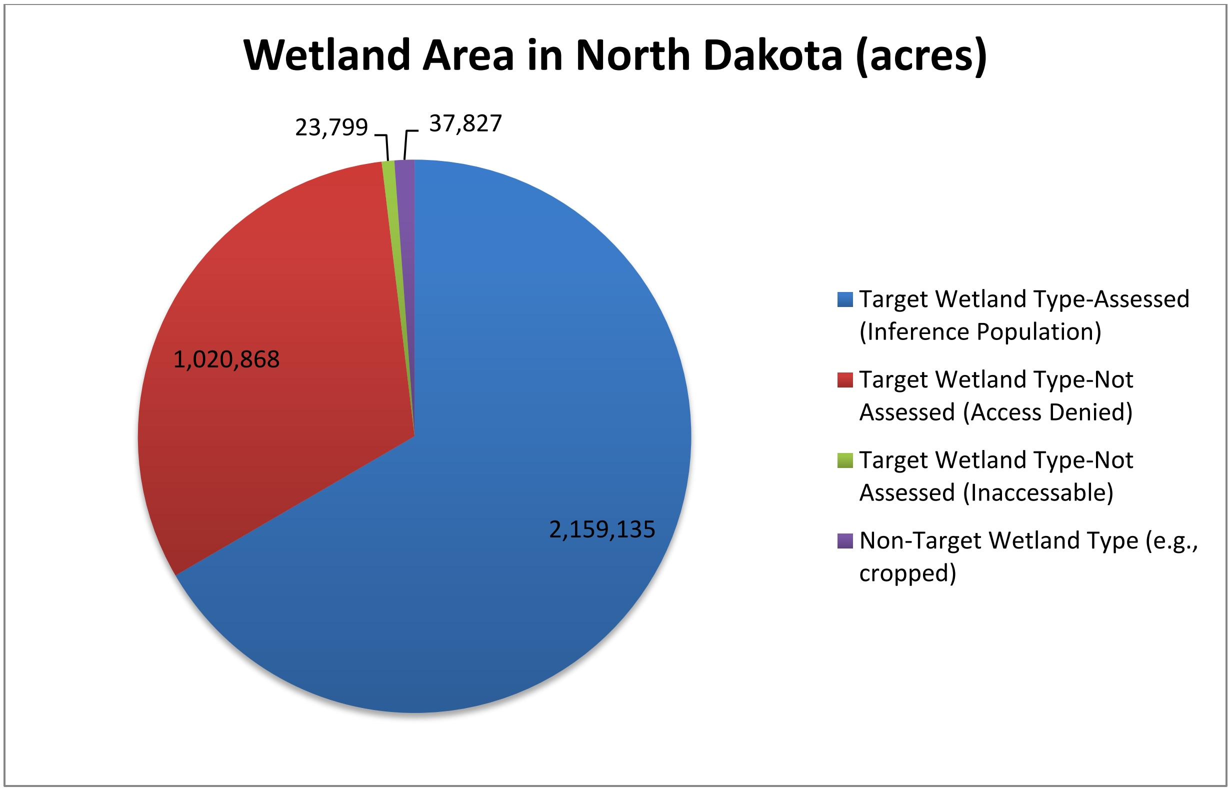


Figure V-35. Estimated Wetland Area in North Dakota by NWCA Wetland Category (includes the proportion that met the NWCA target wetland type criteria and was assessed for the state intensification project (i.e., wetlands for which inference of results can be made), the proportion that met the NWCA target wetland type criteria, but were not assessed, and the proportion that were wetlands, but did not meet the NWCA target wetland type criteria (e.g., cropped wetlands).

Wetland Condition

One of the primary goals of the NWCA is to describe the ecological condition of the nation's wetlands and to identify the stressors commonly associated with poor condition. Similarly the primary goal of the state intensification project is to describe the ecological condition of the state's wetlands and the primary stressors associated with poor wetland condition in North Dakota. To accomplish this goal for the state intensification project, the department worked with NDSU in the development of several regional methods to assess the condition of NWCA and intensification wetlands for this project. These wetland assessment methods can be classified based on EPA's three-tiered framework for wetland monitoring and assessment (US EPA, 2006). The three levels of wetland assessment generally correspond with the level of effort necessary for the assessment and the accuracy of the assessment. Under EPA's three-tiered wetland assessment framework, level 1 assessment methods consist of landscape assessments that rely entirely on GIS data. This level 1 assessment approach involves characterizing the land use that surround wetlands through the use of landscape metrics (e.g., percent cropland) derived through GIS. Level 2 assessment methods are generally characterized as rapid assessments that are based on readily observable hydrogeomorphic and plant community metrics that are relatively easy and quick to measure in the field. These rapid assessment methods often use a "stressor checklist" which is translated to a single wetland assessment score. Level 3 wetland assessment methods are the most intensive methods and provide a more thorough and rigorous measure of wetland condition. Level 3 assessment methods involve the sampling and direct measurement of landscape, biological (e.g., vegetation), and hydrogeomorphic data from the wetland site.

The following is a description of the two regional assessment methods developed by NDSU and employed for this study to assess wetland condition. The first regional assessment method is the North Dakota Rapid Assessment Method (NDRAM) (Hargiss, 2009). The NDRAM, is a level 2 assessment method that was used to rapidly assess wetlands based on wetland characteristics, stressors, and overall estimation of condition. The second regional assessment method is the Index of Plant Community Integrity (IPCI) (Hargiss et al., 2008). The IPCI is a level 3 assessment method that was used to intensely evaluate wetland plant communities based on disturbance level and multiple community attributes.

North Dakota Rapid Assessment Method (NDRAM)

The NDRAM is used to rapidly assess wetlands based on the buffer width, amount of soil disturbance, plant community present, level of alteration to hydrology, land use, and overall condition. The NDRAM was developed by NDSU with 4 condition categories: poor, fair low, fair high, and good, however, for purposes of this study, wetland condition categories fair low and fair high were combined into one category, fair.

Based on the NDRAM, 14 percent of North Dakota's wetlands (302,279 acres) were in good condition, while 62 percent (1,342,982 acres) were in fair condition and 24 percent (513,874 acres) were in poor condition (Figure V-36).

Index of Plant Community Integrity (IPCI)

The IPCI is an index of biological integrity which is used to assess wetland condition by studying the vegetation composition in a wetland. An IPCI score is developed for a wetland by sampling the vegetation within each zone of a given wetland. Vegetation is sampled in twenty (20) 1 m^2 quadrats which are spaced at regular intervals in a spiral fashion around each wetland zone. Eight (8) quadrats are sampled in the low prairie zone, 7 quadrats in the wet meadow zone, and 5 quadrats in the shallow marsh zone. Within each 1m^2 quadrat, all plants are identified and percentage aerial cover is estimated. The plant species located in the 1 m^2 quadrats are considered to be primary species. Another list of plants found outside quadrats, but within wetland zones are also recorded as secondary species. Metric scores are then assigned for the nine (9) metrics in the IPCI. Metric scores are added together to get a total score between 0-99 for each wetland. The IPCI was developed by NDSU with five (5) condition categories: very good, good, fair, poor, and very poor. However, for purposes of this study, wetland condition categories very good and good were combined into one category, good. Similarly, the poor and very poor categories were combined in to one category, poor. The result is three condition categories based on the IPCI which are good, fair and poor.

Based on the IPCI, 61 percent of wetlands in North Dakota (1,317,072 acres) were in good condition, while 11 percent (237,505 acres) were in fair condition (Figure V-15). Twenty-eight (28) percent of wetlands in the state (604,558 acres) were in poor condition (Figure V-37).

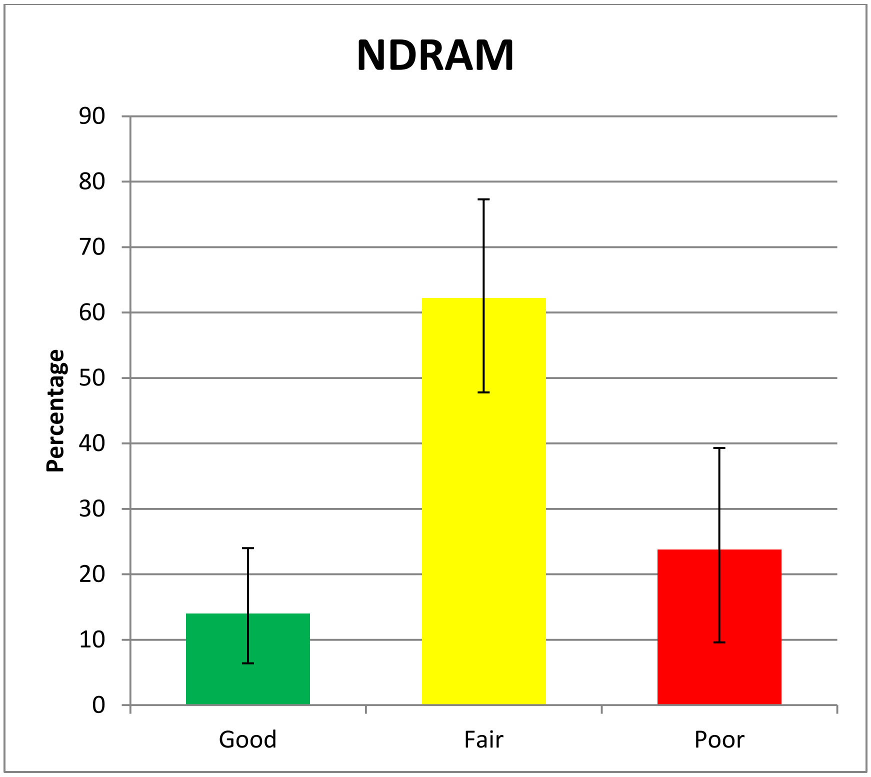


Figure V-36. North Dakota Rapid Assessment Method (NDRAM) Condition Category Estimates for Wetlands in North Dakota.

Stressor Indicators

The 2011 NWCA and state intensification project also included measures to assess the potential for anthropogenic (i.e., human induced) impacts to wetland condition. These indicators of stress do not necessarily cause a direct decline in the ecological integrity of a wetland, but are often associated with changes in wetland condition. The goal of the NWCA and state intensification project was to characterize indicators of stress that are common in wetlands to help inform priorities for management actions that can be employed to protect and restore wetlands in the nation and the state.

The stressor indicators assessed for this study can be broadly categorized into three categories: physical, chemical, and biological stressors. Of the physical stressors assessed, two were measures of vegetation alteration (vegetation removal and vegetation replacement) and four were measures of hydrologic alteration (damming, ditching, hardening, and filling/erosion). One biological stressor, presence of nonnative plant species, was also assessed. While included as part of the 2011 NWCA analysis and report, no chemical stressors were assessed for the state intensification project. The results presented for each stressor are reported as the extent of wetlands affected by stressor level (low, moderate, or high).

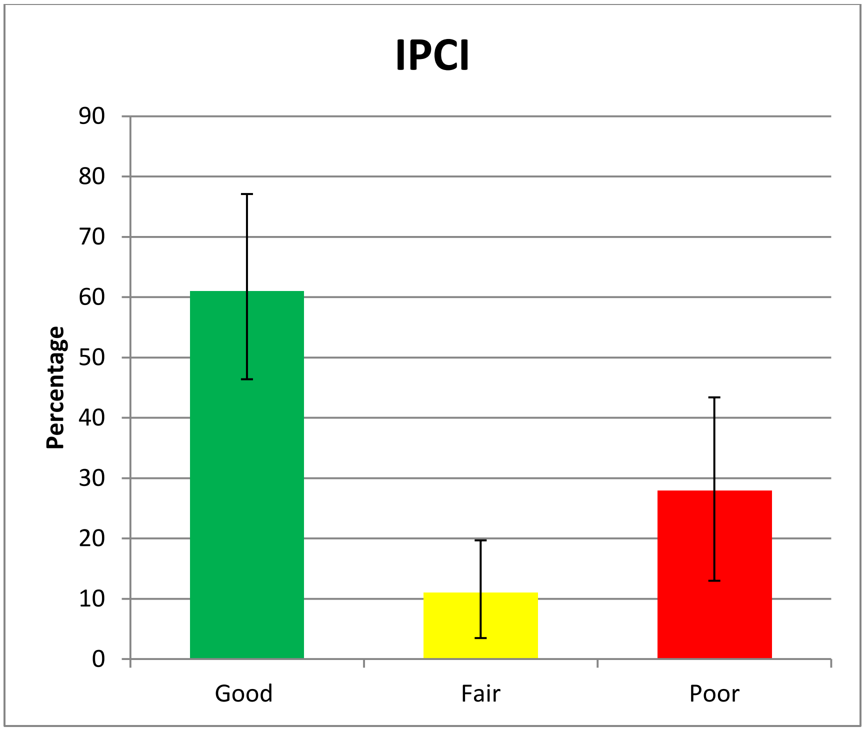


Figure V-37. Index of Plant Community Integrity (IPCI) Condition Category Estimates for Wetlands in North Dakota.

<u>Vegetation Removal</u>

The removal of vegetation from a wetland is one type of physical disturbance that can alter the condition of a wetland. Vegetation removal is the loss, removal, or damage caused to the naturally occurring plant community within a wetland or its buffer area. The vegetation removal stressor was rated high in 67 percent of North Dakota wetlands (1,450,939 acres) (Figure V-38). The stressor was low in 18 percent of wetlands (395,122 acres) and moderate in 14 percent of wetlands in the state (310,915 acres) (Figure V-38).

<u>Vegetation Replacement</u>

The vegetation replacement stressor is intended to document major changes to the natural structure and composition of a wetland's plant community due to anthropogenic activities. A high and moderate level of stress due to vegetation replacement was reported in 45 percent (982,406 acres) and 18 percent (377,849 acres) of wetlands in North Dakota, respectively (Figure V-39). Wetland condition stress due to vegetation replacement was low in 37 percent of wetlands in the state (798,880 acres) (Figure V-39).

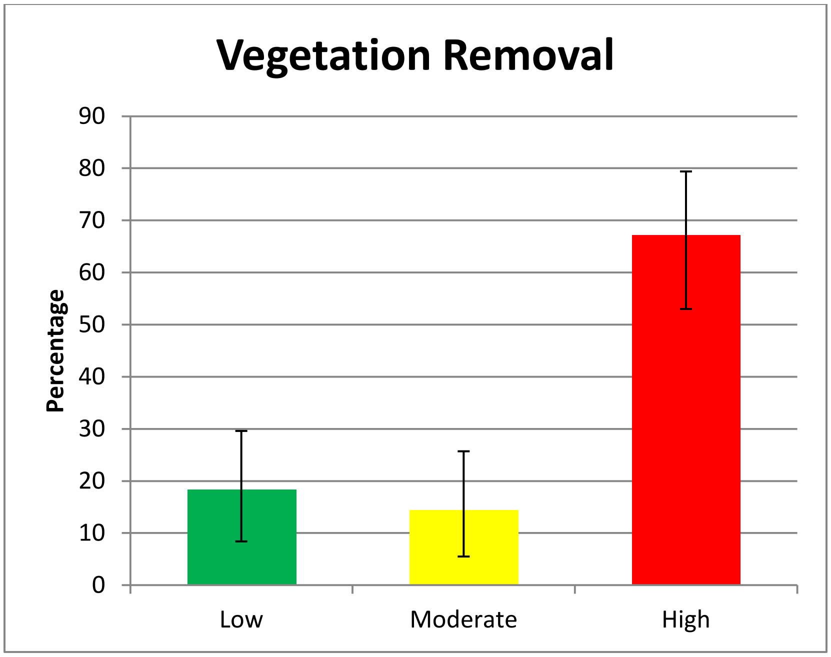


Figure V-38. Vegetation Removal Stressor Ranking Estimates for Wetlands in North Dakota.

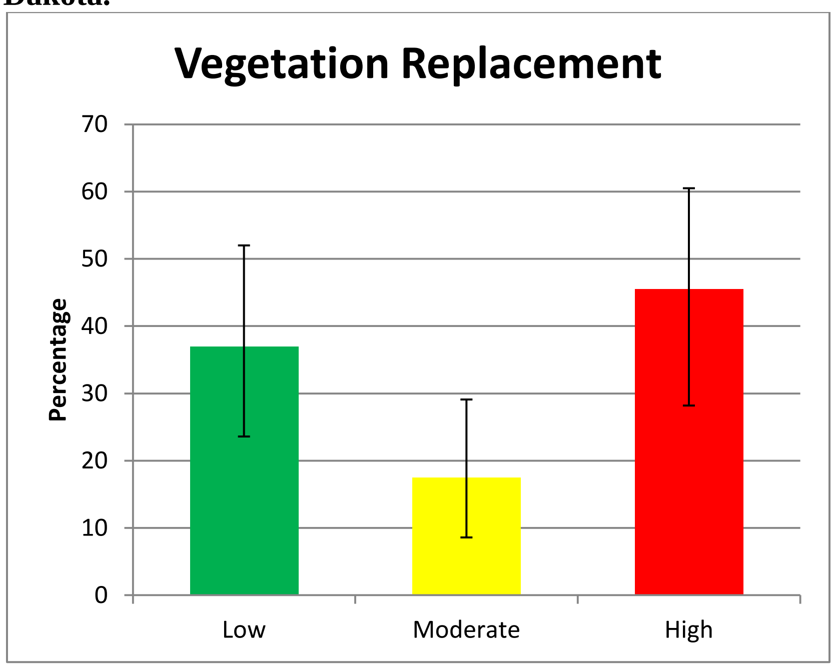


Figure V-39. Vegetation Replacement Stressor Ranking Estimates for Wetlands in North Dakota.

Hydrologic Alteration

Four stressors associated with man-made changes to wetland hydrology (damming, ditching, hardening, and filling) were assessed for the 2011 NWCA and state intensification project. Of the four hydrologic alteration stressors, the greatest percentage of wetland area in the state was assessed as being at high risk due to **hardening**. For purposes of the 2011 NWCA and state intensification project, hardening was defined as any field observation related to soil compaction either in the wetland or its buffer. Examples of activities which can cause hardening, include roads or trails; urban, suburban or rural residential development; and animal trampling associated with livestock feeding operations or grazing. Fifty-nine (59) percent of wetlands in the state (1,280,367 acres) were assessed as high risk due to hardening (Figure V-40. Nine (9) percent (194,322 acres) were at moderate risk and 32 percent (684,446 acres) were low risk due to hardening (Figure V-40).

The majority of wetlands in the state were at low risk for damming, ditching, and filling. **Damming**, which is defined as any activity related to impounding or impeding water flow from or within a wetland, was assessed as low risk in 88 percent (1,897,880 acres) of wetland area in the state (Figure V-41). Similarly, the activities related to **filling**, including erosion, sedimentation, or excavation, was low in the majority (74 percent; 1,591,282 acres) of wetland area assessed in the state (Figure V-42). **Ditching** or any activity related to the draining of water from a wetland was assessed as low risk in 63 percent of wetlands assessed in the state (1,364,573 acres) (Figure V-43). It was, however, estimated that 27 percent (585,126 acres) of wetlands in the state were at high risk due to ditching, compared to only 9 percent (192,163 acres) and 16 percent (349,780 acres) that were at high risk due to damming and filling, respectively (Figures V-41, V-42 and V-43).

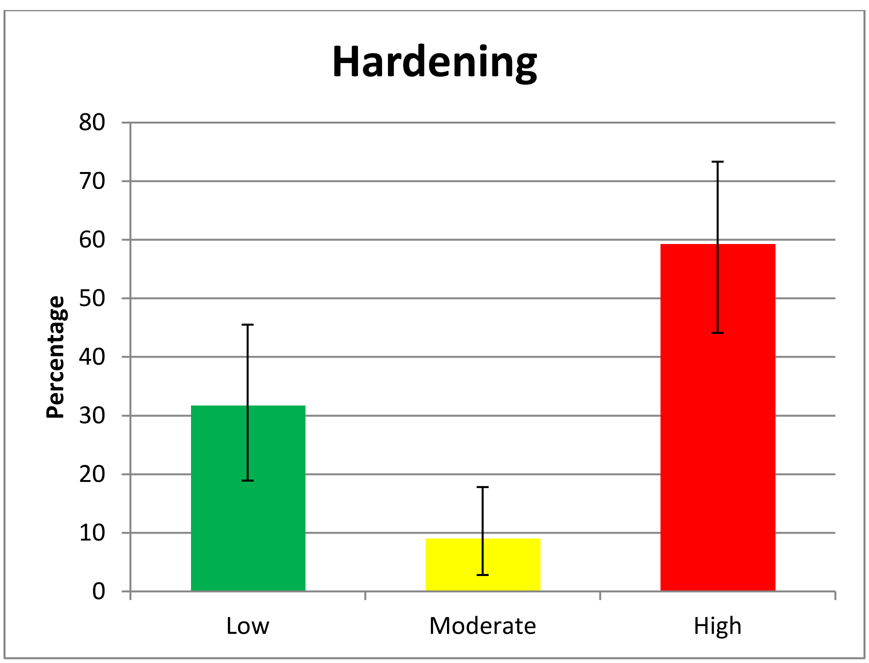


Figure V-40. Hardening Stressor Ranking Estimates for Wetlands in North Dakota.

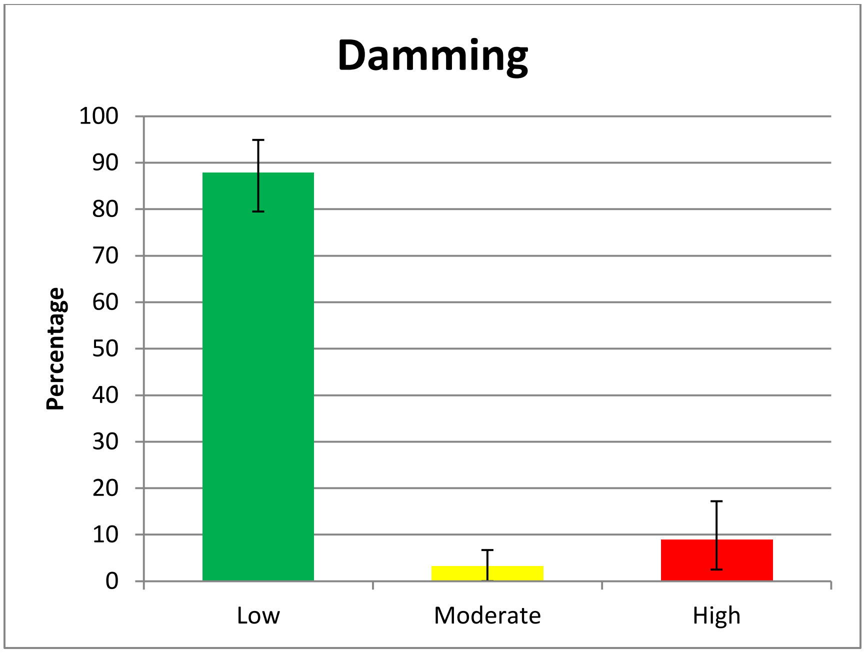


Figure V-41. Damming Stressor Ranking Estimates for Wetlands in North Dakota.

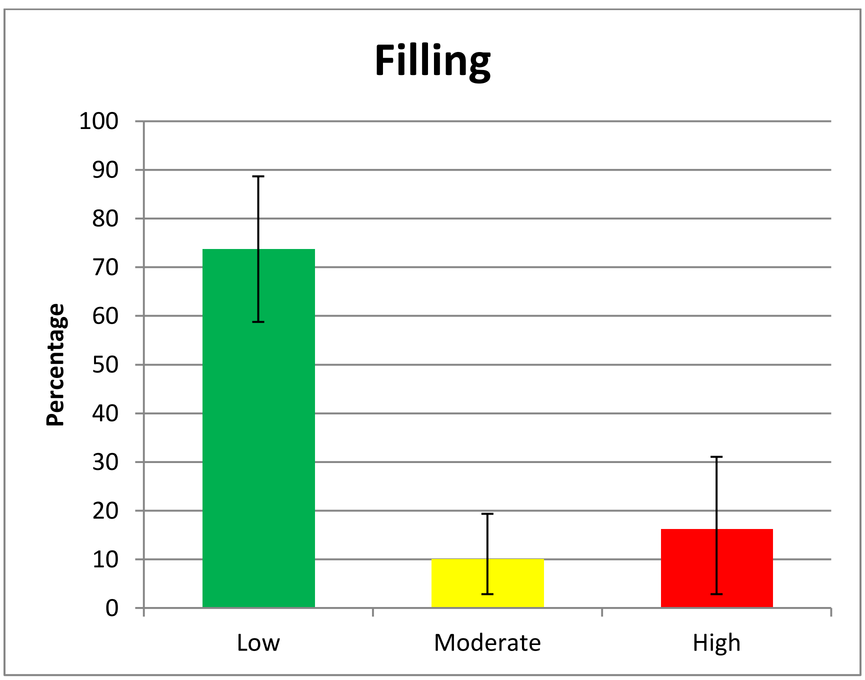


Figure V-42. Filling Stressor Ranking Estimates for Wetlands in North Dakota.

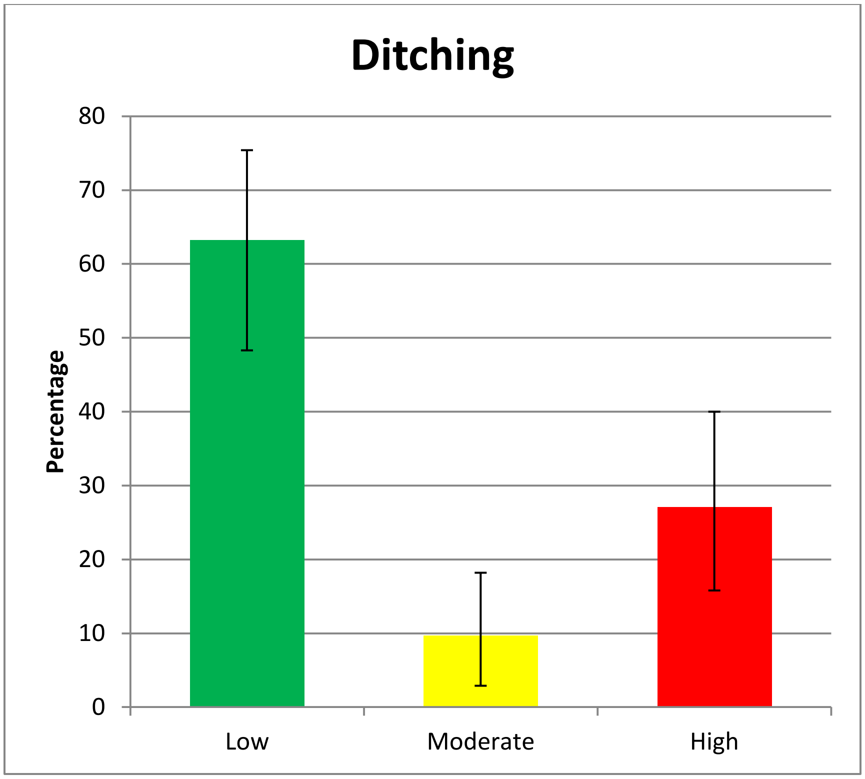


Figure V-43. Ditching Stressor Ranking Estimates for Wetlands in North Dakota.

Nonnative Plant Species

To assess the risk to wetlands from nonnative plant species, the Nonnative Plant Stressor Indicator (NPSI) was developed for the NWCA and the state intensification project (US EPA, 2016). The NPSI includes three nonnative plant species metrics to describe potential impacts to wetland condition by the presence of nonnative plant species. These three metrics include: relative cover of nonnative species; richness of nonnative species; and relative frequency of occurrence of nonnative species. These three metrics we combined into an overall NPSI score for each wetland. Based on the scores wetlands were assigned rankings of low, moderate, high, and very high levels of stress for the NPSI (US EPA, 2016a).

Forty-four (44) percent of wetland area in the state (950,019 acres) was assessed as being at very high risk due to the presence of nonnative plant species based on the NPSI, while 25 percent (539,783 acres) were assessed as being at high risk (Figure V-44). Twenty-seven (27) percent of wetland area (582,966 acres) was assessed to be at moderate risk with only 4 percent (86,365 acres) at low risk due to the presence of nonnative plant species (Figure V-44).

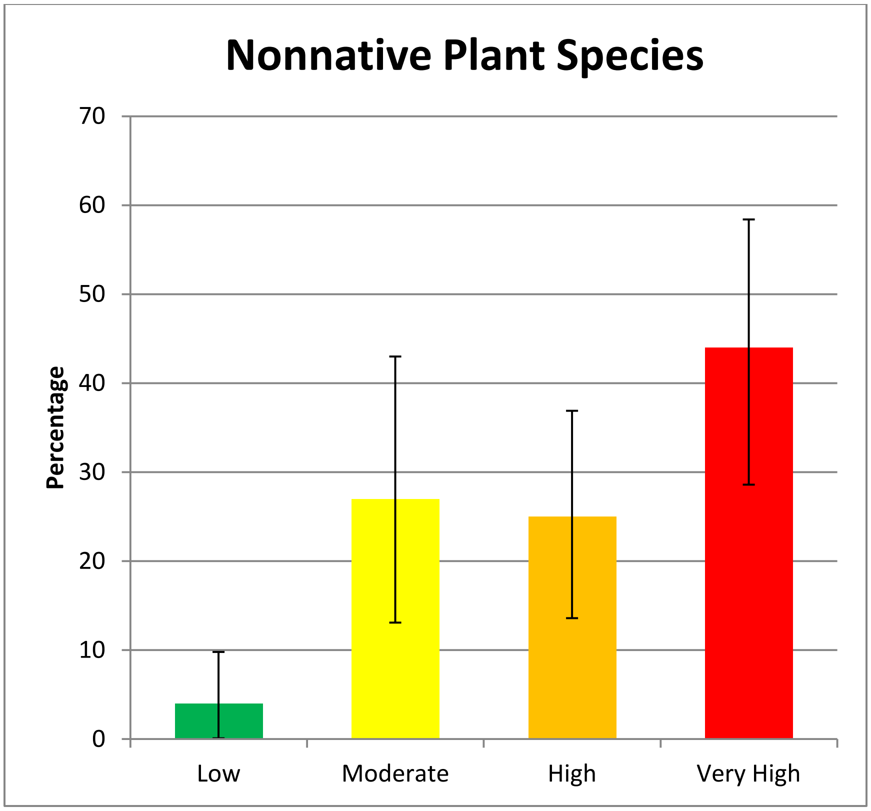


Figure V-44. Nonnative Plant Species Indicator (NPSI) Stressor Ranking Estimates for Wetlands in North Dakota.

Summary

Wetland condition was assessed for the state intensification project using the North Dakota Rapid Assessment Method (NDRAM) and the Index of Plant Community Integrity (IPCI). Both methods were developed by NDSU in cooperation with the department. The NDRAM is used to rapidly assess wetlands based on a variety of wetland attributes including buffer width, amount of soil disturbance, level of alteration to hydrology, land use, and the plant community present. By comparison, the IPCI only uses the plant community data collected from sites in the wetland. Both methods allow the user to rank wetland condition on a scale of good, fair, and poor. Based on the IPCI, 61 percent of wetlands in North Dakota (1,317,072 acres) were in good condition, while 11 percent (237,505 acres) were in fair condition. Twenty-eight (28) percent of wetlands in the state (604,558 acres) were in poor condition. When compared to the IPCI, the NDRAM rated a lower percentage of wetlands in the state as being in good condition (14 percent; 302,279 acres), while the majority (62 percent, 1,342,982 acres) were rated in fair condition and 24 percent (513,874 acres) were in poor condition.

There are many potential anthropogenic impacts (i.e., stressors) that can, directly or indirectly, negatively affect wetland condition. Of the eight stressors measured and assessed as part of the NWCA and state intensification project, vegetation removal was rated high for more wetland area in the state (67 percent; 1,450,939 acres) than any other stressor. Following vegetation removal, the presence of nonnative plant species (as measured by the NPSI) was rated as either high or very high for over 66 percent of wetlands in the state (1,489,803 acres). The stressor termed hardening, which included the presence of roads, trails, and trampling by livestock was rated high in 59 percent of wetlands in the state (1,280,367 acres). Surprisingly, the physical stressors damming, ditching, and filling affected the lowest percentage of wetlands in the state. Damming was rated low for 88 percent of wetlands in the state (1,897,880 acres), while ditching was rated low for 63 percent (1,364,573 acres) and filling was low for over 73 percent of wetland area in the state (1,591,282 acres).

D. Public Health/Aquatic Life Concerns

Harmful algal blooms (HABs) are not only uninviting but also potentially harmful. Typically, a HAB in North Dakota is caused by the rapid growth and overabundance of cyanobacteria. While these HABs typically occur in lakes and reservoirs, they can also occur in wetlands, ponds, stock dams and even in rivers. Cyanobacteria are microscopic organisms and are more like bacteria than plants, but because they live in water and use sunlight to create food (photosynthesis) they are often called 'blue-green algae.'

Under certain environmental conditions (i.e., warm water, sufficient sunlight, and excess nutrients) cyanobacteria can multiply quickly and form a bloom. Some species of cyanobacteria produce cyanotoxins that are released when the cells die and rupture. The toxins can cause harm to people, wildlife, livestock, pets and aquatic life. Almost every year in North Dakota, a few cases of pet and livestock deaths occur due to drinking water with HABs. Additional effects of HABs include:

- Blocking sunlight needed for other aquatic organisms
- Raising treatment costs for public water supply systems and industries
- Depleting dissolved oxygen as the algae dies off, resulting in fish kills
- Specific human health effects are:
- Allergic-like reactions
- Skin rashes
- Eye irritation
- Gastroenteritis
- Respiratory irritation
- Neurological effects

The state's first advisory or warning due to the presence of a HAB and the documented occurrence of cyanotoxin, specifically microcystin, occurred in 2015 at Homme Dam located near the town of Park River in the northeastern part of the state. In 2016, an additional 15 advisories or warnings were issued for lakes and reservoirs in North Dakota (Table V-12).

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 disease. Unlike many other states, North Dakota has had no reported incidents of drinking water supply restrictions for the reporting period 2014 to 2015.

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. Because most fish kills occur during 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-12. Lakes and Reservoirs with Harmful Algal Bloom Warnings or Advisories Posted in 2016.

Name	County	Advisory/Warning	Date Issued
Bowman-Haley Reservoir	Bowman	Warning	July 22, 2016
Cottonwood Lake	Williams	Warning	August 9, 2016
Upper Des Lac Lake	Burke	Advisory	August 18, 2016
Lake Darling	Ward	Advisory	August 18, 2016
Devils Lake	Ramsey	Advisory	September 16, 2016
Fordville Dam	Grand Forks	Advisory	August 26, 2016
Froelich Dam	Sioux	Warning	August 18, 2016
Green Lake	McIntosh	Warning	August 4, 2016
Harvey Reservoir	Wells	Advisory	August 2, 2016
Lake Ashtabula	Barnes	Advisory	August 31, 2016
Lake LaMoure	LaMoure	Advisory	July 15, 2016
Twin Lakes	LaMoure	Advisory	July 15, 2016
Lake Tschida	Grant	Advisory	August 5, 2016
Patterson Lake	Stark	Warning	July 11, 2016
Powers Lake	Burke	Advisory	June 30, 2016

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

A. Background

Section 303(d) of the CWA and its accompanying regulations (CFR Part 130, Section 7) require each state to list waterbodies (i.e., lakes, reservoirs, rivers, streams and wetlands) that are considered water quality limited and require load allocations, waste load allocations and total maximum daily loads (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 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 consider not only the narrative and numeric criteria set forth in the standards but also the classified uses defined for the waterbody and whether the 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 a use impairment but 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) and accompanying EPA regulations and policy require only impaired and threatened waterbodies to be listed, and TMDLs are 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. In other words, all pollutants are pollution, but not all pollution is a pollutant.

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.

Section 303(d) requires states to submit their lists of water quality-limited waterbodies "from time to time." Federal regulations have clarified this language; therefore, beginning in 1992 and by April 1 of every even-numbered year thereafter, states are required to submit a revised list of waters needing TMDLs. North Dakota's 2014 TMDL list was submitted to EPA in December 2014 and was approved on February 12, 2015. This 2016 Section 303(d) list includes waterbodies not meeting water quality standards, waterbodies needing TMDLs and waterbodies that have been removed from the 2014 list. Reasons for removing a waterbody from the 2014 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.

Along with the TMDL list, states are required to provide documentation to the EPA Regional Administrator in support of the state's decision to list or not list waterbodies. Information supporting North Dakota's 2016 TMDL list is provided in Part IV. B. "Assessment Methodology." At a minimum, a state's supporting information should include: (1) a description of the methodology used to develop the list; (2) a description of the data and information used to develop the list; (3) the rationale for any decision to not use this information; (4) the rationale for removing waterbodies previously listed as water quality limited; and (5) a summary of comments received on the list during the state's public comment period.

Following opportunity for public comment, the state must submit its list to the EPA Regional Administrator. The EPA Regional Administrator then has 30 days to either approve or reject the listings. If the EPA Regional Administrator rejects a state submittal, EPA has 30 days to develop a list for the state. This list is also required to undergo public comment prior to finalization.

B. Prioritization of TMDL-Listed Waters

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 "North Dakota Total Maximum Daily Load Prioritization Strategy" (Appendix B). This TMDL Prioritization Strategy describes a two-phased approach for prioritizing impaired waters for TMDL development and watershed planning. Specifically, the TMDL prioritization strategy will be used to identify 1) a list of priority waters targeted for TMDL development or alternative approaches in the next two years (near term); and 2) a list of priority waters scheduled for likely TMDL development or alternative 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 alternative restoration approaches.

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 Vision (see Part III.C. Chapter 4. Total Maximum Daily Load (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 alternative restoration approaches for impaired waters that will achieve water quality standards (i.e., alternative plans)." For purposes of tracking this measure all near term (next two years) and long term (through 2022) high priority TMDL listed waterbodies will be used to track progress towards meeting the WQ-27 measure.

The department has also identified a subcategory to Category 5 waterbodies. This subcategory, termed Subcategory 5A, includes "Low" priority lakes and reservoirs and river and stream segments that were assessed and listed in previous Section 303(d) lists, but where the original basis for the assessment decision and associated cause of impairment is questionable. These Subcategory 5A waterbodies include: (1) rivers and streams listed for biological impairments based on only one sample for the entire segment or on samples collected more than 10 years ago; (2) waterbodies listed for sediment/siltation impairments; (3) waterbodies listed for fecal coliform bacteria impairments; and (4) lakes and reservoirs where the assessments are based on one sampling event or on data that are greater than 10 years old. These waterbodies will remain on the 2016 Section 303(d) list, but they will be targeted for additional monitoring and assessment during the next two to four years.

C. Public Participation Process

Public comments were solicited on the draft 2016 TMDL list through a public notice published in the following daily newspapers: Fargo Forum, Grand Forks Herald, Bismarck Tribune, Minot Daily News, Dickinson Press and Williston Daily Herald (Appendix E). The public noticed encouraged interested parties to obtain a copy of the draft TMDL list by contacting the department in writing, by phone or by accessing the list through the department's website at www.ndhealth.gov.

Comments on the draft 2016 TMDL list were also requested through mail or email from individuals and specific agencies and organizations. These included the South Dakota Department of Environment and Natural Resources, Minnesota Pollution Control Agency (Detroit Lakes Regional Office), the Natural Resources Conservation Service, the U.S. Fish and Wildlife Service, the U.S. Forest Service, the US Army Corps of Engineers, the US Bureau of Reclamation, the North Dakota Game and Fish Department, the North Dakota State Water Commission, the Red River Basin Commission, individuals on the North Dakota State Water Pollution Advisory Board and EPA Region VIII. Comments on the draft 2016 Integrated Report, including the draft Section 303(d) list of impaired waters needing TMDLs were received from the US Bureau of Reclamation's Dakotas Area Office, Bismarck, ND, Scott Korom with Barr Engineering, and from EPA Region VIII. These comments and the department's responses are provided in Appendix F. When appropriate, these comments were incorporated in this final 2016 Integrated Report.

D. Listing of Impaired Waters Needing TMDLs

As stated previously For purposes of 2016 Section 305(b) reporting and Section 303(d) listing, the U.S. Environmental Protection Agency (EPA) is encouraging 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 and 2016 IR guidance memos (http://water.epa.gov/lawregs/lawsguidance/cwa/tmdl/guidance.cfm). This guidance suggests that states place their assessed waterbodies into one of five assessment categories (Table IV-3). Waterbodies (also referred to as AUs) assessed as Category 5 (including subcategory 5A) form the basis of the state's Section 303(d) TMDL list. Tables VI-1, VI-2, VI-3 and VI-4 provide a list of AUs in the Souris, Red, Missouri and James River Basins, respectively, that are impaired and in need of TMDLs. These impaired waters also are depicted graphically for the Souris River Basin (Figure VI-1), the Upper and Lower Red River Basins (Figures VI-2 and VI-3), the Lake Sakakawea and Lake Oahe subbasins of the Missouri River Basin (Figures VI-4 and VI-5) and the James River Basin (Figure VI-6).

The 2016 TMDL list is represented by 225 AUs (32 lakes and reservoirs[1] and 192 river and stream segments) and 356 individual waterbody/pollutant combinations. For purposes of TMDL development, each waterbody/pollutant combination requires a TMDL or alternative restoration plan. Of the 356 individual waterbody/pollutant combinations listed in Tables V-1 through V-4, 157 waterbody/pollutant combinations were further identified as Category 5A. These waterbodies will be targeted for additional monitoring in the next two to four years to verify the current use impairment assessments and pollutant causes.

E. De-listing of 2014-Listed TMDL Waters

Table VI-5 provides a list of lakes, reservoirs, rivers and streams that were listed in the previous 2014 TMDL list but that have been removed from this year's Section 303(d) list submittal. AUs were removed from the TMDL list for a number of reasons. The following are the primary reasons for de-listing an AU:

- A TMDL was completed for the waterbody/pollutant combination.
- The applicable water quality standard is now attained and/or the original basis for the listing was incorrect.
- The applicable water quality standard is now attained due to a change in the water quality standard and/or assessment methodology.
- The applicable water quality standard is now attained due to restoration activities.
- Sufficient data and/or information is lacking to determine water quality status and/or the original basis for listing was incorrect.

In most cases, when the original assessment was judged not to be representative of current water quality conditions due to a lack of sufficient credible data, one of the following usually occurred:

1. The data used to conduct the assessment are now more than 10 years old. Based on best professional judgment, the assessment is no longer believed to be valid. This would occur if it is believed that water quality has been altered due to significant changes in land use and/or due to climatic changes.

2. The original assessment was based only on best professional judgment.

[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.

3. The original assessment was based on data extrapolated from a monitoring station(s) located in an adjacent AU.

F. TMDL Development and Monitoring Schedule

The responsibility for TMDL development in North Dakota lies primarily with the department's Division of Water Quality - Watershed Management Program. TMDL development staff are located in three regional field offices in Bismarck, Fargo and Towner, N.D. Technical support for TMDL development projects and overall program coordination are provided by Watershed Management Program staff also located in Bismarck, N.D.

Historically, the technical and financial resources necessary to complete the state's TMDL development priorities have hampered the pace of TMDL development in the state. Recently, however, the state's TMDL program has seen an improvement in the financial resources available for TMDL development projects. While still significantly short of the funding necessary to meet the state's TMDL development schedule, EPA and the state of North Dakota have made available additional grants and funding to complete TMDLs. Examples of these new financial resources include CWA Section 319 grants administered by the state's Nonpoint Source Pollution Management Program.

With the continued commitment to adequate TMDL development staffing and with a continuation in the growth of funding for TMDL development projects in the state, the department is confident it will meet its TMDL development schedule.

The 2016 Section 303(d) TMDL list for North Dakota has targeted 61 waterbodies or 67 waterbody/pollutant combinations as "High" priority. These "High" priority waterbody/pollutant combinations represent 19 percent of all "High" and "Low" priority Category 5 waterbody/pollutant combinations on the list. These "High" priority waterbody/pollutant combinations are AUs for which TMDLs or alternative restoration approaches will be develop by 2022. For the remaining 289 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 and watersheds for TMDL development. Of the 67 waterbody/pollutant combinations which are high priority and, therefore, are targeted for TMDL development or alternative plans by 2022, 34 waterbody/pollutant combinations have further been targeted for TMDL development or alternative plans in the next two years (i.e., 2017 and 2018).

Table VI-1. 2016 List of Section 303(d) TMDL Waters for the Souris River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
ND-09010003-001-S_00	Souris River from its confluence with Oak Creek downstream to its confluence with the Wintering River. Located in McHenry	51.97 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Combination Benthic/Fishes Bioassessments	L	Yes
					Oxygen, Dissolved	L	No
					Sedimentation/Siltation	L	Yes
ND-09010003-003-S_00	Wintering River, including all tributaries. Located in SW McHenry and NE McLean counties.	213.09 Miles					
			Recreation	Not Supporting			
					Escherichia coli	H	No
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.	74.91 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Sedimentation/Siltation	L	Yes
					Combination Benthic/Fishes Bioassessments	L	Yes
ND-09010004-001-S_00	Willow Creek from its confluence with Ox Creek downstream to its confluence with the Souris River.	39.39 Miles					
			Recreation	Fully Supporting, but Threatened			
					Fecal Coliform	H	Yes
ND-09010008-001-L_00	Lake Darling	8698 Acres					
			Recreation	Fully Supporting, but Threatened			
					Nutrient/Eutrophication Biological Indicators	L	No
ND-09010008-001-S_00	Souris River from the N.D./Saskatchewan border downstream to Lake Darling.	43.55 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Sedimentation/Siltation	L	Yes
ND-09010008-003-S_00	Souris River from Lake Darling downstream to its confluence with the Des Lacs River. Located in Northern Ward County.	33.21 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Benthic-Macroinvertebrate Bioassessments	L	Yes

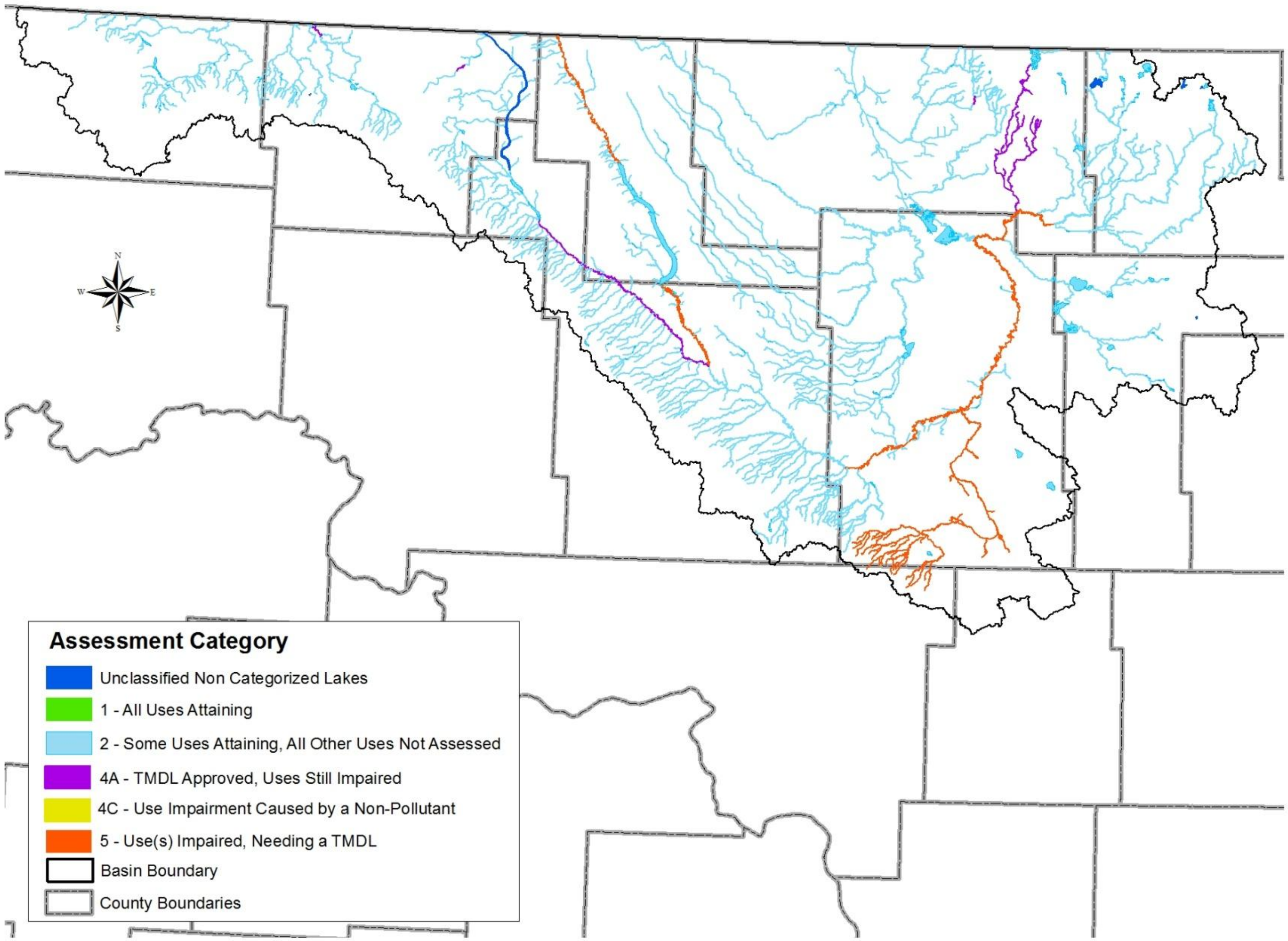


Figure VI-1. Graphical Depiction of 2016 Section 303(d) Listed Waters Needing TMDLs (Category 5) in the Souris River Basin.

Table VI-2. 2016 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
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.	13.08 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Combination Benthic/Fishes Bioassessments	L	Yes
					Sedimentation/Siltation	L	Yes
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.	15.32 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Sedimentation/Siltation	L	Yes
					Benthic-Macroinvertebrate Bioassessments	L	Yes
			Recreation	Fully Supporting, but Threatened			
					Escherichia coli	H*	No
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	27.33 Miles					
			Fish Consumption	Not Supporting			
					Methylmercury	L	No
			Recreation	Fully Supporting, but Threatened			
					Escherichia coli	H*	No
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.	52.28 Miles					
			Fish Consumption	Not Supporting			
					Methylmercury	L	No
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.	21.56 Miles					
			Fish Consumption	Not Supporting			
					Methylmercury	L	No
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.	20.04 Miles					
			Fish Consumption	Not Supporting			
					Methylmercury	L	No

*High priority waterbody/pollutant combination targeted for TMDL development or alternative plan in the next two years.

Table VI-2 (con't). 2016 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
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	10.45 Miles					
			Fish Consumption	Not Supporting			
					Methylmercury	L	No
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	38.58 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Sedimentation/Siltation	L	Yes
					Oxygen, Dissolved	L	No
					Combination Benthic/Fishes Bioassessments	L	Yes
ND-09020105-002-L_00	Mooreton Pond	36.8 Acres					
			Fish and Other Aquatic Biota	Not Supporting			
					Total Dissolved Solids	L	No
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.	47.49 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Combination Benthic/Fishes Bioassessments	L	Yes
					Sedimentation/Siltation	L	Yes
					Oxygen, Dissolved	L	No
			Recreation	Fully Supporting, but Threatened			
					Escherichia coli	H*	No
ND-09020105-005-S_00	Antelope Creek, in Richland County, from its headwaters downstream to its confluence with the Wild Rice River.	44.48 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Sedimentation/Siltation	L	Yes
					Benthic-Macroinvertebrate Bioassessments	L	Yes
			Recreation	Fully Supporting, but Threatened			
					Escherichia coli	H*	No

*High priority waterbody/pollutant combination targeted for TMDL development or alternative plan in the next two years.

Table VI-2 (con't). 2016 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
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.	53.44 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Oxygen, Dissolved	L	No
					Sedimentation/Siltation	L	Yes
ND-09020105-010-S_00	Elk Creek, including all tributaries. Located in SE Ransom, NE Sargent, and West Central Richland Counties.	26.05 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Combination Benthic/Fishes Bioassessments	L	Yes
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).	45.68 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Sedimentation/Siltation	L	Yes
					Combination Benthic/Fishes Bioassessments	L	Yes
			Recreation	Not Supporting			
					Escherichia coli	H*	No
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.	25.25 Miles					
			Recreation	Not Supporting			
					Escherichia coli	H*	No
ND-09020105-016-S_00	Shortfoot Creek from its confluence with the Wild Rice River upstream to the ND-SD border, including all tributaries.	24.78 Miles					
			Recreation	Not Supporting			
					Escherichia coli	H*	No
ND-09020105-017-S_00	Unnamed tributaries to the Wild Rice River (ND-09020105-015-S), including Crooked Creek.	43.5 Miles					
			Recreation	Not Supporting			
					Escherichia coli	H*	No
ND-09020105-018-S_00	Wild Rice River from its confluence with the Silver Lake Diversion downstream to Lake Tewaukon.	20.09 Miles					
			Recreation	Not Supporting			
					Escherichia coli	H*	No

*High priority waterbody/pollutant combination targeted for TMDL development or alternative plan in the next two years.

Table VI-2 (con't). 2016 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
ND-09020105-022-S_00	Wild Rice River from its confluence with Wild Rice Creek downstream to its confluence with the Silver Lake Diversion.	6.17 Miles	**Recreation**	Not Supporting	Escherichia coli	H*	No
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.	29.37 Miles	**Fish Consumption**	Not Supporting	Methylmercury	L	No
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	11.98 Miles	**Fish and Other Aquatic Biota**	Fully Supporting, but Threatened	Combination Benthic/Fishes Bioassessments	L	No
ND-09020107-006-S_00	Elm River from the dam NE of Galesburg, ND downstream to its confluence with the South Branch Elm River.	29.97 Miles	**Fish and Other Aquatic Biota**	Fully Supporting, but Threatened	Combination Benthic/Fishes Bioassessments	L	Yes
					Sedimentation/Siltation	L	Yes
ND-09020107-008-S_00	Elm River from the dam NW of Galesburg, ND downstream to the dam NE of Galesburg.	20.87 Miles	**Fish and Other Aquatic Biota**	Not Supporting	Combination Benthic/Fishes Bioassessments	L	Yes
					Sedimentation/Siltation	L	Yes
ND-09020107-011-S_00	North Branch Elm River, downstream to its confluence with the Elm River.	32.94 Miles	**Fish and Other Aquatic Biota**	Not Supporting	Sedimentation/Siltation	L	Yes
					Combination Benthic/Fishes Bioassessments	L	Yes
ND-09020107-013-S_00	North Branch Elm River upstream from its confluence with Unnamed tributary	59.41 Miles	**Fish and Other Aquatic Biota**	Not Supporting	Combination Benthic/Fishes Bioassessments	L	Yes
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.	30.33 Miles	**Fish Consumption**	Not Supporting	Methylmercury	L	No

*High priority waterbody/pollutant combination targeted for TMDL development or alternative plan in the next two years.

Table VI-2 (con't). 2016 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
ND-09020107-017-S_00	South Branch Elm River from Hunter Dam downstream to its confluence with the Elm River.	15.77 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Combination Benthic/Fishes Bioassessments	L	Yes
ND-09020109-007-S_00	North Branch Goose River, downstream to its confluence with the Goose River.	36.87 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Benthic-Macroinvertebrate Bioassessments	L	Yes
ND-09020109-011-S_00	Goose River from its confluence with Beaver Creek, downstream to its confluence with the South Branch Goose River.	19.32 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Sedimentation/Siltation	L	Yes
					Combination Benthic/Fishes Bioassessments	L	Yes
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	9.21 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Combination Benthic/Fishes Bioassessments	L	No
ND-09020109-015-S_00	South Branch Goose River downstream to its confluence with the Middle Branch Goose River.	43.2 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Combination Benthic/Fishes Bioassessments	L	Yes
			Recreation	Fully Supporting, but Threatened			
					Escherichia coli	L	No
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.	17.89 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Combination Benthic/Fishes Bioassessments	L	Yes
ND-09020109-020-S_00	Middle Branch Goose River downstream to its confluence with tributary watershed near Sherbrooke, ND (ND-09020109-019-S).	35.23 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Benthic-Macroinvertebrate Bioassessments	L	Yes
					Fishes Bioassessments	L	Yes

Table VI-2 (con't). 2016 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
ND-09020109-022-S_00	Goose River from its confluence with Spring Creek downstream to its confluence with Beaver Creek	30.68 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Combination Benthic/Fishes Bioassessments	L	Yes
ND-09020109-024-S_00	Beaver Creek from the Golden Lake Diversion, downstream to its confluence with the Goose River.	25.41 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Fishes Bioassessments	L	Yes
			Recreation	Fully Supporting, but Threatened			
					Fecal Coliform	L	Yes
ND-09020109-027-S_00	Beaver Creek, downstream to the Golden Lake diversion channel.	36.89 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Fishes Bioassessments	L	Yes
					Benthic-Macroinvertebrate Bioassessments	L	No
					Sedimentation/Siltation	L	Yes
			Recreation	Fully Supporting, but Threatened			
					Fecal Coliform	L	Yes
ND-09020109-029-S_00	Spring Creek, including tributaries	126.16 Miles					
			Recreation	Not Supporting			
					Fecal Coliform	L	Yes
ND-09020109-034-S_00	Little Goose River from Little Goose River National Wildlife Refuge downstream to the Goose River.	32.32 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Fishes Bioassessments	L	Yes
					Sedimentation/Siltation	L	Yes
ND-09020201-006-L_00	Devils Lake	102376 Acres					
			Fish Consumption	Not Supporting			
					Methylmercury	L	No
ND-09020202-001-L_00	Warsing Dam	53.4 Acres					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Oxygen, Dissolved	H	No
					Nutrient/Eutrophication Biological Indicators	H	No
					Sedimentation/Siltation	H	No
			Recreation	Fully Supporting, but Threatened			
					Nutrient/Eutrophication Biological Indicators	H	No

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Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
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.	9.16 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Sedimentation/Siltation	L	Yes
ND-09020202-003-L_00	Buffalo Lake	534 Acres					
			Fish and Other Aquatic Biota	Not Supporting			
					Nutrient/Eutrophication Biological Indicators	H	No
			Recreation	Not Supporting			
					Nutrient/Eutrophication Biological Indicators	H	No
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-	40.55 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Sedimentation/Siltation	L	Yes
					Benthic-Macroinvertebrate Bioassessments	L	Yes
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.	34.58 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Sedimentation/Siltation	L	Yes
					Benthic-Macroinvertebrate Bioassessments	L	Yes
ND-09020202-012-S_00	Sheyenne River from Coal Mine Lake downstream to Harvey Dam. Located along the Sheridan and Wells County border.	19.42 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Oxygen, Dissolved	L	No
ND-09020203-001-L_00	Lake Ashtabula	5467 Acres					
			Recreation	Not Supporting			
					Nutrient/Eutrophication Biological Indicators	H	No
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.	30.18 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Benthic-Macroinvertebrate Bioassessments	L	Yes

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Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
ND-09020203-005-L_00	Carlson-Tande Reservoir	15.2 Acres					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Oxygen, Dissolved	L	No
					Nutrient/Eutrophication Biological Indicators	L	No
			Recreation	Fully Supporting, but Threatened			
					Nutrient/Eutrophication Biological Indicators	L	No
ND-09020203-007-L_00	McVille Dam	36.7 Acres					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Sedimentation/Siltation	L	No
					Oxygen, Dissolved	L	No
					Nutrient/Eutrophication Biological Indicators	L	No
			Recreation	Fully Supporting, but Threatened			
					Nutrient/Eutrophication Biological Indicators	L	No
ND-09020203-012-S_00	Pickerel Lake Creek, including all tributaries. Located in NE Griggs County.	34 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Benthic-Macroinvertebrate Bioassessments	L	No
			Recreation	Not Supporting			
					Escherichia coli	L	No
ND-09020203-013-S_00	Unnamed tributary watershed to the Sheyenne River (ND-09020203-001-S). Located in northern Griggs County.	33.72 Miles					
			Recreation	Not Supporting			
					Escherichia coli	L	No
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.	26.75 Miles					
			Recreation	Fully Supporting, but Threatened			
					Fecal Coliform	L	Yes
ND-09020204-003-L_00	Brewer Lake	117.8 Acres					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Sedimentation/Siltation	L	No
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.	18.93 Miles					
			Recreation	Not Supporting			
					Fecal Coliform	L	Yes

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Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
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.	16.43 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Combination Benthic/Fishes Bioassessments	L	Yes
					Sedimentation/Siltation	L	Yes
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.	42.38 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Sedimentation/Siltation	L	Yes
					Fishes Bioassessments	L	No
					Benthic-Macroinvertebrate Bioassessments	L	No
			Recreation	Not Supporting			
					Escherichia coli	L	No
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 border.	28.04 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Combination Benthic/Fishes Bioassessments	L	No
					Sedimentation/Siltation	L	Yes
			Recreation	Not Supporting			
					Escherichia coli	H	No
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.	57.49 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Benthic-Macroinvertebrate Bioassessments	L	Yes
					Fishes Bioassessments	L	No
					Sedimentation/Siltation	L	Yes

Table VI-2 (con't). 2016 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
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.	11.55 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Fishes Bioassessments	L	Yes
			Recreation	Fully Supporting, but Threatened			
					Escherichia coli	H	No
ND-09020204-023-S_00	Timber Coulee, including all tributaries. Located in south central Ransom County.	32.69 Miles					
			Recreation	Fully Supporting, but Threatened			
					Escherichia coli	H*	No
ND-09020204-025-S_00	Sheyenne River, from its confluence with a tributary near Highway 46 (ND-09020204-025-S_00) downstream to its confluence with a tributary near Lisbon, ND (ND-09020204-024-S_00).	46.96 Miles					
			Recreation	Fully Supporting, but Threatened			
					Fecal Coliform	H	Yes
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.	34.05 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Benthic-Macroinvertebrate Bioassessments	L	Yes
					Sedimentation/Siltation	L	Yes
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.	13.29 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Sedimentation/Siltation	L	Yes
					Benthic-Macroinvertebrate Bioassessments	L	Yes
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.	13.69 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Sedimentation/Siltation	L	Yes

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Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
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.	28.56 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Combination Benthic/Fishes Bioassessments	L	Yes
					Sedimentation/Siltation	L	Yes
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.	61.07 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Combination Benthic/Fishes Bioassessments	H	No
			Recreation	Fully Supporting, but Threatened			
					Escherichia coli	H	No
ND-09020205-006-S_00	Buffalo Creek from Embden Dam, downstream to the Maple River. Located in S.C. Cass County.	30.86 Miles					
			Recreation	Not Supporting			
					Escherichia coli	H*	No
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.	48.33 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Fishes Bioassessments	L	Yes
					Benthic-Macroinvertebrate Bioassessments	L	Yes
					Sedimentation/Siltation	L	Yes
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 S.W. Cass County.	26.15 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Fishes Bioassessments	L	Yes
					Oxygen, Dissolved	L	No

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Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
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.	40.09 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Oxygen, Dissolved	L	No
					Benthic-Macroinvertebrate Bioassessments	L	Yes
					Fishes Bioassessments	L	Yes
ND-09020205-017-S_00	Unnamed tributary watershed to the Maple River (ND-09020205-015-S_00). Located in S.E. Barnes County.	56.35 Miles					
			Recreation	Not Supporting			
					Escherichia coli	H	No
ND-09020205-018-S_00	Unnamed tributary watershed to the Maple River (ND-09020205-015-S_00). Located in Eastern Barnes County.	160.3 Miles					
			Recreation	Not Supporting			
					Escherichia coli	H	No
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-	28.28 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Oxygen, Dissolved	L	No
					Fishes Bioassessments	L	Yes
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					
			Fish Consumption	Not Supporting			
					Methylmercury	L	No

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Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
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).	8.48 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Selenium	L	No
					Oxygen, Dissolved	L	No
					Total Dissolved Solids	L	No
					Sedimentation/Siltation	L	No
			Recreation	Not Supporting			
					Sedimentation/Siltation	L	No
					Escherichia coli	H*	No
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).	12.1 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Total Dissolved Solids	L	No
					Oxygen, Dissolved	L	No
					Selenium	L	No
			Recreation	Not Supporting			
					Escherichia coli	H*	No
ND-09020301-006-S_00	English Coulee from its headwaters, downstream to a major control structure.	18.29 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Oxygen, Dissolved	L	No
					Total Dissolved Solids	L	No
					Selenium	L	No
			Recreation	Not Supporting			
					Escherichia coli	H*	No
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.	31.03 Miles					
			Fish Consumption	Not Supporting			
					Methylmercury	L	No
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.	7.99 Miles					
			Fish Consumption	Not Supporting			
					Methylmercury	L	No

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Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
ND-09020301-011-S_00	Cole Creek, including tributaries	35.64 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Combination Benthic/Fishes Bioassessments	L	Yes
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.	3.78 Miles					
			Fish Consumption	Not Supporting			
					Methylmercury	L	No
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).	8.76 Miles					
			Fish Consumption	Not Supporting			
					Methylmercury	L	No
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.	12.37 Miles					
			Fish Consumption	Not Supporting			
					Methylmercury	L	No
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.	31.44 Miles					
			Fish Consumption	Not Supporting			
					Methylmercury	L	No
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					
			Fish Consumption	Not Supporting			
					Methylmercury	L	No
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.	29.93 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Cadmium	L	No
					Combination Benthic/Fishes Bioassessments	L	Yes
					Sedimentation/Siltation	L	Yes
					Selenium	L	No
			Municipal and Domestic	Fully Supporting, but Threatened			
					Chloride	L	No
					Selenium	L	No
					Arsenic	L	No
					Sulfates	L	No
					Cadmium	L	No

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Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
ND-09020307-004-L_00	Kolding Dam	9.8 Acres					
			Fish and Other Aquatic Biota	Not Supporting			
					Oxygen, Dissolved	L	No
					Nutrient/Eutrophication Biological Indicators	L	No
			Recreation	Not Supporting			
					Nutrient/Eutrophication Biological Indicators	L	No
ND-09020307-006-S_00	Turtle River from its confluence with Kelly Slough, downstream to its confluence with Salt Water Coulee.	0.64 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Cadmium	L	No
					Selenium	L	No
					Sedimentation/Siltation	L	Yes
ND-09020307-007-S_00	Fresh Water Coulee from its confluence with Salt Water Coulee downstream to its confluence with the Turtle River.	6.43 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Selenium	L	No
					Cadmium	L	No
ND-09020307-016-S_00	Kelly Slough from the control structure at Kelly Slough National Wildlife Refuge downstream to its confluence with the Turtle	2.65 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Selenium	L	No
					Cadmium	L	No
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	25.43 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Cadmium	L	No
					Combination Benthic/Fishes Bioassessments	L	Yes
					Selenium	L	No
			Municipal and Domestic	Fully Supporting, but Threatened			
					Arsenic	L	No
					Cadmium	L	No
					Selenium	L	No

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Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
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.	13.71 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Combination Benthic/Fishes Bioassessments	L	No
					Selenium	L	No
					Cadmium	L	No
			Municipal and Domestic	Fully Supporting, but Threatened			
					Arsenic	L	No
					Cadmium	L	No
					Selenium	L	No
					Sulfates	L	No
ND-09020307-024-S_00	South Branch Turtle River downstream to Larimore Dam.	18.24 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Combination Benthic/Fishes Bioassessments	L	Yes
					Selenium	L	No
					Cadmium	L	No
ND-09020307-031-S_00	North Branch Turtle River from its confluence with Whiskey Creek, downstream to its confluence with South Branch Turtle River.	14.88 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Selenium	L	No
					Cadmium	L	No
ND-09020308-001-S_00	Forest River from Lake Ardoch, downstream to its confluence with the Red River Of The	15.49 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Sedimentation/Siltation	L	Yes
					Fishes Bioassessments	L	No
					Benthic-Macroinvertebrate Bioassessments	L	Yes
ND-09020308-002-L_00	Whitman Dam	149.7 Acres					
			Recreation	Fully Supporting, but Threatened			
					Nutrient/Eutrophication Biological Indicators	H	Yes

Table VI-2 (con't). 2016 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
ND-09020308-003-L_00	Matejcek Dam	130 Acres					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Oxygen, Dissolved	H*	No
					Nutrient/Eutrophication Biological Indicators	H*	No
			Recreation	Fully Supporting, but Threatened			
					Nutrient/Eutrophication Biological Indicators	H*	No
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.	13.04 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Benthic-Macroinvertebrate Bioassessments	L	Yes
					Fishes Bioassessments	L	Yes
					Selenium	L	No
ND-09020308-017-S_00	South Branch Forest River from its confluence with Unnamed tributary watershed (ND-09020308-018-S) downstream to Fordville Dam.	7.96 Miles					
			Recreation	Fully Supporting, but Threatened			
					Escherichia coli	H	No
ND-09020308-023-S_00	Middle Branch Forest River from Matecjek Dam, downstream to its confluence with North Branch Forest River.	8.71 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Fishes Bioassessments	L	Yes
					Benthic-Macroinvertebrate Bioassessments	L	Yes
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	12.31 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Combination Benthic/Fishes Bioassessments	L	Yes
ND-09020310-001-L_00	Homme Dam	194 Acres					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Sedimentation/Siltation	H*	No

*High priority waterbody/pollutant combination targeted for TMDL development or alternative plan in the next two years.

Table VI-2 (con't). 2016 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
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.	11.58 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Selenium	L	No
					Combination Benthic/Fishes Bioassessments	L	Yes
ND-09020310-003-S_00	Willow Creek from Dam NE of Mountain, ND downstream to Salt Lake.	39.5 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Combination Benthic/Fishes Bioassessments	L	Yes
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-	14.39 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Selenium	L	No
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).	6.67 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Selenium	L	No
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	4.57 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Combination Benthic/Fishes Bioassessments	L	Yes
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-	16.39 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Combination Benthic/Fishes Bioassessments	L	Yes
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.	16.58 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Benthic-Macroinvertebrate Bioassessments	L	Yes
					Fishes Bioassessments	L	Yes

Table VI-2 (con't). 2016 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
ND-09020310-023-S_00	South Branch Park River downstream to A tributary watershed near Adams, ND (ND-09020310-022-S).	33.43 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Benthic-Macroinvertebrate Bioassessments	L	Yes
ND-09020310-029-S_00	Middle Branch Park River from a tributary near Highway 32, downstream to tributary near Highway 18.	25.47 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Combination Benthic/Fishes Bioassessments	L	Yes
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.	27.63 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Combination Benthic/Fishes Bioassessments	L	Yes
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.	15.66 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Fishes Bioassessments	L	Yes
					Benthic-Macroinvertebrate Bioassessments	L	No
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	36.32 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Fishes Bioassessments	L	Yes
					Benthic-Macroinvertebrate Bioassessments	L	Yes
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	19.08 Miles					
			Fish Consumption	Not Supporting			
					Methylmercury	L	No
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	28.82 Miles					
			Fish Consumption	Not Supporting			
					Methylmercury	L	No
ND-09020311-005-S_00	Red River of the North from its confluence with Two Rivers, downstream to its confluence with the Pembina River.	17.84 Miles					
			Fish Consumption	Not Supporting			
					Methylmercury	L	No

Table VI-2 (con't). 2016 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
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					
			Fish Consumption	Not Supporting			
					Methylmercury	L	No
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.	8.63 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Lead	L	No
					Cadmium	L	No
					Selenium	L	No
					Copper	L	No
			Municipal and Domestic	Fully Supporting, but Threatened			
					Lead	L	No
					Arsenic	L	No
			Recreation	Fully Supporting, but Threatened			
					Fecal Coliform	L	Yes
ND-09020316-002-L_00	Renwick Dam	220 Acres					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Sedimentation/Siltation	L	Yes
			Recreation	Fully Supporting, but Threatened			
					Nutrient/Eutrophication Biological Indicators	L	Yes
ND-09020316-002-S_00	Tongue River from its confluence with Big Slough downstream to its confluence with the Pembina River.	11.47 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Combination Benthic/Fishes Bioassessments	L	Yes
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.	22.76 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Combination Benthic/Fishes Bioassessments	L	Yes
					Sedimentation/Siltation	L	Yes

Table VI-2 (con't). 2016 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
ND-09020316-009-S_00	Tongue River from Renwick Dam, downstream to a tributary N.E. of Cavalier, ND.	14.59 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Selenium	L	No
					Combination Benthic/Fishes Bioassessments	L	Yes
					Sedimentation/Siltation	L	Yes
ND-09020316-011-S_00	Tongue River from Herzog Dam watershed downstream to Renwick Dam.	8.07 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Combination Benthic/Fishes Bioassessments	L	Yes
ND-09020316-019-S_00	Tongue River downstream to Senator Young Dam.	18.3 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Combination Benthic/Fishes Bioassessments	L	Yes
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.	28.47 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Lead	L	No
					Selenium	L	No
					Sedimentation/Siltation	L	Yes
					Copper	L	No
					Cadmium	L	No
			Municipal and Domestic	Fully Supporting, but Threatened			
					Arsenic	L	No
					Lead	L	No
					Cadmium	L	No
			Recreation	Fully Supporting, but Threatened			
					Escherichia coli	H	No

Table VI-2 (con't). 2016 List of Section 303(d) TMDL Waters for the Red River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
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.	32.24 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Fishes Bioassessments	L	Yes
					Benthic-Macroinvertebrate Bioassessments	L	Yes
			Municipal and Domestic	Fully Supporting, but Threatened			
					Cadmium	L	No
					Lead	L	No
					Arsenic	L	No
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.	13.07 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Selenium	L	No
					Fishes Bioassessments	L	Yes
			Municipal and Domestic	Fully Supporting, but Threatened			
					Lead	L	No
					Arsenic	L	No
					Cadmium	L	No

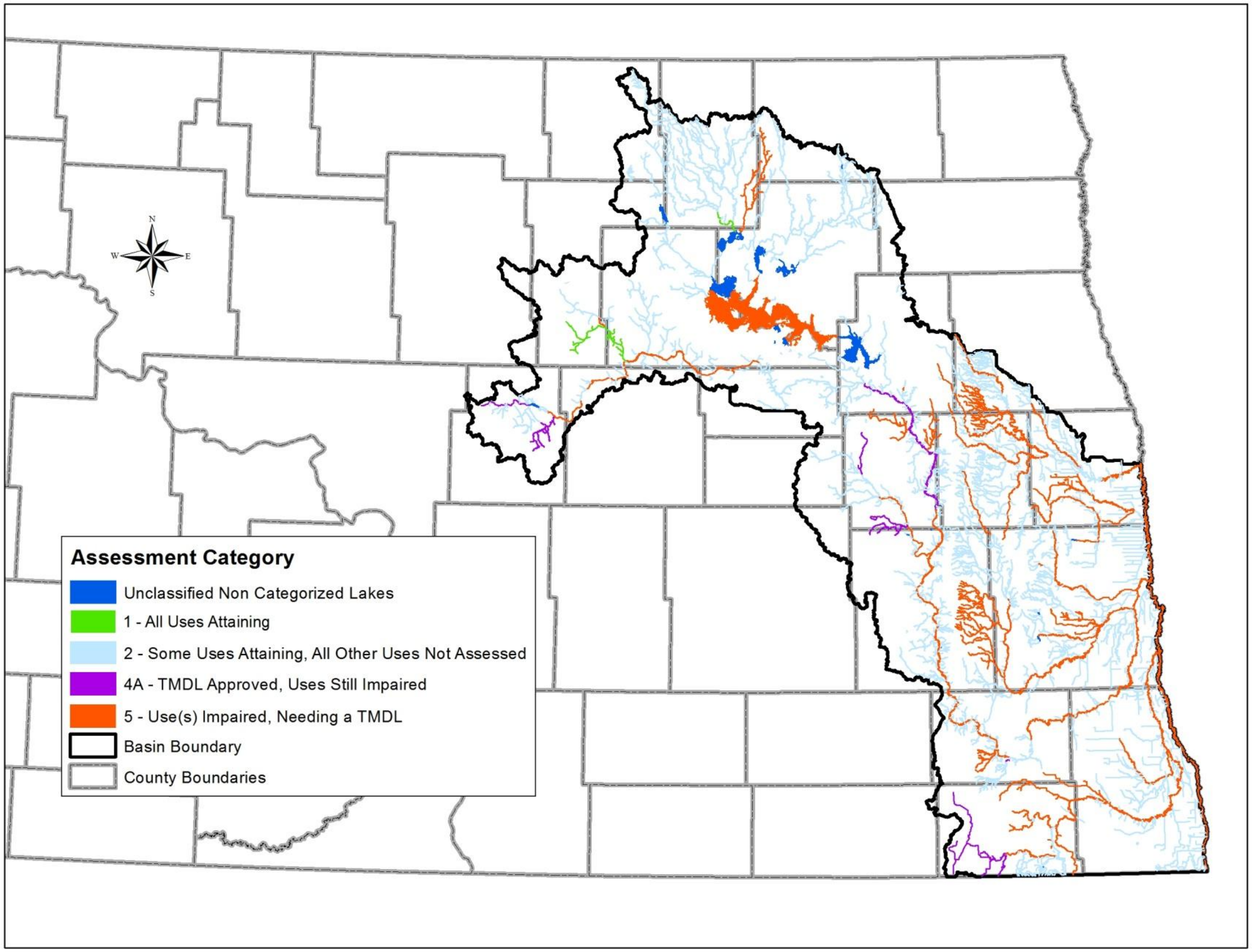

Figure VI-2. Graphical Depiction of 2016 Section 303(d) Listed Waters Needing TMDLs (Category 5) in the Upper Red River Basin.

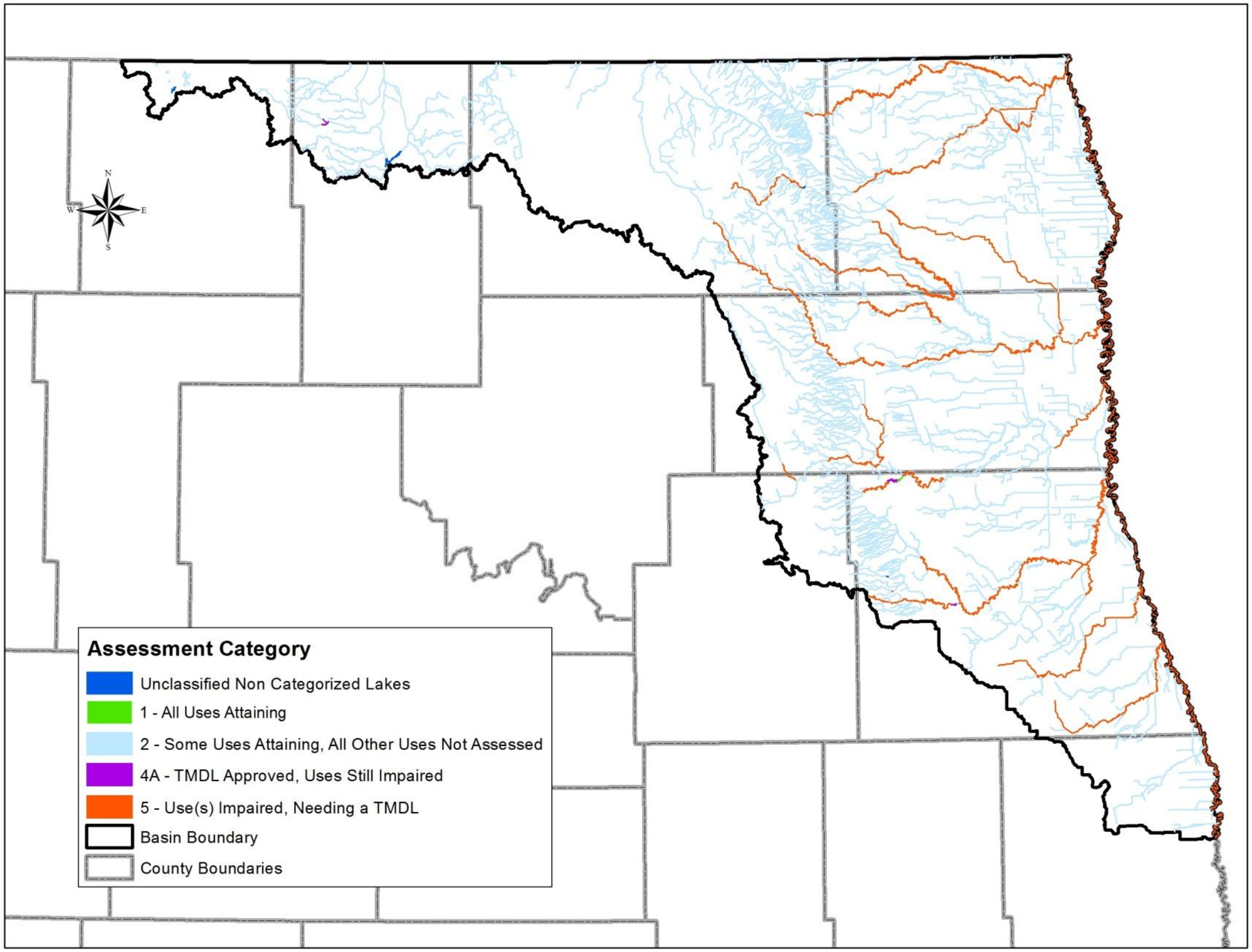

Figure VI-3. Graphical Depiction of 2016 Section 303(d) Listed Waters Needing TMDLs (Category 5) in the Lower Red River Basin.

Table VI-3. 2016 List of Section 303(d) TMDL Waters for the Missouri River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
ND-10110101-001-L_00	Powers Lake	950.6 Acres	**Fish and Other Aquatic Biota**	Fully Supporting, but Threatened	Sedimentation/Siltation	L	No
ND-10110101-009-L_00	Stanley Reservoir	253 Acres	**Recreation**	Fully Supporting, but Threatened	Nutrient/Eutrophication Biological Indicators	L	Yes
ND-10110101-021-L_00	Lake Sakakawea, including Little Missouri Bay (ND-10110205-001-L_00)	341540 Acres	**Fish Consumption**	Not Supporting	Methylmercury	L	No
ND-10110101-056-S_00	Handy Water Creek, including all tributaries. Located in Eastern McKenzie County.	42.09 Miles	**Fish and Other Aquatic Biota**	Not Supporting	Benthic-Macroinvertebrate Bioassessments	L	Yes
ND-10110101-080-S_00	Little Knife River from Stanley Reservoir, downstream to Lake Sakakawea. Located in Central Mountrail County.	44.95 Miles	**Recreation**	Not Supporting	Fecal Coliform	L	Yes
ND-10110102-001-L_00	Cottonwood Lake	227.7 Acres	**Recreation**	Not Supporting	Nutrient/Eutrophication Biological Indicators	L	No
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.	25.82 Miles	**Recreation**	Fully Supporting, but Threatened	Fecal Coliform	H	Yes
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.	77.52 Miles	**Recreation**	Fully Supporting, but Threatened	Escherichia coli	L	No
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.	48.85 Miles	**Recreation**	Not Supporting	Escherichia coli	H*	No

*High priority waterbody/pollutant combination targeted for TMDL development or alternative plan in the next two years.

Table VI-3 (con't). 2016 List of Section 303(d) TMDL Waters for the Missouri River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
ND-10110205-001-S_00	Little Missouri River from its confluence with Beaver Creek downstream to highway 85. Located in McKenzie County.	58.18 Miles					
			Recreation	Not Supporting	Escherichia coli	H	No
ND-10110205-033-S_00	Little Missouri River from Hwy 85 downstream to its confluence with Cherry Creek. Located in McKenzie and Dunn	21 Miles					
			Recreation	Fully Supporting, but Threatened	Escherichia coli	H	No
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	2.83 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened	Sedimentation/Siltation	L	Yes
ND-10130101-009-S_00	Square Butte Creek from Nelson Lake downstream to its confluence with Otter Creek. Located in Oliver and Morton	38.3 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened	Sedimentation/Siltation	L	Yes
			Recreation	Not Supporting	Fecal Coliform	L	Yes
ND-10130101-035-S_00	Turtle Creek from Turtle Lake to Lake Ordway. Located in McLean County.	0.94 Miles					
			Recreation	Not Supporting	Escherichia coli	H*	No
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.	32.74 Miles					
			Recreation	Not Supporting	Escherichia coli	H*	No
ND-10130103-002-S_00	Long Lake Creek and unnamed tributaries located in Emmons and Burleigh Counties.	222.41 Miles					
			Recreation	Fully Supporting, but Threatened	Escherichia coli	H*	No
ND-10130103-003-L_00	Braddock Lake	91.2 Acres					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened	Sedimentation/Siltation	L	No
ND-10130103-004-S_00	West Branch Long Lake Creek upstream from Braddock Dam, including tributaries. Located in Emmons County.	85.27 Miles					
			Recreation	Fully Supporting, but Threatened	Escherichia coli	H*	No

*High priority waterbody/pollutant combination targeted for TMDL development or alternative plan in the next two years.

Table VI-3 (con't). 2016 List of Section 303(d) TMDL Waters for the Missouri River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
ND-10130103-006-S_00	Goose Creek and tributaries, located in Emmons County including tributary watershed up to Napoleon Lake.	64.47 Miles					
			Recreation	Not Supporting			
					Escherichia coli	H*	No
ND-10130103-010-L_00	Lake Isabel	805.7 Acres					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Nutrient/Eutrophication Biological Indicators	L	No
					Oxygen, Dissolved	L	No
			Recreation	Fully Supporting, but Threatened			
					Nutrient/Eutrophication Biological Indicators	L	No
ND-10130103-012-L_00	Rudolph Lake	71.1 Acres					
			Recreation	Fully Supporting, but Threatened			
					Nutrient/Eutrophication Biological Indicators	L	Yes
ND-10130103-013-L_00	Mitchell Lake	298.1 Acres					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Nutrient/Eutrophication Biological Indicators	L	Yes
					Oxygen, Dissolved	L	Yes
ND-10130104-001-L_00	Beaver Lake	953.1 Acres					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Nutrient/Eutrophication Biological Indicators	H	No
					Oxygen, Dissolved	H	No
					Sedimentation/Siltation	H	No
			Recreation	Fully Supporting, but Threatened			
					Nutrient/Eutrophication Biological Indicators	H	No
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.	20.6 Miles					
			Recreation	Not Supporting			
					Escherichia coli	H*	No
ND-10130201-003-S_00	Knife River from its confluence with Spring Creek downstream to its confluence with Antelope Creek. Located in Mercer County.	17.94 Miles					
			Recreation	Not Supporting			
					Escherichia coli	H*	No

*High priority waterbody/pollutant combination targeted for TMDL development or alternative plan in the next two years.

Table VI-3 (con't). 2016 List of Section 303(d) TMDL Waters for the Missouri River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
ND-10130201-014-S_00	Antelope Creek from its confluence with East Branch Antelope Creek Watershed (ND-10130201-016-S) downstream to its confluence with the Knife River. Located in	8.52 Miles					
			Recreation	Not Supporting	Fecal Coliform	L	Yes
ND-10130201-016-S_00	East Branch Antelope Creek upstream from Antelope Creek, including tributaries. Located in Mercer County.	82.05 Miles					
			Recreation	Not Supporting	Fecal Coliform	L	Yes
ND-10130201-017-S_00	Antelope Creek main stem downstream to its confluence with East Branch Antelope Creek Watershed (ND-10130201-016-S). Located in Mercer County.	21.24 Miles					
			Recreation	Not Supporting	Fecal Coliform	L	Yes
ND-10130201-020-S_00	Goodman Creek downstream to its confluence with Spring Creek, located in Mercer County.	29.34 Miles					
			Recreation	Not Supporting	Escherichia coli	H*	No
ND-10130201-035-S_00	Knife River from its confluence with Coyote Creek downstream to its confluence with Spring Creek. Located in Mercer County.	14.7 Miles					
			Recreation	Fully Supporting, but Threatened	Escherichia coli	H*	No
ND-10130201-042-S_00	Knife River from its confluence with Branch Knife River downstream to its confluence with Coyote Creek. Located in Dunn and Mercer Counties.	36.06 Miles					
			Recreation	Not Supporting	Escherichia coli	H*	No
ND-10130202-001-L_00	Lake Tschida	5018 Acres					
			Fish Consumption	Not Supporting	Methylmercury	L	No
			Recreation	Fully Supporting, but Threatened	Nutrient/Eutrophication Biological Indicators	L	No
ND-10130202-012-S_00	Heart River from its confluence with Plum Creek downstream to its confluence with Govt' Creek. Located in Stark County.	20.02 Miles					
			Recreation	Fully Supporting, but Threatened	Escherichia coli	H	No

*High priority waterbody/pollutant combination targeted for TMDL development or alternative plan in the next two years.

Table VI-3 (con't). 2016 List of Section 303(d) TMDL Waters for the Missouri River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
ND-10130202-050-S_00	Heart River from Patterson Lake, downstream to its confluence with the Green River. Located in Stark County.	25.12 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Benthic-Macroinvertebrate Bioassessments	L	Yes
ND-10130203-002-L_00	Crown Butte Dam	31.2 Acres					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Sedimentation/Siltation	L	No
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.	22.13 Miles					
			Recreation	Not Supporting			
					Escherichia coli	L	No
ND-10130203-006-S_00	Antelope Creek from a tributary watershed near Elgin, ND (ND-10130203-054-S) downstream to its confluence with the Heart	30.87 Miles					
			Recreation	Not Supporting			
					Escherichia coli	H	No
ND-10130203-007-L_00	Danzig Dam	147.5 Acres					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Oxygen, Dissolved	H*	No
					Nutrient/Eutrophication Biological Indicators	H*	No
					Sedimentation/Siltation	L	No
			Recreation	Fully Supporting, but Threatened			
					Nutrient/Eutrophication Biological Indicators	H*	No
ND-10130203-009-S_00	Heart River from its confluence with Fish Creek downstream to its confluence with Dead Heart Slough. Located in Morton	33.95 Miles					
			Recreation	Fully Supporting, but Threatened			
					Escherichia coli	H	No
ND-10130203-032-S_00	Big Muddy Creek from its confluence with Hay Marsh Creek downstream to its confluence with Hailstone Creek. Located in	32.55 Miles					
			Recreation	Not Supporting			
					Escherichia coli	L	No
ND-10130203-033-S_00	Hailstone Creek from Danzig Dam downstream to its confluence with Big Muddy Creek. Located in Morton county.	28.07 Miles					
			Recreation	Not Supporting			
					Escherichia coli	H	No

*High priority waterbody/pollutant combination targeted for TMDL development or alternative plan in the next two years.

Table VI-3 (con't). 2016 List of Section 303(d) TMDL Waters for the Missouri River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
ND-10130203-034-S_00	Sims Creek from its confluence with Cut Bank Creek downstream to its confluence with Hailstone Creek. Located in Morton County.	9.1 Miles					
			Recreation	Not Supporting			
					Escherichia coli	H	No
ND-10130203-041-S_00	Danzig Dam Watershed, Hailstone Creek upstream from Danzig Dam, including tributaries. Located in Morton County.	60.03 Miles					
			Recreation	Fully Supporting, but Threatened			
					Escherichia coli	H	No
ND-10130203-046-S_00	Wilson Creek and tributaries located in Morton County.	62.56 Miles					
			Recreation	Not Supporting			
					Escherichia coli	L	No
ND-10130203-055-S_00	Antelope Creek upstream from its confluence with a tributary watershed in Grant County (ND-10130203-054-S).	130.14 Miles					
			Recreation	Not Supporting			
					Escherichia coli	H	No
ND-10130204-002-L_00	Larson Lake	108.5 Acres					
			Fish and Other Aquatic Biota	Not Supporting			
					Oxygen, Dissolved	L	No
					Nutrient/Eutrophication Biological Indicators	L	No
			Recreation	Not Supporting			
					Nutrient/Eutrophication Biological Indicators	L	No
ND-10130204-005-L_00	Mott Watershed Dam	35 Acres					
			Fish and Other Aquatic Biota	Not Supporting			
					Nutrient/Eutrophication Biological Indicators	L	No
					Oxygen, Dissolved	L	No
			Recreation	Not Supporting			
					Nutrient/Eutrophication Biological Indicators	L	No
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.	40.87 Miles					
			Fish and Other Aquatic Biota	Not Supporting			
					Benthic-Macroinvertebrate Bioassessments	L	Yes
			Recreation	Fully Supporting, but Threatened			
					Escherichia coli	L	No

Table VI-3 (con't). 2016 List of Section 303(d) TMDL Waters for the Missouri River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
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.	41.14 Miles					
			Recreation	Not Supporting	Escherichia coli	L	No
ND-10130205-003-L_00	Cedar Lake	198.5 Acres					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened	Sedimentation/Siltation	L	Yes
ND-10130205-021-S_00	Plum Creek, including all tributaries. Located in Adams County.	66.72 Miles					
			Recreation	Fully Supporting, but Threatened	Fecal Coliform	L	Yes
ND-10130205-033-S_00	Cedar Creek from Cedar Lake, downstream to its confluence with Chanta Peta Creek. Located in Adams County.	44.05 Miles					
			Fish and Other Aquatic Biota	Not Supporting	Benthic-Macroinvertebrate Bioassessments	L	Yes
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.	31.84 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened	Sedimentation/Siltation	L	Yes
ND-10130205-043-S_00	North Fork Cedar Creek, including all tributaries. Located in Slope County.	14.81 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened	Sedimentation/Siltation	L	Yes
ND-10130205-044-S_00	Unnamed tributaries to Cedar Creek (ND-10130205-042-S_00). Located in Slope and Bowman counties.	84.74 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened	Sedimentation/Siltation	L	Yes
ND-10130205-045-S_00	South Fork Cedar Creek, including all tributaries. Located in Bowman County.	22.2 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened	Sedimentation/Siltation	L	Yes
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.	50.03 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened	Sedimentation/Siltation	L	Yes

Table VI-3 (con't). 2016 List of Section 303(d) TMDL Waters for the Missouri River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
ND-10130205-047-S_00	North Cedar Creek, including all tributaries. Located in Slope County.	116.42 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Sedimentation/Siltation	L	Yes
			Recreation	Not Supporting			
					Fecal Coliform	L	Yes
ND-10130206-008-S_00	Dogtooth Creek from its confluence with Louse Creek downstream to its confluence with the Cannonball River. Located in	6.53 Miles					
			Recreation	Not Supporting			
					Escherichia coli	L	No
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.	30.63 Miles					
			Recreation	Not Supporting			
					Escherichia coli	L	No
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.	9.92 Miles					
			Recreation	Not Supporting			
					Escherichia coli	L	No
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.	30.12 Miles					
			Recreation	Not Supporting			
					Escherichia coli	L	No
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.	12.69 Miles					
			Recreation	Not Supporting			
					Escherichia coli	L	No
ND-10130301-001-L_00	Bowman-Haley Dam	1750 Acres					
			Recreation	Not Supporting			
					Nutrient/Eutrophication Biological Indicators	L	No

Table VI-3 (con't). 2016 List of Section 303(d) TMDL Waters for the Missouri River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
ND-10130303-001-S_00	Flat Creek, downstream to Mirror Lake. Located in Adams County.	19.12 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened			
					Nutrient/Eutrophication Biological Indicators	L	Yes
ND-10130303-003-S_00	Flat Creek from Mirror Lake downstream to the ND-SD border. Located in Adams County.	22.39 Miles					
			Recreation	Fully Supporting, but Threatened			
					Fecal Coliform	L	Yes

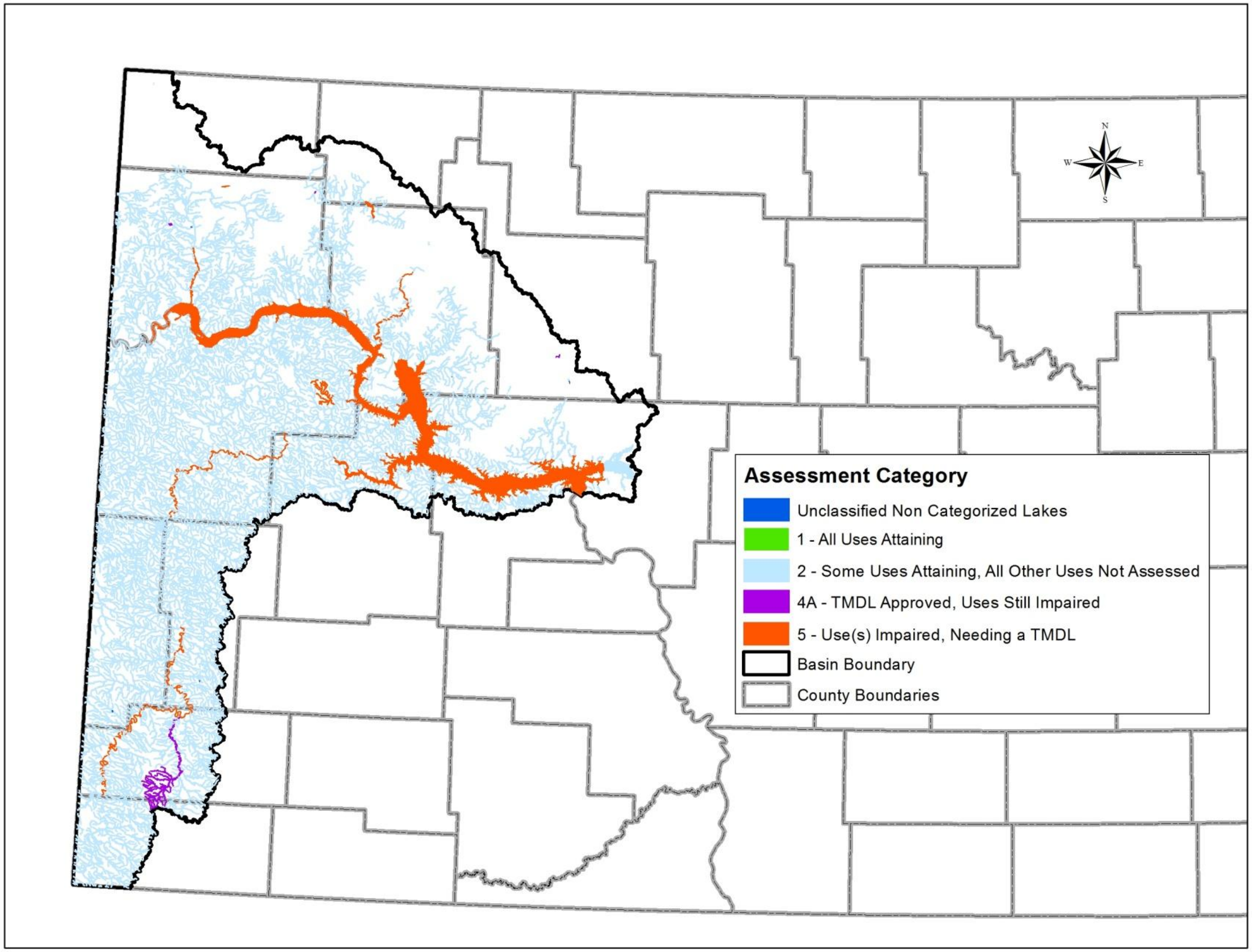

Figure VI-4. Graphic Depiction of 2016 Section 303(d) Listed Waters Needing TMDLs (Category 5) in the Lake Sakakawea/Missouri River Basin.

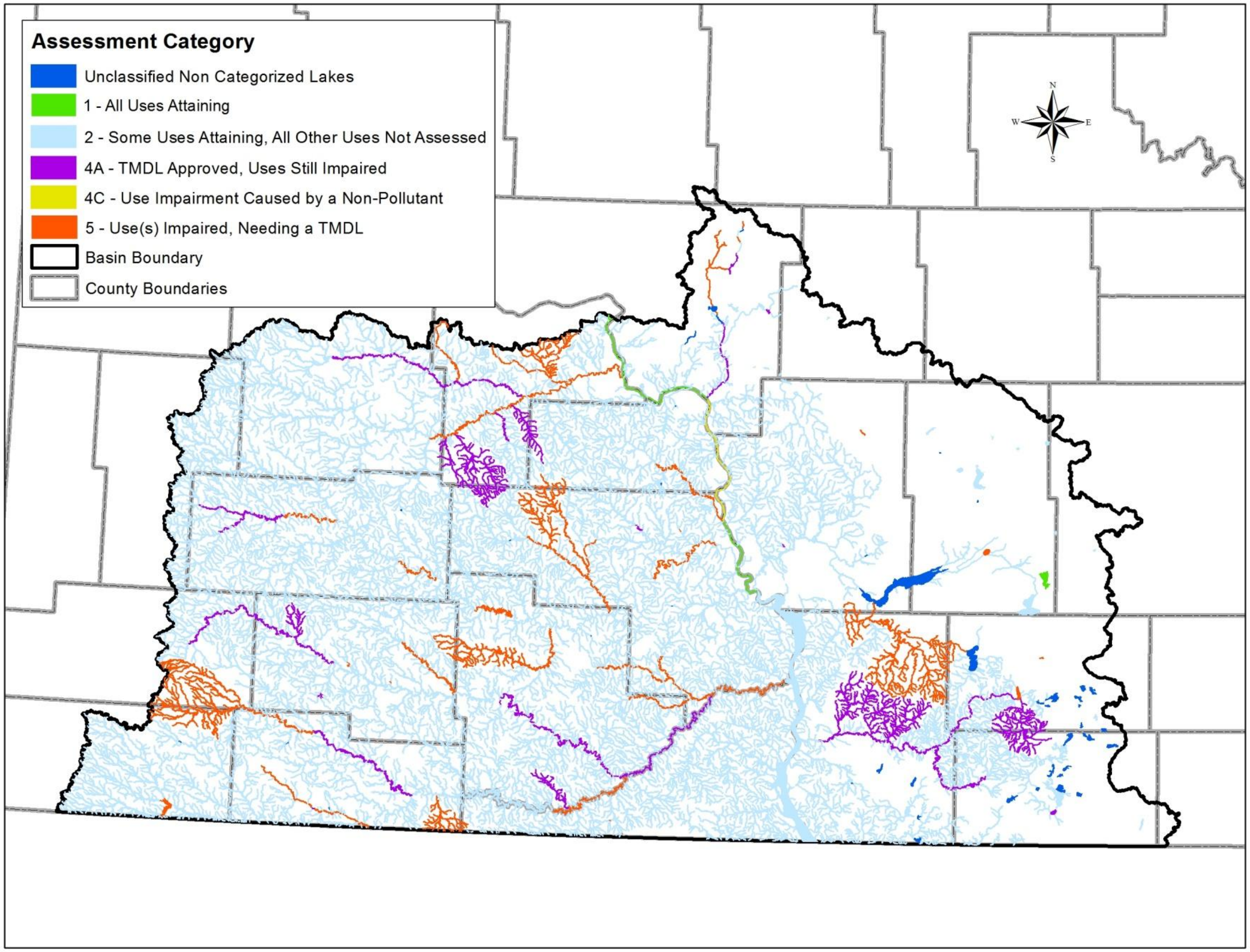

Figure VI-5. Graphical Depiction of 2016 Section 303(d) Listed Waters Needing TMDLs (Category 5) in the Lake Oahe/Missouri River Basin.

Table VI-4. 2016 List of Section 303(d) TMDL Waters for the James River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
ND-10160001-002-L_00	Jamestown Reservoir	2073.4 Acres	**Recreation**	Fully Supporting, but Threatened	Nutrient/Eutrophication Biological Indicators	L	No
ND-10160001-002-S_00	James River downstream from Jamestown Reservoir to its confluence with Pipestem Creek, including one tributary.	4.74 Miles	**Fish and Other Aquatic Biota**	Fully Supporting, but Threatened	Benthic-Macroinvertebrate Bioassessments	L	Yes
ND-10160001-003-S_00	James River from Arrowwood Lake, downstream to Jim Lake, including Mud Lake.	5.18 Miles	**Fish and Other Aquatic Biota**	Fully Supporting, but Threatened	Oxygen, Dissolved	L	No
ND-10160001-006-S_00	James River from Jim Lake, downstream to Jamestown Reservoir. The length of this segment may be open for interpretation, depending upon how far the Jamestown Reservoir backs up on full pool.	7.23 Miles	**Recreation**	Fully Supporting, but Threatened	Escherichia coli	H	No
ND-10160001-013-S_00	James River from its confluence with Big Slough, downstream to its confluence with Rocky Run.	20.27 Miles	**Recreation**	Not Supporting	Escherichia coli	H	No
ND-10160001-018-S_00	Rocky Run from its confluence with a tributary watershed west of Cathay, ND, downstream to its confluence with Rosefield	14.53 Miles	**Recreation**	Fully Supporting, but Threatened	Fecal Coliform	L	Yes
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	**Recreation**	Fully Supporting, but Threatened	Fecal Coliform	L	Yes
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).	21.94 Miles	**Recreation**	Not Supporting	Escherichia coli	H	No
ND-10160002-001-L_00	Pipestem Reservoir	1877 Acres	**Recreation**	Fully Supporting, but Threatened	Nutrient/Eutrophication Biological Indicators	L	Yes

Table VI-4 (con't). 2016 List of Section 303(d) TMDL Waters for the James River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
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.	16.05 Miles	**Recreation**	Not Supporting	Escherichia coli	H*	No
ND-10160003-008-S_00	Buffalo Creek from its beginning, downstream to its confluence with Beaver Creek (ND-10160003-005-S_00).	32 Miles	**Recreation**	Not Supporting	Escherichia coli	H*	No
ND-10160003-013-S_00	Seven Mile Coulee, including all tributaries. Located in Eastern Stutsman County.	83.21 Miles	**Recreation**	Not Supporting	Escherichia coli	H*	No
ND-10160004-001-S_00	Elm River from Pheasant Lake, downstream to the ND/SD border and Elm Lake.	5.58 Miles	**Fish and Other Aquatic Biota**	Fully Supporting, but Threatened	Sedimentation/Siltation	L	Yes
ND-10160004-002-S_00	Maple River from its confluence with South Fork Maple River, downstream to the ND/SD border.	41.87 Miles	**Fish and Other Aquatic Biota**	Fully Supporting, but Threatened	Sedimentation/Siltation	L	Yes
ND-10160004-005-S_00	Elm River, downstream to Pheasant Lake. Located in Dickey County.	13.79 Miles	**Fish and Other Aquatic Biota**	Fully Supporting, but Threatened	Sedimentation/Siltation	L	Yes
ND-10160004-006-S_00	Upper Elm River, including all tributaries. Located in Dickey County.	15.24 Miles	**Fish and Other Aquatic Biota**	Fully Supporting, but Threatened	Sedimentation/Siltation	L	Yes
ND-10160004-007-S_00	Bristol Gulch, including all tributaries. Located in Dickey County.	45.93 Miles	**Fish and Other Aquatic Biota**	Fully Supporting, but Threatened	Sedimentation/Siltation	L	Yes
ND-10160004-008-S_00	Unnamed tributaries to the Elm River (ND-10160004-005-S_00). Located in Dickey County.	21.69 Miles	**Fish and Other Aquatic Biota**	Fully Supporting, but Threatened	Sedimentation/Siltation	L	Yes
ND-10160004-009-S_00	Unnamed tributary to Pheasant Lake. Located in Dickey County.	2.53 Miles	**Fish and Other Aquatic Biota**	Fully Supporting, but Threatened	Sedimentation/Siltation	L	Yes

*High priority waterbody/pollutant combination targeted for TMDL development or alternative plan in the next two years.

Table VI-4 (con't). 2016 List of Section 303(d) TMDL Waters for the James River Basin in North Dakota.

Assessment Unit ID	AU Description	AU Size	Designated Use	Use Support	Impairment	TMDL Priority	5A
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	16.08 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened	Sedimentation/Siltation	L	Yes
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.	14.92 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened	Sedimentation/Siltation	L	Yes
ND-10160004-022-S_00	Maple Creek, downstream to its confluence with the Maple River. Located in Lamoure County.	34.45 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened	Sedimentation/Siltation	L	Yes
ND-10160004-026-S_00	Maple River from Schlect-Thom Dam, downstream to its confluence with Maple Creek. Located in Lamoure County.	20.52 Miles					
			Fish and Other Aquatic Biota	Fully Supporting, but Threatened	Sedimentation/Siltation	L	Yes

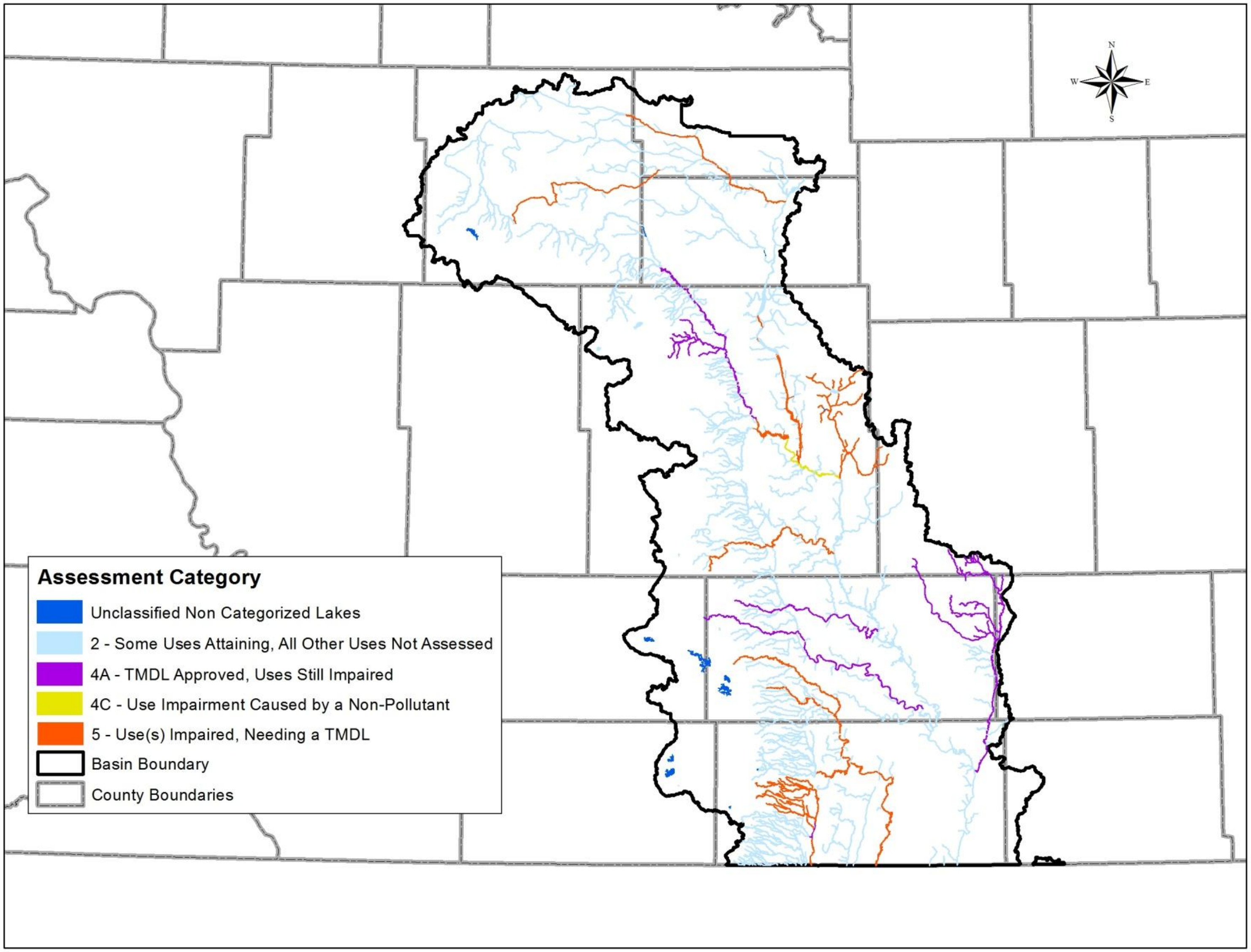

Figure VI-6. Graphical Depiction of 2016 Section 303(d) Listed Waters Needing TMDLs (Category 5) in the James River Basin.

Table VI-5. 2014 Section 303(d) TMDL Waters in the State Which Have Been De-listed for 2016.

Assessment Unit ID/Description	AU Size	Impaired Use	Pollutant	Rationale for De-listing
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.	74.91 Miles			
		Recreation		
			Escherichia coli	TMDL approved or established by EPA (4A). A TMDL for E. coli bacteria was approved by EPA on September 2, 2015.
			Fecal Coliform	Applicable WQS attained; due to change in WQS. Fecal coliform is no longer a water quality standard. It has been replaced by an E. coli standard. The assessment is currently assessed as fully supporting, but threatened for recreation use due to E. coli bacteria for which a TMDL has been approved by EPA on September 2, 2015.
ND-09020105-005-S_00 - Antelope Creek, in Richland County, from its headwaters downstream to its confluence with the Wild Rice River.	40.72 Miles			
		Fish and Other Aquatic Biota		
			Temperature, water	Applicable WQS attained; reason for recovery unspecified. Based on 23 field measurements for temperature taken by the USGS at station 05052500 between October 1, 2006 and September 1, 2015 there were no exceedences of the water quality standard for temperature.
ND-09020105-019-S_00 - Wild Rice River upstream from its confluence with Wild Rice Creek, including all tributaries.	62.51 Miles			
		Recreation		
			Escherichia coli	TMDL approved or established by EPA (4A). This assessment had been assessed as fully supporting, but threatened for recreation use due to fecal coliform. As a result of this listing a TMDL for E. coli bacteria was approved by EPA on September 21, 2011. The assessment unit was then assessed as fully supporting, but threatened for recreation use due to E. coli for the 2014 IR cycle. Since the September 21, 2011 addresses the E. coli impairment the assessment unit has been de-listed due to TMDL complete.

Table VI-5 (con't). 2014 Section 303(d) TMDL Waters in the State Which Have Been De-listed for 2016.

Assessment Unit ID/Description	AU Size	Impaired Use	Pollutant	Rationale for De-listing
ND-09020105-020-S_00 - Wild Rice Creek from its confluence with the Wild Rice River upstream to the ND-SD border, including all tributaries.	8.68 Miles			
		Recreation		
			Escherichia coli	
				TMDL approved or established by EPA (4A). This assessment had been assessed as fully supporting, but threatened for recreation use due to fecal coliform. As a result of this listing a TMDL for E. coli bacteria was approved by EPA on September 21, 2011. The assessment unit was then assessed as fully supporting, but threatened for recreation use due to E. coli for the 2014 IR cycle. Since the September 21, 2011 addresses the E. coli impairment the assessment unit has been de-listed due to TMDL complete.
ND-09020109-001-S_00 - Goose River from a tributary upstream from Hillsboro, ND downstream to its confluence with the Red River Of The North.	30.88 Miles			
		Fish and Other Aquatic Biota		
			Fishes Bioassessments	
				Applicable WQS attained; reason for recovery unspecified. Two macroinvertebrate samples, one collected in 2000 and one collected in 2005, show that aquatic life use is fully supporting. This fully supporting use assessment is also supported by over 90 dissolved oxygen, temperature and pH measurements taken by the NDDoH and the USGS between October 1, 2005 and September 30, 2015. Trace element data collected also support this assessment.
ND-09020201-021-S_00 - Calio Coulee, upstream from Chain Lake including all tributaries.	73.65 Miles			
		Recreation		
			Escherichia coli	
				Applicable WQS attained; reason for recovery unspecified. E. coli data collected in 2008, 2009 and 2010 support a fully supporting recreation use assessment for this waterbody.
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.	28.56 Miles			
		Recreation		
			Escherichia coli	
				TMDL approved or established by EPA (4A). A TMDL for E. coli bacteria was approved by EPA on August 18, 2016.

Table VI-5 (con't). 2014 Section 303(d) TMDL Waters in the State Which Have Been De-listed for 2016.

Assessment Unit ID/Description	AU Size	Impaired Use	Pollutant	Rationale for De-listing
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 S.W. Cass County.	26.15 Miles			
		Recreation		
			Escherichia coli	
				TMDL approved or established by EPA (4A). A TMDL for E. coli bacteria was approved by EPA on August 18, 2016.
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.	40.09 Miles			
		Recreation		
			Escherichia coli	
				TMDL approved or established by EPA (4A). A TMDL for E. coli bacteria was approved by EPA on August 18, 2016.
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).	28.28 Miles			
		Recreation		
			Escherichia coli	
				TMDL approved or established by EPA (4A). A TMDL for E. coli bacteria was approved by EPA on August 18, 2016.
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)	16.39 Miles			
		Fish and Other Aquatic Biota		
			Selenium	
				Applicable WQS attained; reason for recovery unspecified. Based on 14 samples collected from 5 sites located on the waterbody in 2007, 2010 and 2011 by the NDDoH there were no exceedences of with the acute or chronic aquatic life criteria for selenium.

Table VI-5 (con't). 2014 Section 303(d) TMDL Waters in the State Which Have Been De-listed for 2016.

Assessment Unit ID/Description	AU Size	Impaired Use	Pollutant	Rationale for De-listing
ND-10130101-020-S_00 - Turtle Creek from Lake Ordway downstream to its confluence with the Missouri River. Located in Mclean County.	27.71 Miles			
		Recreation		
			Escherichia coli	TMDL approved or established by EPA (4A). An E. coli bacteria TMDL was completed and approved by EPA on April 26, 2016.
ND-10130204-017-S_00 - Thirty Mile Creek from tributary watershed (ND-10130204-019-S_00), downstream to its confluence with Springs Creek. Located in Hettinger County.	20.07 Miles			
		Recreation		
			Escherichia coli	Applicable WQS attained; due to restoration activities. Following the implementation of a Section 319 Nonpoint Source Watershed Restoration Project, E. coli bacteria data collected in 2011 shows that water quality standards are now fully attained. The assessment is based on geometric mean E. coli concentration results for the months of May, June, July and August.
ND-10130206-001-S_00 - Cannonball River from its confluence with Dogtooth Creek downstream to Lake Oahe. Border between Morton and Sioux Counties.	28.44 Miles			
		Recreation		
			Escherichia coli	TMDL approved or established by EPA (4A). The E. coli impairment for recreation use was addressed by a bacteria (fecal coliform and E. coli) TMDL that was approved by EPA on September 29, 2009.

PART VII. GROUND WATER ASSESSMENT

A. Ground Water Extent and Uses

Chapter 1. Aquifer Description

Ground water underlies the land surface throughout all of North Dakota and is present in both unconsolidated deposits and bedrock. Unconsolidated deposits are loose beds of sand, gravel, silt or clay that are of glacial origin. Aquifers in the unconsolidated deposits are called glacial drift aquifers and are the result of glacial outwash deposits. Glacial drift aquifers are generally more productive than aquifers found in the underlying bedrock and provide better quality water. Approximately 206 glacial drift aquifers have been identified and delineated throughout the state. The locations and aerial extent of the major glacial drift aquifers in the state are shown in Figure VII-1. It is estimated that 60 million acre-feet (AF) of water are stored in the major glacial drift aquifers in the state.

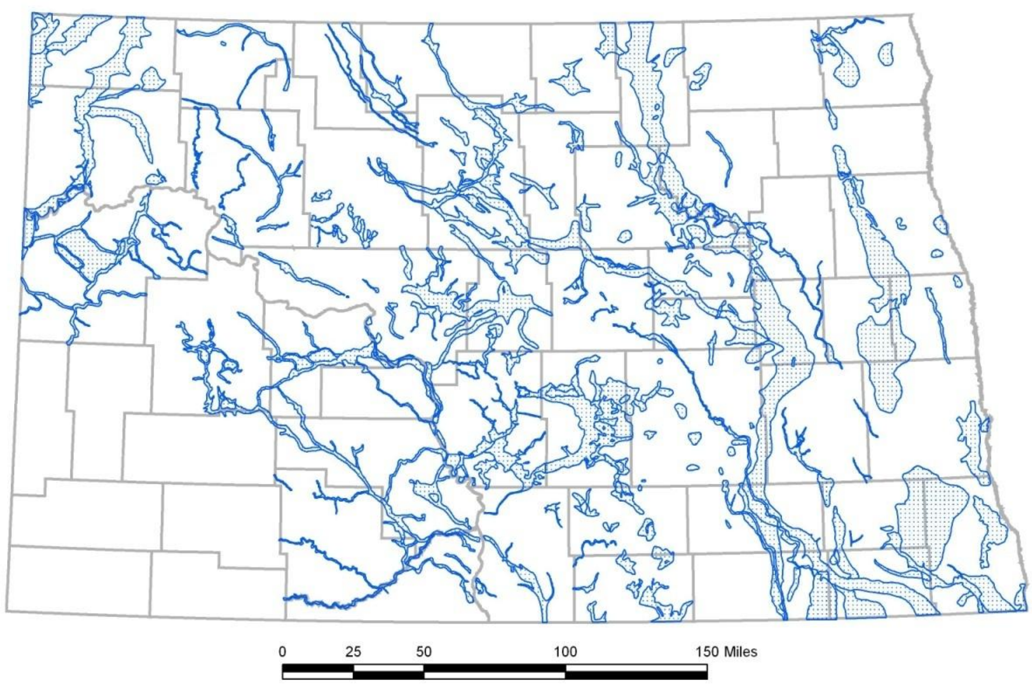

Figure VII-1. Major Glacial Drift Aquifers in North Dakota.

The bedrock underlying North Dakota consists primarily of shale and sandstone that generally (except in southwestern North Dakota) underlie the unconsolidated deposits. Bedrock aquifers underlie the entire state and tend to be more continuous and widespread than glacial drift aquifers. Water contained within bedrock aquifers occurs primarily along fractures in the rock, and the water produced is generally more mineralized and saline than water from glacial drift aquifers. The major bedrock aquifers that underlie North Dakota are shown in Figure VII-2. The amount of water available in the bedrock aquifers is unknown.

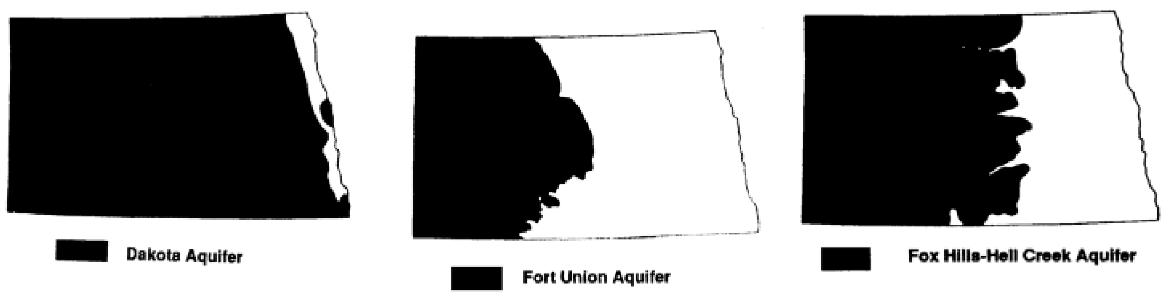

Figure VII-2. Location and Extent of North Dakota's Primary Bedrock Aquifers.

North Dakota has completed a multi-agency effort to assess and map the major ground water resources found within the state's boundaries. The County Ground Water Studies Program provides a general inventory of the state's ground water resources and was completed through a cooperative effort of the North Dakota State Water Commission (SWC), the North Dakota Geological Survey, the United States Geological Survey, county water resource districts and county commission boards. The country ground water studies identified the location and extent of major aquifers, hydraulic properties of the aquifers, water chemistry, estimated well yields and the occurrence and movement of ground water, including sources of recharge and discharge. The county studies were prepared in three parts:

- Part I describes the geology.
- Part II provides basic ground water data, including descriptive lithologic logs of test holes and wells, water levels in observation wells and water chemistry analyses.
- Part III describes the general hydrogeology.

The County Ground Water Studies are available for all counties in North Dakota. The SWC and other federal and state agencies continue to evaluate the ground water resources and expand the available knowledge of the quantity and quality of these resources.

Chapter 2. Ground Water Use

Ground water use in North Dakota has historically been Most of the incorporated communities in the state rely on ground water from private wells, municipal distributions systems and/or rural water systems. Ground water is virtually the sole source of all water used by farm families and residents of small communities having no public water distribution system.

As indicated in Table VII-1, the highest consumptive use of ground water is related to irrigation.

Table VII-1. 2013 Reported Ground Water Use in North Dakota.

Type of Water Use	Amount of Water Used (acre-feet)	Percent of Total Water Used (%)
Irrigation	119,136	69
Municipal	23,482	13
Rural Water Systems	13,249	8
Industrial/Power/Multi-Use (Consumptive)	17,039	10
Total	**172,906**	**100**

Notes: 1 acre-foot = 325,850 gallons
Data was obtained from the North Dakota State Water Commission website.

B. Ground Water Contamination Sources

Chapter 1. Contaminant Source Description

Contamination of ground water from manmade and natural sources has been detected in every county of the state. The degree to which contamination incidents are investigated or remediated is a function of the contaminant, its impact on the beneficial use of the resource and the overall risk it poses to the public or the environment. The following are the highest priority contaminant sources which have caused adverse impacts on the beneficial use of ground water resources throughout the state:

- Agricultural chemical facilities
- Animal feedlots
- On-farm agricultural mixing and loading procedures
- Above ground and underground storage tanks
- Surface impoundments
- Large industrial facilities
- Spills and releases

Common contaminants associated with these facilities include organic pesticides, nitrates, halogenated solvents, petroleum hydrocarbon compounds, sulfates, chlorides and total dissolved solids.

Chapter 2. Ground Water Contaminant Source Databases

The major sources of ground water contamination were determined utilizing a combination of professional experience and a review of existing department computer databases. Several databases maintained by the Division of Water Quality compile information relating to the type of regulated activity, its size and location and, in some cases, regional ground water quality information. The primary databases used to identify the major sources of ground water contamination are:

Concentrated Animal Feeding Operations (CAFO) Database

Since 1972, North Dakota has maintained an active concentrated animal feeding operations (CAFO) permit program. The program is designed to protect the quality of the state's water resources through oversight of the construction and management of CAFOs. The program regulates animal feeding operations and can require design or operational modifications to protect the quality of the waters of the state. Regulatory authority is provided in North Dakota Century Code (NDCC) 61-28 and North Dakota Administrative Code (NDAC) 33-16, which can require specific actions for construction, water quality monitoring, animal disposal, contingency planning and animal waste disposal. The CAFO database provides location, operation and contact information. The database is updated as needed to reflect changes in the program, such as the approval of new operations or modifications to existing operations. At present, information regarding 762 facilities is listed in the CAFO database.

Underground Injection Control (UIC) Program Class I/Class V Database

The Underground Injection Control (UIC) Program regulates the injection of liquid waste into the ground where it may have the potential to adversely impact underground sources of drinking water. The department has regulatory primacy to oversee and enforce the Class I and Class V UIC Programs. As part of this effort, the department completed a statewide survey designed to identify the type, location and use of small industrial or commercial injection systems. The State had previously developed and maintained a UIC Class V database to catalog information obtained during the survey and to document inspection and enforcement activities. Class I well information was recently added to the UIC database.

In response to EPA's effort to create a national UIC database, North Dakota's existing database was updated to include the data fields required in the national database. The new database facilitates the electronic submission of inspection and enforcement information to EPA, which has reduced the State's reporting burden. The new Class I/Class V database was submitted to EPA for a Quality Assurance/Quality Control review. EPA approved the dataset, and all reporting is now conducted through updates to the database and quarterly submittals of the information to EPA. At present, 5 active class V Wells and 840 active Class V wells are in the database.

Spill Response/Contaminant Release Database

The department maintains databases which track the initial response and subsequent follow-up action at locations where contaminants released to the environment impact water quality. Site location, contaminant type, responsible party and a historical record of activities conducted at the site are maintained.

Ambient Ground Water Quality Monitoring Database

The Ambient Ground Water Quality Program was developed to monitor ground water quality in the 50 most vulnerable aquifers in the state. In general, vulnerability was determined based upon natural geologic conditions, total appropriated water use and land use. The program was originally designed to identify the occurrence of about 60 different pesticides in ground water. New pesticides are added from time to time in response to increased production of specialty crops and/or new pest infestations. The Ambient Ground Water Quality Database contains all the data obtained through the implementation of the monitoring program. This includes sample location, analytical results and other site-specific information.

C. Ground Water Protection Programs

In 1967, North Dakota enacted legislation enabling the state regulation of activities which have caused, or which have the potential to cause, adverse impacts to the quality of the waters of the state. NDCC 61-28 entitled, "Control, Prevention and Abatement of Pollution of Surface Waters," not only defines the statement of policy for surface and ground water quality protection, but also sets specific prohibitions and penalties for violation of the state law. Since the enactment of NDCC 61-28, the state has pursued a policy to:

> "...act in the public interest to protect, maintain and improve the quality of the waters of the state for continued use as public and private water supplies, propagation of wildlife, fish and aquatic life and for domestic, agricultural, industrial and recreational and other legitimate beneficial uses...."

North Dakota has historically envisioned ground water quality protection to include a mix of financial and technical cooperation among federal, state and local governmental agencies and private entities. Since the early 1970s, the department has continued to build upon existing ground water protection capacities through the attainment of primacy for federal programs or through cooperative working relationships with other state, federal and local entities.

The following are brief descriptions of the programs administered by the department's Division of Water Quality.

Chapter 1. Wellhead and Source Water Protection Programs

The 1996 Amendments to the Safe Drinking Water Act established the Source Water Protection Program to serve as an overall umbrella of protection efforts for all public water systems, including ground water- and surface water-dependent systems. In North Dakota, the Wellhead Protection Program focuses on the ground water-dependent systems, while the Source Water Protection Program addresses surface water-dependent systems. The Source Water Protection Program involves the delineation of a protection area along rivers or reservoirs that provide source water for the system and an inventory of potential contaminant sources within the protection area. Under both wellhead and source water protection, the department assesses the system's susceptibility to potential contaminant sources found in the protection area.

The 1996 Amendments to the Safe Drinking Water Act required all states to complete the minimum elements of wellhead and source water protection (delineation, contaminant source inventory and susceptibility) by May 2003. The department completed the mandatory elements for all of the Community Water Systems and all of the Non-community Water Systems in the state by the required deadline.

North Dakota continues to promote and implement the Source Water Assessment Program. Public water systems are encouraged to implement the voluntary elements of wellhead and source water protection. These elements include the development of management strategies, contingency planning and public awareness programs. The department works with, and provides assistance to, all public water systems who desire to follow through with the voluntary elements of the program.

Following the completion of source water assessment requirements in 2003, the Wellhead Protection Program began conducting source water monitoring and contaminant source studies for ground water-dependent community public water systems that have been rated as susceptible or for systems that have had detections of organic or inorganic contaminants regulated by the Safe Drinking Water Act National Primary Drinking Water Regulations. Source water monitoring typically involves the use of existing monitoring wells at contaminant release sites or the use of private water supply wells in or near the wellhead protection area. Source water monitoring is accomplished through coordination with the local public water system and the department's divisions of Municipal Facilities and Waste Management.

D. Ground Water Quality

Chapter 1. Ambient Ground Water Monitoring Program

Ambient ground water quality monitoring activities are conducted by several agencies, with the primary activities being conducted by the North Dakota SWC and the department. The monitoring programs have been developed to assess ground water quality and/or quantity in the major aquifer systems located throughout the state. The monitoring is designed to evaluate the condition of ground water quality as it relates to inorganic/organic chemical constituents and the occurrence of selected agricultural chemical compounds. Additional water quality information is collected as part of the Safe Drinking Water Act requirements through the monitoring of public drinking water programs.

The maintenance of a baseline description of ground water quality is an essential element of any statewide comprehensive ground water protection program. In recent years, concern for the quality of North Dakota’s environment and drinking water has increased as it is learned that many states in the country have experienced ground water contamination from a variety of point and nonpoint sources of pollution.

In North Dakota, a large portion of the potable ground water resource underlies agricultural areas. Prior to the inception of the Ambient Ground Water Monitoring Program in 1992, only limited data were available to assess the impact of agricultural chemicals on the state’s ground water quality. The goal of the Ambient Ground Water Monitoring Program is to provide an assessment of the quality of North Dakota's ground water resources with regard to agricultural chemical contamination.

Several glacial drift aquifers have been monitored each year of the program since 1992. The monitoring conducted in 1996 marked the completion of the first five-year cycle of monitoring high-priority glacial drift aquifers in the state. The second five-year cycle of monitoring began in 1997, during which time the aquifers sampled five years earlier in 1992 were resampled. The third five-year cycle of monitoring was completed in 2006, and the fourth five-year cycle was completed in 2011. Conducting the monitoring on five-year cycles, preferably using most of the same wells for sampling, will provide a temporal assessment of agricultural chemical occurrence in specific aquifers.

In September 2013, the Department implemented the Western Ambient Water Quality Program to establish a ground water quality baseline and to analyze the potential impacts to groundwater as a result of developing oil and gas resources within the Williston Basin**.** Approximately 130 wells in 29 aquifers are sampled on a 1 ½ year rotation schedule; the first sampling cycle for all wells was completed in 2015.

Chapter 2. Underground Injection Control (UIC) Program

The department’s Class I and V Underground Injection Control (UIC) Programs have been administered in accordance with UIC rules and program descriptions. Program activities include administration of the program grant, permitting, surveillance and inspections, quality assurance, enforcement, data management, public participation, training, technical assistance and Class V assessment activities. The current UIC inventory includes 5 active Class I wells and 840 active Class V injection wells of various subclasses. The UIC Program coordinates with other programs, including the Resource Conservation and Recovery Act (RCRA), Underground Storage Tank (UST), National Pollutant Discharge Elimination System (NPDES) and Wellhead/Source Water Protection to identify activities which may threaten groundwater quality.

Chapter 3. Additional Ground Water-Related Projects

Ground Water Protection Program staff work on many projects related to the protection of the ground water resources of North Dakota. Projects include special monitoring projects; review of sites for livestock feeding operations; review of sites for landfill operations; and working on emergency response, investigations and cleanup of releases to the environment.

Facility Location Reviews

The Ground Water Protection Program takes the lead or assists other programs and agencies in evaluating the impacts land use activities may have on ground water quality. Site reviews or preliminary site reviews are conducted for new feedlot or CAFO operations, landfill or waste disposal facilities and industrial facilities. In addition, site reviews are conducted for on-site sewage systems in new residential subdivisions to assess potential ground water impacts.

Water Appropriation and Monitoring

The department reviews water appropriation permits to assess potential impacts to ground water quality. Proposed water uses includes agricultural, public water supply, recreational and industrial uses. A cooperative project with the SWC is underway involving the Karlsruhe aquifer to identify causes and potential solutions to nitrate increases in irrigated areas. Meetings were conducted with SWC personnel and local residents to discuss survey results and ongoing research. Currently, voluntary measures such as BMPs and reduced nutrient application rates are being implemented and evaluated in these areas. One of the irrigators has voluntarily installed shallow recovery/production wells to recover nitrate in the area of highest contamination. Residential drinking water wells are being monitored to ensure there is no danger to public health.

Contaminant Release Sites

The Ground Water Protection Program coordinates with the UST Program, RCRA/Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Program and the Drinking Water Program to provide technical oversight relating to the assessment and remediation of ground water contamination incidents. The majority of sites are related to fuel storage facilities, although other types of storage sites include pesticides, nutrients/fertilizers, chlorinated solvents, metals and trace metals, and other inorganic compounds.

Pesticide Use Exemption Evaluations

The department also reviews applications for pesticide use exemptions (Federal Insecticides, Fungicides and Rodenticides Act Section 18 Requests) for potential impacts to surface or ground water. Comments regarding each request are provided to the North Dakota Department of Agriculture.

Emergency Response and Spills

Additional project oversight is provided by the Ground Water Protection Program staff for a wide variety of emergency response and release incidents. The Ground Water Protection Program provides technical assistance to the Division of Emergency Management to address potential water quality impacts from accidental or intentional releases. The department continues to work with the North Dakota Oil and Gas Division on response to oilfield spills, using the one-stop online spill reporting capabilities which were added to the department web site, with automatic notification to appropriate department personnel. The Ground Water Protection Program also provides oversight or technical comment either directly to the responsible party or through the appropriate oversight agency on other ground water contamination projects. Typical projects include sites that require one or more of the following activities: site assessment, selection and implementation of appropriate corrective action, and sample collection and data review/evaluation.

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Appendix A

Changes Made To Assessment Units Entered into the Assessment Database for the 2016 Integrated Reporting Cycle

New Lake and Reservoir Assessment Units Added to the Assessment Database (ADB) in 2016

Assessment Unit ID	Assessment Unit Name	AU Size (acres)	Water Quality Standards Classification
ND-10130102-008-L_00	Jake's Lake	483.5	Class 3 Lakes, Warm Water Fishery
ND-10130102-009-L_00	Miller Lake (Emmons)	194.4	Class 3 Lakes, Warm Water Fishery
ND-10130104-009-L_00	Baumgartner Lake	500	Class 3 Lakes, Warm Water Fishery
ND-10130104-010-L_00	Senger Lake	565.76	Class 3 Lakes, Warm Water Fishery
ND-09010004-014-L_00	Boundary Lake	370	Non-Class Lake or Impoundment
ND-10130101-026-L_00	Coal Lake	450.17	Non-Class Lake or Impoundment

Lake and Reservoir Assessment Units Where There is a Change in the Waterbody Size Estimate for 2016

Assessment Unit ID	Assesment Unit Name	2014 AU Size (acres)	2016 AU Size (acres)	Comment
ND-09020201-020-L_00	Island Lake	1984	2109	AU size revised to be consistent with North Dakota Game and Fish Department size estimate. Estimate confirmed through GIS.
ND-10130101-022-L_00	Harmon Lake	135.9	137.91	AU size revised to be consistent with North Dakota Game and Fish Department size estimate. Estimate confirmed through GIS.
ND-10130102-002-L_00	Neuwsma Dam	53	64.7	AU size revised to be consistent with North Dakota Game and Fish Department size estimate. Estimate confirmed through GIS.

New River and Stream Assessment Units Added to the Assessment Database (ADB) in 2016

Assessment Unit ID	Assessment Unit Name	AU Size (Miles)	Comment
ND-10110101-085-S_00	Tioga Reservoir Watershed	10.91	New assessment unit for 2016.
ND-10130101-038-S_00	Otter Creek	2.7	New assessment unit for 2016.
ND-10130101-039-S_00	Otter Creek tributary	2.8	New assessment unit for 2016.
ND-10130101-040-S_00	Harmon Lake Tributaries	7.92	New assessment unit for 2016.
ND-10130102-036-S_00	Miller Lake Watershed	6.65	New assessment unit for 2016.
ND-10130102-037-S_00	Jake's Lake Watershed	19.5	New assessment unit for 2016.
ND-10130103-019-S_00	Napoleon Lake Watershed	11.96	New assessment unit for 2016.
ND-10130103-020-S_00	West Lake Watershed	94.03	New assessment unit for 2016.

River and Stream Assessment Units Where There is a Decrease in the Waterbody Size Estimate for 2016

Assessment Unit ID	2014 AU Size (miles)	2016 AU Size (miles)	Comment
ND-09010003-002-S_00	78.79	41.06	Part of this ID abruptly stopped near the town of Votaire ND. After much investigation and use of DEM, DRG, HUCs and NHD, it was determined that it actually curves east and drains into 004.
ND-09010003-009-S_00	139.07	134.3	Many new straightened ditches in this area. When drawn in with more accuracy, it actuall resulted in a decrease in miles.
ND-09010004-003-S_01	57.65	57.26	Several circular loops were removed and some more detail was drawn in for 09010004-003_01, 004, 005, and 006. Overall net miles were not affected all that much.
ND-09010004-005-S_00	109.53	108.66	Several circular loops were removed and some more detail was drawn in for 09010004-003_01, 004, 005, and 006. Overall net miles were not affected all that much.
ND-09010004-006-S_00	61.28	60.23	Several circular loops were removed and some more detail was drawn in for 09010004-003_01, 004, 005, and 006. Overall net miles were not affected all that much.
ND-09020104-008-S_00	39.09	38.35	I redrew this entire ID due to the fact that most of it runs in or near Fargo and many things have changed. So, I used a detailed 2014 photo and corrected the segments. Some of the storm drainage was unclear, but used best judgment on where it appeared
ND-09020105-007-S_00	95.03	91.29	In the ADB description, it said from headwaters. I included a couple more segments which made it more accurate to the description by going upstream more. Increase of a few miles, and decrease for 007.
ND-09020105-024-S_00	24.57	22.29	The underlying stream or connecting segment under Lake Tewaukon was named 024-S, and I renamed it to 005-L which is the lake entity ID resulting in a slight decrease to 024.
ND-09020107-008-S_00	21.34	20.87	Slight correction made where an unnamed tribributary confluences with the Elm.
ND-09020205-008-S_00	52.35	44.35	A very large loop was removed from this segment.
ND-09020307-020-S_00	40.26	28.51	A very large multiple loop area and old oxbow areas were deleted.
ND-09020308-002-S_00	22.58	22.46	A few new canals and ditches were created in this area. Used a recent photo and DEM to draw them in and straighten out where the old stream channels used to be.
ND-09020308-005-S_00	98.3	96.86	Numerous canals/ditches were drawn in and corrected in this area using a detailed photo and DEM.
ND-09020308-010-S_00	92.26	90.33	Many new canals and ditches were created in this area. Used a recent photo and DEM to draw them in and straighten out where the old stream channels used to be.
ND-09020310-011-S_00	12.89	9.59	A large circle/oxbow was removed.
ND-09020310-023-S_00	35.47	33.43	The headwaters of 09020310-023 and 09020316-039 were altered based off of a current photo, and DEM. Resulted in changes to 023, 024, and 039.
ND-09020310-024-S_00	96.29	94.47	The headwaters of 09020310-023 and 09020316-039 were altered based off of a current photo, and DEM. Resulted in changes to 023, 024, and 039.
ND-09020310-044-S_00	37.22	36.32	I used the 2014 photo and corrected the stream network just to the NW of Crystal ND.
ND-09020310-045-S_00	64.75	64.6	I used the 2014 photo and corrected the stream network just to the NW of Crystal ND.
ND-10110101-004-S_00	53.21	51.23	There was a circular loop in part of the stream. Reduced by 1.98 miles once that was removed.
ND-10110101-013-S_00	140.28	61.39	There were two separate closed basin sub-watersheds included as part of the Powers Lake watershed in the reach indexed GIS layer. Since they were closed basins, and neither of the watersheds drained to a classified waterbody or lake, the entire closed bas

ND-10130101-012-S_00	19.04	14.69	Otter Creek watershed was restructured due to the construction of Harmon Lake reservoir. Resulted in 3 new ID's, 038, 039, and 040. More detail was also drawn in while working in the area.
ND-10130101-013-S_00	44.9	38.94	Otter Creek watershed was restructured due to the construction of Harmon Lake reservoir. Resulted in 3 new ID's, 038, 039, and 040. More detail was also drawn in while working in the area.
ND-10130101-023-S_00	85.06	80.04	Part of 023 was wrongly ID'd as 023 when it should have been 024. So 023 got smaller in length and 024 grew in length due to this.
ND-10130101-026-S_00	93.77	93.42	Small correction right at Painted woods Lake. The hydrology flow was backwards in the GIS layer. So I switched that, and used my best judgment for which way the water goes. HUCS, DEM, Photo. Only way to be sure would be to verify in the field.
ND-10130103-001-S_00	18.08	17.54	With development in the Bismarck area, I updated the flow network in that area, in particular the Apple Creek Hay Creek confluence area.
ND-10130103-003-S_00	7.1	4.1	With development in the Bismarck area, I updated the flow network in that area, in particular the Apple Creek Hay Creek confluence area.
ND-10130103-007-S_00	15.95	15.67	With development in the Bismarck area, I updated the flow network in that area, in particular the Apple Creek Hay Creek confluence area.
ND-10130103-009-S_00	45.3	44.51	With development in the Bismarck area, I updated the flow network in that area, in particular the Apple Creek Hay Creek confluence area.
ND-10130104-011-S_00	272.57	271.65	There was one segment that was labeled as tributaries to Beaver Creek, when in actuality it was the main stem. After renaming, it resulted in a slight decrease to this ID.

River and Stream Assessment Units Where There is an Increase in the Waterbody Size Estimate for 2016

Assessment Unit ID	2014 AU Size (miles)	2016 AU Size (miles)	Comment
ND-09010002-001-S_00	70.83	81.33	Using a photo, DEM, and topo, I redrew nearly the entire segment from Des Lacs Lake downstream to Burlington. Resulted in nearly 11 more miles after the accuracy correction.
ND-09010002-002-S_00	159.12	166.05	Using a photo, DEM, and topo, I redrew nearly all of the tribs from Des Lacs Lake downstream to Burlington. Resulted in nearly 7 more miles after the accuracy correction.
ND-09010003-003-S_00	210.41	211.75	Some of this reach was modified, 6.5 miles south of Bergen ND. It is a flat area and the NHD wasn't correct. Used a photo easily trace which way the water actually flows.
ND-09010003-004-S_00	29.32	85.59	Part of 002 was added to 004 resulting in a much larger sum of miles. Also, significant more detail was drawn in using the 1:24k NHD layer.
ND-09010004-002-S_00	82.26	84.83	More detail was drawn in especially near where it confluences with Willow Creek resulting in just a couple more miles.
ND-09010004-004-S_00	9.69	9.86	Several circular loops were removed and some more detail was drawn in for 09010004-003_01, 004, 005, and 006. Overall net miles were not affected all that much.
ND-09010004-012-S_00	113.36	115.86	There were two loops in the main stem that I removed, and more detail was drawn in with some of the tributaries resulting in a slight increase after all was done.
ND-09010008-010-S_00	57.04	58.38	I drew in very fine detail on the Larsen Coulee watershed that runs through south Minot. It didn't result in a large change in miles, but graphically it was very incorrect.
ND-09020101-003-S_00	76.58	81.73	More accuracy and resolution was drawn in that didn't exist in the original layer, in the upper reaches of this watershed.
ND-09020105-005-S_00	40.72	44.48	In the ADB description, it said from headwaters. I included a couple more segments which made it more accurate to the description by going upstream more. Increase of a few miles, and decrease for 007.
ND-09020105-011-S_00	44.11	64.11	An entire tributary feeding the Wild Rice River was not included in our reach indexed layer. The tributary added runs just to the north of Hankinson ND on the north side of the city lagoons.
ND-09020105-022-S_00	5.66	6.17	I corrected some incorrect loops and direction/accuracy in this portion of the wild rice river.
ND-09020107-009-S_00	5.85	35.64	An entire 12 digit HUC (090201070402) did not have any stream network in our reach indexed layer. I used a 24k topo and photo to draw in most of the stream network. Resulted in 30 more miles of stream.
ND-09020109-016-S_00	72.92	104.98	There were numerous segments from the original NHD layer that were not reach indexed in the Hope ND area. I added them in and it resulted in 30.35 extra miles for this waterbody id. I also drew in more detail and accuracy in some areas.
ND-09020109-029-S_00	124.61	126.16	There was one disconnected segment, and in that same area some channels that look like they have changed so I rerouted them and connected the broken segment.
ND-09020204-007-S_00	41.4	42.38	I used 1:24k topo, and photo to draw in some details to give it a more accurate resolution.
ND-09020204-029-S_00	22.18	24.32	There was a stretch of this watershed in which it was incorrect. It was flowing uphill and it was missing a main connection to the main stem. I fixed using DEM and photo.
ND-09020205-018-S_00	155.28	160.3	There was a small branched segment that was not in the reach indexed file just to the west of Oriska ND. I added it because it is part of the original 1:100k NHD file. Also an area along the Cass and Barnes County line was wrong and I re-routed correctly.

ND-09020205-020-S_00	32.83	33.45	I fixed a broken segment, and while I was fixing that area I drew in more detail and accuracy on that tributary near Buffalo ND.
ND-09020301-004-S_00	27.57	38.57	I used the 1:24k topo, 2014 photo, and DEM and added a few tributaries that were obvious. The 1:100k level did not contain the 11 added miles of tributaries.
ND-09020301-006-S_00	14.08	18.29	I used the 1:24k topo, 2014 photo, and DEM and extended the upper headwaters of this stretch of English Coulee. The 1:100k level did not contain the roughly 4 added miles of headwaters.
ND-09020310-046-S_00	55.44	55.51	I used the 2014 photo and corrected the stream network just to the NW of Crystal ND.
ND-09020316-007-S_00	107.63	108.91	Minor corrections were made to this unit. Resulting in a little over a mile more of stream.
ND-09020316-039-S_00	10.92	13.84	The headwaters of 09020310-023 and 09020316-039 were altered based off of a current photo, and DEM. Resulted in changes to 023, 024, and 039.
ND-10060006-003-S_00	7.62	16.71	Nearly this entire watershed was not reach indexed. I used a topo and photo to draw in the many tributaries that this watershed consists of. Netted a large increase.
ND-10100004-013-S_00	31.89	43.16	Nearly this entire watershed was not reach indexed. I used a topo and photo to draw in the many tributaries that this watershed consists of. Netted a large increase.
ND-10100004-022-S_00	9.85	40.68	This whole watershed was very sparsely drawn in, so I used the 1:24k topo and drew it in with greater detail just across the MT border so all segments connect to the main stem.
ND-10100004-023-S_00	89.3	91.3	More detail of this watershed was drawn in down to where it confluences with Poison Creek.
ND-10100004-024-S_00	29.83	30.69	After more detail was drawn in for Smith Creek, I was able to connect Poison Creek to its confluence with Smith Creek.
ND-10100004-025-S_00	25.24	52.85	The RI layer only had a very small segment representing this watershed. I used the 1:24 Topo and drew in the actual watershed which resulted in doubling the miles.
ND-10100004-027-S_00	1.43	17.51	Only 1 little segment existed in the RI layer. I drew in much more detail were the watershed meanders in and out of the ND MT border.
ND-10110101-003-S_00	814.38	825.45	I went around the entire Lake Sakakawea and corrected where 003 reaches the Lake based and pool elevations in the 2014 photo. The segment from 003 to the centerline of the lake was then named ND-10110101-021-L_00.
ND-10110101-006-S_00	94.93	97.1	The stream segment coming out of Tioga Reservoir was not connected to anything. Used a photo to connect it up with 006 (tribs to Paulsen Creek).
ND-10110201-015-S_00	52.91	59.63	There was a small area along the ND MT border in which it weaves in and out of the state and I connected segments so it wasn't a broken apart stream system.
ND-10110203-020-S_00	55.36	64.97	One segment was corrected, and a few others were drawn in more precisely along the MT border where they weaved in an out.
ND-10110203-063-S_00	32.19	32.52	There was a segment of the main branch that was actually drawn in and connected to 064, or the trib to the main branch. Using a photo I drew it in correctly connecting it to the main stem.
ND-10110203-064-S_00	72.45	73.29	There was a segment of the main branch that was actually drawn in and connected to 064, or the trib to the main branch. Using a photo I drew it in correctly connecting it to the main stem.
ND-10110204-001-S_00	35.86	37.77	More detail was drawn in near the area where Beaver confluences with Dry Creek along the MT border.
ND-10130101-001-S_00	32.14	33.82	More detail was drawn in near where it empties into Painted Woods Lake/Missouri River area.
ND-10130101-018-S_00	10.45	19.68	Coal Lake was not represented in the Lakes GIS layer, so I drew in Coal Lake, and then connected this tributary system using DEM's and photos drawing in more detail. Resulted in roughly 9 more miles.

ND-10130101-024-S_00	138.49	146.42	A small correction was made utilizing the HUC boundary layer. It was wrongly crossing the HUC boundary 1001 from 1003, and I redrew the segment that empties into the Missouri. Also, a correction to 023 being changed to 024 caused an increase in miles.
ND-10130102-001-S_00	186.18	193.21	There was something goofy looking, or like it was missing something, just to the west of Moffit, ND, so I used the 1:24 topo and a 2014 photo and drew in quite a bit of detail resulting in more stream miles.
ND-10130102-002-L_00	53	64.7	The lake name spelling was corrected using the topo map. There should not have been the "I" in name. Corrected to Neuwsma instead of Nieuwsma. Also, size was adjusted.
ND-10130102-009-S_00	104.14	121.98	There were numerous segments from the original NHD layer that were not reach indexed in the Hazelton ND area. I added them in and it resulted in 17.84 extra miles for this waterbody id.
ND-10130102-027-S_00	151.32	154.31	This ID comprised the remaining segments after fixing/adding 028,036,037, and 029. Netted only a 3 miles increase in the original value.
ND-10130102-028-S_00	17.98	67.8	Numerous stream segments from the original NHD layer were not included in this watershed. I added them, and then connected them to what was originally indexed. Nearly a 50 mile increase.
ND-10130102-029-S_00	14.9	69.27	Nearly the entire watershed for Rice Lake was not reach indexed, most likely because there were numerous broken segments with sloughs in between. I connected and resulted in 54.37 mile increase.
ND-10130103-002-S_00	210.11	222.53	There were numerous segments from the original NHD layer that were not reach indexed in the Hazelton ND area. I added them in and it resulted in 12.42 extra miles for this waterbody id.
ND-10130103-006-S_00	54.08	64.47	A small sub portion of the watershed was added using the original 1:100K NHD layer that was not previously included in what was reach indexed, most likely because there was a disconnected segment.
ND-10130103-008-S_00	25.13	27.07	With development in the Bismarck area, I updated the flow network in that area, in particular the Apple Creek Hay Creek confluence area.
ND-10130103-013-S_00	154.67	163.9	A very long segment was not in the reach indexed layer so I used a topo, DEM, and photo to draw it in.
ND-10130104-004-S_00	113.1	124.58	There were streams that were in the 1:100 k NHD layer that were not associated with our reach indexed layer. I connected the disconnected segment and summed up the new mileage.
ND-10130104-007-S_00	38.56	38.78	There were two disconnected tribs to Beaver. I connected them and drew in a little more detail in the immediate area resulting in a slight increase in miles to the main stem.
ND-10130104-009-S_00	141.11	142.33	There were two disconnected tribs to Beaver. I connected them and drew in a little more detail in the immediate area resulting in a slight increase in miles to the tribs.
ND-10130104-010-S_00	39.86	39.98	There were a couple of loops in the main stem that I removed, and there was one short segment that was labeled as -011, tribs to, so net result was a very slight increase.
ND-10130104-012-S_00	161.69	162.93	I never really made any changes to this waterbody ID, It was just slightly off of the actual calculated, so I updated the ADB to the correct value.
ND-10130201-019-S_00	84.63	88.19	An obviously flowing tributary was not reach indexed. Used photo to draw it in.
ND-10130201-030-S_00	45.61	47.97	An obviously flowing tributary was not reach indexed. Used photo to draw it in.
ND-10130205-002-S_00	137.02	149.68	There was a cluster of stream segements not included in our Reach Indexed layer, located roughly 20 mi SW of Porcupine ND. There is a small area where it flattens out and there is no clear definition of where the water flows, so that is probably why it

ND-10130205-009-S_00	17.16	53.98	The description says Hay Creek downstream to Cedar Creek. So, I connected numerous broken segments of the main stem that weaved in and out of the NDSD border. Resulted in significant increase.
ND-10130205-010-S_00	55.56	66.34	Due to 009, the mainstem of Hay Creek getting reworked, resulted in many of the tribs being connected to the mainstem along the NDSD border. Resulted in more miles.
ND-10160003-013-S_00	40.32	83.21	***This is a major difference/increase. There were literally miles and miles of interconnected lakes and streams that were not drawn in on the reach indexed layer. After connecting and drawing them in, it nearly doubled the miles. During this wet cycle

Appendix B

North Dakota Total Maximum Daily Load Prioritization Strategy

North Dakota Total Maximum Daily Load Prioritization Strategy

Final
January 2017

North Dakota Department of Health
Division of Water Quality
Surface Water Quality 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 Health, 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 alternative 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.

“Alternatives” By 2018, States use alternative 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 alternative 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 alternative approaches in the next two years (near term); and
- A list of priority waters scheduled for likely TMDL development or alternative 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 Alternative 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. Alternative 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 Alternative Plans as a practical alternative to TMDLs for many waterbody impairments. Since implementation is a requirement of Alternative 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 alternative 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 alternative 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 indentified 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 alternative 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.

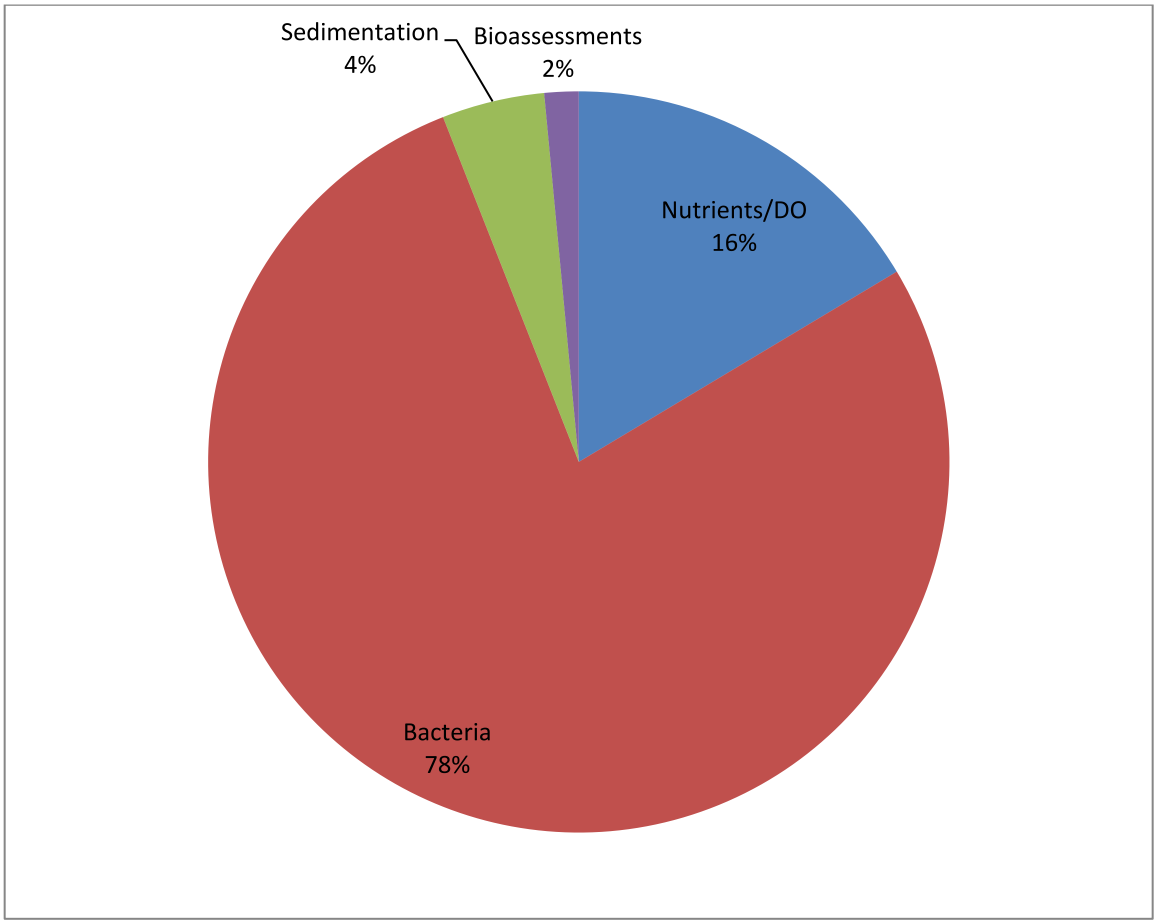

Figure 1. Phase 1 Long Term (2016-2022) TMDL and Alternative Plan Development Priorities (n=67).

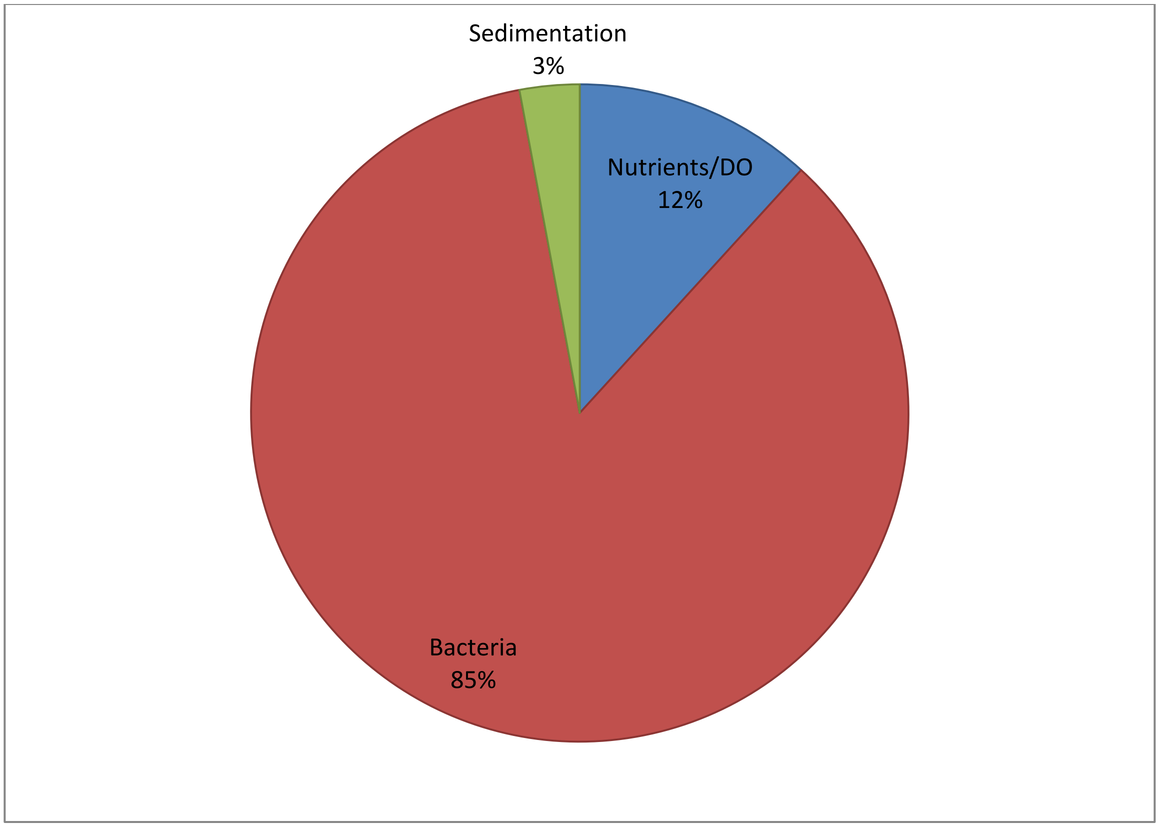

Figure 2. Phase 1 Near Term (2017-2018) TMDL and Alternative Plan Development Priorities (n=34).

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 Alternative 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 alternative 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.

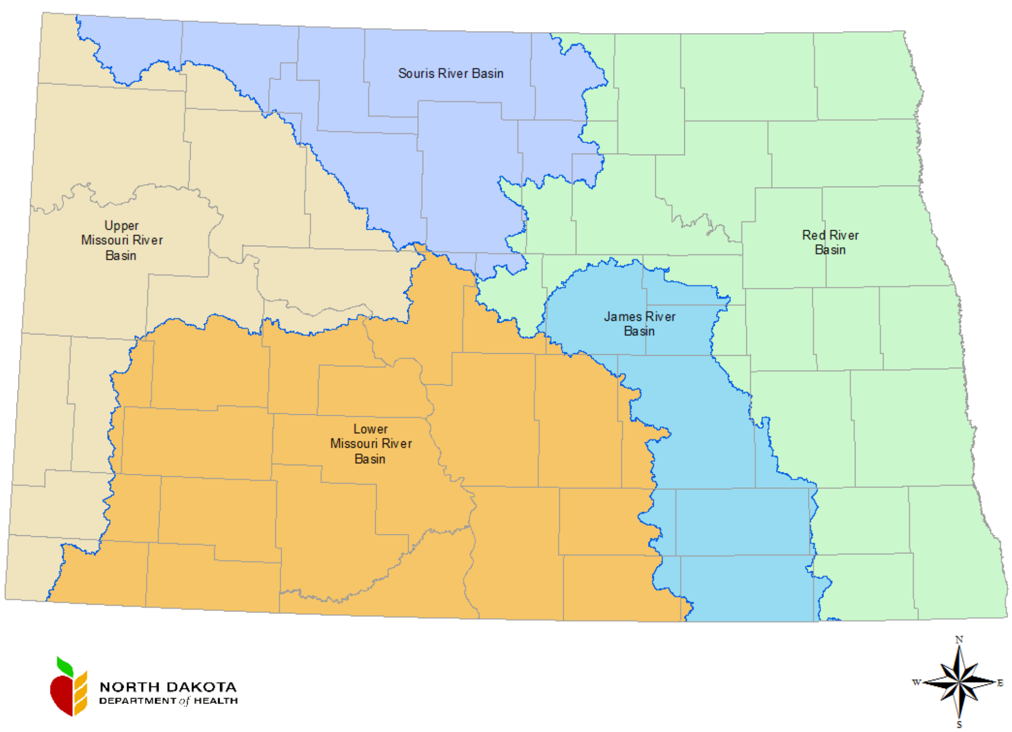

Figure 3. Major River Basins in North Dakota.

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 alternative 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.

Appendix A
North Dakota Basin Water Quality Management Framework

North Dakota Basin Water Quality Management Framework
2015-2027

Final
October 2015

North Dakota Department of Health
Division of Water Quality
Surface Water Quality Management Program

Introduction

The North Dakota Department of Health, Division of Water Quality's Surface Water Quality Management Program (SWQMP) 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 SWQMP 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 SWQMP 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 SWQMP 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 Health's Strategic Plan (2011-2015), the mission of the North Dakota Department of Health (NDDoH) 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 NDDoH is committed "to preserving and improving the quality of the environment," including the state's water resources.

To accomplish the NDDoH's mission, the SWQMP 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 SWQMP will begin implementation of the Basin Framework with the Red River Basin. The SWQMP 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 SWQMP as the Basin Framework is further developed and implemented.

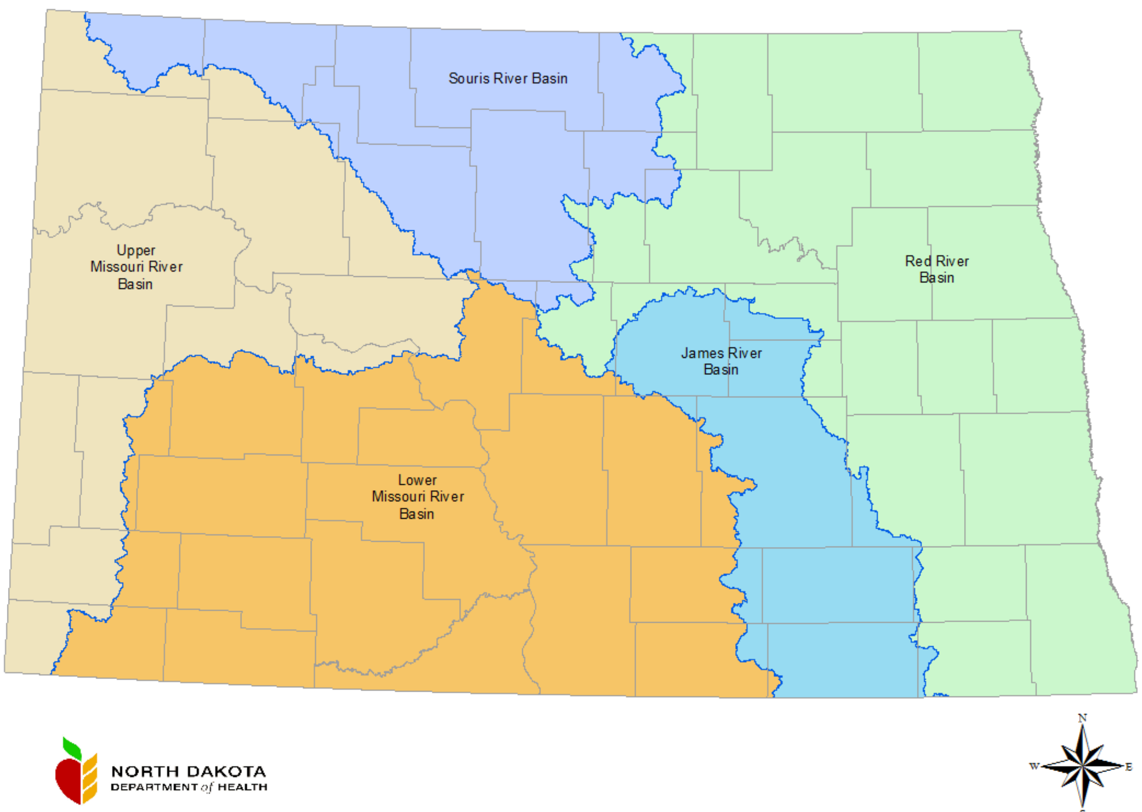

Figure 1. Major River Basins in North Dakota.

Roles and Responsibilities

The SWQMP is committed to providing the necessary assistance to develop a locally led process for basin water quality management. SWQMP staff will assist newly formed BSAGs through each step of the basin water quality management planning process. Initially, SWQMP 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 SWQMP, 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 NDDoH, 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 SWQMP 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. SWQMP 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, SWQMP 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 SWQMP, 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 SWQMP 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 SWQMP, 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.

Appendix A
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 NDDoH 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, NDDoH, local residents and project partners.

Appendix C

Water Quality Assessment Methodology for North Dakota's Surface Waters

Water Quality Assessment Methodology for North Dakota's Surface Waters

North Dakota Department of Health
Division of Water Quality

Revised
December 2015

Water Quality Assessment Methodology for North Dakota's Surface Waters

Jack Dalrymple, Governor
Terry Dwelle, M.D., State Health Officer

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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 Health (NDDoH) 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

Based on the state's Assessment Database, the 146 reservoirs have an aerial surface of 476,730 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 65,232 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 or 43 percent attributed to Devils Lake. The remaining 148 lakes average 925 acres, with approximately 41 percent being smaller than 250 acres.

There are 56,384 miles of rivers and streams in the state. Estimates of river stream miles in the state are based on river and stream waterbodies in the ADB that are reach indexed to the 1:100K 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 2.5 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 NDDoH'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 and 2016 IR guidance memos (http://www.epa.gov/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 Database (ADB).

Table 1. Assessment Categories for the Integrated Report

Assessment Category	Assessment Category Description
Category 1	All of 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 of time; 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. • 5A – 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 more narrow 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 more narrow 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* (Appendix A). 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 supply for drinking and culinary purposes after treatment to a level approved by the NDDoH.

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 (Appendix A). 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 (ADB) 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 NDDoH 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 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 NDDoH have addressed some of the many toxicological, water chemistry, and practical realities the 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 its 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 (Appendix A). 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. ASSESSMENT DATABASE

North Dakota's Assessment Database (ADB) for the 2016 Integrated Reporting cycle contains 1,790 discreet assessment units (AUs) representing 56,384 miles of rivers and streams and 295 lakes and reservoirs. Within the ADB, 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 use is then assessed using available chemical, physical and/or biological data.

With an estimated 56,384 miles of rivers and streams and 715,967 acres of lakes and reservoirs, it is impractical to adequately assess each and every mile of stream or every acre of lake. However, the NDDoH 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 NDDoH has adopted the ADB to manage water quality assessment information for the state's rivers, streams, lakes, and reservoirs.

Developed by EPA, the ADB is an Access® based "accounting"/database management system that provides a standard format for water quality assessment information. It includes a software program for adding and editing assessment data and transferring assessment data between the personal computer and EPA. Assessment data, as compared to raw monitoring data, describes the overall health or condition of the waterbody by describing beneficial use impairment and, for those waterbodies where beneficial uses are impaired or threatened, the causes and sources of pollution affecting the beneficial use. The ADB also allows the user to track and report on TMDL-listed waters, including their development and approval status and de-listing rationale.

To create North Dakota's ADB, the state's 56,384 miles of rivers and streams and 295 lakes and reservoirs have been delineated into 1,790 discreet AUs. An AU can be an individual lake or reservoir, a specific river or stream reach or a collection of stream reaches in a sub-watershed. North Dakota's ADB for the 2016 Integrated Reporting cycle is currently represented by 1,494 river and stream AUs and 296 lake and reservoir AUs (Note, Lake Sakakawea is represented by two assessment units in the ADB, one for the main reservoirs and one for the Little Missouri Bay segment of the reservoir.). Each of these AUs is then assessed individually, based on the availability of sufficient and credible data. In order to delineate and define AUs used in the ADB, the NDDoH 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 the ADB.

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, are not included in the ADB. 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)

The ADB 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 the ADB to the NHD file through "reach indexing" and geographic information systems (GIS). In order to facilitate the GIS data link, the NDDoH has "reach-indexed" each AU in the ADB 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 the ADB. 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 into the ADB also form the basis for the state's Section 319 Nonpoint Source (NPS) Assessment Report and Management Plan. Because of the way the NDDoH's Surface Water Quality 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.

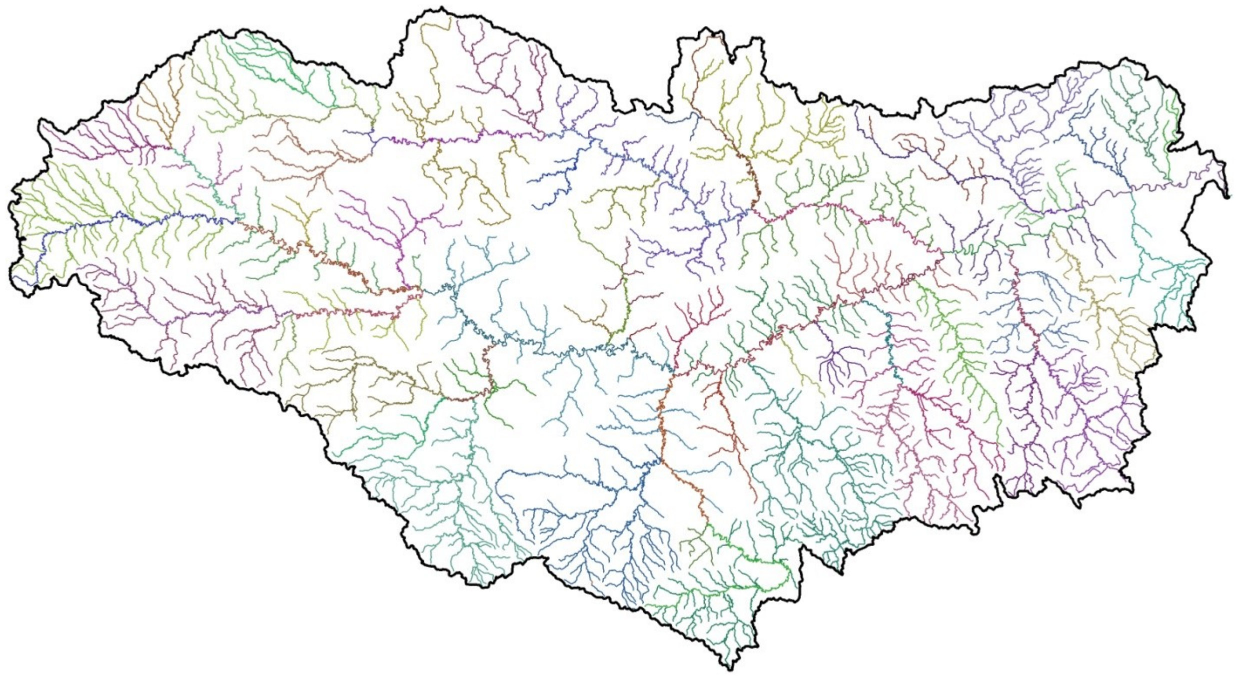

Figure 1. Map of Reach-Indexed Assessment Units Delineated in the Knife River Sub-basin (10130201).

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 NDDoH 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.
- 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 are 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 collected

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 2009, two samples collected in May 2010 and one sample collected in May 2014).

- 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 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.

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 the ADB 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 NDDoH during the last 10 years (i.e., 2005-2014), EPA National River and Stream Assessment data collected in 2008 and 2009, and Red River mainstem biological assessment data collected in 2010.

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 NDDoH 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 NDDoH 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* (Appendix A) 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 NDDoH 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 (Appendix A) describe a narrative biological goal that "the biological condition of surface waters shall be similar to that of sites or waterbodies determined by the NDDoH 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 NDDoH 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 NDDoH 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 will be 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 through the use of 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 NDDoH has developed final multi-metric IBIs for fish in the Lake Agassiz Plain ecoregion and macroinveretebrates 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).

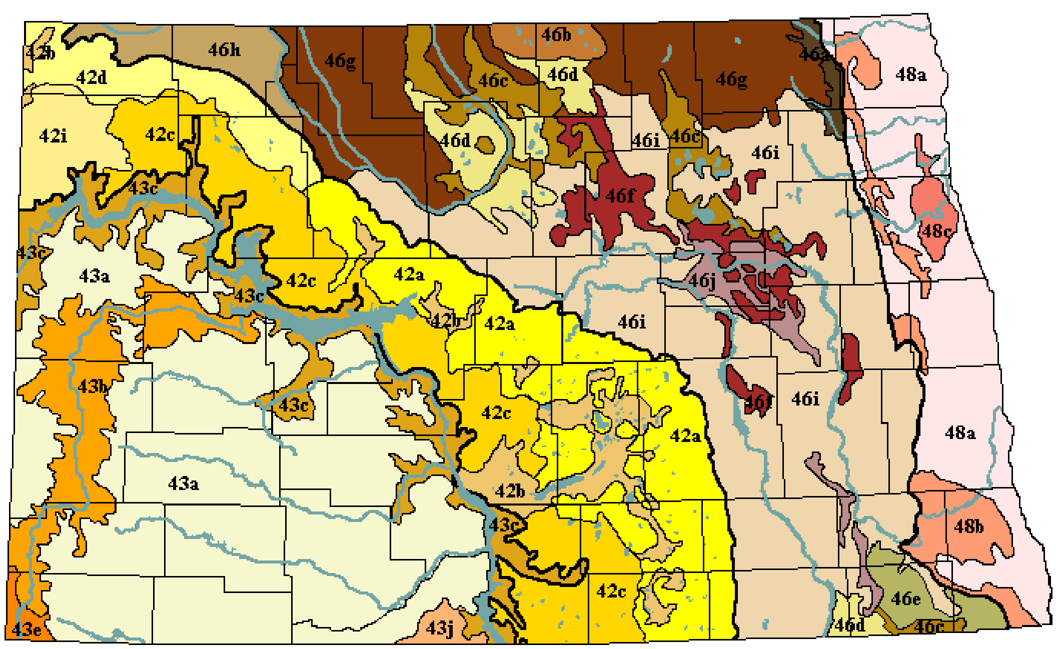

Figure 2. Map Depicting Ecoregions in North Dakota (Lake Agassiz Plain [48], Northern Glaciated Plain [46], Northwestern Glaciated Plain [42], Northwestern Great Plain [43]).

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 what 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 which are used to distinguish sites that are in relatively 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 5A (Table 1), but with the condition that it will be targeted for further stressor identification monitoring and assessment. Only after a stressor identification assessment is completed will the AU be targeted for TMDL development.

Other Biological Assessment Data

The NDDoH 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 NDDoH 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 (Appendix A).

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 CFUs 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 CFUs 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 in the state based on trophic response indicators. 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

The state's narrative water quality standards (Appendix A) 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 Department 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, bluegreen 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 µg L^{-1}.

- Trophic status based on chlorophyll-a (TSIC):
  TSIC = 9.81 ln (TC) + 30.60
  Where TC = Chlorophyll-a concentrations in µg 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.

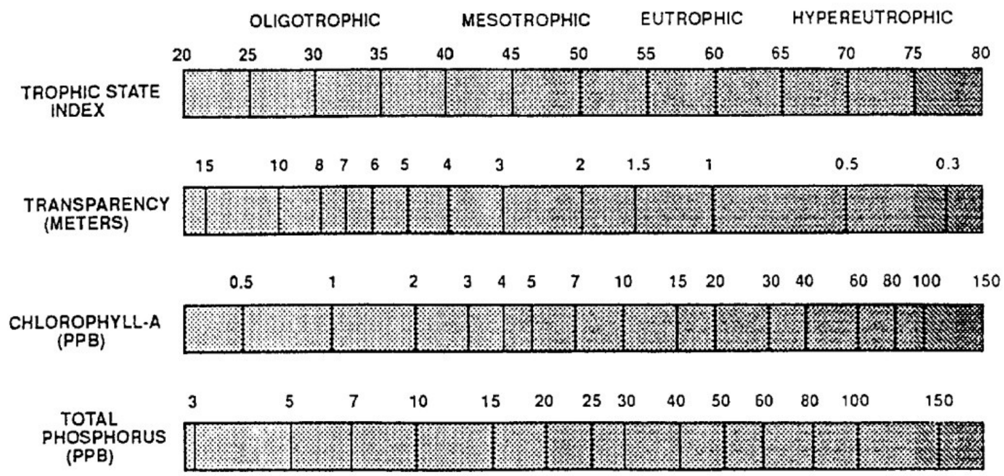

Figure 3. A Graphic Representation of Carlson's TSI.

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 NDDoH” (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 (Appendix A), 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 Appendix A). 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 Appendix A). 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 states 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.

The 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 in this mean and variance the test statistic is calculated as:

$$t_c = (z-c) / s$$

$$t_c = (0.35-0.3)/0.09396$$

$$t_c = 0.532$$

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 states 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 on 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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Appendix A

Standards of Quality for Waters of the State

CHAPTER 33-16-02.1
STANDARDS OF QUALITY FOR WATERS OF THE STATE

33-16-02.1-01. Authority. These rules are promulgated pursuant to North Dakota Century Code chapters 61-28 and 23-33; specifically, sections 61-28-04 and 23-33-05, respectively.

History: Effective June 1, 2001.
General Authority: NDCC 61-28-04
Law Implemented: NDCC 23-33, 61-28

33-16-02.1-02. 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 June 1, 2001; amended effective April 1, 2014.
General Authority: NDCC 61-28-04, 61-28-05
Law Implemented: NDCC 23-33, 61-28-04

33-16-02.1-03. 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 June 1, 2001.
General Authority: NDCC 61-28-04
Law Implemented: NDCC 23-33, 61-28

33-16-02.1-04. 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, but are not limited to, 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 North Dakota state department of health.

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. "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.

8. "Site-specific standards" mean water quality criteria developed to reflect local environmental conditions to protect the uses of a specific water body.

9. 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.

10. "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 June 1, 2001; amended effective October 1, 2006; April 1, 2014.
General Authority: NDCC 61-28-04, 61-28-05
Law Implemented: NDCC 23-33, 61-28

33-16-02.1-05. Variances. 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 public participation requirements and environmental protection agency approval. A variance will not preclude an existing use.

History: Effective June 1, 2001.
General Authority: NDCC 61-28-04, 61-28-05
Law Implemented: NDCC 23-33, 61-28

33-16-02.1-06. 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 June 1, 2001.
General Authority: NDCC 61-28-04
Law Implemented: NDCC 23-33, 61-28

33-16-02.1-07. 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 June 1, 2001.
General Authority: NDCC 61-28-04
Law Implemented: NDCC 23-33, 61-28

33-16-02.1-08. 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.

   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 exceedences 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 June 1, 2001.
General Authority: NDCC 61-28-04
Law Implemented: NDCC 23-33, 61-28

33-16-02.1-09. 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 33-16-02.1-08.

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. Unless stated otherwise, maximum limits 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, with the following exceptions:

Substance or Characteristic	Maximum Limit
Chlorides (total)	175 mg/l (30-day arithmetic average)
Sodium	60% of total cations as mEq/l
Sulfate (total)	450 mg/l (30-day arithmetic average)

Site-Specific Sulfate (total) Standard

The following site-specific standard applies to the Sheyenne River from its headwaters to one-tenth mile downstream from Baldhill Dam.

Sulfate (total)	750 mg/l

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.

c. Class II streams. The physical and chemical criteria shall be those for class IA, with the following exceptions:

Substance or Characteristic	Maximum Limit
Chlorides (total)	250 mg/l (30-day arithmetic average)
pH	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)

d. Class III streams. The physical and chemical criteria shall be those for class II, with the following exceptions:

Substance or Characteristic	Maximum Limit
Sulfate (total)	750 mg/l (30-day arithmetic average)

e. Lakes and reservoirs.

(1) The beneficial uses and parameter limitations designated for class I streams shall apply to all classified lakes or reservoirs. However, specific background studies and information may require that the department revise a standard for any specific parameter.

(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 20.0 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) Lake Sakakawea must maintain a minimum volume of water of five hundred thousand-acre feet [61674-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 June 1, 2001; amended effective October 1, 2006; July 1, 2010; April 1, 2014.
General Authority: NDCC 61-28-04
Law Implemented: NDCC 23-33, 61-28

TABLE 1

MAXIMUM LIMITS FOR SUBSTANCES IN
OR CHARACTERISTICS OF CLASS I STREAMS

CAS[1] No.	Substance or Characteristic	Maximum Limit
		Acute Standard
7429905	Aluminum	750 ug/l
		Chronic Standard
		87 ug/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 ug/l chronic total recoverable aluminum criterion will not apply, and aluminum will be regulated based on compliance with the 750 ug/l acute total recoverable aluminum criterion.
		Acute Standard
7446-41-7	Ammonia (Total as N)	The one-hour average concentration of total ammonia (expressed as N in mg/l) does not exceed, more often than once every three years on the average, the numerical value given by the following formula: $\frac{0.411}{1 + 10^{7.204-pH}} + \frac{58.4}{1+10^{pH-7.204}}$, where salmonids are absent; or $\frac{0.275}{1 + 10^{7.204-pH}} + \frac{39.0}{1 + 10^{pH-7.204}}$, where salmonids are present.
		Chronic Standard
		The 30-day average concentration of total ammonia (expressed as N in mg/l) does not exceed, more often than once every three years on the average, the numerical value given by the following formula; and the highest 4-day average concentration of total ammonia within the 30-day averaging period does not exceed 2.5 times the numerical value given by the following formula:

CAS[1] No.	Substance or Characteristic	Maximum Limit
		$= \left(\frac{0.0577}{1 + 10^{7.688-pH}} + \frac{2.487}{1 + 10^{pH-7.688}} \right) \bullet$ Criteria Variable (CV); where CV = 2.85, when T ≤ 14° C; or CV = $1.45 \times 10^{0.028 \cdot (25-T)}$, when T > 14° C. **Site-Specific Chronic Standard** The following site-specific standard applies to the Red River of the North beginning at the 12th Avenue North bridge in Fargo, North Dakota, and extending approximately 32 miles downstream to its confluence with the Buffalo River, Minnesota. This site-specific standard applies only during the months of October, November, December, January, and February. During the months of March through September, the statewide chronic ammonia standard applies. The 30-day average concentration of total ammonia (expressed as N in mg/l) does not exceed, more often than once every three years on the average, the numerical value given by the following formula; and the highest 4-day average concentration of total ammonia within the 30-day averaging period does not exceed 2.5 times the numerical value given by the following formula: $= \left(\frac{0.0577}{1 + 10^{7.688-pH}} + \frac{2.487}{1 + 10^{pH-7.688}} \right) \bullet$ CV; where CV = 4.63, when T ≤ 7° C; or CV = $1.45 \times 10^{0.028 \cdot (25-T)}$, when T > 7° C.
7440-39-3	Barium (Total)	1.0 mg/l (one-day arithmetic average)
	Boron (Total)	.75 mg/l (30-day arithmetic average)
16887-00-6	Chlorides (Total)	100 mg/l (30-day arithmetic average)
7782-50-5	Chlorine Residual (Total)	Acute .019 mg/l Chronic .011 mg/l

CAS[1] No.	Substance or Characteristic	Maximum Limit
7782-44-7	Dissolved Oxygen	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)
	E. coli[3]	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.
14797-55-8	Nitrates (N) (Diss.)[2]	1.0 mg/l (up to 10% of samples may exceed)
	pH	7.0-9.0 (up to 10% of representative samples collected during any three-year period may exceed this range, provided that lethal conditions are avoided)
108-95-2	Phenols (Total)	0.3 mg/l (organoleptic criterion) (one-day arithmetic average)
	Sodium	50 percent of total cations as mEq/l
	Sulfates (Total as SO_4)	250 mg/l (30-day arithmetic average)
	Temperature	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.
	Combined radium 226 and radium 228 (Total)	5 pCi/l (30-day arithmetic average)

CAS[1] No.	Substance or Characteristic	Maximum Limit
	Gross alpha particle activity, including radium 226, but excluding radon and uranium	15 pCi/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 an interim guideline limit. Since each stream or lake has unique characteristics which determine the concentration of this constituent that will cause excessive plant growth (eutrophication), the department reserves the right to review this standard after additional study and to set specific limitations on any waters of the state. 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.

TABLE 2

WATER QUALITY CRITERIA[1]
(MICROGRAMS PER LITER)

		Aquatic Life Value Classes I, IA, II, III		Human Health Value	
CAS No.	Pollutant	Acute	Chronic	Classes I, IA, II[2]	Class III[3]
83-32-9	Acenaphthene			670	990
107-02-8	Acrolein	3.0	3.0	6	9
107-13-1	Acrylonitrile[4]			0.051	0.25
71-43-2	Benzene[4]			2.2	51
92-87-5	Benzidine[4]			0.000086	0.00020
63-25-2	Carbaryl (1-naphthyl-N-methycarbamate)	2.1	2.1		
56-23-5	Carbon tetrachloride[4] (Tetrachloromethane)			0.23	1.6
108-90-7	Chlorobenzene (Monochlorobenzene)			100[7]	1,600
2921-88-2	Chlorpyrifos	0.083	0.041		
120-82-1	1,2,4-Trichlorobenzene			35	70
118-74-1	Hexachlorobenzene[4]			0.00028	0.00029
107-06-2	1,2-Dichloroethane[4]			0.38	37
71-55-6	1,1,1-Trichloroethane			200[7]	
67-72-1	Hexachloroethane[4]			1.4	3.3
79-00-5	1,1,2-Trichloroethane[4]			0.59	16
79-34-5	1,1,2,2-Tetrachloroethane[4]			0.17	4.0
111-44-4	Bis(2-chloroethyl) ether[4]			0.030	0.53
91-58-7	2-Chloronaphthalene			1,000	1,600
88-06-2	2,4,6-Trichlorophenol[4]			1.4	2.4
59-50-7	p-Chloro-m-cresol (4-Chloro-3-methylphenol)			3000	
67-66-3	Chloroform (HM)[4] (Trichloromethane)			5.7	470
95-57-8	2-Chlorophenol			81	150
95-50-1	1,2-Dichlorobenzene[7]			420	1,300
541-73-1	1,3-Dichlorobenzene			320	960
106-46-7	1,4-Dichlorobenzene[7]			63	190
91-94-1	3,3'-Dichlorobenzidine[4]			0.021	0.028
75-35-4	1,1-Dichloroethylene[4]			7[7]	7,100
156-60-5	1,2-trans-Dichloroethylene[7]			100[7]	10,000
120-83-2	2,4-Dichlorophenol			77	290
542-75-6	1,3-Dichloropropylene (1,3-Dichloropropene) (cis and trans isomers)			0.34	21
78-87-5	1,2-Dichloropropane			0.50	15
105-67-9	2,4-Dimethylphenol			380	850

		Aquatic Life Value Classes I, IA, II, III		Human Health Value	
CAS No.	Pollutant	Acute	Chronic	Classes I, IA, II[2]	Class III[3]
121-14-2	2,4-Dinitrotoluene[4]			0.11	3.4
122-66-7	1,2-Diphenylhydrazine[4]			0.036	0.20
100-41-4	Ethylbenzene[7]			530	2,100
206-44-0	Fluoranthene			130	140
108-60-1	Bis(2-chloroisopropyl) ether			1400	65,000
75-09-2	Methylene chloride (HM)[4] (Dichloromethane)			4.6	590
74-83-9	Methyl bromide (HM) (Bromomethane)			47	1,500
75-25-2	Bromoform (HM)[5] (Tribromomethane)			4.3	140
75-27-4	Dichlorobromomethane (HM)[5]			0.55	17
124-48-1	Chlorodibromomethane (HM)[5]			0.40	13
87-68-3	Hexachlorobutadiene[4]			0.44	18
77-47-4	Hexachlorocyclopentadiene			40	1,100
78-59-1	Isophorone[4]			35	960
98-95-3	Nitrobenzene			17	690
51-28-5	2,4-Dinitrophenol			69	5,300
534-52-1	4,6-Dinitro-o-cresol (4,6-Dinitro-2-methylphenol)			13	280
62-75-9	N-Nitrosodimethylamine[4]			0.00069	3.0
86-30-6	N-Nitrosodiphenylamine[4]			3.3	6.0
621-64-7	N-Nitrosodi-n-propylamine[4]			0.005	0.51
87-86-5	Pentachlorophenol	19[8]	15[8]	0.27	3.0
108-95-2	Phenol			10,000	860,000
117-81-7	Bis(2-ethylhexyl)phthalate[4]			1.2	2.2
85-68-7	Butyl benzyl phthalate			1,500	1,900
84-74-2	Di-n-butyl phthalate			2,000	4,500
84-66-2	Diethyl phthalate			17,000	44,000
131-11-3	Dimethyl phthalate			270,000	1,100,000
56-55-3	Benzo(a)anthracene (PAH)[4] (1,2-Benzanthracene)			0.0038	0.018
50-32-8	Benzo(a)pyrene (PAH)[4] (3,4-Benzopyrene)			0.0038	0.018
205-99-2	Benzo(b)fluoranthene (PAH)[4] (3,4-Benzofluoranthene)			0.0038	0.018
207-08-9	Benzo(k)fluoranthene (PAH)[4] (11,12-Benzofluoranthene)			0.0038	0.018
218-01-9	Chrysene (PAH)[4]			0.0038	0.018
120-12-7	Anthracene (PAH)[5]			8,300	40,000
86-73-7	Fluorene (PAH)[5]			1,100	5,300
53-70-3	Dibenzo(a,h)anthracene (PAH)[4] (1,2,5,6-Dibenzanthracene)			0.0038	0.018

		Aquatic Life Value Classes I, IA, II, III		Human Health Value	
CAS No.	Pollutant	Acute	Chronic	Classes I, IA, II[2]	Class III[3]
193-39-5	Indeno(1,2,3-cd)pyrene (PAH)[4]			0.0038	0.018
129-00-0	Pyrene (PAH)[5]			830	4,000
127-18-4	Tetrachloroethylene[4]			0.69	3.3
108-88-3	Toluene			1,000[7]	15,000
79-01-6	Trichloroethylene[4]			2.5	30
75-01-4	Vinyl chloride[4] (Cloroethylene)			0.025	2.4
309-00-2	Aldrin[4]	1.5		0.000049	0.000050
60-57-1	Dieldrin[4]	0.24	0.056	0.000052	0.000054
57-74-9	Chlordane[4]	1.2	0.0043	0.00080	0.00081
50-29-3	4,4'-DDT[4]	0.55[12]	0.001[12]	0.00022	0.00022
75-55-9	4,4'-DDE[4]			0.00022	0.00022
72-54-8	4,4'-DDD[4]			0.00031	0.00031
959-98-8	alpha-Endosulfan	0.11[11]	0.056[11]	62	89
33213-65-9	beta-Endosulfan	0.11[11]	0.056[11]	62	89
1031-07-8	Endosulfan sulfate			62	89
72-20-8	Endrin	0.09	0.036	0.059	0.060
7421-93-4	Endrin aldehyde			0.29	0.30
76-44-8	Heptachlor[4]	0.26	0.0038	0.000079	0.000079
1024-57-3	Heptachlor epoxide[4]	0.26	0.0038	0.000039	0.000039
319-84-6	alpha-BHC[4] (Hexachlorocyclohexane-alpha)			0.0026	0.0049
319-85-7	beta-BHC[4] (Hexachlorocyclohexane-beta)			0.0091	0.017
58-89-9	gamma-BHC (Lindane)[4] (Hexachlorocyclohexane-gamma)	0.95		0.2[7]	1.8
319-86-8	delta-BHC[4] (Hexachlorocyclohexane-delta)				
53469-21-9	PCB 1242 (Arochlor 1242)[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]
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]
11096-82-5	PCB-1260 (Arochlor 1260)[4]		0.014[10]	0.000064[10]	0.000064[10]
12674-11-2	PCB-1016 (Arochlor 1016)[4]		0.014[10]	0.000064[10]	0.000064[10]
8001-35-2	Toxaphene[4]	0.73	0.0002	0.00028	0.00028
7440-36-0	Antimony			5.6	640
7440-38-2	Arsenic[7]	340[9]	150[9]	10[7]	
1332-21-4	Asbestos[4 7]			7,000,000 f/l	7000000 f/l
7440-41-7	Beryllium[4]			4[7]	
7440-43-9	Cadmium	2.1[6,15]	0.27[6,15]	5[7]	

		Aquatic Life Value Classes I, IA, II, III		Human Health Value	
CAS No.	Pollutant	Acute	Chronic	Classes I, IA, II[2]	Class III[3]
16065-83-1	Chromium (III)	1800[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]	9.3[6,15]	1000	
57-12-5	Cyanide (total)	22	5.2	140	140
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
7440-66-6	Zinc	120[6,15]	120[6,15]	7,400	26,000
688-73-3	Tributyltin	0.46	0.072		
1746-01-6	Dioxin (2,3,7,8-TCDD)[4]			5.0E-9	5.1E-9
15972-60-8	Alachlor			2[7]	
1912-24-9	Atrazine			3[7]	
56-38-2	Parathion	0.065	0.013		
1563-66-2	Carbofuran			40[7]	
94-75-7	2,4-D			70[7]	
75-99-0	Dalapon			200[7]	
103-23-1	Di(2-ethylhexyl)adipate			400[7]	
333-41-5	Diazinon	0.17	0.17		
84852-15-3	Nonylphenol (Isomer mixture)[13]	28	6.6		
67708-83-2	Dibromochloropropane			0.2[7]	
156-59-2	Dichloroethylene (cis-1,2-)			70[7]	
88-85-7	Dinoseb			7[7]	
85-00-7	Diquat			20[7]	
145-73-3	Endothall			100[7]	
106-93-4	Ethylene dibromide (EDB)			0.05[7]	
1071-83-6	Glyphosate			700[7]	
72-43-5	Methoxychlor			40[7]	
23135-22-0	Oxamyl (Vydate)			200[7]	
1918-02-1	Picloram			500[7]	
122-34-9	Simazine			4[7]	
100-42-5	Styrene			100[7]	
1330-20-7	Xylenes			10,000[7]	
7782-41-4	Fluoride			4,000[7]	
14797-65-0	Nitrite			1,000[7]	
12587-47-2	Beta/photon emitters			4 mrem/yr[7]	
7440-61-1	Uranium			30[7]	

		Aquatic Life Value Classes I, IA, II, III		Human Health Value	
CAS No.	Pollutant	Acute	Chronic	Classes I, IA, II[2]	Class III[3]
15541-45-4	Bromate			10[7]	
14998-27-7	Chlorite			1,000[7]	
	Halocetic acids[14]			60[7]	

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 $CaCO_3$ hardness of 100 mg/l. Criteria for each case must be calculated using the following formula:

For the Criterion Maximum Concentration (CMC):

Cadmium	$CMC = e^{(1.0166[\ln (hardness)] - 3.9240)}$
Chromum (III)	$CMC = e^{(0.8190[\ln (hardness)] +3.7256)}$
Copper	$CMC = e^{(0.9422[\ln (hardness)] - 1.7000)}$
Lead	$CMC = e^{(1.2730[\ln (hardness)] - 1.4600)}$
Nickel	$CMC = e^{(0.8460[\ln (hardness)] +2.2550)}$
Silver	$CMC = e^{(1.7200[\ln (hardness)] - 6.5900)}$
Zinc	$CMC = e^{(0.8473[\ln (hardness)] +0.8840)}$

CMC = Criterion Continuous 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	$CMC = e^{(0.7409[\ln (hardness)] - 4.7190)}$
Chromium (III)	$CMC = e^{(0.8190[\ln (hardness)] +0.6848)}$
Copper	$CMC = e^{(0.8545[\ln (hardness)] - 1.7020)}$
Lead	$CMC = e^{(1.2730[\ln (hardness)] - 4.7050)}$
Nickel	$CMC = e^{(0.8460[\ln (hardness)] +0.0584)}$
Silver	No CCC criterion for silver
Zinc	$CMC = e^{(0.8473[\ln (hardness)] +0.8840)}$

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.

33-16-02.1-10. Ground water classifications and standards.

1. Class I ground waters. Class I ground waters shall have a total dissolved solids concentration of less than 10,000 mg/l. Class I ground waters are not exempt under the North Dakota underground injection control program in section 33-25-01-05.

2. Class II ground waters. Class II ground waters shall have 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 33-25-01-05.

History: Effective June 1, 2001; amended effective April 1, 2014.
General Authority: NDCC 61-28-04, 61-28-05
Law Implemented: NDCC 61-28-04

33-16-02.1-11. 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 (701-328-5210) or the North Dakota hazardous materials emergency assistance and spill reporting number (1-800-472-2121) and provide all relevant information about the spill. Depending on the severity of the spill or accidental discharge, the department may require the owner or operator to:

   a. Take immediate remedial measures;

   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; or

   d. Any other actions necessary to comply with this chapter.

History: Effective June 1, 2001; amended effective October 1, 2006; July 1, 2010.
General Authority: NDCC 61-28-04
Law Implemented: NDCC 23-33, 61-28

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. There are a number of minor or intermittently flowing watercourses, unnamed creeks, or draws, etc., which are not listed. All tributaries not specifically mentioned are classified as Class III streams.

RIVER BASINS, SUBBASINS, AND 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

RIVER BASINS, SUBBASINS, AND TRIBUTARIES	CLASSIFICATION
Des Lacs River	II
Willow Creek	II
Deep River	III
Mauvais Coulee	I
James River	IA
Pipestem	IA
Cottonwood Creek	II
Beaver Creek	II
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	III
Park River	II
North Branch	III

RIVER BASINS, SUBBASINS, AND TRIBUTARIES	CLASSIFICATION
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 beneficial water uses and parameter limitations designated for Class I streams shall apply to all classified lakes and reservoirs. For lakes not listed, the following default classification applies: Class 4.

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

COUNTY	LAKE	CLASSIFICATION
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

COUNTY	LAKE	CLASSIFICATION
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
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

COUNTY	LAKE	CLASSIFICATION
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

COUNTY	LAKE	CLASSIFICATION
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

COUNTY	LAKE	CLASSIFICATION
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

COUNTY	LAKE	CLASSIFICATION
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

COUNTY	LAKE	CLASSIFICATION
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

COUNTY	LAKE	CLASSIFICATION
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

COUNTY	LAKE	CLASSIFICATION
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

COUNTY	LAKE	CLASSIFICATION
Williams	McCleod (Ray) Reservoir	3
Williams	McGregor Dam	1
Williams	Tioga Dam	3
Williams	Trenton Lake	2
Williams	West Spring Lake Pond	3
	Lake Oahe	1
	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 10 times the stream width at critical low flows, whichever is more limiting. Also, at a maximum, mixing zones in lakes shall not exceed 5 percent of lake surface area or 200 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 exceedences 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 NDPDES 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 (non-carcinogens)	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 EPA. 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 (POTWs) 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 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.

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 POTWs

Minor POTWs that discharge to a lake or to a river/stream at a dilution greater than 50:1 qualify for this procedure. Minor POTWs with dilution ratios less than 50:1 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 POTW discharge divided by the mean daily flow of the POTW. 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 POTWs 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 19:1 (5 percent effluent) may be provided.

For minor POTWs 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 EPA Region VIII. Near instantaneous and complete mixing is defined as no more than a 10 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 (non-carcinogens)	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 EPA. 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 10 percent of the volume of the chronic mixing zone.
Rivers and Streams:	The ZID shall not exceed 10 percent of the chronic mixing zone volume or flow, nor shall the ZID exceed a maximum downstream length of 100 feet, whichever is 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 10 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 4:1 ratio (20 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.

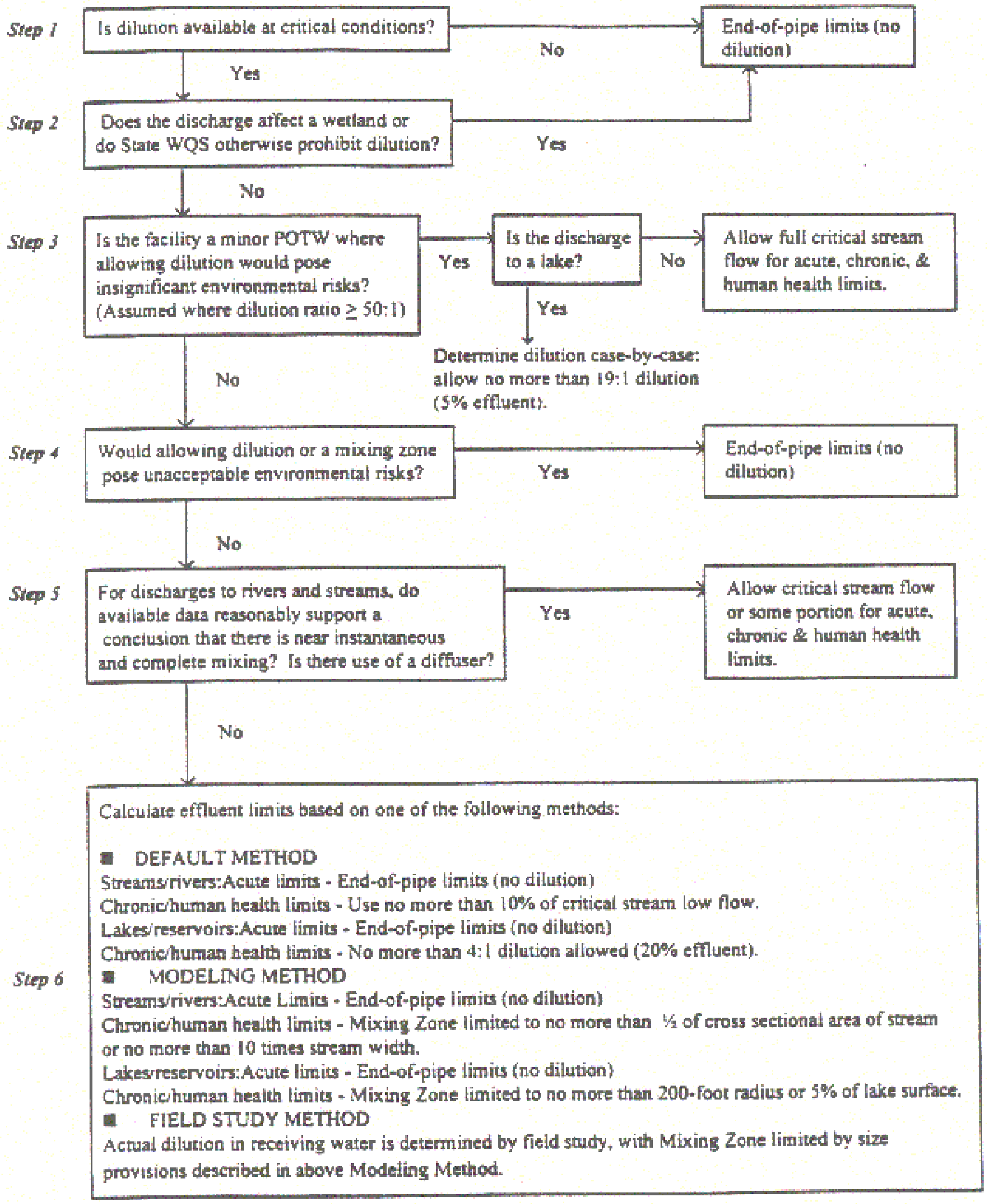
Modeling Method

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 10 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*



* This procedure is applied to both chemical-specific and WET limits. In the case of complex discharges, the dilution or 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 North Dakota State Department of Health for implementing the antidegradation policy found in the Standards of Water Quality for the State of North Dakota, Rule 33-16-02.

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 Section 402 (NDPDES) and 404 (Dredge and Fill) of the Clean Water Act (CWA), and any other activity requiring Section 401 water quality certification. Nonpoint sources of pollution are not included. When reviewing 404 nationwide permits, the department will issue 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 actually 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 an NDPDES permit or CWA § 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 Water Quality for the State of North Dakota 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 IV and Class V 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 15 percent, reduce the available assimilative capacity by more than 15 percent, or increase permitted pollutant loadings to a water body by more than 15 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 NPDES permit limits. However, the existence of a compliance schedule in the NPDES 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 State Department of Health 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 Water Pollution Control Board, the department, and the State Water Commission will solicit public comment and/or hold a public hearing regarding the nomination. The Water Pollution Control Board will review the application record and the public comments, and make a recommendation to the department. After reviewing the board's recommendation, 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 State Health 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.

Appendix B

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 Health (NDDH) 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 NDDH Surface Water Quality Management Program (SWQMP) 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, SWQMP 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) <u>or</u> 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.

Appendix D

Agency and Organization Data Request

Letter, Form and Contacts

October 20, 2015

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, 2016. 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 2016 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,

Michael J. Ell
Environmental Administrator
Division of Water Quality

Letter Contacts

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US Forest Service
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Bismarck, ND 58501

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Energy and Environmental Research Center
University of ND
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Jim Zeigler
Minnesota Pollution Control Agency
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Darrin Kron
Water Quality Monitoring and Assessment Section
Montana Dept. of Environmental Quality
1520 E 6th Ave
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Pete Jahraus
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Terry Steinwand, Director
North Dakota Game and Fish Department
100 N Bismarck Expressway
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Michelle Klose, Assistant State Engineer
North Dakota State Water Commission
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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: _______________________________________

____

Were the data collected according 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: Mike Ell, North Dakota Department of Health, Division of Water Quality, 918 E Divide Ave, 4th Floor, Bismarck, ND 58501-1947

Appendix E

Public Notice Statement Requesting Public Comment on the State of North Dakota's Draft 2016 Section 303(d) List

PUBLIC NOTICE STATEMENT

Notice of submittal to the U.S. Environmental Protection Agency (EPA) and a request for public comment on the State of North Dakota's draft 2016 Section 303(d) List of Waters Needing Total Maximum Daily Loads (TMDLs).

1. Summary

Section 303(d) of the Clean Water Act (CWA) and its accompanying regulations (CFR Part 130 Section 7) requires each state to identify waterbodies (i.e., lakes, reservoirs, rivers, streams, and wetlands) which are considered water quality limited and require load allocations, waste load allocations, or total maximum daily loads. A waterbody is considered water quality limited when it is known that its water quality does not meet applicable water quality standards 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.

Section 303(d) of the Clean Water Act requires states to submit their lists of water quality limited waterbodies "from time to time." Federal regulations have clarified this language, therefore, beginning in 1992 and by April 1st of every even numbered year thereafter, states were required to submit a revised list of waters needing TMDLs. This list has become known as the "TMDL list" or "Section 303(d) list." The state of North Dakota last submitted its TMDL list to EPA on December 31, 2014. This list, referred to as the "2014 list" was approved by EPA on February 12, 2015. The draft 2016 Section 303(d) list, which will be submitted to EPA as part of the integrated Section 305(b) water quality assessment report and Section 303(d) TMDL list (i.e., 2016 Integrated Report), includes a list of waterbodies not meeting water quality standards and which need TMDLs, and a list of waterbodies which have been removed from the "2014 list."

Following an opportunity for public comment, the state must submit its list to the EPA Regional Administrator. The EPA Regional Administrator then has 30 days to either approve or disapprove the state's listings. The purpose of this notice is to solicit public comment on the draft "2016 list" prior to formally submitting the list to the EPA Regional Administrator. In addition, the North Dakota Department of Health is also requesting comment on the draft 2016 Integrated Report.

2. Public Comments

Persons wishing to comment on the State's draft 2016 Section 303(d) List of Waters Needing TMDLs may do so, in writing, within thirty (30) days of the date of this public notice. Comments must be received within this 30-day period to ensure consideration in the EPA approval or disapproval decision. All comments should include the name, address and telephone number of the person submitting comments, and a statement of the relevant facts upon which they are based. All comments should be submitted to the attention of the Section 303(d) TMDL Coordinator, North Dakota Department of Health, Division of Water Quality, 918 East Divide Avenue, 4th Floor, Bismarck, ND 58501 or by email at mell@nd.gov. The 2016 Section 303(d) TMDL list may be reviewed at the above address during normal business hours or by accessing it through the Department's web address (http://www.ndhealth.gov). Copies may also be requested by writing to the Department at the above address or by calling 701.328.5210.

Public Notice Number ND-2016-041

Appendix F

Public and EPA Region 8 Comments on the State of North Dakota's Draft 2016 Section 303(d) List and the North Dakota Department of Health's Responses

Draft 2016 IR Public Comments and the Department's Response

US Bureau of Reclamation Comment: The Department received a phone call from staff from the US Bureau of Reclamation's Dakotas Area Office in Bismarck. They asked that language in Part V of the draft Integrated Report be changed to reflect the fact that Patterson Lake is no longer considered a back-up water supply for the city of Dickinson. They indicated that when the Bureau of Reclamation forgave the loan for the bascule gates, the city's water permit was nullified and the water intake closed.

Department Response to Comment: Language in Part V. B. Chapter 2 was modified to remove Patterson Lake from the discussion on Municipal Drinking Water Supply use.

Scott Korom Comment: Scott Korom with Barr Engineering provided comments on the Executive Summary. Comments were primarily editorial in nature, although one consistent comment was on the use of percentages when discussing the miles of rivers and streams and acreas of lakes and reservoirs attaining beneficial use designations.

Department Response to Comments: Editorial comments were incorporated in both the Executive Summary as well as in the report where appropriate. References to percentages were removed.

Draft 2016 IR EPA Region 8 Comments by Kris Jensen on December 21, 2016 and the Department's Response

US EPA Region 8 Comment: Reconciliation of the numbers of 303(d) listed assessment units and waterbody/pollutant combinations will need to be completed once the final IR electronic files are submitted in Web Express. Currently the numbers I have differ from the State's. I will continue to work on the counts when I return to the office in January and will have questions for you then.

Department Response to Comment: Counts and numbers of Section 303(d) listed waterbodies and waterbody/pollutant combinations were recalculated and changed to reflect the removal of AU ND-10130206-001-S_00 from the list and errors in double counting several waterbody/pollutant combinations.

US EPA Region 8 Comment: In the draft IR, North Dakota recognizes global warming as a concern and the role of wetlands in mitigating climate change (see page 135): "Recently, wetlands have been recognized as a significant source for carbon sequestration. This could make wetlands an important component in the campaign to prevent global warming." Please consider expanding this language into a new section in the IR with a discussion of how climate change may affect the state's water resources, including impacts from drought, heavy precipitation, rising temperatures, heat waves, and other extreme events which may affect North Dakota.

Please consider including a discussion of ways North Dakota can contribute to the mitigation of climate change through initiatives such as soil health enhancement and wetland creation and/or restoration in North Dakota. Consider discussing anticipated water and wastewater infrastructure impacts due to extreme events, and any steps being evaluated to ensure climate resilient infrastructure. Please provide a discussion of anticipated climate change for North Dakota referencing the source of those predictions such as the National Climate Assessment, state climatologist, NOAA, or EPA produced forecasts.

Department Response to Comment: Since this comment is a suggestion to "consider" adding a new section in the IR, due to the time commitment needing to add this section it will not be done for the 2016 IR, but will be considered for the next report.

Draft 2016 IR EPA Region 8 Comments by Vern Berry on January 3, 2017 and the Department's Response

US EPA Region 8 Comment: The impairments shown as "H" (i.e., high TMDL priority) on the 303(d) list match the FY2017 list of WQ-27 priorities, ***except for:*** ND-10130206-001-S_00 Cannonball River, Escherichia coli. For purposes of WQ-27, we agreed that the previously approved TMDL for fecal coliform and E. coli would count as addressing this impairment (i.e., it's currently part of the WQ-27 baseline area).

Department Response to Comment: To be consistent with the FY2017 list of WQ-27 priorities, the Cannonball River segment was deleted from the 2016 303(d) list and added it to the list of waters that have been de-listed with the explanation that the E. coli listing was removed because it was addressed by a TMDL that was completed and approved by EPA in 2009.

US EPA Region 8 Comment: Phase I of the TMDL Prioritization Strategy describes the process and resulting 129 WBPCs (waterbody/pollutant combinations) for the State's original WQ-27 priorities. However, it doesn't capture the 2017 revisions to the WQ-27 priorities. Therefore, I recommend adding an explanation of those revisions to reflect the 2017 revised WBPC count of 77 (which excludes the Antelope Creek temperature delisting). The additional explanation and revised numbers should match those shown as "H" on the 303(d) list.

Department Response to Comment: The section in the TMDL Prioritization Strategy (Appendix B) describing Phase I has been modified to reflect the 2017 revised list of waterbody/pollutant combinations (which I counted as 67 not 77). This matches the revised numbers and those waterbody/pollutant combinations shown as H on the 303(d) list and the 34 WBPCs targeted for TMDL development and alternative plans in the next two years.

US EPA Region 8 Comment: The TMDL regulations specify that the 303(d) list indicate which WBPCs are targeted for TMDL development in the next two years. The 303(d) Vision prioritization and identification of WQ-27 priorities overlaps those "targeted" impairments and complicates the messages for the public and other WQ stakeholders. We included one option for minimizing confusion in the 2016 IR reminders document attached. Since the State's H WBPCs = WQ-27 priorities, please consider adding an asterisk footnote to the "H" WBPCs that you expect to complete TMDLs for in the next 2-years (i.e., H* - those WBPCs the State expects to complete TMDLs for before the next 303(d) list), as another way to indicate the targeted impairments.

Department Response to Comment: Additional language was added to section VI of the IR describing the 34 WBPCs targeted for TMDL development and alternative plans in the next two years. An * was also added to the H for those WBPC in the list and a footnote added as well.

US EPA Region 8 Comment: EPA's 2016 IR guidance memo recommends showing WBPCs expected to be addressed by alternative plans as "L" (low priority for TMDL development). That recommendation is intended to be consistent with the TMDL regulations which do not mention an alternative plan option and also helps to maintain the distinction between each plan type (i.e., an alternative plan is not a TMDL). However, we recognize that these program nuances are difficult to explain and for the public to understand. Because the 303(d) Vision includes alternative plans as an optional approach, the WBPCs addressed by alternative plans remain on the 303(d) list until WQ is restored or a TMDL is developed and the potential to further confuse the public, I think the State's approach is okay for now but we may need to revisit this issue during future list cycles.

Department Response to Comment: No response to comment.